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Locus of control and Human Capital Investment Decisions: The Role of Effort, Parental Preferences and Financial Constraints

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ABSTRACT

We study the relationship between locus of control (LoC) and human capital investment decisions in the adolescence, using PDS lasso to exploit high-dimensional data. While LoC is not significantly associated with graduation from high school once we use exogenous controls, it correlates strongly with dropout age and college attendance even if we take into account predetermined variables and cognitive abilities, and it exhibits a significant positive relationship with plans to apply to college even if we control for potentially endogenous variables.

We find that effort is an important conduit through which LoC operates and it is different from the expectation channel that has been already documented in the literature. The associations are heterogenous: LoC has a significant association with dropout age, high school graduation and college application plans in low-SES families, and with college attendance in mid-SES families. These heterogenous relations are in a large part determined by parental preferences and financial constraints.

JEL codes: D91, I21, I23, I24, I26

Keywords: Human Capital Investment Decision, LoC, Machine learning, PDS Lasso

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A kontrollhely hatása a human tőke befektetési döntésre: az erőfeszítés, a szülői preferenciák és a pénzügyi korlátok szerepe

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ÖSSZEFOGLALÓ

A tanulmányban a kontrollhely és a human tőke befektetési döntések összefüggéseit vizsgáljuk serdülőkorban, ehhez PDS lasso módszert használunk annak érdekében, hogy az extém sok változós adatbázis kezdvező tulajdonságait kiaknázhassuk. A független kontroll változók bevonása után a kontrollhely nem mutat erős összefüggést a sikeres középiskolai érettségi valószínűségével. Ugyanakkor a középiskolai lemorzsolódás életkora és az egyetemre való sikeres felvételi esetében erős összefügést találunk a kontrollhellyel, még akkor is, ha kiszűrjük a független változók és a kognitív képességek hatását. A kontrollhely erős összefüggést mutat az egyetemi jelentkezési szándékkal még azt követően is, hogy a modellben kontrollálunk az egzogén változókra, a kognitív képességekre, és potenciálisan endogen változókra is. Azt találjuk, hogy az egyéni erőfeszítés igen fontos csatorna, amely a belső kontrollhely hatásait közvetíti a humán tőke befektetések és teljesítmények felé. Megmutatjuk, hogy az erőfeszítés eltér a szakirodalomban már dokumentált jövőbeli várakozások csatornájától.

A vizsgált összefüggések heterogének: a kotrollhely erős összefüggést mutat a középiskolai lemorzsolódással, a sikeres érettségi valószínűségével és az egyetemi jelentkezési szándékokkal az alacsony szocioökonómiai hátterű serdülők esetében, valamint a sikeres egyetemi felvételivel a közepes szocioökonómiai hátterű kamaszoknál. Ezen összefüggések heterogenitását a szülők preferenciái és a család anyagi korlátai jelentős mérték,ben meghatározzák.

JEL: D91, I21, I23, I24, I26

Kulcsszavak: Humán tőke befektetési döntések, kontrollhely, gépi tanulás, PDS lasso

Locus of control and Human Capital Investment Decisions: The Role of Effort, Parental Preferences and Financial Constraints

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Abstract

We study the relationship between locus of control (LoC) and human capital investment decisions in the adolescence, using PDS lasso to exploit high-dimensional data. While LoC is not significantly associated with graduation from high school once we use exogenous controls, it correlates strongly with dropout age and college attendance even if we take into account predetermined variables and cognitive abilities, and it exhibits a significant positive relationship with plans to apply to college even if we control for potentially endogenous variables. We find that effort is an important conduit through which LoC operates and it is different from the expectation channel that has been already documented in the literature. The associations are heterogenous: LoC has a significant association with dropout age, high school graduation and college application plans in low-SES families, and with college attendance in mid-SES families. These heterogenous relations are in a large part determined by parental preferences and financial constraints.

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1. Introduction

Those individuals who perceive to have control over their life and believe that life outcomes are due to their efforts are said to have an internal locus of control, while those who attribute those outcomes to external factors, like luck, have an external locus of control (Rotter, 1966). It is one of the most widely studied non-cognitive skills that is related to a vast array of life outcomes: individuals with more internal control tend to a) have higher and faster growing earnings (Andrisani, 1977; Goldsmith et al., 1997; Duncan and Dunifon, 1998; Groves, 2005; Semykina and Linz, 2007; Heineck and Anger, 2010; Piatek and Pinger, 2016; Schnitzlein and Stephani, 2016); b) have better job performance and greater job satisfaction (Judge and Bono, 2001; Ng et al., 2006; Wang et al., 2010); c) lead a healthier life (Strudler Wallston and Wallston, 1978; Wallston et al., 1978; Steptoe and Wardle, 2001; Chiteji, 2010; Cobb-Clark et al., 2014; Mendolia and Walker, 2014; Oi and Alwin, 2017); d) and accumulate more savings (Cobb-Clark et al., 2016; Chatterjee et al., 2011).

When summarizing the main findings of the report on educational equality and opportunity in the US, James Coleman, the renowned sociologist, stated that LoC "was more highly related to achievement than any other factor in the student's background or school." (Coleman, 1966).[1] Much evidence has been accumulating, showing that individuals with a more internal LoC tend to perform better academically (Wang et al., 1999; Heckman and Kautz, 2012; Mendolia and Walker, 2014). However, it is not only school performance that matters for success in life, but also human capital investment decisions, e.g., dropping out of school, graduating from high school, attending university. A growing literature using large and representative samples studies how LoC associates with these decisions.

We use data from the Life Course Survey (Hungary) comprising 10,000 adolescents attending the eighth grade in elementary school in May 2006 and who have completed the National Basic Capabilities Test (a nationwide test in reading and maths, similar to the PISA test). Importantly, in 2006 and 2009, the survey contained a locus of control section, along with an outstandingly rich set of data. Due to attrition the sample size is 7638. In this paper, we add to the literature on the relationship between LoC and human capital investment decisions in three ways.

First, we are the first to show that effort is an essential channel of LoC to human capital investments. As Coleman and DeLeire (2003) already showed, when someone has a more internal LoC, it increases her expectations regarding the returns of a

[1] Coleman did not call it LoC, but referred to it as 'an attitude which indicated the degree to which the student felt in control of his fate.'

human capital investment. We show that students with a more internal LoC exert more effort in studying, which leads to higher achievement and better human capital investment decisions. Moreover, we show that the effort conduit is different from the expectation channel.

Second, we explore the heterogeneity of LoC effect by gender and socioeconomic status (SES). Regarding gender, we find that in all outcomes except graduation from high school LoC plays a more crucial role for females. Mendolia and Walker (2014) find that a more disadvantaged background is related to a stronger association between LoC and educational outcomes. A possible explanation is that more internal control might offset the adverse effects of a lack of positive stimuli and support from home. Our results confirm this finding. Moreover, we offer an alternative explanation. We utilize questions on parental preferences and financial constraints regarding the highest level of education of the child. We report that parental preferences strongly influence the magnitude of the association between LoC and educational outcomes. If parents prefer the child to attain an education lower than finishing high school, LoC will have a very strong association with graduating from high school. That is most likely because that would be an excess accomplishment compared to what is expected from the adolescent. In these families, LoC is not related to higher stake outcomes, like planning to apply to college or attending college, as these are far from realistic options for most of these students. At the other extreme, where parents expect that the child attains college education at the minimum, LoC is not associated with low-stake achievements, like graduating from high school. Also, LoC is not associated with college application plans, as applying ti college is an implicit requirement from their families that they have to meet. In the case of adolescents in between, who seem to have more freedom to decide whether they would like to apply to college or not, it is apparent that LoC is strongly associated with college application plans and actual college attendance. These findings shed new light on the channels of intergenerational transmission of socioeconomic status.

Third, we add to the literature by utilizing machine learning. Economists are concerned about causal effects most of the time. For identification, one needs exogenous variations in the primary variable of interest. However, if not impossible, it is hard to find such exogenous variations in personality traits. The second-best solution is to approach a model that includes all the relevant control variables, thus avoiding biased parameter estimates. However, with increasing the number of control variables, the risk of overfitting the model rises. Post Double Selection lasso is a machine learning technique that uses out-of-sample testing for variable selection, preventing the model from overfitting. This technique assures that the most relevant controls are selected from a large set of potential variables. Our dictionary size, the

number of available control variables, is 119, counting only exogenous controls and 221 if all the exogenous and the channel variables (that potentially mediate the effect of LoC) are included. From the exogenous control variables, at most fifteen are selected in our various specifications, which results in R^2 values of about about 40% in the models. This fit is much higher than those reported in the previous literature. Nevertheless, we still do not claim our results to be causal effects.

We also have two minor additions to the literature. First, besides human capital decisions already considered in the literature (dropout, graduation from high school, college attendance), we can see if LoC is associated with college application plans. It turns out to be an interesting variable because it is not as tightly related to school performance as the other outcome variables, but it expresses aspiration for higher education. Second, beyond exogenous (or pre-determined) variables that cannot be plausibly affected by the LoC, we investigate if the association between LoC and the outcome variable persists even if we consider potential conduits and possibly endogenous variables. We document that the association between LoC and the outcome variable of interest becomes insignificant once we control for exogenous variables and cognitive abilities for the low-end human capital investment decisions (that concern dropping out and graduation from high school). In contrast, for high-end decisions related to tertiary studies (college application plans and attending college), the association remains significant even after controlling for conduits.

In section 2 we review briefly the literature. In section 3 the data are presented. The methodology used in this study is described in 4, and the results are shown in 5.

2. Literature review

Once LoC became an accepted concept in psychology, scholars started to look at how it was associated with different outcomes in different domains, among them academic performance. Most of this research found that students with an internal LoC have a better performance in school, spend more years in education, and are more likely to go to college (Gurin et al., 1969; Bar-Tal and Bar-Zohar, 1977; Diesterhaft and Gerken, 1983; Findley and Cooper, 1983; Keith et al., 1986; Garner and Cole, 1986; Mone et al., 1995; Nelson et al., 1995; Wang et al., 1999). Most of these studies use small samples that are not representative.

More recent research differs from the previous one in (at least) two dimensions. On the one hand, these studies use larger (and hence more representative) data sets. On the other hand, apart from academic performance, more attention has been given to human capital investment decisions that are tightly connected to academic

Table 1: Features of the data used in the literature

Study	Data	Grade / age at wave 1	N	LoC test
Coleman and DeLeire (2003)	US, National Educational Longitudinal Study, 1988-1994, 4 waves	8th grade	13720	Rotter's (1996) internal-external scale
Cebi (2007)	US, National Longitudinal Survey of Youth, 1979-2007, annual waves until 1994, after biannual	10th - 11th grade	1737	Rotter's (1996) internal-external scale
Barón and Cobb-Clark (2010)	Australia, Youth in Focus (YIF) Project, 2006	12th grade, 18 years	2065	7 questions from the Pearlin and Schooler Mastery Scale
Coneus et al. (2011)	Germany, German Socio-Economic Panel, 2000-2007	17-21 years old	2542	Rotter's (1966) scale
Mendolia and Walker (2014)	England, Longitudinal Study of Young People, 2004-2008	9th grade, 14 years	5500	6 questions, test not specified
This study	Hungary, Life Course Survey, 2006-2012, 6 waves	8th grade	7638	4-question Rotter test (1966)

performance. This paper focuses on human capital investment decisions but also takes academic performance into account.

In Table 1, we summarize information on the studies that use large data sets and that are most closely related to our research. As column 2 reveals, most of these papers are based on data from developed parts of the world, like the United States, Australia, and countries from the European Union. These papers - including this study - concentrate mostly on high school and college students, aged 14-21, as shown in column 3. The sample size ranges from less than 2000 to more than 13000; the present study has the second-largest sample size. In these studies, Rotter's test is the most frequently used test to measure the LoC.

Table 2 summarizes the main findings of the literature. As column 3 indicates, the previous literature has investigated how LoC associates with human capital investment decisions related to finishing high school (high-school dropping out, choosing subjects required to go to university, graduating from high school), and university entrance and attendance. We call the first / second set of decisions as low-end / high-end decisions. In this study we use both low-end outcome variables (dropout age, graduating from high school) and also high-end outcome variables (college application plans, attending university). We are not aware of any paper that uses college application plans as an outcome variable.

Column 4 in Table 2 shows the controls used in the literature.[2] Note that all the variables used in the specifications are exogenous (or pre-determined), that is they may affect LoC, but LoC cannot (or is very unlikely to) affect these variables. The first specifications in these studies tend to contain the most basic exogenous variables (e.g. ethnicity / race, gender). Later specifications include variables related to family background and cognitive abilities (if available), though here the order and logic is less clear.[3]

In column 5 in Table 2 we summarize the main findings in a compact form. The different coefficients correspond to different specifications. For instance, in Cebi (2007), the first coefficient (5.4***) corresponds to specification 1, the next one (4.6***) to specification 2 and so on.

Considering low-end decisions, the only paper that studies dropout (Coneus et al., 2011) documents a significant association between LoC and the probability of dropping out at different ages. While for the ages of 18 and 19 years the GPA plays a greater role in explaining dropout, for the ages of 20 and 21 LoC is a more important factor to predict dropout than GPA, in the presence of other controls. Regarding graduation from high school, all papers that investigate this decision report a significant association between LoC and graduation. However, while in Coleman and DeLeire (2003) and Barón and Cobb-Clark (2010) the significance remains after using a large set of controls, in Cebi (2007) it vanishes when cognitive abilities are controlled for. The size of the effect varies from 1.4 pp to 4.5 pp increase in the probability of graduation from high school upon a standard-deviation increase in the LoC. As of subject choice that may determine the possibilities to go to university, Mendolia and Walker (2014) report a significant correlation between LoC and the outcome variable.

Turning to high-end decisions, Coleman and DeLeire (2003) and Cebi (2007) document a significant association between LoC and attending college in the specifications with few controls. However, while it remains significant (albeit only marginally) in Cebi (2007) even after all controls are included, the significance disappears in Coleman and DeLeire (2003), when including parenting controls (that are related to the home environment). Barón and Cobb-Clark (2010) find that LoC correlates significantly with performance at the university entrance exam.

[2]The numbers in parentheses indicate in which specification the variable was used. For instance, in Coleman and DeLeire (2003) the variables following (1) and before (2) are used in specification 1. The variables following (2) (and before (3)) are the ones that the authors use in specification 2 in addition to the previous variables, and so on.

[3]Some papers report only one specification for a given outcome variable.

Table 2: Summary of the main findings in the literature

Study	Methods	Outcome	Controls	Finding
Coleman and DeLeire (2003)	Probit	Graduates from high school	(1) Hispanic, Black, Female, Urban, Region, (2) Math, Reading, GPA, Parents' education, (3) Parenting controls, (4) Family structure	A sd increase in LoC results in a 6.8 / 1.6** / 1.4** / 1.4** pp higher probability of outcome variable.
		Attends college	Same as above	A sd increase in LoC results in a 8.3** / 1** / 0.6 / 0.5 pp higher probability of outcome variable.
Cebi (2007)	Probit	Graduates from high school	(1) Black, Hispanic, Female, Urban, Age, Residence, (2) Parental education, (3) Family structure, (4) Home life, (5) AFQT (5)	A sd increase in LoC results in 5.4*** / 4.6*** / 4.1*** / 3.8*** / 1.5 pp higher probability of outcome variable.
		Attends college	Same as above	A sd increase in LoC results in a 7.4*** / 5.7*** / 6.2*** / 6*** / 2.3* pp higher probability of outcome variable.
Barón and Cobb-Clark (2010)	Probit	Graduates from high school	Social disadvantage, Family structure, Male, Indigenous, Home environment, Parental education, Parent inmigrant, Early born	A sd increase in LoC results in a 4.5* pp higher probability of outcome variable.
		Passes university entry exam	Same as above	A sd increase in LoC results in a 2.9** pp higher probability of outcome variable.
		University entrance rank	Same as above	A one standard deviation change in LoC is associated with an increase of less than one (0.95*) percentiles in one's university ranking.
Coneus et al. (2011)	Probit	Drops out at age 18 /19 /20	GPA, Mother LoC, Female, Family structure, Migration background, Mother education, Mother occupation, West	A sd increase in LoC results in a 1.9* / 2.8*** / 3.7*** pp higher probability of outcome variable at age 18 / 19 / 20.
Mendolia and Walker (2014)	OLS, Probit with propensity score matching	GCSE performance (Has 5+GCSE with A*-C, Has GCSEA*-C in English, Has GCSEA*-C in Maths)	(1) at-birth characteristics (birth weight, premature, ethnicity, gender, family characteristics), (2) other family's characteristics (child's or parent's disability, maternal education and employment status, single parent family, grandparents' education, family income and older siblings)	Being external decreases GCSE performance. Very significant (***) effect in both specifications for all the elements.
		Has A levels (overall, in Maths, Science, English)	Same as above	Being external decreases probability to have A levels. Very significant (***) effect in both specifications overall, ** for Maths and Science, not consistent for English.
		Points in A levels (overall, Maths, Science, English)	Same as above	Being external decreases test scores in A levels. Very significant (***) effect in both specifications overall, ** for Maths and English, * for Science.
		No. facilitating subjects	Same as above	Being external decreases number of facilitating subjects. Very significant (***) effect in both specifications for all the elements.

Even though the idea of LoC seems intuitively important to explain human capital investment decisions, it is vital to uncover how it exactly exerts its effect. The existing literature made essential attempts to unearth the conduits through which LoC affects those decisions. Coleman and DeLeire (2003) show that LoC operates through affecting the expectations of teenagers about future expected income and occupation at the age of 30. More precisely, they find that more internal LoC correlates with more positive expectations about the future.[4] In Coleman and DeLeire (2003)'s interpretation, more positive expectations reflect a higher subjective rate of return on human capital investment that is why more internal students are more likely to graduate from high school and attend college.[5] [6]

Effort may be a further conduit through which LoC operates. Psychologists often link LoC to motivation. Atkinson (1964) claims that motivation has two key elements, motive and expectancy. The latter refers to an individual's judgement to which extent her efforts and actions are causally related to desired results.[7] Motivation can be seen as a prerequisite of exerting effort. Borghans et al. (2008) use a lab experiment to show that internal LoC is associated with higher motivation that, in turn, translates into more effort. There are empirical papers showing the relationship between LoC and effort in job search (Caliendo et al., 2015; McGee, 2015) or in leading a healthy life (Cobb-Clark et al., 2014), but we are unaware of any studies that document such an association between effort put into academic activities and LoC.[8] Our data permit us to check if such a relationship between LoC and effort exists and, in fact, we find that LoC is tightly related to effort.[9]

[4]There are also other studies documenting a link between LoC and future expectations (Marecek and Frasch, 1977; Bush et al., 1998; Mutlu et al., 2010).

[5]Cebi (2007) also investigates the role of expectations, but she fails to find a connection between LoC and future expectations.

[6]Similar arguments have been used to show that positive future expectations suggesting higher perceived health returns to investment in healthy life explains why individuals with internal LoC eat well and exercise regularly (Cobb-Clark et al., 2014).

[7]Bandura (1989) also links motivation to the effort individuals are willing to make.

[8]Mendolia and Walker (2014) speculate on the relationship between LoC and academic effort-making in the following way: "One possible explanation for the negative effects of external LoC is that external individuals tend to think that their choices have less impact on their future, which they believe are mostly driven by luck and external circumstances. As a consequence, these children are less likely to put a strong effort in their school work, as they do not believe this will impact their future. This affects their performance and their chances to achieve high results in their education."

[9]Delaney et al. (2013) document that conscientiousness (a Big Five trait that is positively correlated with LoC (Judge et al., 2002)) positively associates with lecture attendance and study hours at university that can be seen as proxies for effort.

The existing literature also focused on the question whether LoC associates in the same way with the outcome variable of interest in different subsamples, mainly along the socioeconomic status (SES).[10] Barón and Cobb-Clark (2010) document that growing up in disadvantage (captured by family welfare receipt history) does not correlate with the adolescent's LoC. However, Mendolia and Walker (2014) find that the association of LoC with the outcome variables changes with socioeconomic status: more disadvantaged background is related to a stronger association. They speculate that this result may be due to the fact that students from advantaged SES are more likely to receive positive stimuli and support at home and have parents who value more school performance and make efforts that their children succeed in school. Hence, students from high-SES families do not need to have a strong internal control to make good human capital investment decisions, while for students from a low-SES background it is more likely that having an internal LoC makes a difference when making such decisions. We confirm this finding as we find that for three (dropout age, graduating from high school and planning to apply to college) of the four outcome variables LoC exhibits the strongest association for students whose mother has a low level of education. In the case of attending college the strongest correlation is observed when the mother has a mid-level education. In this study, we extend the analysis to how different parental preferences for the level of education of the adolescent explain the differences of the LoC effect by the family SES.

Studies investigating the role of LoC in the labour market have revealed important gender differences (Goldsmith et al., 1996; Hansemark, 2003; Semykina and Linz, 2007; Cobb-Clark and Tan, 2011; Cobb-Clark, 2015) though with mixed results as in some studies females, while in others males experience a stronger impact of LoC. With respect to human capital investment decisions, we are not aware of any paper that studies the effect of LoC separately for females and males. However, in regressions (where females and males are pooled) reported in different studies gender is often significant (see Coleman and DeLeire (2003) and Barón and Cobb-Clark (2010)).

3. Data

We use an outstandingly detailed longitudinal database, Life Course Survey (Életpálya) of the social research institute TÁRKI in Hungary. A sample of 10,000 adolescents was selected from the students who completed the Hungarian National Assessment of Basic Competencies (a PISA-like national standardized test, see Sinka

[10]Coneus et al. (2011) report that the effect of LoC increases with age.

(2010) for details) in the 8th grade in May 2006. 9.8%, 64%, and 24% of the individuals in the sample were born in 1990, 1991, and 1992 respectively. Participation in the survey required the written consent of parents. Due to sample attrition up to the 6th wave in 2012, we are able to use the panel data from about 7600 students.[11] Importantly, in 2006 and 2009, the survey (waves 1 and 4) contained a LoC section. At the time of the 2006 (2009) test, respondents were mostly 15 to 16 (18 to 19) years old.

Table 3 contains the LoC questions, the 4-question version of the Rotter-test that was administered to the respondents (in the brackets, we indicate the valuation of the answers). In each question (a to d) respondents had to choose a statement that describes more their judgment about their own life. Note that for each item and in both years, when LoC was measured, 60 to 80% of the respondents chose the answer indicating internal tendencies.

[11] Appendix A contains a table on the structure of data collection with information on in which year (wave) which question was asked that we use in our analysis.

Table 3: The locus of control pairs of statements - Rotter-test

Question N=7,638	2006	2009
a.) What happens to me is first of all my own doing. (1p)	7,807	5,980
	(78.11%)	(78.42%)
Sometimes I feel that I don't have enough control over the direction my life is taking. (0p)	2,188	1,646
	(21.89%)	(21.58%)
b.) When I make plans, I am almost certain that I can make them work. (1p)	6,681	5,341
	(66.84%)	(69.93%)
It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow. (0p)	3,315	2,297
	(33.16%)	(30.07%)
c.) In my case getting what I want has little or nothing to do with luck. (1p)	7,945	6,016
	(79.57%)	(79.12%)
Many times we might just as well decide what to do by flipping a coin. (0p)	2,040	1,588
	(20.43%)	(20.88%)
d.) Many times I feel that I have little influence over the things that happen to me. (0p)	3,956	2,968
	(39.70%)	(39.18%)
It is impossible for me to believe that chance or luck plays an important role in my life. (1p)	6,008	4,608
	(60.30%)	(60.82%)

There are several ways to use the answers. The easiest is to add up the points, higher points indicating more internal LoC.[12] There are other possible methods like averaging answers (Elkins et al., 2017) or using factor analysis (Mendolia and Walker, 2014; Piatek and Pinger, 2016; Caliendo et al., 2020). We also use factor analysis, and we standardize the variable to come up with our LoC measure with zero mean and unit standard deviation.

As mentioned earlier, we study four outcome variables: dropout age, whether the student graduates from high school, whether the student plans to apply to college, and whether they attend college. We present the summary statistics in Table B.11 in the Appendix.

To illustrate the dimensions and richness of the database, here we briefly report some statistics about it. The database contains answers to 4910 distinct questions, some of which were asked in each wave, and others not.[13] Table B.12 in the Appendix contains the dictionary of all the variables that we use in the analysis.

Related to family background, besides the usual questions on parental education, occupation, and household income, the Life Course Survey contains information even on the level of education of the grandparents, the health, nationality, and languages spoken by the parents. Importantly, it has detailed information on the home environment.[14] A widely used measure of that in empirical studies is the so-called HOME (Home Observation for Measurement of the Environment) scale that is part of the database. This scale incorporates measures related to objects, activities, circumstances, and events at home that may play an essential role in the development of the adolescent. In this survey, a young adolescent short version was administered, which followed the methodology of NSLY (for Human Resource Research, 2004). The elements of the scale are described in Appendix C. The scale consists of 27 items, 9 of which are rated by the interrogator, and the rest is based on the parents' answers. The scale includes two part-scales, cognitive stimulation (13 items) and emotional support (14 items).

Related to individual characteristics, the survey asks, for example, about the number of books and reading habits, it has many questions on the babyhood and

[12]Several other studies follow this strategy (Pearlin and Schooler, 1978; Semykina and Linz, 2007; Cobb-Clark and Schurer, 2013; Caliendo et al., 2015).

[13]The data is organized into four main (family background, individual characteristics, school environment, attrition), and many subblocks. Attrition refers to those respondents who did not respond at a certain wave but then participated in later waves.

[14]According to the developmental psychology literature, psychological and physiological development of the children is strongly related to stimuli at the home environment (Strauss and Knight, 1999; Davis-Kean, 2005; Sarsour et al., 2011).

childhood (e.g., birth weight; length of breastfeeding; if the parents read fairy tales; if they played board games), on health (asking about all major diseases), on self-evaluation, on employment, on future expectations, on friends, (un)healthy life (e.g., exercising, smoking, alcohol or drug use), on prejudice, on political orientation.

Related to school environment, the database has detailed information on the school the respondent attends, on the school performance, on schooling history (e.g., the age of starting school, schools that the respondent went to earlier), on the class (e.g., composition of the class in terms of socioeconomic status), on extracurricular activities, on parental involvement in schooling, on attachment to the school, on absenteeism and dropping out.

As the database works with a tremendous number of variables, there is a high probability that at least one variable is missing for an individual. To avoid sample selection on missing variables, we impute missing values of control variables. We use the mean of the nonmissing observations in case of continuous variables and the mode in categorical variables.

4. Empirical method

Economists are usually after the causal effects. However, it is challenging, if not impossible, to find any exogenous variability in the LoC, which would allow for causal analysis. A second-best solution is to include the best possible explanatory variables to outrule confounders. In the previous literature, several variables are used as controls to measure the association of LoC with human capital investment decisions, see Table 2. Unless restricted by data availability, the specifications chosen reflect a professional judgment that might be correct or not. Nevertheless, various studies use different sets of control variables, which indicates that there is no scientific consent in this question. Here, we circumvent this issue by making use of machine learning.

We turn to the Post Double Selection (PDS) lasso method of Ahrens et al. (2019), based on Belloni et al. (2012, 2011, 2014b,a, 2016) which is designed to estimate causal effects after a lasso selection procedure, using high-dimensional data.[15] Although we do not claim our results to be causal, we would like to get as close to the

[15]The lasso technique uses shrinkage and thus offers a simple way to select a model with reasonably few variables, which performs best in predicting the value of the dependent variable out of sample (see https://web.stanford.edu/ hastie/StatLearnSparsity/). We are not the first to use machine learning techniques to select control variables. Angrist and Frandsen (2019) claim that "ML may be useful for automated selection of ordinary least squares (OLS) control variables." Other examples include Böheim et al. (2020); Fluchtmann et al. (2020).

causal population parameter as possible.

During the double selection part, PDS lasso selects control variables in two steps, which make the best out-of sample prediction for the actual dependent variable ($Y_{i,t+n}$) in the first step, and the LoC variable ($LoC_{i,t}$) in the second step. As the last step, a simple OLS regression is estimated using the union of the selected control variables.

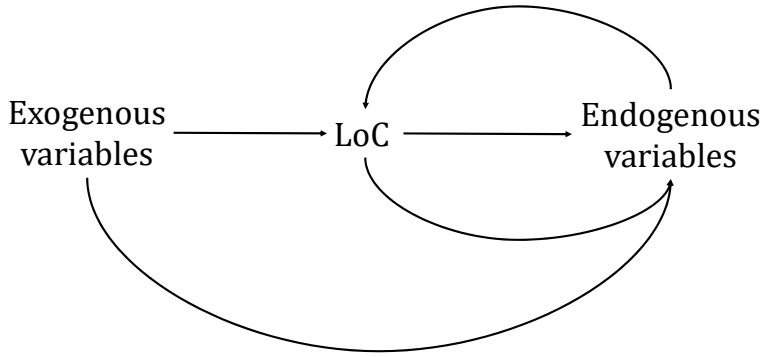
$$Y_{i,t+n} = \gamma \times LoC_{i,t} + X'_{i,t-m}\beta + \xi_{i,t} \tag{1}$$

where n and m may take different values for each variable, due to data availability, and $n = \{-3, -2, -1, 0, 2, 3\}$ and $m = \{1, 2, 3\}$. This means that in the regression, the timing of the variables are selected such that the control variables refer to years 2006 to 2008, the LoC values are from 2009, and the outcome variables refer to various years in the database. The robust standard errors are clustered at the school level. We include four dependent variables in the regressions: dropout age, a dummy on graduating from high school, a dummy on planning to go to college, and a dummy on attending college.

Ideally, we would have a database that included all the factors that determine LoC, as well as all the factors that influence the outcome variables. Also, the ideal timing of these data would be such that the explanatory variables predate the outcome variables. In our regressions, we use LoC as measured in 2009, so that we can include a wide range of factors that determine LoC, which were measured before 2009. If we were to use LoC measured in 2006, we would be able to include only a very limited number of such factors, which were measured in May 2006 or determined before 2006, like gender or parental education. This strategy, however, comes at a cost. The literature on non-cognitive skills has pointed out that the contemporaneous measurement of the non-cognitive skill and the outcome variable may be problematic because the direction of the effect is not clear (Almlund et al., 2011) and it may lead to overestimation of the impact of LoC (Piatek and Pinger, 2016). We have no contemporaneity issue in the case of two of the outcome variables.[16] First, graduating from high school, LoC was measured in October 2009, and then students graduated in May 2010. Second, attending college clearly postdates the measurement of LoC in 2009. On the contrary, dropout age is measured throughout the six waves, some preceding the year 2009. Moreover, college application plans are measured in 2009 on the same day as LoC. In all four cases, we claim to be measuring

[16]Table A.10 in the Appendix contains information on when LoC and the outcome variables were measured.

Figure 1: Variable structure



associations; however, in case of the non-contemporaneous outcomes, our estimates are likely closer to the causal effects.

We distinguish between different sets of control variables based on their degree of exogeneity. In line with the literature, the first set of variables that we use in our analysis are exogenous (or pre-determined). That is, these variables are not affected by the LoC of the student. Note that in the related literature (see Table 2) these variables are the predominant ones, and most of the studies restrict their attention only to these variables, see for instance Mendolia and Walker (2014). The exogenous variables include circumstances determined independently of the adolescent's cognitive and non-cognitive characteristics, such as the level of education and labor market status of the parents, home environment, verbal or physical abuse in earlier years, or birth weight. Some additional variables are also exogenous in adolescence, like the financial status of the family and the living circumstances of the household in general.

In contrast, the endogenous variables might affect LoC and vice versa (see Figure 1). These variables include personality traits other than LoC (like self-esteem, emotional stability), health status, and circumstances that are likely correlated with LoC (such as bullying in school or adverse behavior of the adolescent). The endoge-

nous variables can be thought of as channels that mediate the effect of LoC to the outcome variables of interest. These variables are included in the second to sixth set of controls, as shown in Cols 3 to 7 in Table 6. We refer to endogenous variables as channels in our regressions, acknowledging the fact that these variables in themselves could be regarded as outcomes.

By adding the sets of endogenous variables, instead of going for the exact point estimate, we are after the channels likely to mediate the association between LoC and the human capital investment decisions.

5. Findings

5.1. Descriptive statistics

In Appendix D we provide a detailed analysis on our LoC measure, including descriptive statistics about the distribution and the determinants of the level and the change of LoC. Here we briefly summarize the main findings. Our sample contains a high share of students with internal tendencies. The distribution of the change is bell-shaped, peaking at zero, suggesting that LoC is a stable trait.[17] The PDS lasso estimates with only exogenous variables indicate that many variables related to the family background (home environment, parental education, household's financial position) predict LoC. All of these variables have the expected sign: more (less) favourable home environment, better (worse) schooling of the parents and grandparents, better (worse) financial position of the household associates positively (negatively) with the level of internal tendencies in 2009. When we allow PDS lasso to select also from endogenous variables, many other variables also associate with the level and change of LoC in the expected way, for instance, psychological traits (e.g., self-esteem), health-related variables, and environmental factors not related to home, but to school and friends. When considering endogenous variables, lasso selects considerably less exogenous variables, suggesting that those endogenous variables mediate the effect of the exogenous variables that have been dropped. Overall, our findings related to the stability and determinants of LoC are in line with the literature.

In Table 4 we present summary statistics for the variables of most interest to us. LoC is always higher in the groups with more favourable outcomes (e.g. above-median dropout age), suggesting that more internal tendencies associate with positive

[17]There is no change in LoC for 15% of the sample, and and 56% of the changes are at most 0.25 of the standard deviation. We see only 0.78% (0.75%) of individuals experiencing the maximum downward (upward) change.

outcomes. We observe the same pattern when considering our cognitive measures like GPA, test scores in math, and reading. Better outcomes correlate with better cognitive measures. Being female relates positively with better outcomes. Mother's education correlates expectedly with the outcome variables because the share of low-educated (high-educated) mothers is higher when worse (better) outcomes are considered. Household income exhibits the expected relationship: higher incomes associate with better outcomes. We see the same pattern with the components of the HOME scale. The difference in the scores of these scales between worse and better outcomes is clearly larger for the HOME cognitive scale, suggesting that it plays a more important role in human capital decisions than the HOME emotional scale. The last three variables (mother's education, household income, HOME scale) capture family background, and overall, better family background correlates with better outcomes, as expected. Conduits through which LoC may operate also associate with the outcome variables as expected . Hence, more positive future expectations (either considered jointly as a factor variable, or the elements of it from which we report two) are related with better outcomes. The same occurs with effort, either when considered as a factor composed of several elements or when those elements are taken into account separately (see study time and effort grade). Better outcomes also associate with the ability of the family to pay for the child's studies (a constraint), and also with the positive parental preferences regarding the minimum or ideal educational attainment of the child.

Table 4: Summary statistics for the entire sample and by outcome variables

	Entire sample				Dropout age		High school graduation		Plans to apply to college		Attends college	
	Mean	SD	95% CI		< median	median <	No	Yes	No	Yes	No	Yes
LoC (2009)	0.018	0.014	-0.009	0.046	-0.116	0.063	-0.163	0.096	-0.097	0.169	-0.070	0.185
Cognitive: GPA	3.529	0.012	3.506	3.552	3.186	3.706	3.101	3.767	3.233	4.036	3.285	4.136
NABC: reading	-0.277	0.015	-0.306	-0.248	-0.889	-0.015	-1.059	0.124	-0.748	0.451	-0.677	0.601
NABC: math	-0.159	0.014	-0.187	-0.132	-0.683	0.077	-0.789	0.171	-0.559	0.479	-0.515	0.657
Female	0.463	0.007	0.449	0.476	0.413	0.483	0.381	0.505	0.414	0.539	0.430	0.533
Mother's education:												
low	0.506	0.007	0.492	0.520	0.752	0.394	0.798	0.351	0.675	0.238	0.648	0.187
mid	0.314	0.007	0.301	0.327	0.191	0.366	0.167	0.388	0.249	0.404	0.266	0.404
high	0.180	0.005	0.169	0.191	0.058	0.240	0.035	0.261	0.076	0.358	0.087	0.409
Household inc. (000 HUF)	221.287	1.896	217.570	225.003	199.637	230.693	198.676	232.469	202.855	250.586	205.365	257.444
HOME Cognitive	82.696	0.362	81.986	83.405	67.989	88.660	65.339	91.040	72.946	96.604	74.706	98.646
HOME Emotional	99.467	0.310	98.860	100.074	96.961	100.073	96.019	100.770	97.473	101.716	97.907	101.769
Future exp. (factor)	0.005	0.013	-0.020	0.029	-0.328	0.107	-0.383	0.158	-0.228	0.284	-0.192	0.333
Expectation:												
earn more than avg (2008)	0.553	0.004	0.546	0.560	0.494	0.566	0.482	0.576	0.506	0.604	0.513	0.614
Expectation:												
permanent employment (2008)	0.695	0.004	0.688	0.702	0.612	0.713	0.612	0.718	0.645	0.737	0.653	0.740
Effort (factor)	-0.029	0.011	-0.050	-0.008	-0.296	0.068	-0.383	0.136	-0.250	0.286	-0.207	0.323
Study time (2007)	4.553	0.040	4.475	4.630	3.830	4.788	3.594	4.970	3.981	5.306	4.092	5.385
Effort grade (2007)	3.796	0.012	3.77	3.820	3.493	3.937	3.433	3.991	3.533	4.232	3.573	4.323
Can pay for child's												
college studies (2006)	0.658	0.007	0.645	0.671	0.423	0.761	0.332	0.830	0.486	0.925	0.528	0.938
Minimum wanted education												
for child: college (2006)	0.276	0.006	0.263	0.288	0.106	0.338	0.050	0.382	0.119	0.507	0.146	0.547
Ideal education for												
child: college (2006)	0.570	0.007	0.557	0.584	0.285	0.699	0.165	0.788	0.351	0.920	0.404	0.941

5.2. Conduits of LoC

Here we investigate if LoC associates with the two conduits that we consider: future expectations and effort. A strong association would suggest that LoC may operate through these conduits.

We measure expectations with five different questions from 2008. Respondents have to rate the probability that at the age of 35, i) they will earn more money than the average, ii) they will be in the decile with the highest earnings, iii) will have a permanent job after finishing school, iv) will earn more than HUF 100,000 (appr. USD 350), and v) earn more than HUF 200,000 (appr. USD 700). We use factor analysis to generate a factor that we use as a dependent variable. The level of the expected salary and the probability of having a permanent job load onto factor 1, while factor 2 relies on relative salary.[18] In this section we will use factor 1 as our dependent variable to see if LoC is associated with it.

The effort is measured with teacher-given grades on diligence (in 2007, 2008 and 2009), questions on studying time regarding hours spent studying in a week and whether it occurred that the individual studied after 8PM on weekdays, or studied on weekends (in 2007 and 2008).[19] Similarly to expectations, we utilize factor analysis to come up with the dependent variables that we will use below. Grades on diligence and study time load on factor 1, while the weekend study time and studying after 8PM load onto factor 2. Table B.11 reports summary statistics for these factor variables.

In Table 5 we show the results of PDS lasso regressions where the dependent variable is future expectations or effort, and we deploy more and more control variables in the different specifications. More specifically, in Column 1, we estimate a univariate regression with LoC as the sole explanatory variable. In Column 2, we add exogenous controls, in Column 3 we allow PDS lasso to include cognitive controls as well. In the next specification (Column 4), we add the conduit other than the dependent variable. So in the regression explaining expectations, we use effort as an independent variable and vice versa. We do so to see if the two conduits that we propose reflect the same mechanism or not. In the most thorough specification, in Column 5, besides the previous controls, PDS lasso also selects from the set of endogenous variables. We observe a very strong association between LoC and future

[18] In Appendix E we show the graphical representation of the factor loadings, both for expectations and effort.

[19] In Hungary, students get grades on two general issues: behavior (how they behave in school) and diligence (how much effort they make in the school). The second one is clearly related to the idea of effort.

Table 5: LoC, expectations and effort

	None	+Exogenous	+Cognitive	+Effort	+Other
	(1)	(2)	(3)	(4)	(5)
	Expectations (2008)				
LoC score in 2006	0.149***	0.098***	0.096***	0.096***	0.064***
	[0.018]	[0.017]	[0.017]	[0.017]	[0.018]
Observations	3,352	3,232	3,232	3,232	3,223
Clusters	1328	1299	1299	1299	1299
Selected controls	0	11	13	13	16
Dictionary size	0	77	79	80	109
R-squared (in-sample)	0.0259	0.180	0.183	0.183	0.187
R-squared (out-of-sample)	0.0144	0.151	0.163	0.163	0.172

	None	+Exogenous	+Cognitive	+Exp.	+Other
	(1)	(2)	(3)	(4)	(5)
	Effort (2008)				
LoC score in 2006	0.069***	0.037***	0.033**	0.031**	0.029**
	[0.014]	[0.013]	[0.013]	[0.013]	[0.014]
Observations	3,352	3,232	3,232	3,232	3,223
Clusters	1328	1299	1299	1299	1299
Selected controls	0	6	7	7	10
Dictionary size	0	77	79	80	109
R-squared (in-sample)	0.00857	0.210	0.221	0.221	0.227
R-squared (out-of-sample)	0.0140	0.230	0.239	0.244	0.248

	None	+Exogenous	+Cognitive	+Exp.	+Other
	(1)	(2)	(3)	(4)	(5)
	Effort (2007-8-9)				
LoC score in 2006	0.099***	0.055***	0.047***	0.041***	0.034**
	[0.018]	[0.015]	[0.015]	[0.015]	[0.016]
Observations	3,352	3,232	3,232	3,232	3,223
Clusters	1328	1299	1299	1299	1299
Selected controls	0	9	11	11	13
Dictionary size	0	77	79	80	109
R-squared (in-sample)	0.0117	0.310	0.342	0.342	0.349
R-squared (out-of-sample)	0.0187	0.327	0.353	0.353	0.363

Standard errors in parentheses. */**/*** denotes significance at 10 / 5 / 1 % level.

expectations even after controlling for exogenous variables, cognitive abilities, effort and endogenous variables. This is in line with Coleman and DeLeire (2003) and Caliendo et al. (2020) who claim that an important channel through which LoC operates through future expectations. Turning to effort, we see a very similar picture. LoC correlates strongly with effort (considering effort data only from 2008 as well as from 2007-2009) even when we take into account exogenous and cognitive variables, expectations and the endogenous variables. Overall, there is strong evidence that individuals with a more internal LoC are more likely to exert effort. The point estimate on the effect of Loc on effort (2007-8-9) in Column 3 means that even after controlling for exogenous variables and cognitive ability, a one standard deviation increase in LoC would increase effort by 0.047 which is an increase of 5.3% of the standard deviation of effort (calculating with a standard deviation of 0.871 as shown in Table B.11 in the Appendix).

Column 4 indicates that the two conduits represent different mechanisms through which LoC operates, because neither the coefficient nor the significance of LoC changes upon including the other conduit.

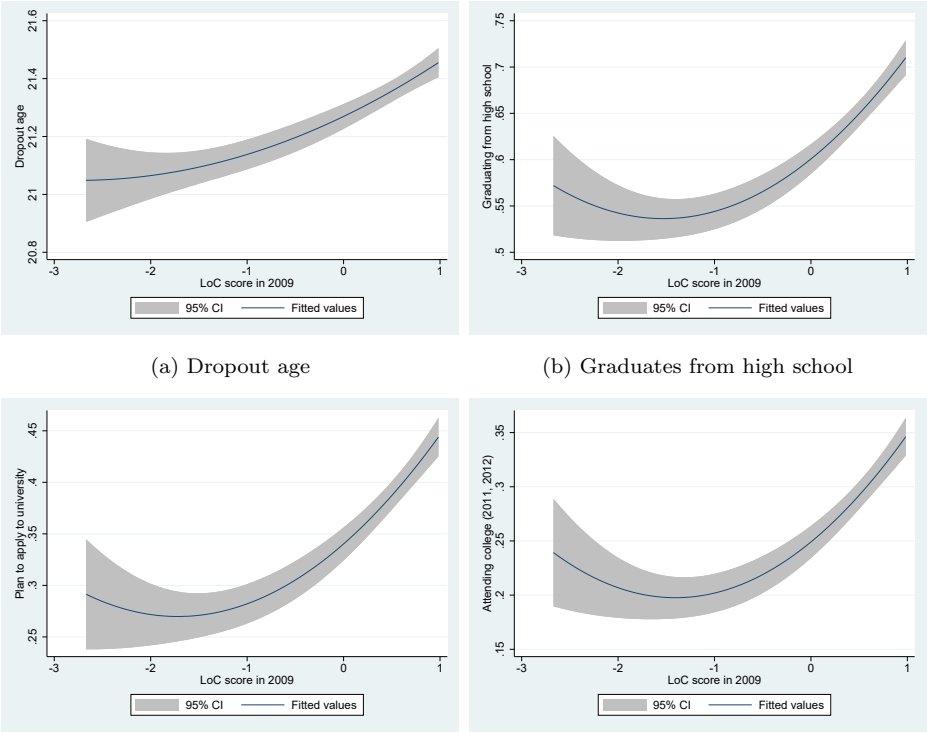
5.3. LoC and human capital investment decisions

In Figure 2 we show the raw associations between the outcome variables and LoC. In all cases, more internal LoC correlates with better outcomes. For graduating from high school, college plans and college attendance, Figure 2 suggests some non-linear relationship. However, given the wide confidence interval for low values of LoC, an increase in LoC for those values does not correlate with the outcome variables. In contrast, for larger values of LoC, more internal tendency goes hand in hand with better outcomes.[20]

Table 6 contains our main results. For each outcome variable, we have seven specifications. Column 1 indicates the raw association of LoC with the outcome variable without any further controls. LoC associates at 1% significance level with each of the outcome variables in the expected way, indicating that adolescents with more internal tendencies drop out of school at an older age and are more likely to graduate from high school, to plan to go to college and to attend college. The effects are substantial as a one-standard deviation increase in LoC is estimated to lead to a 0.134 year increase in dropout age, or a 5.4 / 6.3 / 5.6 percentage point increase in the likelihood of graduating from high school / college plans / college attendance.

[20]LoC of the students in our sample is skewed to the left, so students in our sample tend to have internal tendencies. Hence, at the lower end of the distribution, we have fewer observations and more noise.

Figure 2: Raw associations between LoC and the outcome variables. Lowess curves.



(a) Dropout age

(b) Graduates from high school

(c) Plans to apply to college

(d) Attends college

Note that the R-squared (in or out of sample) is a meager 1.2-1.9%.

In Column 2 we add exogenous controls.[21] Most of the exogenous variables that PDS lasso selects to are related to family background. For instance, HOME cognitive scale appears in the regressions for each outcome variable and is significant at the 1%. Similarly, the variable about parental preferences on the ideal education level is selected for each outcome variable and is significant at 1%. Other control variables are selected only for some of the outcomes. For instance, financial distress of the family has a strong negative association with dropout age, but does not prove to be a relevant factor for the other outcomes.

As the selected controls row indicates in each panel, the PDS lasso technique selects 9 to 15 controls from the set of exogenous variables. The coefficient of LoC drops markedly (by 57 to 78%) in all cases. It remains only marginally significant

[21] Appendix F contains the complete regressions for all the columns reported in Table 6.

when considering if the student graduates from high school, suggesting that for this decision factors related to the family background are very important and explain most of the variation in the outcome variable. The coefficient reveals that a standard deviation increase in LoC is associated with a 1.2 percentage point (corresponding to an 1.9% increase, calculated with averages shown in Table B.11) higher probability of graduating from high school. This is very similar to the 1.4 percentage point finding in the most related specification in Coleman and DeLeire (2003) and lower than the 3.8 and 4.5 percentage point increase documented by Cebi (2007) and Barón and Cobb-Clark (2010), respectively. Furthermore, a standard deviation increase in LoC correlates with a 2.3 percentage point (that is, a 6.6% increase, calculated with averages shown in Table B.11) higher probability of planning to apply to college (for which there are no comparable findings in the literature). Last, a standard deviation increase in LoC associates with a 2.4 percentage point (a 8.8% increase, calculated with averages shown in Table B.11) higher probability of college attendance, that is higher than the non-significant 0.5 percentage point reported by Coleman and DeLeire (2003), but lower than the significant 6 percentage point documented by Cebi (2007).

After controlling for exogenous variables, LoC is significant at the 5% for dropout age, and maintains 1% significance for college plans and attending college. It is noteworthy that the inclusion of variables that - to a large degree - predict LoC does not eliminate the association of LoC for three of our outcome variables. The presence of the exogenous variables increases dramatically the predictive power of the model as R-squared (in or out of sample) rises to 25-45%.

In Column 3 we allow PDS lasso to select also cognitive measures into the regression as Cebi (2007) pointed out that controlling appropriately for cognitive abilities may weaken or remove the significance of LoC. Our cognitive measures include the test scores in reading and mathematics at the National Assessment of Basic Competencies. In fact, for all the outcome variables both reading and math scores are included in the regressions and in all cases they are significant at least at the 5%. Note that the number of selected controls drops in three cases even though we added two new items to the set of variables from which PDS lasso can select control variables. The coefficient of LoC decreases moderately in all cases. The significance level changes only in one case, as LoC ceases to be significant when predicting graduation from high school. Interestingly, in Cebi (2007) it is also at this stage when LoC becomes insignificant, moreover the size of the coefficients is very similar (1 vs 1.5 percentage point). After allowing for cognitive abilities, LoC still has a significant association with dropout age, planning to go to college and college attendance at least at the 5% significance level. Again, our results are very similar to Cebi (2007)'s

findings if we consider college attendance, as she reports a significant coefficient of 2.3 percentage points, very similar in magnitude to our 1.9 percentage points. The predictive power of the model increases further by 1-7 percentage points.

Next, in Column 4 we explore the role of expectations, allowing PDS lasso to select from the expectation variables also besides the variables that we considered in the previous regressions. From the expectations variables, PDS lasso selects three that appear in the regressions of all outcome variables. Two refer to the probability that the salary of the respondent at her / his first employment will be over 100,000 / 200,000 HUF, and the third is about the probability to earn a higher wage than the average at the age of 35. The literature proposes that such positive expectations reflect that the respondents have more favourable expectations on the rate of return in human capital investments. The coefficient of LoC remains the same or decreases only slightly in all cases except dropout age, where we observe a substantial drop.

In fact, as a consequence of this drop, LoC ceases to be significant in explaining dropout age. As dropout age and LoC are measured contemporaneously, there are two possible explanations for this. First, the different view on the rate of return plays a vital role in dropout, and LoC seems to operate through this conduit. Second, the causality may go the other way around, that after a dropout, the expectations become very low and this happens more often if LoC is more external.

After allowing PDS lasso to choose from such a wide range of variables, LoC remains still significant at least at the 5% for the 'high-end' decisions (college plans and attending college). In this specification, the predictive power of the model increases very little for all outcome variables, except for the dropout age where we see a marked increase. This is in line with our interpretation that future expectations play a large role in understanding the dropout age.

In Column 5, we consider the role of effort as a potential conduit through which LoC may operate. To be able to assess the relative role of effort to future expectations, in this column, we do not allow PDS lasso to select from the variables corresponding to expectations. We capture effort through self-reported study time in 2007 and 2008 (hours per week), if the student studies after 8 PM, the hours that the student spends studying on weekends, and the grade on effort in 2007 and 2008 which is given based on the diligence of the student in school. All of these variables are selected in at least one specification, and they are often very significant. For all outcome variables, the drop in the coefficient of LoC is more extensive when we consider effort (Col 5) than in the case of future expectations (Col 4), suggesting that LoC may be more related to the former. This is also corroborated by the fact that the increase in predictive power is higher when we add effort than after including future expectations. Overall, effort seems to be at least as important a conduit as

Table 6: OLS estimates of the association between LoC and the outcome variables

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				A. Dropout age			
LoC score in 2009	0.134***	0.046**	0.045**	0.027	0.024	0.024	0.028*
	[0.025]	[0.022]	[0.022]	[0.021]	[0.017]	[0.017]	[0.017]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	15	13	17	20	24	34
Dictionary size	0	119	121	131	137	147	221
R-squared (in sample)	0.0130	0.258	0.268	0.316	0.431	0.441	0.484
R-squared (out of sample)	0.0124	0.249	0.258	0.319	0.469	0.479	0.508
				B. Graduates from high school			
LoC score in 2009	0.054***	0.012*	0.010	0.009	0.006	0.006	0.006
	[0.009]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	14	14	17	21	23	30
Dictionary size	0	119	121	131	137	147	221
R-squared (in sample)	0.0135	0.430	0.458	0.460	0.484	0.485	0.499
R-squared (out of sample)	0.0187	0.451	0.482	0.483	0.504	0.503	0.511
				C. Plans to apply to college			
LoC score in 2009	0.063***	0.023***	0.021***	0.021***	0.016**	0.016**	0.016**
	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	13	12	14	16	19	26
Dictionary size	0	119	121	131	137	147	221
R-squared (in sample)	0.0153	0.411	0.449	0.450	0.491	0.493	0.498
R-squared (out of sample)	0.0175	0.400	0.444	0.445	0.478	0.479	0.482
				D. Attends college			
LoC score in 2009	0.056***	0.024***	0.019**	0.017**	0.015*	0.013	0.015*
	[0.010]	[0.009]	[0.009]	[0.009]	[0.008]	[0.008]	[0.008]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	9	11	14	15	18	24
Dictionary size	0	119	121	131	137	147	221
R-squared (in sample)	0.0131	0.337	0.409	0.411	0.452	0.453	0.456
R-squared (out of sample)	0.0158	0.361	0.426	0.428	0.460	0.462	0.466

Standard errors in parentheses. */**/*** denotes significance at 10 / 5 / 1 % level.

future expectations. Regarding dropout age, the significance of LoC vanishes when we include effort, similarly to future expectations. Relative to future expectations, effort has a stronger effect in the 'high-end' decisions because there its inclusion lowers the significance of LoC a lot more. However, even after this lowering the association between LoC and college plans / attending college remains significant at the 5% / 10% significance level.

When we consider both conduits at the same time (see Column 6), PDS lasso selects always the future expectations variables that were chosen also in Column 4 and from the effort variables effort grades in years 2007 and 2008 and weekly study time are chosen for each outcome variable. The effort variables tend to be significant more often than the future expectations variables. Compared to the inclusion of effort (Column 5), we see no change in the coefficient of LoC for three of our outcome variables and in the fourth case the decrease is modest. The increase in R-squared is also very small. The inclusion of both conduits eliminates the significance of LoC to predict college attendance (though when considering them separately, LoC remained significant), indicating that LoC exerts its impact by affecting both future expectations and effort. Interestingly, the significance of LoC survives the incorporation of both conduits when we predict college plans, showing that it is not through future expectations or effort that LoC impinges on this human capital investment decision.

Column 7 has the largest dictionary size, including variables which could be outcomes themselves, like personality traits (emotional stability) and behavioural variables (related to health, sex, etc.). Even with this broadest set of variables, LoC remains significant at 5% for college plans. This result is intuitive, as all the other outcome variables are a sort of achievement, where internal LoC can have an affect only if it facilitates a change in behaviour (e.g., putting more effort in studying). So LoC exerts its effect through certain channels. Whereas, filling an application form is a mere expression of wants, where a more internal LoC can prove just enough.

Interestingly, in this last specification, the predictive power of the models does not increase much, neither does decrease the point estimate of LoC. Looking at the complete regressions we observe that often the new controls are significant while previous controls lose significance, suggesting that this additional set of controls do not really control for additional exogenous variations, rather these are channels through which the controls included before exert their effects.[22]

[22]For instance, regarding dropout age the significance of father working and financial distress vanishes, while the number of positive events appears as a significant variable. Interestingly, the endogenous variable that is significant concerning all outcomes is the age at the first sex.

5.4. Heterogeneity

The association of LoC with the outcome variables may vary across subsamples. Studies about the relationship between LoC and labour market outcomes concentrated on gender differences (see Cobb-Clark (2015)). We find that when we consider graduating from high school, LoC is slightly more relevant for males, however regarding the other outcome variables, LoC plays a more important role for females. While LoC ceases to be significant for males in all outcomes when we add the exogenous variables, it remains significant for females for dropout age, planning to apply to college and college attendance. The difference is starkest in the case of plans to apply to college as there LoC remains significant for females even when the endogenous variables are added.[23], while studies on human capital investment decisions focused on the role of socioeconomic status. In this section, we concentrate on how the association of LoC with the outcome variables varies according to socioeconomic status. We go a step further in this analysis by utilizing questions regarding parental preferences on the adolescent's highest educational attainment and financial constraints. We offer an alternative explanation as to why LoC plays a different role in case of low, middle and high SES students.

The role of socioeconomic status related to human capital investment decisions received attention in the recent literature. Barón and Cobb-Clark (2010) investigate if growing up in disadvantage, captured by family welfare receipt history, affects how LoC influences educational outcomes and report no significant association. In contrast, Mendolia and Walker (2014) find that LoC has a larger impact for low-SES students.[24] They conjecture that this result is because students with a high-SES background are more likely to live in a more stimulating home environment, with parents closely following and supporting their school work.

Given the divergent findings in the literature, we first investigate if LoC correlates with the outcome variables differently according to socioeconomic status (see Table 7). To capture SES, we use the mother's education that we classify as low / mid / high (corresponding to less than high school / high school / college). The coefficients in Table 7 indicate that indeed, the impact of LoC is dependent on the mother's education. When the mother's education level is high, in three out of four cases LoC is not significant even in the univariate regressions (see Column 1). In case

[23]Our findings related to gender differences are summarized in Appendix G.

[24]Related to other non-cognitive skills it has been also shown that non-cognitive skills have a differential association with educational outcomes. For instance, Lundberg (2013) shows that elements of the Big Five affect individuals' schooling outcomes differently for men and women, and also according to family background.

of mothers with lower education level (low and mid), LoC associates strongly with the outcome variables if we do not use any further controls. However, when we add exogenous variables, in all but one case, the significance disappears in the case of mid-education mothers. For dropout age, graduation from high school and college plans, clearly LoC has the most significant association for students whose mother ended up with low education. For college attendance, we observe the largest effect in case of mothers with a middle level of education. Overall, these results are in line with Mendolia and Walker (2014).

We make one step further to understand better how family background interacts with LoC. Based on the existing literature, it is not clear if the stronger association that we observe in students from a low-SES background is due to the poor stimuli received at the home environment, the parental preferences (parents do not want their child to invest in human capital) or financial constraints (parents cannot or are not willing to financially support the human capital investment).

Our data set contains three relevant questions in this regard. The first / second question asks the parents about the ideal / minimum level of education they would like their child to obtain. The third question asks how long they can / plan to finance the education of their child. The first two questions are more related to parental preferences about the child's educational attainment, while the last one is informative about the financial constraint.

By studying the role of parental preferences and / or financial constraints in the association between LoC and the outcome variables, we complement Mendolia and Walker (2014), because both of them are highly related to SES, see Table 8 and Appendix H). We start with parental preferences and we define three groups. Parental preferences are low if both the minimum and ideal education level is less than graduating from high school. In this group, parents do not expect much from their children, and the lack of expectations may affect their motivations and educational achievement. We call this group *strict low*. We expect that for (most of the) students in this group tertiary studies are not something that they strive to achieve so LoC may be less critical for them when we consider the high-end decisions. For low-end decision, LoC may make a difference. At the other end of the spectrum, we define another group (that we call the *strict high* group) where both the minimum and ideal parental preferences are at least a college degree.[25] In this group, students are expected to end up in college, so graduating from high school is a must for them, so LoC may be less important for low-end decisions. However, in high-end decisions

[25]We discard from the analysis those observations where the minimum education level is higher than the ideal. This involves 0.64% of the observations.

Table 7: Heterogeneity: mother's education
(Independent variable LoC score in 2009 in all cases)

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Dependent variable: A. Dropout age			
Mother's education: low	0.192***	0.114***	0.106***	0.066*	0.055*	0.052*	0.071**
	[0.044]	[0.041]	[0.039]	[0.036]	[0.028]	[0.028]	[0.028]
Mother's education: mid	0.047**	0.010	0.006	0.014	0.002	0.010	0.010
	[0.023]	[0.024]	[0.024]	[0.024]	[0.024]	[0.024]	[0.024]
Mother's education: high	0.007	-0.018	-0.014	-0.013	-0.014	-0.013	-0.005
	[0.020]	[0.020]	[0.020]	[0.020]	[0.020]	[0.020]	[0.020]
				Dependent variable: B. Graduates from high school			
Mother's education: low	0.056***	0.024**	0.021*	0.018	0.015	0.014	0.017
	[0.014]	[0.012]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
Mother's education: mid	0.038***	0.008	0.008	0.011	0.004	0.006	-0.000
	[0.013]	[0.012]	[0.012]	[0.011]	[0.011]	[0.011]	[0.011]
Mother's education: high	0.008	0.001	0.001	0.004	0.001	0.004	0.002
	[0.011]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.008]
				Dependent variable: C. Plans to apply to college			
Mother's education: low	0.040***	0.024**	0.021*	0.019	0.019*	0.016	0.015
	[0.013]	[0.012]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
Mother's education: mid	0.059***	0.028	0.017	0.020	0.008	0.009	0.009
	[0.018]	[0.017]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
Mother's education: high	0.046**	0.019	0.025	0.024	0.021	0.021	0.020
	[0.019]	[0.016]	[0.015]	[0.015]	[0.014]	[0.015]	[0.014]
				Dependent variable: D. Attends college			
Mother's education: low	0.030**	0.021*	0.018	0.016	0.014	0.011	0.014
	[0.012]	[0.012]	[0.011]	[0.011]	[0.010]	[0.010]	[0.010]
Mother's education: mid	0.072***	0.037**	0.031*	0.030*	0.022	0.022	0.025
	[0.018]	[0.017]	[0.017]	[0.017]	[0.016]	[0.016]	[0.016]
Mother's education: high	0.023	0.004	0.014	0.008	0.013	0.011	0.012
	[0.022]	[0.021]	[0.020]	[0.020]	[0.020]	[0.020]	[0.020]

Standard errors in parentheses. */**/*** denotes significance at 10 / 5 / 1 % level.

LoC may play a role. The third group comprises all the students in between (that we call the *challenge* group). In this group, typically parents expect their children to graduate from high school at least, but ideally, they would like them to end up with a college degree. This latter preference set allows a certain degree of freedom for the adolescent to decide about the final level of education for themselves.

Table 8 indicates that parental preferences correlate with ability / willingness to pay for studies, because as we move from strict low to strict high the share of the students whose parents are able / willing to pay for college studies increases steeply, from 23% to 97%. Table 8 also shows that parental preferences associate with SES, captured by the mother's education, as the share of mothers with a college education increases in parental preferences (from 2% to 37%, as we move from strict low to strict high). LoC also correlates with parental preferences as it is the lowest in the strict low group, followed by the challenge and the strict high group.

Table 8: Heterogeneity by parental preferences

	Strict low	Challenge	Strict high
Minimum education Ideal education	less than grad. from high school less than grad. from high school	in between	at least college at least college
Able / willing to pay for college	23%	72%	97%
Mother's education: college	2%	17%	37%
Mother's education: secondary	17%	35%	38%
LoC (2009)	-0,13	0,00	0,14
Dropout age **Dropout age vs. LoC**	20,49 0.070	21,49 0.048*	21,80 0.010
Graduates from high school **Graduates from high school vs. LoC**	19% 0.043***	72% 0.001	93% 0.001
Plans to apply to college **Plans to apply to college vs. LoC**	3% 0.009	36% 0.038***	71% 0.023
Attends college **Attends college vs. LoC**	2% 0.003	26% 0.029**	60% 0.040**
Observations	1,907	3,087	1,680

*/**/*** denotes significance at 10 / 5 / 1 % level. Specification 2 of Table 6 is used.

Turning to the outcome variables, we observe that dropout age associates with parental preferences as expected, higher parental preferences correlating with higher dropout age. When we investigate how LoC associates with dropout age, we see that the coefficient decreases as we move from strict low to strict high, being marginally significant in the challenge group only, indicating that more internal students are slightly more likely to finish studying later.[26]

Graduation from high school also goes hand in hand with parental preferences as the share of students that graduate from high school increases markedly with parental preferences (from 19% to 93%). Moreover, LoC has the largest coefficient in the strict low group that is significant at the 1% level. In contrast, in the other groups the coefficient is not statistically different from zero. Hence, being internal has a strong positive association with graduation from high school for students in the strict low group.

Regarding college application plans, we observe an increasing pattern again as a function of parental preferences. Only 3% of the students in the strict low group plans to apply to college, while this share is 36% in the challenge and 71% in the strict high group. For this outcome, the only group in which the coefficient of LoC is statistically different from zero (and is significant at 1%) is the challenge group. Thus, in this group, those who have more internal LoC are more likely to plan to apply to college.

When looking at college attendance, we see that only 2% in the strict low group does so, while the corresponding numbers in the challenge and strict high groups are 26% and 60%. Coefficients of LoC are significantly different from zero in the challenge and the strict high groups, showing the positive effect that having internal LoC tendencies has on attending college.

Overall, we see that LoC associates with the low-end decisions in a significant way in the groups with lower parental preferences, while in the high-end decisions LoC plays a role in the groups with higher parental preferences. As a consequence, it is the challenge group in which LoC has an essential role in most decisions. These findings suggest that it is not simply the SES that matters when investigating the role of LoC, but also the nature of the decision. The further away is the decision in question from the parental preferences, the less important is the role of LoC. Also, the wider liberty is allotted for the adolescent to decide on their further education, the larger role LoC plays in their human capital investment decisions.

[26]In Table 8 for simplicity, we use the coefficients of LoC corresponding to the specification that includes the exogenous variables besides LoC, specification 2 in Table 6. Table H.20 in Appendix H contains all the specifications.

Next, we focus on the effect of financial constraints. LoC probably helps adolescents to overcome difficulties related to financing a higher level of education. Table 9 summarizes the main results of our findings. We divide the sample into *low / mid / high level* of ideal education (Less than high school graduation/ At least high school graduation / At least college), and divide these further into groups where the financial constraints are *non-binding* (parents are able / willing to pay at least the ideal level of education) and *binding* (able to finance less than the ideal level). Most families can finance the ideal level of education, so there is only a low number of adolescents who face financial constraints. The average level of education of the mother is higher in groups where the ideal education is higher and where the financial constraint is non-binding. Similar associations are detected with each outcome variable, and there is a substantial increase from 2.7/2.7/0% to 88.9/58.6/46.5% in the probability of high school graduation, college plans and college attendance, respectively.

In the low-level subsample, the mother's level of education is significantly higher in the non-binding group. Either as a consequence of this SES difference or the financial constraints, we see a considerable discrepancy between the averages of the low-end outcome variables, dropout age and high school graduation. The high-end outcomes, college plans and college attendance are similarly deficient in both groups. Although the sample size is as tiny as 37 observations in the binding subgroup, the estimated effect of LoC on dropout age is 0.89 and significant at the 1%. This suggests that for these adolescents, LoC makes a vast difference in dropout. On the contrary, for these adolescents, LoC does not help to increase other outcomes. In the non-binding subsample, a one standard deviation increase in LoC elevates high school graduation probability by 4.6%, and it is significant at the 1% level.

Table 9: Heterogeneity by financial constraints

	Low level		Mid level		High level	
	Binding fin. constr.	Non-binding fin. constr.	Binding fin. constr.	Non-binding fin. constr.	Binding fin. constr.	Non-binding fin. constr.
Ideal education	Less than high school graduation	Less than high school graduation	At least high school graduation	At least high school graduation	At least college	At least college
Able and willing to pay for	Less than the ideal education	At least the ideal education	Less than the ideal education	At least the ideal education	Less than the ideal education	At least the ideal education
Mother's education: college	0.0%	2.2%	1.3%	7.4%	27.5%	28.8%
Mother's education: secondary	2.7%	17.0%	19.5%	26.7%	35.5%	39.2%
LoC (2009)	-0.16	-0.12	-0.09	-0.11	0.09	0.10
Dropout age	19.6	20.5	20.6	21.2	21.7	21.7
Dropout age vs. LoC	0.894**	0.085	0.288	0.082	0.132	0.017
Graduated from high school	2.7%	20.2%	22.1%	48.8%	85.0%	88.9%
Graduated from high school vs. LoC	0.069	0.046***	-0.002	0.006	0.061**	0.002
Plan to apply to college	2.7%	3.6%	1.3%	12.2%	57.8%	58.6%
Plan to apply to college vs. LoC	0.069	0.009	0.000	0.014	0.094***	0.029**
Attends to college	0.0%	2.0%	0.0%	7.3%	47.2%	46.5%
Attends to college vs. LoC	0.000	0.003	0.000	0.002	0.140***	0.030**
Observations	37	1,995	77	978	386	3,388

In the mid-level groups, there are significant differences in the mother's level of education and all the outcome variables between subgroups. However, in these groups, we do not estimate any significant LoC effect whatsoever. The point estimates are very close to zero for most outcome variables except dropout age, but all are insignificant.

In the high-level groups, mother's education is much more similar in the two subgroups. There is only 1.3 (3.7) percentage point difference between college (high school) education ratios. At the same time, the high school graduation rate is slightly lower in the binding group (85%) than in the non-binding group (88.9%). Nevertheless, dropout age, college plans as well as the college attendance rates are very similar in the two groups.

The estimates of the LoC effects are significant for high school graduation as well as the high-end decisions. Moreover, the point estimates in the group with a binding financial constraint are a lot higher and more significant compared to the group where the financial constraint is non-binding. It is three times higher for college plans (0.094 vs 0.029) and almost five times higher for college attendance (0.14 vs 0.030). The effects are significant at the 1 % in the binding and 5 % in the non-binding group. In case of high school graduation, the impact of LoC is zero and insignificant in the non-binding group, and 0.061 and significant at the 5% level in the binding group. This suggests that in these groups, financial constraints can be mastered if the adolescents have favourable personality traits, like more internal LoC.

Overall, where LoC is significant in the binding group, we see very little difference in the outcome variables between subgroups. Whereas, if LoC is significant in the non-binding group, there is a huge difference in the outcome. This is an indication of the power of LoC to combat the negative effects of financial constraints.

6. Conclusion

In this article, we analyze an outstandingly detailed database from Hungary and study how locus of control shapes human capital investment decisions. We are the first to show in human capital investment decisions that LoC may operate through effort as students with more internal LoC tend to exert more effort in studying. We also find that after controlling for the exogenous factors and also cognitive ability, a one standard deviation increase in LoC increases dropout age significantly by 0.045 years, the probability of college application by 2.1 percentage points (6%) and the probability of college attendance by 1.9 percentage points (6.9%), while it does not affect the probability of graduating from high school in a significant way. The point

estimates change to insignificant after including expectations and effort in case of dropout age and college attendance. This suggests that these are important channels between LoC and these outcomes. For college application plans, the impact of LoC stays significant and unchanged even after including a broad set of personality traits and behavioural outcome variables as controls. A likely explanation is that for LoC to exert its effect on dropout, high school graduation and college attendance, LoC should affect behaviour in a favourable way (e.g. increase study effort), which in turn, helps the person reach these outcomes. College application, on the contrary, is a decision variable, and not much behavioural change is needed to fill out an application form.

We also study the heterogeneity of the LoC effect on human capital outcomes. We show that LoC is more important for females as in all outcomes except graduation from high school. As to SES, our findings are very similar to those of Mendolia and Walker (2014) who document that LoC is significant in the low-SES families regarding dropout age, high school graduation and college application plans. However, when it comes to college attendance, LoC is significant only in case of mid-SES adolescents.

We offer two explanations for this heterogeneity that are entirely new in this literature. First, we examine parental preferences regarding the minimum and the ideal education level of the adolescent. These preferences are strongly correlated with family SES. We find that LoC only matters in those investment choices which are allowed by parental preferences. That is, parental preferences do not seem to be overridden by adolescents with the help of internal LoC. Also, LoC matters more when adolescents have more room to decide.

Second, constraints regarding the financing of education are also associated with SES. If parents prefer that the adolescent's ideal education level is lower than high school graduation, outcomes are very different for adolescents with binding or non-binding financial constraints. In these families, LoC does not seem to help in overcoming the financial obstacles. Whereas, if the ideal education is college, the mother's level of education and the adolescent's outcomes are very similar in binding and non-binding families. It seems that in these families LoC matters a lot more for the binding group in high school graduation, college plans and college attendance.

The existing literature proved already that internal LoC played an essential role in making human capital investment decisions and in reaching more favourable educational outcomes. Nevertheless, there was no actual evidence on the process through which the LoC exerted its effects. To summarize our findings, we can define LoC as a personality trait which can unfold its beneficial effects if the parents leave space for it. In that case, a more internal LoC may provide support for the adolescent to overcome certain impediments, just like financial difficulties related to keeping up

studying.

References

Abdallah, T.M., 1989. Self-esteem and locus of control of college men in saudi arabia. Psychological Reports 65, 1323–1326.

Ahrens, A., Hansen, C.B., Schaffer, M.E., 2019. LASSOPACK: Stata module for lasso, square-root lasso, elastic net, ridge, adaptive lasso estimation and cross-validation. URL: https://ideas.repec.org/c/boc/bocode/s458458.html. language: en Publication Title: Statistical Software Components.

Almlund, M., Duckworth, A.L., Heckman, J., Kautz, T., 2011. Personality psychology and economics, in: Handbook of the Economics of Education. Elsevier. volume 4, pp. 1–181.

Andrisani, P.J., 1977. Internal-external attitudes, personal initiative, and the labor market experience of black and white men. Journal of Human Resources , 308–328.

Anger, S., Schnitzlein, D.D., 2017. Cognitive skills, non-cognitive skills, and family background: evidence from sibling correlations. Journal of Population Economics 30, 591–620.

Angrist, J., Frandsen, B., 2019. Machine labor. Technical Report. National Bureau of Economic Research.

Arbuthnott, J., 1710. An Argument for Divine Providence, Taken from the Constant Regularity Observ'd in the Births of Both Sexes. By Dr. John Arbuthnott, Physitian in Ordinary to Her Majesty, and Fellow of the College of Physitians and the Royal Society. Philosophical Transactions (1683-1775) 27, 186–190. URL: https://www.jstor.org/stable/103111. publisher: The Royal Society.

Archer, S.L., Waterman, A.S., 1988. Psychological individualism: Gender differences or gender neutrality? Human Development 31, 65–81.

Atkinson, J.W., 1964. An introduction to motivation. van Nostrand.

Bandura, A., 1989. Human agency in social cognitive theory. American psychologist 44, 1175 – 1184.

Bar-Tal, D., Bar-Zohar, Y., 1977. The relationship between perception of locus of control and academic achievement: Review and some educational implications. Contemporary educational psychology 2, 181–199.

Barón, J.D., Cobb-Clark, D.A., 2010. Are young people's educational outcomes linked to their sense of control? Available at SSRN 1594792 .

Battle, E.S., Rotter, J.B., 1963. Children's feelings of personal control as related to social class and ethnic group. Journal of personality 31, 482–490.

Belloni, A., Chen, D., Chernozhukov, V., Hansen, C., 2012. Sparse Models and Methods for Optimal Instruments With an Application to Eminent Domain. Econometrica 80, 2369–2429. URL: https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA9626, doi:10.3982/ECTA9626. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.3982/ECTA9626.

Belloni, A., Chernozhukov, V., Hansen, C., 2011. Inference for High-Dimensional Sparse Econometric Models. arXiv:1201.0220 [econ, stat] URL: http://arxiv.org/abs/1201.0220. arXiv: 1201.0220.

Belloni, A., Chernozhukov, V., Hansen, C., 2014a. High-Dimensional Methods and Inference on Structural and Treatment Effects. Journal of Economic Perspectives 28, 29–50. URL: https://www.aeaweb.org/articles?id=10.1257/jep.28.2.29, doi:10.1257/jep.28.2.29.

Belloni, A., Chernozhukov, V., Hansen, C., 2014b. Inference on Treatment Effects after Selection among High-Dimensional Controls. The Review of Economic Studies 81, 608–650. URL: https://academic.oup.com/restud/article/81/2/608/1523757, doi:10.1093/restud/rdt044. publisher: Oxford Academic.

Belloni, A., Chernozhukov, V., Hansen, C., Kozbur, D., 2016. Inference in High-Dimensional Panel Models With an Application to Gun Control. Journal of Business & Economic Statistics 34, 590–605. URL: https://amstat.tandfonline.com/doi/full/10.1080/07350015.2015.1102733, doi:10.1080/07350015.2015.1102733. publisher: Taylor & Francis.

Böheim, R., Stöllinger, P., et al., 2020. Decomposition of the Gender Wage Gap using the LASSO Estimator. Technical Report.

Borghans, L., Golsteyn, B.H., Heckman, J.J., Humphries, J.E., 2016. What grades and achievement tests measure. Proceedings of the National Academy of Sciences 113, 13354–13359.

Borghans, L., Meijers, H., Ter Weel, B., 2008. The role of noncognitive skills in explaining cognitive test scores. Economic inquiry 46, 2–12.

Bowles, S., Gintis, H., 1972. Iq in the us class structure. Social policy .

Browne, A., Evans, K., 2007. National evaluation of the prince's trust xl programme–qualitative evaluation. QA Research .

Bush, S., Mandel, F.S., Giardina, P.J., 1998. Future orientation and life expectations of adolescents and young adults with thalassemia major a. Annals of the New York Academy of Sciences 850, 361–369.

Cairns, E., McWhirter, L., Duffy, U., Barry, R., 1990. The stability of self-concept in late adolescence: Gender and situational effects. Personality and individual differences 11, 937–944.

Caliendo, M., Cobb-Clark, D.A., Obst, C., Seitz, H., Uhlendorff, A., 2020. Locus of control and investment in training. Journal of Human Resources , 0318–9377R2.

Caliendo, M., Cobb-Clark, D.A., Uhlendorff, A., 2015. Locus of control and job search strategies. Review of Economics and Statistics 97, 88–103.

Cebi, M., 2007. Locus of control and human capital investment revisited. Journal of Human Resources 42, 919–932.

Chatterjee, S., Finke, M., Harness, N., 2011. The impact of self-efficacy on wealth accumulation and portfolio choice. Applied Economics Letters 18, 627–631.

Chiteji, N., 2010. Time preference, noncognitive skills and well being across the life course: do noncognitive skills encourage healthy behavior? American Economic Review 100, 200–204.

Chubb, N.H., Fertman, C.I., Ross, J.L., 1997. Adolescent self-esteem and locus of control: A logitudinal study of gender and age differences. Adolescence 32, 113.

Cobb-Clark, D.A., 2015. Locus of control and the labor market. IZA Journal of Labor Economics 4, 3.

Cobb-Clark, D.A., Kassenboehmer, S.C., Schurer, S., 2014. Healthy habits: The connection between diet, exercise, and locus of control. Journal of Economic Behavior & Organization 98, 1–28.

Cobb-Clark, D.A., Kassenboehmer, S.C., Sinning, M.G., 2016. Locus of control and savings. Journal of Banking & Finance 73, 113–130.

Cobb-Clark, D.A., Schurer, S., 2013. Two economists' musings on the stability of locus of control. The Economic Journal 123, F358–F400.

Cobb-Clark, D.A., Tan, M., 2011. Noncognitive skills, occupational attainment, and relative wages. Labour Economics 18, 1–13.

Coleman, J.S., 1966. Equal schools or equal students? The Public Interest 4, 70.

Coleman, J.S., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weinfeld, F., York, R., 1966. The coleman report: Equality of educational opportunity. US Government, Washington .

Coleman, M., DeLeire, T., 2003. An economic model of locus of control and the human capital investment decision. Journal of Human Resources 38, 701–721.

Coneus, K., Gernandt, J., Saam, M., 2011. Noncognitive Skills, School Achievements and Educational Dropout. Schmollers Jahrbuch : Journal of Applied Social Science Studies / Zeitschrift für Wirtschafts- und Sozialwissenschaften 131, 547–568.

Davis-Kean, P.E., 2005. The influence of parent education and family income on child achievement: the indirect role of parental expectations and the home environment. Journal of family psychology 19, 294.

Delaney, L., Harmon, C., Ryan, M., 2013. The role of noncognitive traits in undergraduate study behaviours. Economics of Education Review 32, 181–195.

Diesterhaft, K., Gerken, K., 1983. Self-concept and locus of control as related to achievement of junior high students. Journal of Psychoeducational Assessment 1, 367–375.

Doepke, M., Sorrenti, G., Zilibotti, F., 2019. The economics of parenting. Annual Review of Economics 11, 55–84.

Doherty, W.J., Baldwin, C., 1985. Shifts and stability in locus of control during the 1970s: Divergence of the sexes. Journal of Personality and Social Psychology 48, 1048.

Duncan, G.J., Dunifon, R., 1998. Soft-skills and long-run labor market success. Research in labor economics 17.

Elkins, R.K., Kassenboehmer, S.C., Schurer, S., 2017. The stability of personality traits in adolescence and young adulthood. Journal of Economic Psychology 60, 37–52.

Ertac, S., 2020. The formation and malleability of preferences and noncognitive skills. Handbook of Labor, Human Resources and Population Economics , 1–27.

Feather, N., 1967. Some personality correlates of external control. Australian Journal of Psychology 19, 253–260.

Findley, M.J., Cooper, H.M., 1983. Locus of control and academic achievement: a literature review. Journal of personality and social psychology 44, 419.

Fluchtmann, J., Glenny, A.M., Harmon, N., Maibom, J., 2020. The Gender Application Gap: Do men and women apply for the same jobs? Technical Report. Mimeo University of Copenhagen.

Garner, C.W., Cole, E.G., 1986. The achievement of students in low-ses settings: An investigation of the relationship between locus of control and field dependence. Urban Education 21, 189–206.

Goldsmith, A.H., Veum, J.R., Darity Jr, W., 1996. The psychological impact of unemployment and joblessness. The journal of socio-economics 25, 333–358.

Goldsmith, A.H., Veum, J.R., Darity Jr, W., 1997. The impact of psychological and human capital on wages. Economic inquiry 35, 815–829.

Gong, J., Lu, Y., Xie, H., 2015. Adolescent environment and noncognitive skills. Available at SSRN 2397046 .

Gore, P.M., Rotter, J.B., 1963. A personality correlate of social action. Journal of personality 31, 58–64.

Groves, M.O., 2005. How important is your personality? labor market returns to personality for women in the us and uk. Journal of Economic Psychology 26, 827–841.

Gurin, P., Gurin, G., Lao, R.C., Beattie, M., 1969. Internal-external control in the motivational dynamics of negro youth. Journal of social issues 25, 29–53.

Hansemark, O.C., 2003. Need for achievement, locus of control and the prediction of business start-ups: A longitudinal study. Journal of economic Psychology 24, 301–319.

Heckman, J.J., Kautz, T., 2012. Hard evidence on soft skills. Labour economics 19, 451–464.

Heineck, G., Anger, S., 2010. The returns to cognitive abilities and personality traits in germany. Labour economics 17, 535–546.

for Human Resource Research, C., 2004. Nlsy79 child and young adult data users guide.

Judge, T.A., Bono, J.E., 2001. Relationship of core self-evaluations traits—self-esteem, generalized self-efficacy, locus of control, and emotional stability—with job satisfaction and job performance: A meta-analysis. Journal of applied Psychology 86, 80.

Judge, T.A., Erez, A., Bono, J.E., Thoresen, C.J., 2002. Are measures of self-esteem, neuroticism, locus of control, and generalized self-efficacy indicators of a common core construct? Journal of personality and social psychology 83, 693.

Judge, T.A., Erez, A., Bono, J.E., Thoresen, C.J., 2003. The core self-evaluations scale: Development of a measure. Personnel psychology 56, 303–331.

Katkovsky, W., Crandall, V.C., Good, S., 1967. Parental antecedents of children's beliefs in internal-external control of reinforcements in intellectual achievement situations. Child Development , 765–776.

Keith, T.Z., Pottebaum, S.M., Eberhart, S., 1986. Effects of self-concept and locus of control on academic achievement: A large-sample path analysis. Journal of Psychoeducational Assessment 4, 61–72.

Kohn, M.L., 1959. Social class and parental values. American Journal of sociology 64, 337–351.

Kohn, M.L., Schooler, C., 1983. Work and personality: An inquiry into the impact of social stratification. Ablex Pub.

Krampen, G., 1989. Perceived childrearing practices and the development of locus of control in early adolescence. International Journal of Behavioral Development 12, 177–193.

Krishnan, P., Krutikova, S., 2013. Non-cognitive skill formation in poor neighbourhoods of urban india. Labour Economics 24, 68–85.

Lau, S., Leung, K., 1992. Self-concept, deliquency, relations with parents and school and chinese adolescents' perception of personal control. Personality and Individual Differences 13, 615–622.

Lefcourt, H.M., Ladwig, G.W., 1965. The american negro: A problem in expectancies. Journal of Personality and Social Psychology 1, 377–380.

Lekfuangfu, W.N., Powdthavee, N., Warrinnier, N., Cornaglia, F., 2018. Locus of control and its intergenerational implications for early childhood skill formation. The Economic Journal 128, 298–329.

Lewis, S.K., Ross, C.E., Mirowsky, J., 1999. Establishing a sense of personal control in the transition to adulthood. Social forces 77, 1573–1599.

Lundberg, S., 2013. The college type: Personality and educational inequality. Journal of Labor Economics 31, 421–441.

Marecek, J., Frasch, C., 1977. Locus of control and college women's role expectations. Journal of Counseling Psychology 24, 132.

McClun, L.A., Merrell, K.W., 1998. Relationship of perceived parenting styles, locus of control orientation, and self-concept among junior high age students. Psychology in the Schools 35, 381–390.

McGee, A.D., 2015. How the perception of control influences unemployed job search. ILR Review 68, 184–211.

Mendolia, S., Walker, I., 2014. The effect of personality traits on subject choice and performance in high school: Evidence from an english cohort. Economics of Education Review 43, 47–65.

Mone, M.A., Baker, D.D., Jeffries, F., 1995. Predictive validity and time dependency of self-efficacy, self-esteem, personal goals, and academic performance. Educational and Psychological Measurement 55, 716–727.

Mutlu, T., Balbag, Z., Cemrek, F., 2010. The role of self-esteem, locus of control and big five personality traits in predicting hopelessness. Procedia-Social and Behavioral Sciences 9, 1788–1792.

Nelson, E., Mathia, K.E., et al., 1995. The relationships among college students' locus of control, learning styles, and self prediction of grades. Education research and perspectives 22, 110.

Ng, T.W., Sorensen, K.L., Eby, L.T., 2006. Locus of control at work: a meta-analysis. Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior 27, 1057–1087.

Oi, K., Alwin, D.F., 2017. Children's sense of control as a determinant of adult health: Causation, mediation, and spuriousness. Journal of Health and Social Behavior 58, 198–216.

Pearlin, L.I., Kohn, M.L., 1966. Social class, occupation, and parental values: A cross-national study. American sociological review , 466–479.

Pearlin, L.I., Schooler, C., 1978. The structure of coping. Journal of health and social behavior , 2–21.

Piatek, R., Pinger, P., 2016. Maintaining (locus of) control? data combination for the identification and inference of factor structure models. Journal of Applied Econometrics 31, 734–755.

Piskin, M., 1996. Self-esteem and locus of control of secondary school children both in England and Turkey. University of Leicester.

Rotter, J.B., 1966. Generalized expectancies for internal versus external control of reinforcement. Psychological monographs: General and applied 80, 1.

Sarsour, K., Sheridan, M., Jutte, D., Nuru-Jeter, A., Hinshaw, S., Boyce, W.T., 2011. Family socioeconomic status and child executive functions: The roles of language, home environment, and single parenthood. Journal of the International Neuropsychological Society: JINS 17, 120.

Schnitzlein, D.D., Stephani, J., 2016. Locus of control and low-wage mobility. Journal of Economic Psychology 53, 164–177.

Semykina, A., Linz, S.J., 2007. Gender differences in personality and earnings: Evidence from russia. Journal of Economic Psychology 28, 387–410.

Sherman, A.C., Higgs, G.E., Williams, R.L., 1997. Gender differences in the locus of control construct. Psychology and Health 12, 239–248.

Sinka, E., 2010. Hungary - Country Background Report. Technical Report. OECD.

Skinner, E.A., Zimmer-Gembeck, M.J., Connell, J.P., Eccles, J.S., Wellborn, J.G., 1998. Individual differences and the development of perceived control. Monographs of the society for Research in Child Development , i–231.

Snedecor, G.W., Cochran, W.G., 1989. Statistical Methods. 8 edition ed., Iowa State University Press, Ames, Iowa.

Specht, J., Egloff, B., Schmukle, S.C., 2013. Everything under control? the effects of age, gender, and education on trajectories of perceived control in a nationally representative german sample. Developmental psychology 49, 353.

Steptoe, A., Wardle, J., 2001. Locus of control and health behaviour revisited: a multivariate analysis of young adults from 18 countries. British journal of Psychology 92, 659–672.

Strauss, R.S., Knight, J., 1999. Influence of the home environment on the development of obesity in children. Pediatrics 103, e85–e85.

Strudler Wallston, B., Wallston, K.A., 1978. Locus of control and health: A review of the literature. Health education monographs 6, 107–117.

Tzuriel, D., Haywood, H.C., 1985. Locus of control and child-rearing practices in intrinsically motivated and extrinsically motivated children. Psychological reports 57, 887–894.

Wallston, K.A., Strudler Wallston, B., DeVellis, R., 1978. Development of the multidimensional health locus of control (mhlc) scales. Health education monographs 6, 160–170.

Wang, L.Y., Kick, E., Fraser, J., Burns, T.J., 1999. Status attainment in america: The roles of locus of control and self-esteem in educational and occupational outcomes. Sociological Spectrum 19, 281–298.

Wang, Q., Bowling, N.A., Eschleman, K.J., 2010. A meta-analytic examination of work and general locus of control. Journal of Applied Psychology 95, 761.

Webster, R.A., Hunter, M., Keats, J.A., 1994. Personality and sociodemographic influences on adolescents' substance use: A path analysis. International Journal of the Addictions 29, 941–956.

Wilcoxon, F., 1945. Individual Comparisons by Ranking Methods. Biometrics Bulletin 1, 80–83. URL: https://www.jstor.org/stable/3001968, doi:10.2307/3001968. publisher: [International Biometric Society, Wiley].

Table A.10: Structure of the data collection

Year of data collection	2006	2006	2007	2008	2009	2010	2011	2012
Month of data collection	May	Oct	Oct	Oct	Oct	Oct	Oct	Oct
Name of survey	NABC	LC wave 1	LC wave 2	LC wave 3	LC wave 4	missing	LC wave 5	LC wave 6
Class	8	9	10	11	12	13	14	15
School	Elem.	High	High	High	High	Univ.	Univ.	Univ.
Age (born in 1991)	14	15	16	17	18	19	20	21
LoC		x			x			
Cognitive abilities	x							
Study time			x	x				
Study at weekend			x	x				
Study after 8PM on weekday			x	x				
Effort grade in school			x	x	x			
Expectations about the future				x				
Plans to go to college					x			
Attends school		x	x	x	x		x	x
Attends college							x	x
Graduated from high school							x	x

Appendix A. Structure of data collection

In Table A.10 we show which year the main variables were collected. NABC refers to National Assessment of Basic Competencies, while LC stands for Life Course survey. Cognitive abilities comprise standardized math and reading test scores. Study time is the time the student spend studying on an average school day, and together with Effort grade in school they are used to capture effort. Dropout age is calculated based on the question if the respondent attends school in a given year.

Appendix B. Variables

Appendix B.1. Dependent variables

Throughout the article, we use several dependent variables, here we present summary statistics for each.

Table B.11: Summary statistics of the dependent variables in the regressions

Variable	Obs	Mean	Std. Dev.	Min	Max
Dropout age	6,861	21.3	1.3	15	22
High school graduation	6,861	0.618	0.486	0	1
College plans	6,861	0.350	0.477	0	1
College attendance	6,861	0.272	0.445	0	1
Expectations (2008)	6,861	-0.049	0.939	-2.403	2.544
Effort (2008)	6,861	-0.071	0.716	-1.702	5.230
Effort (2007-8-9)	6,861	-0.094	0.871	-2.436	3.798

Appendix B.2. Dictionary size

In the regressions we let lasso to select from the following set of variables.

Table B.12: Set of variables

Variable	Type	N	Mean	SD	Min	Max
LoC score in 2006		6811	2.92	1.04	0	4
LoC score in 2009		6216	2.92	1.1	0	4
Change of LoC score 2006-9		6173	-0.01	1.36	-4	4
Reading score	Cognitive	6861	-0.33	1.05	-3.78	2.87
Mathematics score	Cognitive	6861	-0.2	0.99	-3.16	3.08
Exp.: earn more than avg (2008)	Expectation	6861	0.54	0.26	0	1
Exp.: earn best 10% (2008)	Expectation	6861	0.25	0.24	0	1
Exp.: permanent employment (2008)	Expectation	6861	0.68	0.27	-0.06	1
Exp.: earn > net HUF100.000 (2008)	Expectation	6861	0.6	0.3	-0.06	1
Exp.: earn > net HUF200.000 (2008)	Expectation	6861	0.33	0.27	-0.06	2
Positive exp-s in general (2008)	Expectation	6861	2.82	0.57	0.22	4.7
Positive exp-s (school. work - 2008)	Expectation	6861	3.55	1.42	-0.18	7
Hours a week spent studying (2007)	Effort	6861	4.44	2.68	0	52
Hours a week spent studying (2008)	Effort	6861	4.17	2.97	0	44
Effort grade (2007)	Effort	6861	3.78	0.85	1	5
Effort grade (2008)	Effort	6861	3.75	0.85	1	5
Mother's education: less than high school	Exogenous	6861	0.52	0.5	0	1
Mother's education: high school	Exogenous	6861	0.3	0.46	0	1
Mother's education: college	Exogenous	6861	0.17	0.38	0	1
Father's education: less than high school	Exogenous	6861	0.71	0.45	0	1
Father's education: high school	Exogenous	6861	0.18	0.38	0	1
Father's education: college	Exogenous	6861	0.11	0.31	0	1
HOME cognitive scale	Exogenous	6776	81.23	26.43	0	130
HOME emotional scale	Exogenous	6699	98.95	22.04	10	140
Number of people sleeping in the same room (2006)	Exogenous	6861	1.53	0.85	1	8
Household size	Exogenous	6861	4.32	1.36	2	15
Social disadvantage (2006)	Exogenous	6861	0.36	0.48	0	1
Financial distress (2006)	Exogenous	6861	0.31	0.46	0	1
Financial distress (2009)	Exogenous	6861	0.32	0.47	0	1
Female	Exogenous	6861	0.46	0.5	0	1
Lives with mother	Exogenous	6861	0.97	0.16	0	1
Lives with father	Exogenous	6861	0.8	0.4	0	1
Has special education needs (SEN)	Exogenous	6861	0.09	0.29	0	1
SEN students in the class	Exogenous	6853	1.16	2.57	0	23
Number of students in the class	Exogenous	6861	22.39	6.03	1	43
Time enrolled to childcare	Exogenous	6861	2.85	0.46	0.5	3
How often did the parents read tales?	Exogenous	6861	17.06	8.84	0	25
Age of female caretaker	Exogenous	6861	41.02	6.28	9	78
Age of female caretaker - squared	Exogenous	6861	1722.31	559.25	81	6084
Mental. physical or sexual abuse before age 14	Exogenous	6861	1.48	2.52	0	19
Mental. physical or sexual abuse AFTER age 14	Exogenous	6861	0.76	1.85	0	18
Parents divorced	Exogenous	6861	0.21	0.41	0	1
Roma ethnicity	Exogenous	6861	0.06	0.23	0	1
Birthweight under 2500g	Exogenous	6861	0.08	0.27	0	1
Been in social home (2006)	Exogenous	6861	0.01	0.09	0	1
Has step parents	Exogenous	6861	0.01	0.09	0	1
Mother's mother: less than elementary school	Exogenous	6861	0.18	0.39	0	1
Mother's mother: elementary school	Exogenous	6861	0.5	0.5	0	1
Mother's mother: high school	Exogenous	6861	0.27	0.45	0	1
Mother's mother: college	Exogenous	6861	0.05	0.21	0	1

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Table B.12 – continued from previous page

Variable	Type	N	Mean	SD	Min	Max
Mother's father: less than elementary school	Exogenous	6861	0.13	0.34	0	1
Mother's father: elementary school	Exogenous	6861	0.39	0.49	0	1
Mother's father: high school	Exogenous	6861	0.4	0.49	0	1
Mother's father: college	Exogenous	6861	0.07	0.26	0	1
Father's mother: less than elementary school	Exogenous	6861	0.15	0.35	0	1
Father's mother: elementary school	Exogenous	6861	0.64	0.48	0	1
Father's mother: high school	Exogenous	6861	0.19	0.39	0	1
Father's mother: college	Exogenous	6861	0.03	0.17	0	1
Father's father: less than elementary school	Exogenous	6861	0.11	0.31	0	1
Father's father: elementary school	Exogenous	6861	0.54	0.5	0	1
Father's father: high school	Exogenous	6861	0.29	0.46	0	1
Father's father: college	Exogenous	6861	0.06	0.23	0	1
Max. wanted education for child: college (2006)	Exogenous	6861	0.55	0.5	0	1
Min. wanted education for child: college (2006)	Exogenous	6861	0.25	0.44	0	1
Can afford to pay college (2006)	Exogenous	6861	0.64	0.48	0	1
Death in the family (2008)	Exogenous	6861	0.06	0.23	0	1
Death in the family (2009)	Exogenous	6861	0.05	0.22	0	1
Accident in the family (2007)	Exogenous	6861	0.05	0.21	0	1
Accident in the family (2008)	Exogenous	6861	0.04	0.19	0	1
Accident in the family (2009)	Exogenous	6861	1.96	0.19	1	2
Illness in the family (2007)	Exogenous	6861	0.07	0.26	0	1
Illness in the family (2008)	Exogenous	6861	0.07	0.26	0	1
Illness in the family (2009)	Exogenous	6861	1.91	0.29	1	2
Household income (2006)	Exogenous	6861	2.20E+05	1.30E+05	0	2.66E+06
Household income (2007)	Exogenous	6861	2.25E+05	3.19E+06	0	2.65E+08
Household income (2008)	Exogenous	6861	1.96E+05	2.39E+05	0	1.80E+07
Household income (2009)	Exogenous	6861	1.94E+05	82019.15	27000	8.50E+05
Region	Exogenous	6861	3.93	2.16	1	7
Central Hungary (%)	Exogenous	1502	21.89			
Central Transdanubia (%)	Exogenous	817	11.91			
Western Transdanubia (%)	Exogenous	696	10.14			
Southern Transdanubia (%)	Exogenous	687	10.01			
Northern Hungary (%)	Exogenous	936	13.64			
Northern Great Plain (%)	Exogenous	1260	18.36			
Southern Great Plain (%)	Exogenous	963	14.04			
Mother works (2006)	Exogenous	6853	0.68	0.51	0	2
No (%)	Exogenous	2318	33.82			
Yes (%)	Exogenous	4402	64.23			
We did not ask (%)	Exogenous	133	1.94			
Mother works (2007)	Exogenous	6861	0.76	0.54	0	2
No (%)	Exogenous	2032	29.62			
Yes (%)	Exogenous	4474	65.21			
We did not ask (%)	Exogenous	355	5.17			
Mother works (2008)	Exogenous	6861	0.77	0.51	0	2
No (%)	Exogenous	1846	26.91			
Yes (%)	Exogenous	4747	69.19			
We did not ask (%)	Exogenous	268	3.91			
Mother works (2009)	Exogenous	6861	0.77	0.52	0	2
No (%)	Exogenous	1877	27.36			
Yes (%)	Exogenous	4651	67.79			
We did not ask (%)	Exogenous	333	4.85			
Father works (2006)	Exogenous	6830	1.01	0.61	0	2
No (%)	Exogenous	1254	18.36			
Yes (%)	Exogenous	4286	62.75			
We did not ask (%)	Exogenous	1290	18.89			

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Table B.12 – continued from previous page

Variable	Type	N	Mean	SD	Min	Max
Father works (2007)	Exogenous	6815	1.07	0.61	0	2
No (%)	Exogenous	1027	15.07			
Yes (%)	Exogenous	4284	62.86			
We did not ask (%)	Exogenous	1504	22.07			
Father works (2008)	Exogenous	6717	1.08	0.61	0	2
No (%)	Exogenous	1009	15.02			
Yes (%)	Exogenous	4177	62.19			
We did not ask (%)	Exogenous	1531	22.79			
Father works (2009)	Exogenous	6647	1.07	0.64	0	2
No (%)	Exogenous	1167	17.56			
Yes (%)	Exogenous	3855	58			
We did not ask (%)	Exogenous	1625	24.45			
Age at 2006 interview	Exogenous	6840	15.25	0.55	13.51	17.84
How healthy do you feel? (2006)	Endogenous	6861	3.25	0.66	1	4
Emotional stability (2006)	Endogenous	6861	6.77	1.46	0	8
Self esteem (2006)	Endogenous	6861	8.19	2.12	0	10
Bullying (2006)	Endogenous	6861	9.93	1.39	9	25
Sociability (2006)	Endogenous	6861	5.65	1.54	0	7
Objective health (2006)	Endogenous	6861	14.43	2.59	1	17
Permanent work in 2006	Endogenous	6861	0	0.03	0	1
0 (%)	Endogenous	6855	99.91			
1 (%)	Endogenous	6	0.09			
Summer work in 2006	Endogenous	6861	0.1	0.3	0	1
Grade retention 2006	Endogenous	6861	0.09	0.29	0	1
Fired from school	Endogenous	6861	0.02	0.13	0	1
Grade retention 2006	Endogenous	6861	0.09	0.29	0	1
Grade retention in grades 1-4	Endogenous	6861	0.06	0.24	0	1
Grade retention in grades 5-8	Endogenous	6861	0.04	0.2	0	1
Number of exogenous life events	Endogenous	6861	2.2	0.56	1	7
Number of positive life events	Endogenous	6861	0.04	0.2	0	2
Number of negative life events	Endogenous	6861	2.16	0.49	1	6
How healthy do you feel? (2008)	Endogenous	6861	3.25	0.71	1	4
Bullying (2008)	Endogenous	6861	0.06	0.4	0	5
Objective health (2008)	Endogenous	6861	14.32	2.7	1	17
Health: headache (2006)	Endogenous	6861	1.8	1.07	1	5
Health: headache (2008)	Endogenous	6861	1.79	1.06	1	5
Health: stomachache (2006)	Endogenous	6861	1.45	0.78	1	5
Health: stomachache (2008)	Endogenous	6861	1.5	0.82	1	5
Health: bad mood (2006)	Endogenous	6861	1.88	1.02	1	5
Health: bad mood (2008)	Endogenous	6861	1.92	1	1	5
Health: cannot sleep (2006)	Endogenous	6861	1.44	0.87	1	5
Health: cannot sleep (2008)	Endogenous	6861	1.47	0.91	1	5
School environment 2008	Endogenous	6861	15.74	3.69	1	23
Summer work in 2007	Endogenous	6861	0.17	0.38	0	1
Summer work in 2008	Endogenous	6861	0.28	0.45	0	1
Permanent work in 2007	Endogenous	6861	0.01	0.08	0	1
0 (%)	Endogenous	6820	99.4			
1 (%)	Endogenous	41	0.6			
Permanent work in 2008	Endogenous	6861	0.01	0.11	0	1
0 (%)	Endogenous	6773	98.72			
1 (%)	Endogenous	88	1.28			
Lost job in 2007	Endogenous	6861	0	0.03	0	1
Lost job in 2008	Endogenous	6861	0	0.06	0	1
Child birth (2007)	Endogenous	6861	1	0	1	1
Child birth (2008)	Endogenous	6861	0	0.02	0	1

Continued on next page

Table B.12 – continued from previous page

Variable	Type	N	Mean	SD	Min	Max
New job in 2007	Endogenous	6861	0.01	0.08	0	1
New job in 2008	Endogenous	6861	0.01	0.1	0	1
How many friends smoke/drink/take drugs? (2008)	Endogenous	6861	8.65	2.7	4	18
Number of friends (2008)	Endogenous	6861	5.19	1.3	0	6
How old at first sex? (2008)	Endogenous	6861	16.9	1.41	11	18
Smoke/drink/take drugs (2008)	Endogenous	6861	2.68	4.09	0	31
Age at first child	Endogenous	6861	16	0	16	16
Religiousness (2007)	Endogenous	6861	0.96	1.56	0	5
Do you look good? (2008)	Endogenous	6861	3.2	0.67	1	5

Appendix C. Description of the Home Cognitive and Emotional Scale

Here we present the items that make up the Home Cognitive and Emotional Scale.

Table C.13: Home Cognitive and Emotional Scale

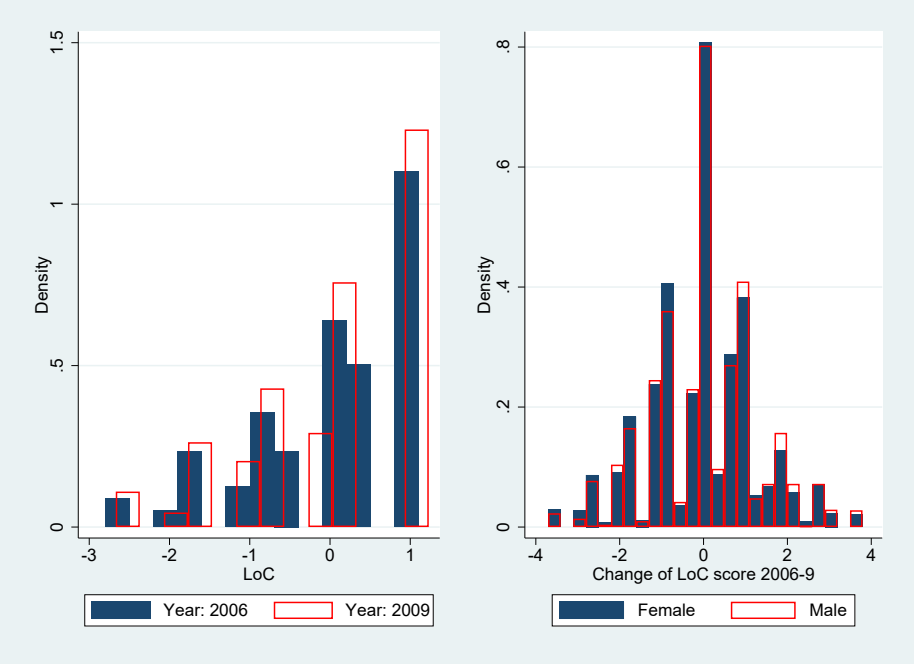
Home Cognitive Scale Question	Freq.	Percent	Home Emotional Scale Question	Freq.	Percent
Has more than 20 books.			I used to tidy up and clean my room.		
Not true	3,402	(34.2%)	Not true	1,512	(15.1%)
True	6,546	(65.8%)	True	8,501	(84.9%)
There is at least one musical instrument at home.			I used to clear away the things in my room.		
Not true	7,239	(72.34%)	Not true	1,581	(15.81%)
True	2,768	(27.66%)	True	8,421	(84.19%)
The family has at least one newspaper subscription.			I usually subsume my time.		
Not true	7,155	(71.63%)	Not true	567	(5.67%)
True	2,834	(28.37%)	True	9,433	(94.33%)
Reads for fun at least weekly.			We meet with relatives and friends at least once in a month.		
Not true	5,592	(56.29%)	Not true	3,071	(30.73%)
True	4,343	(43.71%)	True	6,924	(69.27%)
The family encourages to have a hobby.			I spend time with my father more than once in a week.		
Not true	1,898	(19.02%)	Not true	5,101	(51.2%)
True	8,083	(80.98%)	True	4,860	(48.8%)
Participates in tutorial lectures.			Outdoor activity with my father at least once in a week.		
Not true	6,022	(60.15%)	Not true	4,960	(50.75%)
True	3,990	(39.85%)	True	4,813	(49.25%)
Have gone to museum in the past year with a family member.			Eat a meal with both parents each day.		
Not true	5,807	(58.11%)	Not true	5,911	(59.33%)
True	4,186	(41.89%)	True	4,052	(40.67%)

Continued on next page

Table C.13 – continued from previous page

Home Cognitive Scale Question	Freq.	Percent	Home Emotional Scale Question	Freq.	Percent
Have been to a concert or theatre in the past year with a family member.			The parent would not hit the child is he/she were cursing.		
Not true	5,939	(59.47%)	Not true	357	(3.59%)
True	4,048	(40.53%)	True	9,587	(96.41%)
There are discussions in the family about what was seen on TV.			The parent had to hit the child at most once in the past week.		
Not true	2,868	(29.71%)	Not true	28	(0.29%)
True	6,784	(70.28%)	True	9,777	(99.71%)
The flat is not dark or dreary.			The mother encouraged the child to participate in the conversation.		
Not true	1,593	(16.04%)	Not true	2,912	(29.59%)
True	8,340	(83.96%)	True	6,930	(70.41%)
The rooms are mostly clean.			The mother answered the child's questions.		
Not true	958	(9.65%)	Not true	4,528	(46.1%)
True	8,969	(90.35%)	True	5,295	(53.9%)
The rooms are mostly tidy.			The mother talked to the child.		
Not true	1,052	(10.59%)	Not true	3,849	(39.14%)
True	8,878	(89.41%)	True	5,985	(60.86%)
The building is safe.			The mother introduced the child to the interrogator.		
Not true	538	(5.45%)	Not true	5,876	(59.61%)
True	9,342	(94.55%)	True	3,981	(40.39%)
			The mother spoke in a positive voice about the child.		
			Not true	936	(9.52%)
			True	8,898	(90.48%)

Figure D.3: The distribution (in year 2006 and 2009) and change of LoC (standardized values)



Appendix D. Factors associated to the level and change of LoC

In the LHS panel of Figure D.3 we represent the distribution of the LoC score, while the RHS panel shows the change in LoC from 2006 to 2009. Values are standardized. The distribution of LoC is skewed to the left, indicating that our sample contains a high share of students with internal tendencies.[27] The distribution of the change is bell-shaped, peaking at zero, suggesting that LoC is a stable trait.

In line with Elkins et al. (2017) and Cobb-Clark and Schurer (2013) we observe that the distributions of LoC in both years are similar, according to a Wilcoxon signed-rank test (Wilcoxon, 1945), as well as the sign test (Arbuthnott, 1710; Snedecor and Cochran, 1989). Regarding the change, by far the most frequent outcome is zero change (15%) and 56% of the changes is at most 0.25 in absolute value. On the other extreme of the scope, we see only .78% (.75%) of individuals experiencing the maximal downward (upward) change. This suggests that changes in LoC on the individual level are rather moderate, again in line with Elkins et al. (2017) and Cobb-Clark and

[27]Both in 2006 and 2009 more than two thirds of the respondents score 3 or 4 points on the Rotter scale that ranges from 0 to 4.

Schurer (2013).

Next, we briefly review the literature on what factors correlate with the level and change of LoC.

The role of age and gender is not unambiguous. Lewis et al. (1999) report that age associates positively with higher levels of perceived control for both genders in the adolescence (aged 14-22) using longitudinal data.[28] However, Doherty and Baldwin (1985) document no change for men, but an increase in external tendencies for women for the same age group. Elkins et al. (2017) report only small mean-level changes in LoC with age in the adolescence. In a review of the literature Archer and Waterman (1988) find that in more than half of the studies there was no gender difference in LoC, a finding echoed also by later studies (Sherman et al., 1997).[29]

Cognitive measures correlate positively with LoC (Lewis et al., 1999; Coleman and DeLeire, 2003). Generally cognitive skills are captured through achievement test scores, for instance Cebi (2007) uses the Armed Forces Qualifications Test (AFQT) as a proxy for cognitive abilities.[30]

There is plenty of research documenting that socioeconomic status affects the formation of non-cognitive skills. For instance, Kohn (1959); Kohn and Schooler (1983); Pearlin and Kohn (1966); Doepke et al. (2019) claim that parenting style that vary with SES affect skill acquisition.[31] Katkovsky et al. (1967); Tzuriel and Haywood (1985); Krampen (1989); Lau and Leung (1992); Webster et al. (1994); McClun and Merrell (1998) show that parenting style may shape adolescents' LoC.[32] Therefore, it is not surprising that many studies report a positive relationship between SES and internal LoC (Lefcourt and Ladwig, 1965; Battle and Rotter, 1963; Gore and Rotter, 1963; Coleman et al., 1966). Often, SES is captured by parental education and / or occupation (Lewis et al., 1999). However, other studies also consider other elements. For instance, Coleman et al. (1966) study structural integrity of the home, number of

[28]Cairns et al. (1990); Chubb et al. (1997); Specht et al. (2013) report similar findings.

[29]When gender difference is found, then men tend to be more internal (Cairns et al., 1990; Lewis et al., 1999), but in some samples women are found to be more internal (Feather, 1967).

[30]Achievement test scores are often used as proxies for cognitive abilities, see for example Borghans et al. (2016).

[31]For example, low-SES parents place a high value on honesty, neatness and obedience, while their high-SES counterparts value more self-control, curiosity and happiness (Wang et al., 1999; Bowles and Gintis, 1972).

[32]Lekfuangfu et al. (2018) document how LoC of the mother - in the form of a subjective belief about the effect of parental involvement on the child's skill formation - predicts maternal attitudes towards parenting style and time investment. That is, parental LoC shapes parental attitudes that in turn affect child's LoC. The circle is closed.

brothers and sisters, reading material in home, parents' interest in child's schooling, while Skinner et al. (1998) point out the importance of the home environment. Using sibling correlations, Anger and Schnitzlein (2017) show that 46.6% of the variance in LoC stems from shared sibling-related factors, indicating the importance of family background.

Judge et al. (2002) and Judge et al. (2003) propose that LoC along with self-efficacy, neuroticism and self-esteem underlie a higher order concept that they term as core self-evaluations (simply put, the fundamental assessment about individuals' own self-worth. Hence, LoC may be correlated with these traits as well. Judge et al. (2002) carries out a meta-analysis and reports a correlation of 0.52 between LoC and self-esteem, and a correlation of 0.4 between LoC and emotional stability.[33]

Several studies investigate the role of important life events in shaping LoC. Cobb-Clark and Schurer (2013) report that LoC is s quite stable trait. Furthermore, changes in LoC generally do not associate with demographic, labour market and health events that the respondents experience. Relevant life events that seem to be able this trait (e.g. serious illness, death of a family member) do not significantly correlate with changes in LoC at all. Neither do find the authors evidence that intense or persistent negative life events affect in a meaningful manner individuals' LoC. However, some events (e.g. worsening of financial situation) do cause a change in the expected direction, moreover the young and the old exhibit less stability than middle-aged individuals. While Cobb-Clark and Schurer (2013) analyze a representative sample of the whole Australian population, Elkins et al. (2017) focus on adolescents (aged 15-24). They find that in general one-off life events (e.g. being fired or promoted, serious illness or injury, death of spouse / child) do not explain changes in LoC in a consistent way. However, there are studies that show that strong and long-lasting life events may have a lasting effect (Gong et al., 2015).

It is an unresolved question to which extent non-cognitive skills are malleable (Ertac, 2020). Research on LoC presented in the previous paragraph shows that it is a quite stable trait, at least in the adulthood. However, there are also studies that find that intervention programs may have an important impact (Browne and Evans, 2007; Krishnan and Krutikova, 2013).

In Table D.14 we show the results of the lasso regressions on the level and change of LoC. Columns (1) and (3) contain the results from lasso regressions in which we restrict the set of controls to exogenous variables. In Columns (2) and (4) we show the findings without the previous restriction. Note also that lasso selects variables

[33]Other studies also find a significant positive association between self-esteem and LoC, see for instance Abdallah (1989); Piskin (1996).

Table D.14: The level and change of LoC

	VARIABLES	(1) LoC score (2009)	(2) LoC score (2009)	(3) Change of LoC (2006-2009)	(4) Change of LoC (2006-2009)
Basis LoC	LoC score in 2006			-0.849***	-0.902***
				[0.024]	[0.025]
	HOME cognitive scale	0.002**		0.002	
		[0.001]		[0.001]	
Home environment	Minimum wanted education for child: college (2006)	0.109**		0.084	
		[0.052]		[0.052]	
	How often did the parents read tales from a book?	0.004	0.004*	0.004	0.004
		[0.003]	[0.003]	[0.003]	[0.003]
	How many people sleep in the same room? (2006)	-0.017			
		[0.028]			
	Mother's mother: high school	0.058		0.063	
		[0.051]		[0.049]	
	Mother's father: less than 8	-0.055			
Parental education		[0.080]			
	Mother's father: high school	0.056	0.077*	0.056	0.083*
		[0.048]	[0.044]	[0.046]	[0.045]
	Father's father: less than 8	-0.132	-0.162**	-0.146*	-0.144*
		[0.084]	[0.075]	[0.084]	[0.079]
	Mother works (2009) = 1	0.084		0.065	
		[0.054]		[0.053]	
Household's financial position	Father works (2008) = 1	0.075		0.083*	0.073
		[0.046]		[0.046]	[0.045]
	Household income (2007, imp)	0.074		0.076	0.089
		[0.059]		[0.058]	[0.055]
	Financial distress (2006)	-0.060		-0.064	
		[0.052]		[0.052]	
Special characteristic	Special education needs	-0.199**		-0.165*	
		[0.086]		[0.086]	
	Mental, physical or sexual abuse before age 14	-0.046***	-0.025***	-0.042***	-0.025***
		[0.009]	[0.009]	[0.009]	[0.009]
Family- or health-related shocks	Accident (2009, imp)	-0.371**	-0.389**	-0.426**	-0.402**
		[0.188]	[0.166]	[0.187]	[0.168]
	Death (2009)	-0.184*		-0.182*	-0.179*
		[0.111]		[0.110]	[0.103]
	Death (2009, imp)			0.957***	
				[0.240]	
	Region (=1 if Southern Transdanubia)			-0.063	
Regional dummies				[0.077]	
	Region (=1 if Northern Great Plain)	0.130**	0.142**	0.150**	0.165***
		[0.065]	[0.060]	[0.067]	[0.063]
	Do you look good? (2008)		0.072**		0.076**
			[0.032]		[0.033]
	Sociability (2006)		0.035**		0.027*
			[0.015]		[0.015]
Psychological factors / traits	Self esteem (2006)		0.034**		0.030**
			[0.013]		[0.014]
	Self esteem (2006, imp)				-0.475
					[0.295]
	Emotional stability (2006)		0.023		0.007
			[0.020]		[0.021]
	Health: cannot sleep (2008)		-0.046*		-0.042
			[0.025]		[0.026]
	How healthy do you feel? (2006)		0.073*		0.061
			[0.037]		[0.038]
Health	How healthy do you feel? (2008)		0.020		0.017
			[0.034]		[0.034]
	Objective health (2006)		0.012		0.010
			[0.010]		[0.010]
	Health: bad mood (2008)				-0.019
					[0.025]
	School environment 2008		0.017**		0.017**
			[0.006]		[0.007]
Other environmental issues	How many friends smoke/drink/take drugs? (2008)		-0.013		-0.013
			[0.009]		[0.009]
	How many friends smoke/drink/take drugs? (2008, imp)		-0.117		-0.261*
			[0.109]		[0.143]
	Works (2007, imp)				-0.396***
					[0.135]
	Positive expectations (school, work)- 2008		0.078***		0.070***
			[0.017]		[0.017]
Conduits of LoC	Effort grade (2008)		0.028		0.026
			[0.028]		[0.028]
	Constant	2.665***	1.077***	2.219***	1.449***
		[0.121]	[0.280]	[0.120]	[0.318]
	Observations	2,940	3,038	2,920	2,951
	R-squared	0.052	0.093	0.411	0.437

to optimize prediction and the final regression may have variables that fail to be significant.[34]

When considering only exogenous variables, it is noteworthy how many factors associated with family background (home environment, parental education, household's financial position) predicts LoC, in line with studies cited in Appendix D. Lasso selects 12 variables to predict the level of LoC in 2009 and the HOME cognitive scale is itself a composite scale of 13 items. All of the items selected by lasso have the expected sign: more (less) favourable home environment, better (worse) schooling of the ancestors, better (worse) financial position of the household associates positively (negatively) with the level of LoC in 2009. In line with the literature on the stability of LoC (Cobb-Clark and Schurer, 2013; Elkins et al., 2017) we find that negative shocks have a detrimental effect on LoC. We document a strong negative effect of mental, physical or sexual abuse before the age 14.[35]

When considering endogenous variables also, we observe that psychological traits play an important role. This is not surprising as Judge et al. (2002) and Judge et al. (2003) claim that LoC is related to other psychological traits, notably self esteem.

Health-related issues (both objective and subjective) are also related to the level and change of LoC in the expected way: good / bad health improves / worsens LoC.

Some environmental issues not related to home, but to schools and friends also associate with the level and change of LoC in the expected manner.

The conduits through which LoC may operate in education-related issues (see 5.2) are also selected by lasso and the coefficients have the expected sign.

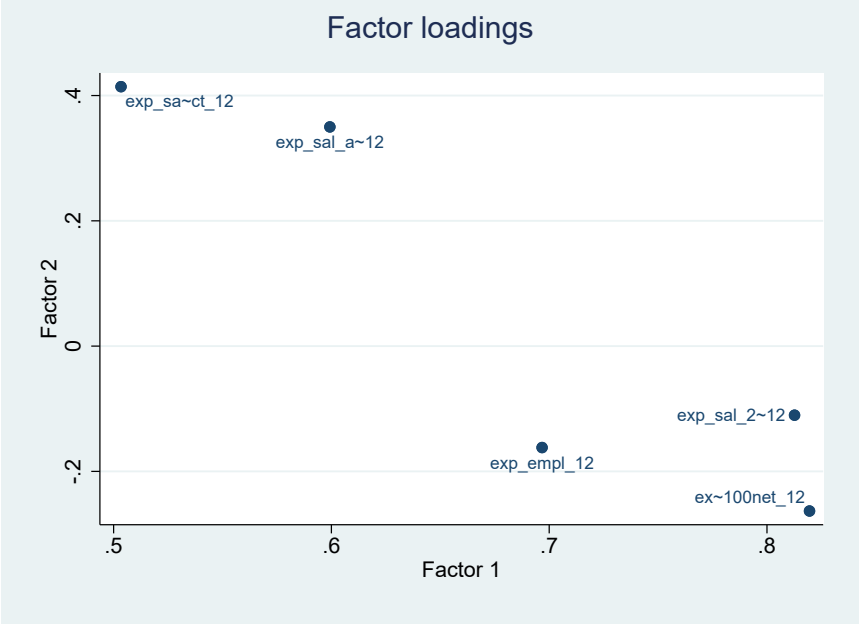
When we allow endogenous variables, then lasso selects considerably less exogenous variables, suggesting that those endogenous variables mediate the effect of the exogenous variables that have been dropped.

Overall, our findings related to the stability and determinants of LoC are in line with the literature.

[34] If a variable name contains *imp*, then it refers to a dummy variable that has value =1 if for the given observation the variable has been imputed, and 0 otherwise.

[35] We have a similar variable related to abuse after the age 14, but lasso does not select it.

Figure E.4: Factor loadings of expectations (2012)

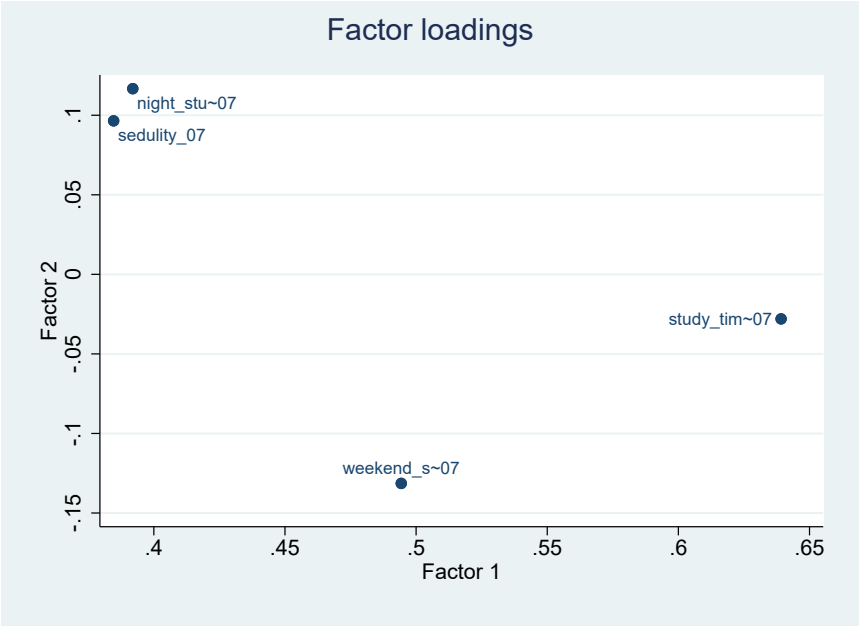


Appendix E. Factor loadings

Appendix E.1. Expectations

Here we show the graphical presentation of the factor loadings for future expectations, measured in 2012.

Figure E.5: Factor loadings of effort (2007)



Appendix E.2. Effort

Here we show the graphical presentation of the factor loadings for effort, measured at different years.

Figure E.6: Factor loadings of effort (2008)

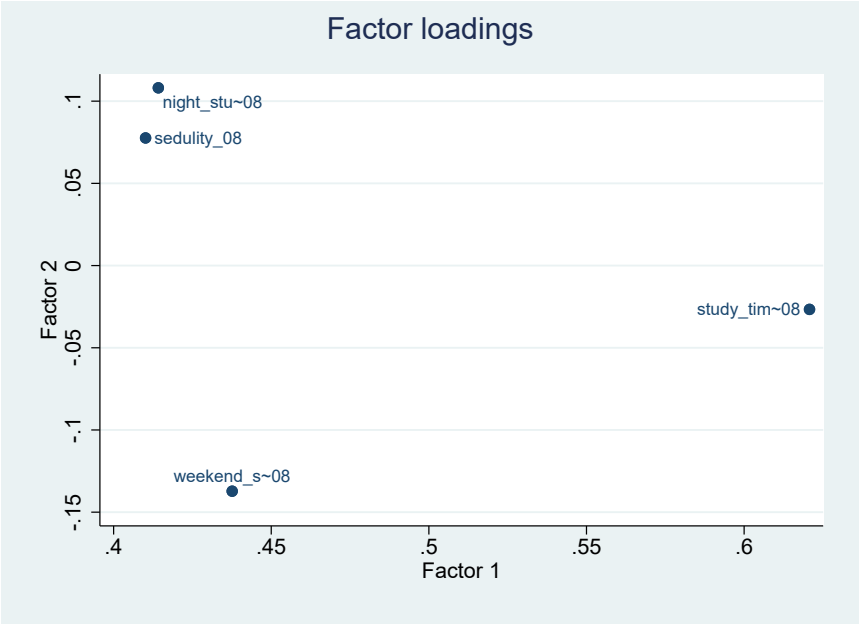
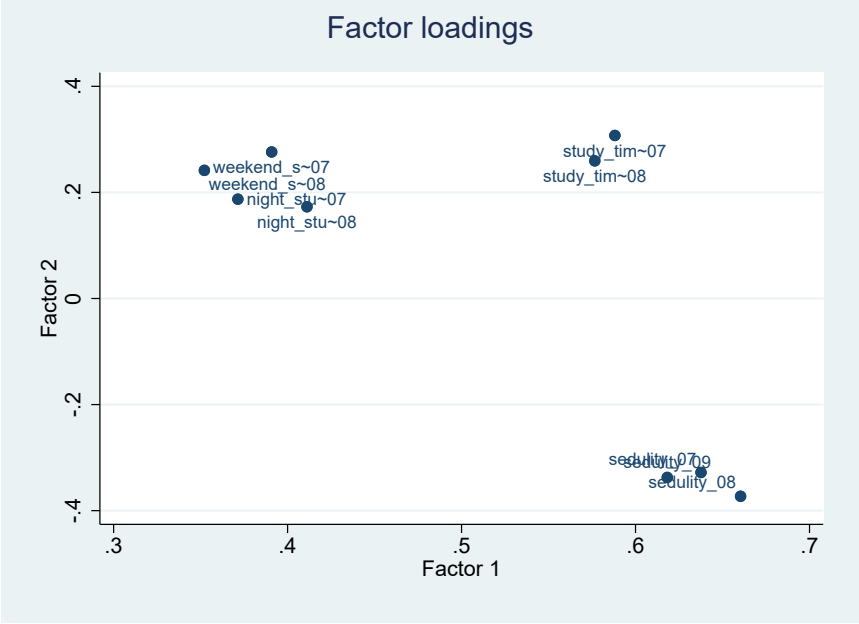


Figure E.7: Factor loadings of effort (2007-2009)



Appendix F. Complete regressions

Appendix F.1. Dropout age

Table F.15: Complete regressions - dropout age

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LoC score in 2009	0.134***	0.046**	0.045**	0.027	0.024	0.024	0.028*
	[0.025]	[0.022]	[0.022]	[0.021]	[0.017]	[0.017]	[0.017]
Mother's education: less than high school		-0.043	-0.001	0.029	-0.115***	-0.110***	-0.102***
		[0.053]	[0.052]	[0.053]	[0.039]	[0.039]	[0.037]
Mother's education: high school		0.140***	0.157***	0.159***			
		[0.037]	[0.037]	[0.039]			
Father's education: less than high school		0.011					-0.001
		[0.036]					[0.031]
HOME cognitive scale		0.006***	0.006***	0.005***	0.003***	0.003***	0.003***
		[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Social disadvantage (2006)		0.049	0.055	0.037	0.065**	0.062*	0.048
		[0.035]	[0.034]	[0.035]	[0.033]	[0.033]	[0.031]
Father works (2006) = 1, Yes		0.153***	0.143***	0.115***	0.085**	0.080**	0.061
		[0.049]	[0.045]	[0.044]	[0.037]	[0.037]	[0.038]
Financial distress (2009)		-0.177***	-0.174***	-0.157***	-0.082**	-0.079*	-0.070*
		[0.050]	[0.049]	[0.047]	[0.041]	[0.040]	[0.038]
Mental, physical or sexual abuse before age 14		-0.005	-0.005	-0.005	-0.011	-0.011	-0.012
		[0.009]	[0.009]	[0.009]	[0.008]	[0.008]	[0.008]
Father's mother: high school		0.103***	0.105***	0.098***	0.083***	0.084***	0.089***
		[0.034]	[0.033]	[0.035]	[0.031]	[0.032]	[0.030]
Highest wanted education for child: college (2006)		0.350***	0.249***	0.238***	0.168**	0.174**	0.129**
		[0.079]	[0.078]	[0.076]	[0.069]	[0.069]	[0.065]

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Table F.15 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
How long can you pay for child's education: college (2006)		0.207**	0.201**	0.192**	0.153**	0.154**	0.164**
		[0.091]	[0.088]	[0.085]	[0.074]	[0.075]	[0.070]
Mother works (2009) = 1, Yes		0.240***	0.243***	0.206***	0.108***	0.108***	0.081**
		[0.052]	[0.051]	[0.049]	[0.041]	[0.041]	[0.039]
Reading score			0.134***	0.127***	0.060**	0.060**	0.032
			[0.031]	[0.031]	[0.025]	[0.025]	[0.024]
Mathematics score			0.070***	0.056**	0.069***	0.069***	0.071***
			[0.027]	[0.027]	[0.023]	[0.023]	[0.022]
Exp: earn more than avg (2008)				-0.276***		-0.195**	-0.088
				[0.100]		[0.084]	[0.079]
Exp: permanent employment (2008)				0.889***		0.152*	0.107
				[0.126]		[0.091]	[0.085]
Exp: earn more than net HUF100.000 (2008)				0.280***		0.031	-0.029
				[0.101]		[0.096]	[0.090]
Exp: earn more than net HUF200.000 (2008)				-0.012		0.080	0.097
				[0.087]		[0.082]	[0.079]
How many hours a week do you spend with studying? (2007)							0.016***
							[0.005]
How many hours a week do you spend with studying? (2008)					0.017***	0.017***	0.008
					[0.005]	[0.005]	[0.005]
Effort grade (2008)					0.042*	0.041*	0.049**
					[0.024]	[0.024]	[0.022]
Study after 8pm on weekday (2008)					0.060	0.061*	0.049
					[0.037]	[0.037]	[0.036]
Night study							

Continued on next page

Table F.15 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2008 imp					-1.492***	-1.460***	-0.887***
					[0.295]	[0.289]	[0.213]
Weekend study 2008 imp					-1.507***	-1.450***	-0.817***
					[0.280]	[0.273]	[0.196]
How healthy do you feel (2006)							-0.007
							[0.032]
Emotional stability (2006)							-0.010
							[0.015]
Self-esteem (2006)							0.002
							[0.010]
Grade retention 2006							-0.247**
							[0.105]
Age at 2006 interview							-0.115***
							[0.041]
Number of positive life events							-0.415***
							[0.141]
How healthy do you feel (2008)							-0.005
							[0.025]
School environment 2008							-0.003
							[0.004]
School environment 2008 imp							-0.597***
							[0.139]
Student works 2008 imp							-1.700***
							[0.298]
How old at first sex (2008)							0.057***
							[0.013]
Number of students in the class		0.013***					

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Table F.15 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		[0.004]					
How often did the parents read tales from a book		0.006**					
		[0.003]					
Minimum wanted education for child: college (2006)		0.047					
		[0.034]					
Effort grade (2007)					0.031	0.030	
					[0.024]	[0.024]	
Effort 20008 imp					-0.287***	-0.283***	
					[0.106]	[0.105]	
Weekend study 2007 imp					-0.391***	-0.390***	
					[0.108]	[0.108]	
Constant	21.411***	19.818***	20.338***	19.847***	20.605***	20.572***	21.662***
	[0.025]	[0.191]	[0.140]	[0.169]	[0.128]	[0.135]	[0.709]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	15	13	17	20	24	34
Dictionary size	0	119	121	131	137	147	221
R-squared (in-sample)	0.0130	0.258	0.268	0.316	0.431	0.441	0.484
R-squared (out-sample)	0.0124	0.249	0.258	0.319	0.469	0.479	0.508

Appendix F.2. Graduating from high school

Table F.16: Complete regressions - graduating from high school

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LoC score in 2009	0.054***	0.012*	0.010	0.009	0.006	0.006	0.006
	[0.009]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
Mother's education: less than high school		-0.059***	-0.041**	-0.038**	-0.034*	-0.035*	-0.033*
		[0.019]	[0.019]	[0.019]	[0.018]	[0.018]	[0.018]
Father's education less than high school		-0.060***	0.001	0.003	0.001	0.003	-0.001
		[0.016]	[0.017]	[0.018]	[0.018]	[0.018]	[0.017]
Father' education: high school			0.069***	0.068***	0.067***	0.067***	0.065***
			[0.017]	[0.017]	[0.018]	[0.018]	[0.017]
HOME cognitive scale		0.002***	0.001***	0.001***	0.001***	0.001***	0.001**
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Social disadvantage (2006)		0.035**	0.032**	0.030**	0.034**	0.036**	0.031**
		[0.015]	[0.014]	[0.014]	[0.014]	[0.014]	[0.014]
Mental, physical or sexual abuse before age 14		0.003	0.002	0.002	0.003	0.003	0.003
		[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Highest wanted education for child: college (2006)		0.321***	0.275***	0.275***	0.235***	0.236***	0.221***
		[0.031]	[0.031]	[0.030]	[0.030]	[0.029]	[0.030]
How long can you pay for child's education: college (2006)		0.062*	0.059*	0.057*	0.062**	0.063**	0.064**
		[0.032]	[0.030]	[0.030]	[0.029]	[0.029]	[0.029]
Mother works (2009) = 1, Yes		0.069***	0.051**	0.050**	0.034*	0.049***	0.026
		[0.019]	[0.021]	[0.021]	[0.020]	[0.017]	[0.021]
Reading score			0.087***	0.087***	0.063***	0.063***	0.062***
			[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
Mathematics score			0.024**	0.024**	0.028***	0.029***	0.025***
			[0.010]	[0.010]	[0.010]	[0.010]	[0.009]

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Table F.16 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exp: earn more than avg (2008)				-0.060*		-0.053	-0.040
				[0.036]		[0.034]	[0.033]
Exp: earn more than net HUF100.000 (2008)				0.049		-0.001	-0.009
				[0.035]		[0.036]	[0.035]
Exp: earn more than net HUF200.000 (2008)				0.036		0.046	0.046
				[0.036]		[0.035]	[0.035]
How many hours a week do you spend with studying? (2007)					0.008***	0.008***	0.008***
					[0.002]	[0.002]	[0.003]
How many hours a week do you spend with studying? (2008)					0.007***	0.007***	0.007***
					[0.002]	[0.002]	[0.002]
Effort grade (2008)					0.011	0.010	
					[0.011]	[0.011]	
Study after 8pm on weekday (2008)					0.092***	0.092***	0.090***
					[0.017]	[0.017]	[0.016]
Night study 2008 imp					-0.042	-0.041	
					[0.049]	[0.050]	
Weekend study 2008 imp					-0.140***	-0.139***	-0.039
					[0.043]	[0.043]	[0.033]
How healthy do you feel (2006)							0.005
							[0.012]
Emotional stability (2006)							0.003
							[0.006]
Self-esteem (2006)							0.003
							[0.004]

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Table F.16 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Grade retention 2006							-0.148***
							[0.030]
How healthy do you feel (2008)							0.013
							[0.012]
School environment 2008							-0.002
							[0.002]
School environment 2008 imp							-0.099***
							[0.038]
How old at first sex (2008)							0.021***
							[0.006]
Mother's education: high school							
Number of students in the class		0.003**					
		[0.001]					
Minimum wanted education for child: college (2006)		0.037***					
		[0.014]					
Effort grade (2007)					0.028**	0.027**	0.027***
					[0.011]	[0.011]	[0.010]
Female		0.055***					
		[0.014]					
Special education needs		-0.133***	-0.160***	-0.159***	-0.156***	-0.157***	-0.135***
		[0.036]	[0.029]	[0.029]	[0.028]	[0.028]	[0.028]
SEN students in the class		-0.006					
		[0.004]					
Roma		-0.151***	-0.118***	-0.116***	-0.113***	-0.114***	-0.108***
		[0.042]	[0.040]	[0.040]	[0.037]	[0.038]	[0.038]

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Table F.16 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mother works (2007) = 1, Yes			0.030	0.029	0.029		
			[0.020]	[0.020]	[0.020]		
Mother works (2008) = 1, Yes							0.027
							[0.022]
Constant	0.711***	0.207***	0.331***	0.325***	0.133**	0.154**	-0.189
	[0.010]	[0.052]	[0.041]	[0.044]	[0.060]	[0.062]	[0.122]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	14	14	17	21	23	30
Dictionary size	0	119	121	131	137	147	221
R-squared (in-sample)	0.0135	0.430	0.458	0.460	0.484	0.485	0.499
R-squared (out-sample)	0.0187	0.451	0.482	0.483	0.504	0.503	0.511

Appendix F.3. Planning to go to college

Table F.17: Complete regressions - planning to go to college

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LoC score in 2009	0.063***	0.023***	0.021***	0.021***	0.016**	0.016**	0.016**
	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Mother's education: less than high school		-0.085***	-0.067***	-0.066***	-0.058***	-0.056**	-0.055**
		[0.024]	[0.023]	[0.024]	[0.023]	[0.023]	[0.022]
Father's education: less than high school		-0.090***	-0.073***	-0.071***	-0.070***	-0.067***	-0.067***
		[0.025]	[0.025]	[0.025]	[0.024]	[0.024]	[0.024]
Mother's education: college		0.069**	0.068***	0.069***	0.067***	0.066***	0.065***
		[0.027]	[0.026]	[0.026]	[0.025]	[0.025]	[0.025]
Father's education: college		0.049	0.041	0.047	0.037	0.038	0.037
		[0.032]	[0.031]	[0.031]	[0.029]	[0.029]	[0.029]
Mother's father: college		0.049*					
		[0.027]					
HOME cognitive scale		0.001***	0.001*	0.001*	0.001	0.000	0.000
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Mental, physical or sexual abuse before age 14		0.002	0.002	0.002	0.004	0.004	0.005*
		[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Highest wanted education for child: college (2006)		0.297***	0.227***	0.230***	0.184***	0.186***	0.181***
		[0.031]	[0.030]	[0.030]	[0.028]	[0.028]	[0.028]
How long can you pay for child's education: college (2006)		0.036	0.033	0.032	0.047**	0.044**	0.047**
		[0.026]	[0.024]	[0.024]	[0.022]	[0.022]	[0.022]
Reading score			0.084***	0.086***	0.052***	0.051***	0.053***
			[0.012]	[0.012]	[0.012]	[0.011]	[0.012]
Mathematics score			0.061***	0.063***	0.063***	0.063***	0.060***
			[0.012]	[0.012]	[0.012]	[0.012]	[0.012]

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Table F.17 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exp: earn more than avg (2008)				-0.068*		-0.065*	-0.062*
				[0.037]		[0.034]	[0.034]
Exp: earn more than net HUF100.000 (2008)				0.005		-0.002	-0.006
				[0.040]		[0.039]	[0.040]
Exp: earn more than net HUF200.000 (2008)				0.105**		0.093**	0.097**
				[0.046]		[0.043]	[0.043]
How many hours a week do you spend with studying? (2008)					0.017***	0.017***	0.016***
					[0.003]	[0.003]	[0.003]
Effort grade (2008)					0.059***	0.058***	0.057***
					[0.011]	[0.011]	[0.012]
How healthy do you feel (2006)							-0.020
							[0.012]
Emotional stability (2006)							-0.003
							[0.007]
Self-esteem (2006)							0.005
							[0.005]
How healthy do you feel (2008)							0.025**
							[0.012]
School environment 2008							-0.001
							[0.002]
How old at first sex (2008)							0.016***
							[0.006]
Number of students in the class		0.007***	0.004***		0.004***	0.004***	0.004***
		[0.002]	[0.002]		[0.001]	[0.001]	[0.001]
How often did the parents read							

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Table F.17 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
tales from a book		0.003**					
		[0.001]					
Minimum wanted education for child: college (2006)		0.165***	0.119***	0.117***	0.087***	0.085***	0.085***
		[0.024]	[0.024]	[0.024]	[0.023]	[0.023]	[0.023]
Effort grade (2007)					0.056***	0.056***	0.052***
					[0.012]	[0.012]	[0.012]
SEN students in the class		-0.006**			-0.009***	-0.009***	-0.009***
		[0.003]			[0.003]	[0.003]	[0.003]
Grade retention in grades 1-4							-0.030
							[0.022]
Constant	0.438***	-0.060	0.139**	0.234***	-0.330***	-0.317***	-0.587***
	[0.012]	[0.057]	[0.055]	[0.047]	[0.071]	[0.071]	[0.127]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	13	12	14	16	19	26
Dictionary size	0	119	121	131	137	147	221
R-squared (in-sample)	0.0153	0.411	0.449	0.450	0.491	0.493	0.498
R-squared (out-sample)	0.0175	0.400	0.444	0.445	0.478	0.479	0.482

Appendix F.4. Attending college

Table F.18: Complete regressions - attending college

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LoC score in 2009	0.056***	0.024***	0.019**	0.017**	0.015*	0.013	0.015*
	[0.010]	[0.009]	[0.009]	[0.009]	[0.008]	[0.008]	[0.008]
Mother's education: less than high school		-0.099***	-0.065***	-0.062***	-0.059***	-0.056***	-0.053***
		[0.023]	[0.022]	[0.022]	[0.020]	[0.021]	[0.021]
Father's education: less than high school		-0.054**	-0.033	-0.031	-0.029	-0.028	-0.028
		[0.027]	[0.026]	[0.026]	[0.025]	[0.025]	[0.025]
Mother's education: college		0.063**	0.046	0.046	0.043	0.043	0.042
		[0.032]	[0.030]	[0.030]	[0.029]	[0.029]	[0.029]
Father's education: college		0.132***	0.108***	0.108***	0.103***	0.103***	0.100***
		[0.038]	[0.036]	[0.036]	[0.035]	[0.035]	[0.035]
HOME cognitive scale		0.002***	0.001*	0.001*	0.001	0.000	0.000
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Mental, physical or sexual abuse before age 14		-0.001	-0.002	-0.002	0.001	0.001	0.001
		[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Highest wanted education for child: college (2006)		0.247***	0.153***	0.150***	0.124***	0.120***	0.120***
		[0.022]	[0.022]	[0.022]	[0.021]	[0.021]	[0.021]
Reading score			0.083***	0.083***	0.054***	0.054***	0.054***
			[0.013]	[0.013]	[0.013]	[0.013]	[0.013]
Mathematics score			0.090***	0.089***	0.090***	0.089***	0.091***
			[0.013]	[0.013]	[0.012]	[0.012]	[0.013]
Exp: earn more than avg (2008)				0.033		0.039	0.052
				[0.038]		[0.038]	[0.037]
Exp: earn more than net HUF100.000 (2008)				-0.008		-0.008	-0.005
				[0.040]		[0.038]	[0.038]

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Table F.18 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exp: earn more than net HUF200.000 (2008)				0.055		0.042	0.039
				[0.046]		[0.044]	[0.043]
How many hours a week do you spend with studying? (2007)					0.006*	0.006*	0.006*
					[0.003]	[0.003]	[0.003]
How many hours a week do you spend with studying? (2008)					0.011***	0.011***	0.010***
					[0.003]	[0.003]	[0.003]
Effort grade (2008)					0.051***	0.050***	0.046***
					[0.011]	[0.011]	[0.011]
How healthy do you feel (2006)							-0.009
							[0.012]
Emotional stability (2006)							-0.004
							[0.007]
Self-esteem (2006)							-0.003
							[0.005]
How healthy do you feel (2008)							0.006
							[0.012]
School environment 2008							0.001
							[0.002]
How old at first sex (2008)							0.020***
							[0.006]
Minimum wanted education for child: college (2006)		0.168***	0.109***	0.108***	0.078***	0.077***	0.078***
		[0.027]	[0.026]	[0.026]	[0.025]	[0.025]	[0.025]
Effort grade (2007)					0.062***	0.062***	0.059***
					[0.011]	[0.011]	[0.011]
Special							

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Table F.18 – continued from previous page

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expecta-tions	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
education needs		-0.068***	-0.048***	-0.044**	-0.073***	-0.070***	-0.075***
		[0.018]	[0.017]	[0.017]	[0.018]	[0.018]	[0.018]
Constant	0.347***	0.045	0.193***	0.169***	-0.282***	-0.302***	-0.560***
	[0.011]	[0.047]	[0.047]	[0.050]	[0.060]	[0.063]	[0.119]
Observations	3,038	2,844	2,844	2,844	2,844	2,844	2,838
Clusters	1264	1219	1219	1219	1219	1219	1218
Selected controls	0	9	11	14	15	18	24
Dictionary size	0	119	121	131	137	147	221
R-squared (in-sample)	0.0131	0.337	0.409	0.411	0.452	0.453	0.456
R-squared (out-sample)	0.0158	0.361	0.426	0.428	0.460	0.462	0.466

Appendix G. Gender differences

Studies on the labour market revealed that there are gender differences in how LoC associates with outcomes. Interestingly, in the case of some labour outcomes LoC matters more for women (e.g. in Semykina and Linz (2007) for wages) and for others for men (e.g. in Cobb-Clark and Tan (2011) for occupational attainment).

Table G.19: Heterogeneity: gender differences
(Independent variable LoC score in 2009 in all cases)

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Dependent variable: A. Dropout age			
Female	0.191***	0.066**	0.062**	0.047	0.040*	0.039*	0.027
	[0.037]	[0.031]	[0.030]	[0.029]	[0.023]	[0.023]	[0.023]
Male	0.085**	0.038	0.036	0.018	0.032	0.029	0.041*
	[0.036]	[0.033]	[0.032]	[0.031]	[0.025]	[0.025]	[0.024]
				Dependent variable: B. Graduates from high school			
Female	0.058***	0.011	0.003	0.001	0.003	0.002	-0.001
	[0.012]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
Male	0.050***	0.019*	0.017*	0.017*	0.012	0.012	0.015
	[0.013]	[0.010]	[0.010]	[0.010]	[0.010]	[0.010]	[0.010]
				Dependent variable: C. Plans to apply to college			
Female	0.104***	0.050***	0.043***	0.041***	0.036***	0.035***	0.034***
	[0.015]	[0.013]	[0.012]	[0.013]	[0.012]	[0.012]	[0.013]
Male	0.027*	0.006	0.004	0.002	-0.001	-0.001	0.001
	[0.014]	[0.011]	[0.010]	[0.010]	[0.010]	[0.010]	[0.010]
				Dependent variable: D. Attends college			
Female	0.078***	0.031**	0.025*	0.020	0.021	0.016	0.017
	[0.016]	[0.014]	[0.013]	[0.014]	[0.013]	[0.013]	[0.013]
Male	0.036***	0.018	0.017	0.017	0.012	0.012	0.013
	[0.014]	[0.011]	[0.011]	[0.011]	[0.010]	[0.010]	[0.010]

Standard errors in parentheses. */**/*** denotes significance at 10 / 5 / 1 % level.

In Table G.19 we show if LoC associates with our outcome variables in a different way for females and males. We carry out the same analysis as in Table 6, but we do so separately for females and males. To economize on space, we only report the coefficient of LoC for the different genders. We see a clear gender difference for three

outcome variables: dropout age, planning to apply to college, and attending college. For these outcome variables, in the case of females LoC is significantly associated with the given outcome at least marginally even if we control for cognitive abilities, while in the case of males LoC is significant only in the univariate regression. The size of the coefficients is generally markedly higher in the case of females (standard errors being very similar), so overall for these outcomes LoC matters a lot more for females. More precisely, in the case of males once we take into account exogenous variables, the significance of LoC vanishes, suggesting that exogenous variables mediate the effect of LoC. For females LoC has an effect beyond exogenous variables. We observe the strongest difference in planning to apply to college. Regarding graduation from high school, males seem to be more affected by LoC, though in their case the significance is only marginal.

Appendix H. Parental preferences and financial constraints

In Table H.20 we investigate the role of parental preferences and show all the seven specifications for all the outcome variables. The coefficients reported in Table 8 correspond to the specification named Exogenous controls.

Table H.20: Parental preferences and the association between LoC and the outcome variables. All specifications

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Dependent variable: A. Dropout age			
Strict low	0.159**	0.070	0.047	-0.004	0.004	0.004	0.015
	[0.069]	[0.065]	[0.064]	[0.057]	[0.048]	[0.048]	[0.048]
Challenge	0.098***	0.048*	0.045*	0.034	0.039*	0.037*	0.040*
	[0.028]	[0.026]	[0.026]	[0.025]	[0.022]	[0.021]	[0.022]
Strict high	0.010	0.010	0.007	0.007	0.007	0.007	-0.004
	[0.019]	[0.020]	[0.019]	[0.019]	[0.019]	[0.019]	[0.018]
				Dependent variable: B. Graduates from high school			
Strict low	0.064***	0.043***	0.040**	0.040**	0.034**	0.034**	0.035**
	[0.017]	[0.016]	[0.016]	[0.016]	[0.015]	[0.015]	[0.016]
Challenge	0.026**	0.001	0.001	0.001	-0.004	-0.003	-0.002
	[0.011]	[0.011]	[0.011]	[0.011]	[0.010]	[0.010]	[0.010]
Strict high	0.003	0.001	-0.002	-0.002	-0.005	-0.005	-0.006
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
				Dependent variable: C. Plans to apply to college			
Strict low	0.010	0.009	0.010	0.010	0.008	0.008	0.009
	[0.007]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Challenge	0.053***	0.038***	0.036***	0.036***	0.032***	0.032**	0.032**
	[0.015]	[0.013]	[0.013]	[0.013]	[0.012]	[0.013]	[0.013]
Strict high	0.027	0.023	0.017	0.017	0.012	0.012	0.011
	[0.017]	[0.015]	[0.014]	[0.014]	[0.015]	[0.015]	[0.015]
				Dependent variable: D. Attends college			
Strict low	0.003	0.003	0.003	0.003	0.003	0.003	0.006
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.006]
Challenge	0.042***	0.029**	0.028**	0.026**	0.023*	0.022*	0.021*
	[0.015]	[0.014]	[0.013]	[0.013]	[0.012]	[0.013]	[0.013]
Strict high	0.041**	0.040**	0.032*	0.032*	0.017	0.017	0.017
	[0.020]	[0.019]	[0.018]	[0.018]	[0.017]	[0.017]	[0.017]

Standard errors in parentheses. */**/*** denotes significance at 10 / 5 / 1 % level.

Table H.21: Parental preferences and the association between LoC and dropout age. All specifications

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				A. Dropout age			
Low, binding	0.835***	0.894**	0.894**	0.202	0.285	0.017	0.119
	[0.291]	[0.400]	[0.400]	[0.258]	[0.323]	[0.314]	[0.293]
Low, non-binding	0.172**	0.085	0.062	0.019	0.014	0.014	0.027
	[0.075]	[0.071]	[0.067]	[0.059]	[0.047]	[0.047]	[0.047]
Mid, binding	0.357	0.288	0.288	0.358	0.498*	0.244	0.244
	[0.331]	[0.383]	[0.383]	[0.325]	[0.266]	[0.354]	[0.354]
Mid, non-binding	0.102*	0.082	0.082	0.036	0.080	0.058	0.065
	[0.058]	[0.061]	[0.061]	[0.058]	[0.050]	[0.049]	[0.051]
High, binding	0.138	0.132	0.109	0.109	0.108	0.108	0.003
	[0.089]	[0.089]	[0.077]	[0.077]	[0.076]	[0.076]	[0.049]
High, non-binding	0.035*	0.017	0.013	0.014	0.007	0.008	0.009
	[0.018]	[0.017]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]

Table H.22: Parental preferences and the association between LoC and high school graduation. All specifications

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	B. Graduates from high school						
Low, binding	0.059	0.069	-0.018	-0.018	-0.018	0.017	0.069
	[0.055]	[0.066]	[0.025]	[0.025]	[0.025]	[0.018]	[0.066]
Low, non-binding	0.069***	0.046***	0.041***	0.041***	0.036**	0.036**	0.040**
	[0.016]	[0.016]	[0.016]	[0.016]	[0.015]	[0.015]	[0.015]
Mid, binding	0.054	-0.002	-0.002	-0.002	0.016	0.016	0.016
	[0.100]	[0.088]	[0.088]	[0.088]	[0.050]	[0.050]	[0.046]
Mid, non-binding	0.009	0.006	0.015	0.015	0.006	0.006	0.007
	[0.026]	[0.027]	[0.025]	[0.025]	[0.022]	[0.022]	[0.023]
High, binding	0.069**	0.061**	0.045**	0.045**	0.045**	0.045**	0.040*
	[0.028]	[0.028]	[0.022]	[0.022]	[0.022]	[0.022]	[0.023]
High, non-binding	0.010	0.002	-0.001	-0.001	-0.008	-0.008	-0.010
	[0.008]	[0.008]	[0.008]	[0.008]	[0.007]	[0.007]	[0.007]

Table H.23: Parental preferences and the association between LoC and college application plans. All specifications

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	C. Plans to apply to college						
Low, binding	0.059	0.069	-0.018	-0.018	-0.018	0.017	0.069
	[0.055]	[0.066]	[0.025]	[0.025]	[0.025]	[0.018]	[0.066]
Low, non-binding	0.010	0.009	0.009	0.009	0.008	0.008	0.010
	[0.007]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Mid, binding	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Mid, non-binding	0.011	0.014	0.013	0.013	0.014	0.014	0.015
	[0.023]	[0.023]	[0.021]	[0.021]	[0.021]	[0.021]	[0.022]
High, binding	0.100**	0.094***	0.097***	0.087***	0.097***	0.087***	0.071**
	[0.044]	[0.034]	[0.031]	[0.032]	[0.031]	[0.032]	[0.035]
High, non-binding	0.046***	0.029**	0.023*	0.023*	0.014	0.015	0.013
	[0.014]	[0.013]	[0.012]	[0.012]	[0.012]	[0.012]	[0.012]

Table H.24: Parental preferences and the association between LoC and college attendance. All specifications

	Basic controls		Cognitive ability, Expectations and Effort				Other channels
	None	Exogenous controls	Exog + Cognitive ability	Exog + Cogn + Expectations	Exog + Cogn + Effort	Exog + Cogn + Exp + Effort	Exog + Cogn + Exp + Effort + Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				D. Attends college			
Low, binding	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Low, non-binding	0.004	0.003	0.003	0.003	0.003	0.003	0.007
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.006]
Mid, binding	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Mid, non-binding	0.005	0.002	0.003	0.003	0.003	0.003	0.002
	[0.021]	[0.021]	[0.021]	[0.021]	[0.021]	[0.021]	[0.021]
High, binding	0.131***	0.140***	0.113***	0.113***	0.103***	0.103***	0.087**
	[0.044]	[0.044]	[0.034]	[0.034]	[0.033]	[0.033]	[0.036]
High, non-binding	0.042***	0.030**	0.022*	0.019	0.012	0.010	0.008
	[0.015]	[0.014]	[0.013]	[0.013]	[0.012]	[0.012]	[0.013]