The Investment Side of College Savings

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ABSTRACT

This paper studies how households invest savings for children's college, and how the portfolio allocation of these savings affects children's college attendance and student debt. I first document that more than 85% of households allocate college savings to risky assets, in particular more than 60% to stocks. As a result, college savings motives explain approximately one-third of stock market participation probability outside of retirement accounts for households with children. Employing exogenous variation based on the design of 529 college savings plans, I show that the allocation of college savings to stocks leads to a larger amount of accumulated college savings, as well as affects positively the quality of college attended and negatively student loan participation, but has no effect on a decision whether to attend college or not.

JEL classification: D14, G50, I22

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I. Introduction

Saving for children's post-secondary education is a vital concern for households in many countries, including the US where approximately half of families with children save for college.[1] The growing popularity of 529 college savings plans, tax-advantaged investment accounts, demonstrates that a lot of households use savings options beyond traditional savings accounts and invest in risky assets to save for college. Nowadays, 37% of the first year college students[2] have 529 college savings accounts with an average balance of more than $40,000.[3] Aside from 529 college savings plans, households may also invest in stocks, bonds, real estate, or alternative forms (e.g., gold or Bitcoin).

As of today, little evidence is available on how households allocate college savings among existing investment options to save for children's college. More importantly, it is also unknown whether the portfolio allocation of college savings has any implications for children's future well-being. In this paper, I first present stylized facts on how households allocate college savings and on the role of college savings in household portfolios. After that, I answer the main research question: how does the portfolio allocation of college savings affect children's college attendance and student debt?

The results demonstrate that the allocation of college savings to some risky assets, e.g. stocks, leads to a larger amount of accumulated college savings, as well as affects positively the quality of college attended and negatively student loan participation, but has no effect on a decision whether to attend college or not. Absent financial frictions, the portfolio allocation of college savings should not affect college attendance decisions, including college quality. However, my results show that it is not the case and the portfolio allocation of

[1] According to the High School Longitudinal Study of 2009, parents of 46.2% 9th grade students and of 50.5% 11th grade students report a positive amount of college savings. The other half may not save for college due to the lack of financial resources, as similar percentages of households with 15-17 year old children use retirement accounts (48.2%) or have at least $1,000 in financial wealth (54.2%) according to the Survey of Income and Program Participation 2014. Financial wealth is the joint value of bank accounts, stocks, and bonds.

[2] Source: How America Pays for College 2020. Sallie Mae's National Study of College Students and Parents.

[3] Source: Ascensus Savings Trends 2019. The average balance for beneficiaries ages 16-17 in 2019.

college savings matters for the quality of college attended and as a result for college wage premium.

To study the portfolio allocation of college savings and its impact on children's college attendance and student debt, I combine several novel data sources with information on college savings. First, I use student-level longitudinal data from the Education Longitudinal Study of 2002 (ELS:2002) and the ongoing High School Longitudinal Study of 2009 (HSLS:2009) that provide information on how families of high school students allocate college savings, as well as on the post-secondary educational outcomes and student debt of these students after high school. This data on the portfolio allocation of college savings has not been used in the household finance literature previously. However, ELS:2002 and HSLS:2009 do not include any information on household portfolios beyond college savings. To get information on household portfolios, I employ household-level panel data from the Survey of Income and Program Participation (SIPP). The last two SIPP panels, SIPP 2014 and SIPP 2018 (ongoing), also provide data on educational savings accounts that has only recently been added to the SIPP. Finally, I work with novel 529 portfolio-level data from Morningstar that includes information on the net assets and asset allocation for investment strategies inside 529 college savings plans, by far the most popular type of educational savings accounts.

Exploring how households allocate college savings across available investment options, I find that more than 85% of them invest college savings in risky assets, in particular more than 60% in stocks. A large percentage of households that allocate college savings to stocks indicate that college savings motives can be an important driver of total stock market participation for households with children. To test this hypothesis, I estimate what share of stock market participation probability outside of retirement accounts can be explained by college savings motives using an exogenous shock similar to the elimination of these motives. This shock was caused by the adoption of a financial aid program, which was created by the passage of the Post-9/11 Veterans Educational Assistance Act of 2008 and made college free for children from military families. I show that the adoption of the program led to more

than a one-third reduction in the probability of stock market participation outside of retirement accounts among military households with children. I additionally verify the magnitude of this estimate using data on the SIPP 2014 and 2018 panels, which include information on educational savings accounts. Specifically, I demonstrate that more than 21% of households with children that invest in the stock market outside of retirement accounts do it only through educational savings accounts. This percentage excludes households that invest in stocks solely to save for college and do not use educational savings accounts. Thus, the share of stock market participation probability explained by college savings motives should be significantly higher than 21%, and the initial estimate, one-third of stock market participation probability, seems realistic.

Studying how the portfolio allocation of college savings affects students' outcomes is challenging, because the allocation of college savings is endogenously determined by factors that most likely simultaneously have impact on college enrollment and student debt, for example, family characteristics, such as family income or parents' college education. For this reason, I first explore the relation between the use of specific savings options (e.g. mutual funds, individual stocks, real estate, government bonds, alternative investment, savings accounts) to save for college and children's college enrollment and student debt controlling for family and student characteristics. The results indicate that only the use of mutual funds is associated with a significantly higher probability (4%) of enrollment in four-year college in comparison to the allocation of college savings to savings accounts. The use of other savings options does not differ significantly from the use of traditional savings accounts by enrolment probability. In addition, the use of only two savings options, mutual funds and individual stocks, is associated with a significantly lower student loan participation rate (4% and 5% lower, respectively) in comparison to the allocation of entire college savings to savings accounts. Thus, only savings options related to stock market participation have a relationship with students' outcomes not explained by student and family characteristics.

I further investigate a causal relationship between the allocation of college savings to

stocks and children's college enrollment and student debt by exploiting a novel empirical methodology based on the design of 529 college plans. A common feature of these plans in many states is the prevalence of age-based portfolios, in which allocation depends on children's age. Age-based 529 portfolios of younger students have a greater share of funds invested in stocks, and this share decreases by approximately 5% each year. I show that pupils of the same grade in many US schools may have more than a two-year difference in age that leads up to a 10% difference in the share of 529 accounts invested in stocks. My results demonstrate that a 10% greater share of 529 accounts invested in stocks during the school years increases the accumulated amount of college savings up to 20% and leads to a higher probability of enrollment in a selective four-year college and a lower student loan participation for 529 plan account beneficiaries from middle- and high-income households. To prove that these results are not driven by other effects related to pupil's age, I consider the control group consisting of pupils, whose parents save for college using savings options other than educational savings accounts. This control group allows to include a month of birth fixed effect in regression specifications. I also address endogeneity concerns related to the selection of the control group by applying the propensity score matching.

Thus, my results demonstrate that the portfolio allocation of college savings, as well as the design of 529 plans have important implications for children's college attendance and student debt. Exogenous variation applied in my empirical design is similar to personal investment experience (e.g., Choi et al. (2009), Strahilevitz et al. (2011), Malmendier and Nagel (2011), Huang (2019)) and financial advisors' beliefs (e.g., Foerster et al. (2017), Linnainmaa et al. (2021)), so these factors most likely also affect college attendance and student debt through the effect on the portfolio allocation of college savings. Moreover, the portfolio allocation of college savings may probably have an impact not only on college attendance and student debt, but on other children's adulthood outcomes as well, because college education and student debt are important determinates of future employment, homeownership, marriage, and other pecuniary and non-pecuniary outcomes (e.g., Oreopoulos and Salvanes (2011), Rothstein

and Rouse (2011), Oreopoulos and Petronijevic (2013), Mezza et al. (2015), Di Maggio et al. (2019)). Studying the relationship between the portfolio allocation of college savings and other children's adulthood outcomes can be a promising direction for future research.

This paper relates to the literature that studies household savings behavior motivated by inter-vivos transfers to children aimed at covering college expenses. Gale and Scholz (1994) estimate that college savings were about 12% of household aggregate net worth in 1983. The theoretical literature that explains parental investment in children's post-secondary education was pioneered by Becker and Tomes (1979) and Becker and Tomes (1986). Apart from few exceptions discussed below, this literature does not consider portfolio choice decisions, the central focus of my paper.

A few papers explore the impact of family composition on household portfolio choice considering the role of children. Love (2009) and Hubener et al. (2015) incorporate the effect of children on household portfolios in life-cycle models. However, both papers do not study a separate role of college savings motives in explaining household portfolios, and I show that it is quite substantial. Bogan (2015) studies portfolio decisions of households that are part of the "Sandwich Generation". These households provide financial support for aging relatives and have children approaching college age. Bogan (2015) documents that households anticipating future college expenses have a higher probability of stock market participation and of having tax-advantage education savings accounts. I confirm this empirical fact and estimate what share of household portfolios is explained by college savings motives using a quasi-natural experiment that eliminates the need in college savings.

The literature on the financial aid also provides evidence that changes in college savings motives can lead to changes in household portfolios. Several papers study how implicit tax induced by financial aid programs affect household portfolios (e.g., Dick and Edlin (1997), Long (2004), Reyes (2008), Babiarz and Yilmazer (2009)). A few studies demonstrate that the extension of student loan supply caused by the adoption of the Higher Education Act in 1992 (Long (2004), Chyi and Wu (2011), Jerphanion (2020)) led to changes in households

portfolios. I contribute to this literature by considering the adoption of a financial aid program that eliminates the need in college savings and allows to estimate the share of household stock market participation explained by college savings motives.

This paper also adds to a literature that studies the effect of family wealth on children's college enrollment, student debt, and other students' outcomes.[4] Most papers in this literature focus on the effect of housing wealth. Despite the classical models of education investment (e.g. Becker (1962)) predict that college attendance decisions should be independent of family wealth, a greater housing wealth is found to positively affect college enrollment and college quality (e.g., Lovenheim (2011), Lovenheim and Reynolds (2013), Cooper and Luengo-Prado (2015), Hotz et al. (2018)).[5] Cooper and Luengo-Prado (2015) additionally show that housing price growth results in greater future income for the children of homeowners. Amromin et al. (2016) also demonstrate that a decline in house prices during the Global Financial Crisis resulted in higher student borrowing. Bulman et al. (2021) do not focus on housing wealth and examine students' outcomes of children whose parents were lottery winners. They find that additional financial resources have a modest effect on college attendance. In contrast to the previous literature, I do not concentrate on the effect of housing or total wealth but study the relationship between the portfolio allocation of family savings accumulated for future intergenerational transfers and students' outcomes.

Finally, this paper contributes to the literature that explores the consequences of participation in educational savings plans. Several papers investigate the effect of having an educational savings account on student outcomes (e.g., Elliott and Beverly (2011), Elliott et al. (2014)), but only two of them, Long and Bettinger (2017) and Martini et al. (2020), provide causal evidence. I add to this literature by studying how the portfolio allocation of

[4]Several papers (e.g., Cameron and Heckman (1998), Cameron and Heckman (2001), Keane and Wolpin (2001), Belley and Lochner (2007), Lochner and Monge-Naranjo (2011), Looney and Yannelis (2015)) consider the impact of family income instead of wealth on student outcomes.

[5]Charles et al. (2018) show that the housing boom during the 2000s negatively affected college attendance and educational attainment through the effect on labour market opportunities. The subsequent housing bust had the opposite effect on college enrollment, except for birth cohorts who were of college-going age during the boom.

funds invested in educational savings accounts affects college enrollment and student debt. Exogenous variation used in my identification arises from institutional features related to the design of 529 plans.

The remainder of the paper is organized as follows. Section II describes the data. Section III presents stylized facts on the portfolio allocation of college savings and the role of college savings motives in explaining household stock market participation. Section IV studies whether and how the portfolio allocation of college savings affects college enrollment and student debt. Finally, Section V concludes.

II. Data

A. High School Longitudinal Studies

The first data employed in my analysis is student-level data from the Education Longitudinal Study of 2002 (ELS:2002) and the High School Longitudinal Study of 2009 (HSLS:2009). These longitudinal studies are nationally representative surveys that track the transition of youths from high school to post-secondary education and beyond. Both datasets provide information on college savings, student and family characteristics, as well as on college enrollment and student debt, but have slightly different survey designs.

The base-year is 2002 for the ELS:2002 and 2009 for the HSLS:2009. In this year, the ELS:2002 and the HSLS:2009 collected information on college savings, student and family characteristics for the sample of 10th and 9th grade school students, respectively. Data on college enrollment and student debt were collected later: in 2006, 2 years after high school, for the ELS:2002 and in 2016, 3 years after high school, for the HSLS:2009. After that, the ELS:2002 finally surveyed youths in 2012, 8 years after high-school. The final data collection in the HSLS:2009 is planned to occur in 2025, 12 years after high school.

The structure of data on college savings also differs in these datasets. The ELS:2002 provides a categorical variable for the amount of college savings and a set of dummy variables,

each of which corresponds to a specific investment option used by families to save for college. The information on college savings in the HSLS:2009 includes a categorical variable for the amount of college savings and a dummy for only one investment option, educational savings account, but does not indicate whether families use other investment options to save for college or not.

Table I presents summary statistics on variables used in further analysis from the ELS:2002 (Column (1)) and the HSLS:2009 (Column (2)). The sample includes only students, who did not repeat any grade and whose parents reported a positive amount of college savings.

INSERT TABLE I

B. Household Panel Data

The limitation of student-level data from the ELS:2002 and the HSLS:2009 is the absence of any information on household portfolios beyond college savings. To get this information, I employ household-level panel data from the Survey of Income and Program Participation (SIPP).

The SIPP database consists of several panels with annual information on household financial wealth, demographic characteristics, employment, and children's well-being. My empirical analysis is based on three panels, the SIPP 2008, the SIPP 2014, and the SIPP 2018 that cover 2009-2011, 2013-2016, and 2017 periods, respectively. Data on household financial variables, such as household wealth, assets, and liabilities is available annually in these panels, but the first panel also comprises information on stock market participation available every four months from September 2008 to September 2013. The SIPP 2014 and the SIPP 2018 additionally provide information on educational savings accounts, but do not include any information on whether households use other savings options to save for college or not.

Table II reports summary statistics for the SIPP 2008 (Panel A), as well as for the SIPP 2014 and the SIPP 2018 (Panel B).Variables from the SIPP 2008 are used in regression

analysis and are winsorized at 1% to exclude the impact of outliers. Data from the SIPP 2014 and the SIPP 2018 is employed to calculate the share of educational savings accounts in household stock market participation outside retirement accounts. Columns (1), (2), (3), and (4) show the mean, median, minimum, and maximum statistics, respectively.

INSERT TABLE II

C. 529 Plans: Data and Institutional Details

High school and household longitudinal studies provide information on aggregate student- and household-level savings in educational savings accounts and do not identify which specific types of these accounts are used by families to save for children's college. The most well-known types of educational savings accounts in the US are a 529 college savings account, a 529 prepaid tuition plan, and a Coverdell account. 529 college savings plans are tax-advantage investment accounts, in which college savings grow tax-free. 529 prepaid tuition plans allow to buy credits at participating colleges and universities for future education at current prices. Finally, Coverdell accounts are also tax-advantage investment accounts with tax-free growth, in which college savings grow tax-free, but with much smaller contribution limits than 529 college savings plans.[6]

Panel A in Table III reports the percentages of total assets in educational savings accounts by account type. 529 college savings plans have the largest share of total assets (91.5%), while assets in 529 prepaid tuition plans and Coverdell accounts correspond to only 6.65% and 1.85% of total assets in educational savings accounts, respectively. In addition, there have been 13.8 million 529 college savings accounts and only 1 million 529 prepaid tuition accounts in 2020.[7] Thus, 529 college savings plans are by far the most popular type of educational savings accounts, and variables related to educational savings accounts in student- and household-level datasets mainly demonstrate how households use 529 college

[6]The annual contribution limit is $2,000 for Coverdell accounts and is $15,000 per contributor (parent, grandparent, etc.) for 529 College Savings accounts in 2021.

[7]Source: Investment Company Institute

savings accounts to save for college.

Both types of 529 plans, college savings and prepaid tuition, are managed by state authorities.[8] Almost all states have created their first 529 plans in the period 1996-2002. Nowadays, all states have at least one 529 college savings plan, and only a few states have 529 prepaid tuition plans.[9] Households usually open 529 accounts for their children using in-state 529 plans, because the majority of states provide tax benefits and/or matching grants for contributions to in-state 529 plans in addition to tax-free growth available to both, in-state and out-of-state, residents. Funds in 529 college savings accounts can be used to pay for qualified education expenses at post-secondary institutions in the US and some foreign universities.[10] The list of qualified education expenses includes not only tuition and fees, but also room and board, books and computers, internet access, etc. In contrast, 529 prepaid tuition plans can only be used to cover tuition expenses at a much smaller number of participating post-secondary institutions, so 529 college savings plans are more convenient than other educational savings accounts.

529 college savings accounts allow to invest in a limited menu of portfolios offered by 529 plan providers. Each portfolio is subsequently invested in mutual funds or ETFs and can be one of three types: static, age-based or enrollment-based. The portfolio allocation of static portfolios remains the same over time. The portfolio allocation of age-based portfolios is adjusted with *children's age*. Specifically, the share of stocks in age-based portfolios goes down with age, while the share of less risky assets (e.g., government bonds or cash) increases. The portfolio allocation of enrollment-based portfolios is usually adjusted with *the number of years before school graduation*. A lower share of stocks in enrollment-based portfolios corresponds to a smaller number of years before school graduation. The differences among age-based and enrollment-based portfolios can be demonstrated using the example of two pupils in the same school grade who have 529 accounts but of different age. If both pupils use

[8]Private College 529 Plan is the only one 529 not run by state authorities.

[9]Source: College Savings Plans Network

[10]Since 2018, 529 college savings accounts can also be used to cover up to $10,000 in tuition expenses at elementary or secondary schools.

age-based portfolios, then the younger pupil, on average, will have a greater share of her age-based portolio invested in stocks. However, if both pupils use enrollment-based portfolios, they will have the same shares of portfolios invested in stocks, as they have the same amount of years before school graduation.

To study the portfolio allocation of funds inside 529 college savings plans and its effect on college enrolment and student debt, I employ novel data on 529 portfolios from Morningstar used jointly with the HSLS 2009. Specifically, I work with portfolio-level historical information on net assets, the shares of assets invested in stocks and cash, and a portfolio type. The HSLS 2009 is a nationally representative survey, but it collects data on youths from 10 states, who were in high school during 2009-2013. So, I use data on 529 portfolios from Morningstar only for 529 plans from these 10 states and for the historical period 2009-2013. Summary statistics on the characteristics of 529 portfolios are presented in Panel B of Table III.

An important feature of 529 plans in 1996-2010 was the dominant role of age-based portfolios. Panel C in Table III demonstrates the share of net assets invested in each portfolio type for 10 states from the HSLS 2009 in 2009 and 2020. In 2009, age-based portfolios had the largest share of assets or 65.53% of net assets in 529 college savings plans in these states. Static portfolios had the second largest share of assets, but static portfolios can also be managed according to age-based re-balancing by families or financial advisors. Thus, the real share of assets managed according to age-based re-balancing could be higher. Enrollment-based options did not exist in these states in 2009. During the period 2010-2020, many states have introduced enrollment-based portfolios that have taken away some assets from age-based portfolios, while the share of assets in static portfolios has remained the same. The popularity of age- and enrolment-based portfolios can be explained by the fact that households cannot change the allocation of funds in 529 accounts more than 2 times a year. Before 2015, they could change it only once a year. So, it is not surprising that households prefer to invest in portfolio with automatic rebalancing.

INSERT TABLE III

III. Portfolio Allocation Decisions and Saving for Children's College: Stylized Facts

A. The Portfolio Allocation of College Savings

I begin my analysis by exploring how households allocate college savings. Figure 1 presents the percentage of the 10th grade students from the ELS:2002, whose parents invest in specific savings options to save for college. In addition, it also includes the percentage of the 9th grade students from the HSLS:2009, who have educational savings accounts. The data in Figure 1 indicates that many households allocate college savings in savings options different from traditional savings accounts. More than 85% of parents with positive college savings invest in the following risky savings options to save for college: mutual funds, individual stocks, real estate, educational savings accounts, and alternative forms. Three risky savings options (individual stocks, mutual funds, and educational savings accounts) are used by households to invest in the stock market, and more than 60% of parents allocate college savings to stocks through one of these options. It is worth noting that this empirical fact is based on data for 2002, but the growing popularity of 529 college savings accounts in recent years has most likely increased the share of households that invest in stocks to save for college. As the percentage of students who have educational savings accounts surged from 13% in 2002 to 49% in 2009. Thus, investment in stocks is the most popular class of risky assets used to save for college, and the percentage of households that allocate college savings to stocks is close to the percentage of households that use savings accounts to save for college.

INSERT FIGURE 1

B. College Savings and Stock Market Participation

The drivers of household stock market participation have been widely studied in the household finance literature. A large percentage of households that allocate college savings to stocks may mean that college savings motives are an important driver of household stock market participation that has not been previously explored. According to Panel B of II, more than 21% of households with children that invest in the stock market outside retirement accounts do it only through educational savings accounts. However, this percentage is not a precise estimate for the share of stock market participation outside retirement accounts explained by college savings motives, because some households invest in stocks and mutual funds directly and do not open educational savings accounts to save for children's college. Moreover, investing in stocks only through educational savings accounts does not mean that households would not invest in stocks to save for something else if college was free.

To obtain a more precise estimate for the share of stock market participation outside retirement accounts explained by college savings motives, I employ an exogenous shock similar to the elimination of college savings motives caused by the adoption of a financial aid program that made college free for children from some military households. This program was created by the passage of the Post-9/11 Veterans Educational Assistance Act of 2008 that allowed current military members and military veterans to transfer their education benefits to children.

From 1984 to 2008, these benefits had been guaranteed by the Montgomery G.I. Bill. The Post-9/11 Veterans Educational Assistance Act of 2008 (or the Post-9/11 GI Bill) was adopted to replace the Montgomery G.I. Bill. It was signed by the President on June 30, 2008, and went into effect on August 1, 2009. The new law also provided the ability for military veterans or current military members to transfer educational benefits to their children after serving 10 years. In other words, military veterans or current military may not save for their children's college, as they can finance it using educational benefits after August 1, 2009, if they are going to have at least 10 years of service starting from September

2001 by the time when their children go to college. The maximum amount of educational benefits for military members and veterans is equivalent to the costs of one bachelor degree at in-state public and some out-of-state or private colleges, including tuition, housing, books and supplies, and other related expenses. So, if households have only one child, they may not save for college at all. However, if they have more than one child, they may still have incentives to save for college.

I investigate the effect of the Post-9/11 GI Bill on stock market participation and the share of risky assets for the sample of military families with children using the SIPP data for the period 2008-2013. It is worth noting that the part of the Post-9/11 GI Bill related to transferring of educational benefits to children was unexpectedly added to the law in June, 2008, because George Bush had threatened to veto the bill without this provision. However, the media almost did not discuss the provision about transferability of educational benefits to children until approximately one year after the bill went into effect.

To explore the effect of the bill on household financial variables, I consider treatment and control groups. The treatment group consists of households with children, in which at least one parent served in the military in the period 2008-2013. The control group includes households with children, in which no parents served in the military in the period 2008-2013, but at least one parent served in the military before that. To make both samples similar, I use the propensity score matching with the 3 nearest neighbours based on several household characteristics: net worth; a dummy variable that equals one if a household previously held stocks or bonds; household head's level of education; household head's age; the number of kids; metropolitan status; and household head's gender. I first estimate the following linear probability model to investigate the dynamics in the stock market participation of military families after the adoption of the Post-9/11 GI Bill:

$$P(Stock\_Participation_{i,s,t}) = \sum_t \beta_t Treated_i + \delta HC_{i,s,t} + \alpha_{s,t} + \alpha_i + \epsilon_{i,s,t} \qquad (1)$$

where $Stock\_Participation_{i,s,t}$ is a dummy variable for the stock market participation of household i in state s at time t, $Treated_i$ denotes a dummy variable that equals 1 for the treatment group and 0 for the control group. α_i is a household fixed effect, and $\alpha_{s,t}$ is a state*time fixed effect. $HC_{i,s,t}$ denotes a vector of household characteristics that includes a labour income and the number of children. Standard errors are double clustered at the state and year level.

Figure 2 plots the coefficients β_t and shows that trends in the stock market participation of households from the treatment and control groups were similar before September 2010. Although the Post-9/11 GI Bill went into effect on August 1, 2009, households had started reducing their stock market participation in September-December 2010, partially because of a low level of media attention to the transferability of educational benefits before that time. Starting from 2012, the SIPP dataset does not have enough observations on military families, so Figure 2 plots the results only for the period from September 2008 to January 2012.

INSERT FIGURE 2

To further study the effect of the Post-9/11 GI Bill on stock market participation decisions, I additionally consider the following difference-in-differences framework:

$$Y_{i,s,t} = \beta Treated_i * Post + \gamma Treated_i * Post * K_2 + \delta HC_{i,s,t} + \alpha_{s,t} + \alpha_i + \epsilon_{i,s,t} \qquad (2)$$

where $Y_{i,s,t}$ is a financial variable of household i in state s at time t, such as the dummy variable for the stock market participation or the share of stocks in financial wealth. $Treated_i$ denotes a dummy variable that equals 1 for the treatment group and zero for the control group. $Post$ is a dummy variable that equals 1 after September 2010 and 0 otherwise. K_2 denotes a dummy variable that equals 1 for households with at least two children. α_i is a household fixed effect, while $\alpha_{s,t}$ is a state*time fixed effect. $HC_{i,s,t}$ denotes a vector of household characteristics that includes a labour income and the number of children. Standard

errors are double clustered at the state and year level.

Table IV reports the results for the panel regression (2). Columns (1) and (3) correspond to the full sample, while (2) and (4) are for the matched sample. The results indicate that military families with one child had reduced their stock market participation and their share of stocks in financial wealth after the adoption of the Post-9/11 GI Bill. The passage of this act led to a 6.42% smaller probability of stock market participation and to a 8.25% decrease in the share of stocks in financial wealth for households with one child. This is equivalent to a one-third reduction in the probability of stock market participation outside retirement accounts for these households. Thus, these results demonstrate that college savings motives are an important driver of stock market participation for households with children.

It is worth pointing out that the effect on stock market participation is different for households with one child and households with at least two children, because the maximum amount of military educational benefits is approximately equivalent to the costs of only one bachelor degree. So, households with more than one child still have incentives to save for college after the adoption of the program. Such households may even prefer to save more expecting a higher probability of college enrolment, as is shown in Jerphanion (2020).

INSERT TABLE IV

IV. How Does the Portfolio Allocation of College Savings Affect College Enrollment and Student Debt?

A. Empirical Results for the Choice of Savings Options

To study how the portfolio allocation of college savings affects college enrollment and student debt, I first provide stylized facts on the probabilities of college enrollment and having student debt associated with different savings options. Figure 3 plots the probabilities of enrollment at four year college (Panel A) and having student debt (Panel B) conditional on using specific saving options for the sample of students in the 10th grade from the ELS 2002.

INSERT FIGURE 3

The observed probabilities indicate that the use of risky savings options, especially mutual funds, for college savings is associated with a higher probability of enrollment and a lower probability of having student debt that the use of risk-free savings options, such as savings accounts or government bonds. However, the choice of savings options is endogenously determined by factors that most likely simultaneously affect college enrollment and student debt, for example, family income or parents' college education. Because of this reason, I explore a relation between the use of specific savings options (e.g., mutual funds, individual stocks, real estate, government bonds, alternative investment) to save for college and children's college enrollment and student loan participation controlling for family and student characteristics. Specifically, I estimate the following linear probability model:

$$P(Y_{i,g,s}) = \sum_j \beta_j D_{j,i} + \gamma \text{Controls}_i + \alpha_{\text{St.FEs}} + \alpha_S + \epsilon_{i,g,s} \tag{3}$$

where $P(Y_{i,g,s})$ is the probability of a student outcome, $D_{j,i}$ denotes a dummy for savings

option j. Controls$_i$ is the set of control variables that includes parents' age and the number of dependants. $\alpha_{\text{St.FEs}}$ denotes the set of fixed effects for the following student and family characteristics: student's race, parent's income group, student's ability quartile, parent's marital status, student's gender, parent's level of education, and student being born in the US. α_S is the school fixed effect. Standard errors are clustered at the school level.

Columns (1) and (2) in Table V report the results where explanatory variables are the probability of enrollment at two- and four-year colleges, respectively. The use of neither savings options significantly differs from the use of a savings account by enrollment probability except for mutual funds. The allocation of college savings to mutual funds is associated with a 3% lower probability of enrollment at two-year college and with a 4% higher probability of enrollment at four-year college. So, the use of mutual funds to save for college is first of all associated with a better quality college. Column (3) shows the relation between the use of different savings options and the probability of having student debt. The use of both, mutual funds and individual stocks, leads to 4% and 5% lower probabilities of having student debt, respectively. Thus, only savings options related to stock market participation have a negative relation with student loan participation (mutual funds and individual stocks) and a positive relation with the quality of college chosen (only mutual funds).

One channel that can explain this result is higher returns from investing in stocks that lead to a greater amount of accumulated college savings. Columns (4) and (5) in Table V demonstrate the relation between the use of specific savings options and the probability of having more than $5,000$ and more than $20,000$ in college savings, respectively. The use of mutual funds and individual stocks is associated with 13% and 17% greater probabilities of having $> \$5,000$ in college savings, respectively, and with 9% and 15% greater probabilities of having $> \$20,000$ in college savings, respectively, than the use of savings accounts. The savings option labelled "Another Form" in Table V denotes the allocation of college savings to alternative asset classes, as gold, private equity, art, or antique. The allocation of college savings to these asset classes is also associated with a greater probability of having a sizeable

amount in college savings than the use of savings accounts. However, the effect is smaller than in the case of mutual funds and individual stocks: the allocation of college savings to alternative asset classes is associated with 9% and 8% higher probabilities of having $> \$5,000$ and $> \$20,000$ in college savings, respectively. Thus, the allocation of college savings to stocks is associated with the largest probability of having a sizeable amount of college savings among all savings options.

INSERT TABLE V

B. Empirical Results for the Share of Stocks in 529 Accounts

The empirical analysis in Table V has several limitations including endogeneity concerns and the lack of information on the shares of college savings invested in each savings option. To partially overcome these limitations and to further explore the causal relationship between the allocation of college savings to stocks and children's college enrollment and student debt, I use an empirical methodology based on exogenous variation in the portfolio allocation of college savings that arises from the design of 529 plans. As it was shown in Section II.C, most assets in educational savings accounts were invested in age-based portfolios in 2009 for states from the HSLS:2009. The allocation of these portfolios depends on children's age, and age-based 529 portfolios of younger students have a greater share of funds invested in stocks. This share decreases by approximately 5% each year. A typical portfolio allocation in age-based 529 portfolios is presented in Panel A of Figure 4.

INSERT FIGURE 4

An important feature of US schools is the large age range of students in the same grade. Panel B in Figure 4 presents the distribution of the school-level age range (maximum minus minimum age of students in the same grade) based on the sample of the 10th grade students, who did not repeat or skip any grade and whose parents saved for college, from the ELS:2002. Most schools have at least a 1-year difference between the youngest and the oldest pupils,

who are in the same grade and whose parents save for college, and many schools have a more than 2-year difference between such pupils. Pupils with 529 accounts, who are in the same grade and the same school, will have different portfolio allocations in their 529 age-based portfolios, if they are of different age. However, this difference in portfolio allocation will be determined by the characteristics of 529 age-based portfolios set by 529 plan providers and not, for example, by household wealth or income. In the US, schools usually admit pupils from the same area based on their residential address, and households from the same area have similar wealth and income that greatly correlate with house prices in this area.

A difference in portfolio allocations will lead to a different amount of accumulated college savings. Using monthly stock market returns and information on the share of 529 accounts invested in stocks from Morningstar, I provide theoretical simulations of the accumulated amount of college savings for students in the same grade but of different age. In these simulations, I assume that households start saving for children's college using 529 accounts at the beginning of the first grade, because, in reality, 54% of all 529 accounts are opened when the beneficiary is 5 years old or younger, and 40% of accounts are opened when the child is 2 years old or younger.[11] I also consider two cases: when households make the same monthly contributions over school years and when they make the same lump-sum investment in the beginning of the first grade.

Figure 5 demonstrates the ratio of the amount of accumulated college savings to total contributions depending on student's birth month for the 2012-2013 (Panel A) and 2019-2020 (Panel B) school graduation cohorts. In general, the youngest students in the cohort have the largest positive effect of age-based rebalancing, as in the case of the 2019-2020 school graduation cohort. However, large falls in stock prices, such as the global financial crisis of 2009, slightly changed this pattern, as in the case of the 2012-2013 school graduation cohort, the cohort of the HSLS:2009.

Panel C in Figure 5 shows the results of theoretical simulations for a percentage difference

[11] Source: Ascensus Savings Trends 2019.

in the amount of accumulated college savings between 529 accounts with the lowest and highest growth of college savings among school students in the same cohort. Simulation results demonstrate that this difference significantly depends on ex-post stock returns and is larger for the case of lump sum investment and for years when the stock market does well. It can be more than 20% as for the 2019-2020 graduation cohort. For this graduation cohort, the maximum difference is the difference between the amount of accumulated college savings of the youngest and the oldest students with approximately a 2 year age gap. In this case, the youngest students have approximately a 10% greater share of 529 accounts invested in stocks.

INSERT FIGURE 5

I further explore whether the results of the theoretical simulations hold on real data and whether a larger amount of accumulated college savings cased by age-based rebalancing in 529 accounts affects college enrolment and student debt. To disentangle the effect of age-based rebalancing in 529 accounts from other age related effects on college savings, college enrollment, and student debt, I consider treatment and control groups. The treatment group includes high school students, who have educational savings accounts, in which most assets are invested in 529 age-based portfolios. The control group consists of high school students, who do not have educational savings accounts, but whose parents save for college using other savings options. The control group allows to include the month of birth fixed effect in regression specifications. I also address endogenous concerns related to the selection of the control group by applying the propensity score matching. My main empirical model is as follows:

$$P(Y_i) = \sum_j \beta_j D_{i,529} D_{i,\text{age group}j} + \gamma \text{Controls}_i + \alpha_{\text{month of birth}} + \alpha_{529} + \alpha_{\text{St.FEs}} + \alpha_{\text{Sch.FEs}} + \epsilon_i \quad (4)$$

where $P(Y_i)$ is the probability of a student outcome, $D_{i,529}$ denotes a dummy that equals 1 if student i has an educational savings account, while $D_{i,\text{age group}j}$ is a dummy that equals

1 if student i is in age group j. Controls$_i$ represents the set of control variables that includes parents' age and the number of household members. $\alpha_{\text{month of birth}}$ and α_{529} mean the month of birth and educational savings account fixed effects, respectively. $\alpha_{\text{St.FEs}}$ is the set of fixed effects for the following student and family characteristics: family income group, parent's level of education, student's ability quintile, parent's marital status, student's gender, being born in the US, and student's race. $\alpha_{\text{Sch.FEs}}$ denotes the list of fixed effects for school characteristics: location in an urban area, control type (public or private), and region (Northeast, Midwest, South, or West). Standard errors are clustered at the month of birth intersected with group (treatment or control) level.

Table VI reports the results for the effect of age-based rebalancing on college savings. The list of dependent variables contains the probabilities of having more than \$10,000 (Columns (1)-(3)) and more than \$25,000 (Columns (4)-(6)) in college savings. Columns (3) and (6) show the results for the sample created by the propensity score matching with the 3 nearest neighbours based on control variables (parent's age and the number of household members), as well as dummies for the following student, family, and school characteristics: student's gender, student's race, low ability student (1st or 2nd ability quintiles), high ability student (5th ability quintile), student was born in the US, family income group, parent's college, parent's marital status, and urban location of school. The results demonstrate that older students have a significantly lower probability of accumulating sizeable college savings because of a lower share of 529 accounts invested in stocks.

INSERT TABLE VI

College savings should be more important as a source of college financing for students from middle- and high-income families than for students from low-income families, because financial aid is more available for students from the latter families. So, the effect of age-based rebalancing on college enrollment and student debt should be more prominent for students from middle- and high-income families. To test this hypothesis, I additionally consider the sample of students from families with income $> \$55,000$.

INSERT TABLE VII

The results for the effect of age-based rebalancing on college enrollment are presented in Table VII, where dependent variables are enrollment in any four-year college (Columns (1)-(4)) and enrollment in a selective four-year college (Columns (5)-(8)). I use college selectivity as an indicator of education quality that also correlates with tuition costs. The results in Table VII show that a smaller share of 529 accounts invested in stocks due to age-based rebalancing leads to a significantly lower probability of enrollment in a selective four-year college for older students with educational savings accounts from families with income $> 55,000$. However, a similar effect is not observed for enrolment at any four-year college, as well as for the sample of all students. So, a greater amount of accumulated college savings due to age-based rebalancing does not affect four-year college enrollment but affects the quality of four-year college chosen. Additionally, this effect holds only for students, for whom college savings play an important role in college financing.

INSERT TABLE VIII

Finally, Table VIII reports the results for the effect of age-based rebalancing on student debt. Columns (1)-(4) show the results, where the dependent variable is student loan participation (extensive margin), while Columns (5)-(8) demonstrate the results, where the dependent variable is the logarithm of student loans' value (intensive margin). A smaller share of 529 accounts invested in stocks due to age-based rebalancing leads to a higher student loan participation for older students from all families, but the effect is larger for students from families with income $> 55,000$. The coefficients on the logarithm of student loans' value are not significant, perhaps, because of the insufficient number of observations.

Thus, my results demonstrate that the portfolio allocation of college savings, as well as the design of 529 plans have important implications for children's college outcomes and student debt. Exogenous variation applied in my empirical design is similar to such factors, as personal investment experience (e.g., Choi et al. (2009), Strahilevitz et al. (2011), Malmendier and Nagel (2011), Huang (2019)) and financial advisors' beliefs (e.g., Foerster et al.

(2017), Linnainmaa et al. (2021)), so these factors most likely also affect college attendance and student debt through the effect on the portfolio allocation of college savings.

V. Conclusion

This paper studies how households invest savings for children's college, and how the portfolio allocation of these savings affects children's college attendance and student debt. I first present stylized facts on how households allocate college savings among existing investment options and on the role of college savings motives in explaining household stock market participation. After that, I answer the main research question: how does the portfolio allocation of college savings affect children's college attendance and student debt?

I find that more than 85% of households allocate college savings to risky assets, in particular more than 60% to stocks. This result is paired with another empirical fact regarding the importance of college savings motives for household stock market participation. Employing the adoption of a financial aid program that covers college costs for children from military families, I show that the elimination of college savings motives leads to more than a one-third reduction in the probability of stock market participation outside retirement accounts among households with children. I verify the magnitude of this effect by demonstrating that more than 21% of households with children that invest in the stock market outside retirement accounts do it only through educational savings accounts.

Studying how the portfolio allocation of college savings affects children's college enrollment and student debt, I first explore a relation between the use of specific savings options (e.g., mutual funds, individual stocks, real estate, government bonds, alternative investment) to save for college and children's college enrollment and student debt controlling for family and student characteristics. The results indicate that only the use of mutual funds is associated with a significantly higher probability (4%) of enrollment in four-year college in comparison to the allocation of college savings to savings accounts. The use of other savings

options does not differ significantly from the use of savings accounts by enrolment probability. In addition, the use of only two savings options, mutual funds and individual stocks, is associated with a significantly lower student loan participation rate (4% and 5% lower, respectively) in comparison to the allocation of total college savings to savings accounts. Thus, only savings options related to stock market participation have a relationship with students' outcomes not explained by student and family characteristics.

I further investigate a causal relationship between the allocation of college savings to stocks and children's college enrollment and student debt by exploiting a novel empirical methodology based on the design of 529 plans. The prevalence of age-based portfolios in 529 plans leads to exogenous variation in the portfolio allocation of 529 accounts. Exploiting this variation, I show that holding a 10% greater share of 529 accounts in stocks over school years increases the accumulated amount of college savings up to 20% and leads to a higher probability of enrollment in a selective four-year college and a lower student loan participation for 529 account beneficiaries from middle- and high-income households. Thus, my results demonstrate that the portfolio allocation of college savings, as well as the design of 529 plans, have important implications for children's college outcomes and student debt.

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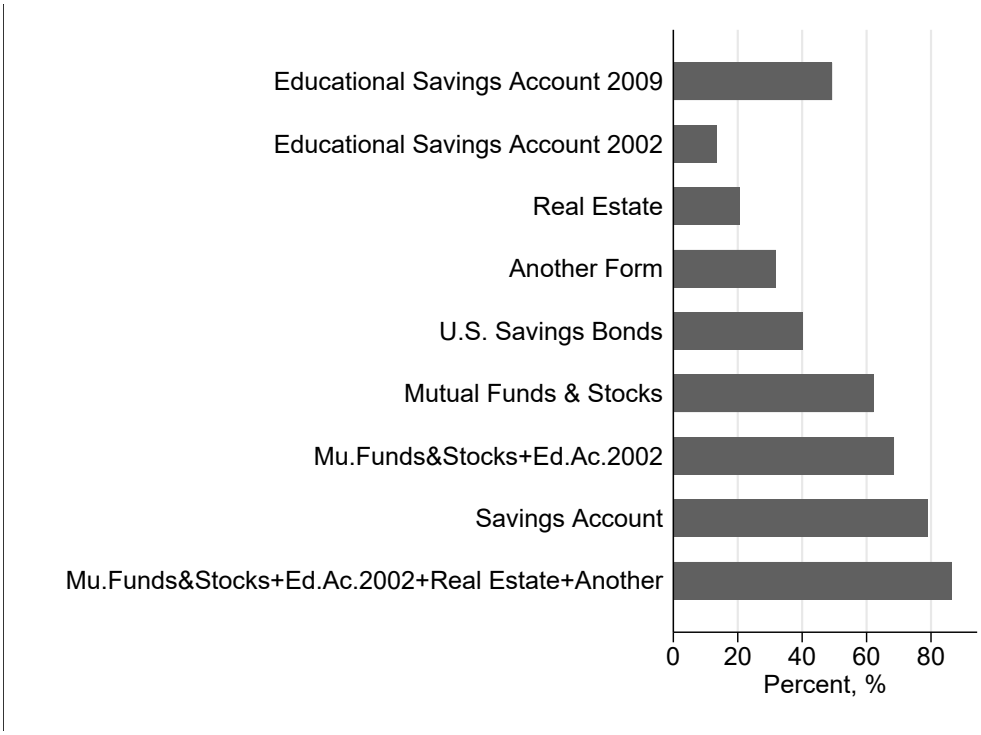
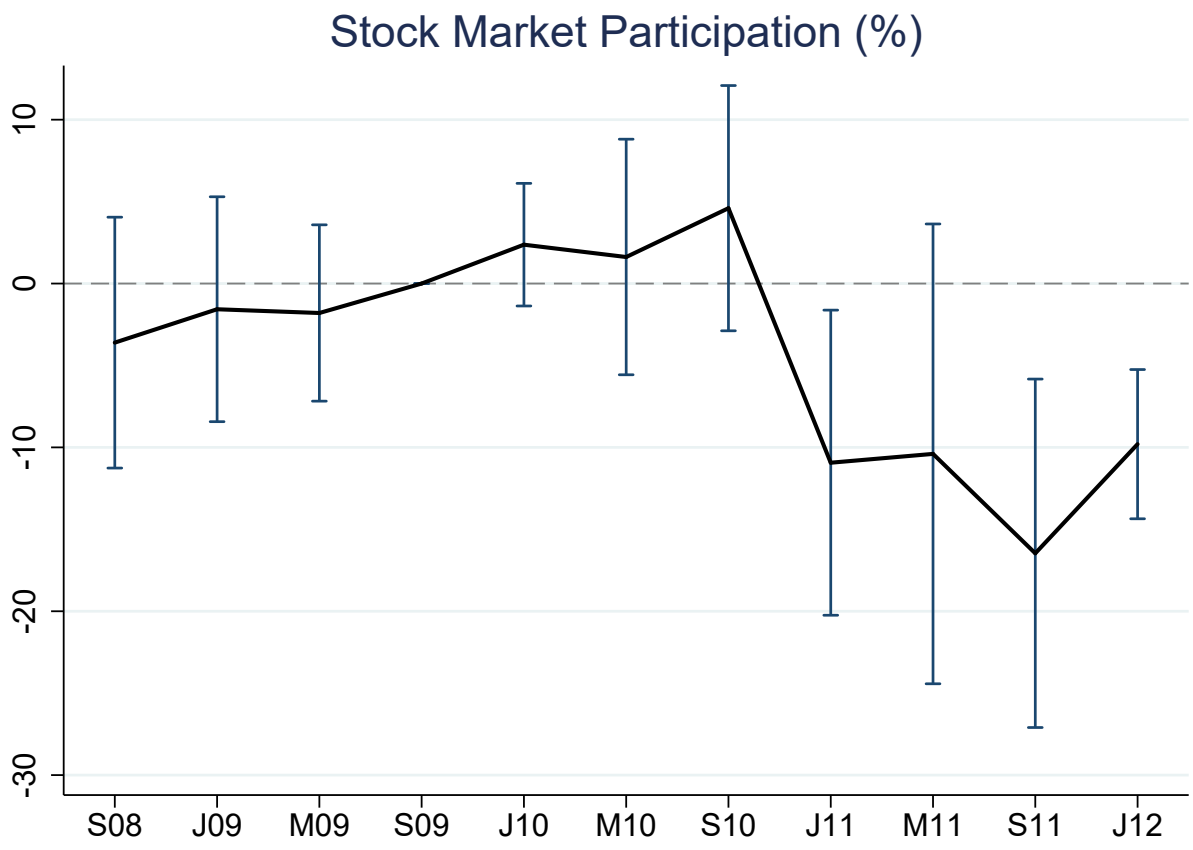
Figures

Figure 1. The Popularity of Savings Options Used to Save for College



This figure demonstrates the percentage of high school students, whose parents use specific savings options to save for college. The sample consists of the 10th grade school students, whose parents save for college, from the Education Longitudinal Study of 2002. The first bar additionally displays the percentage of the 9th grade school students, whose parents use educational savings accounts, from the High School Longitudinal Study of 2009.

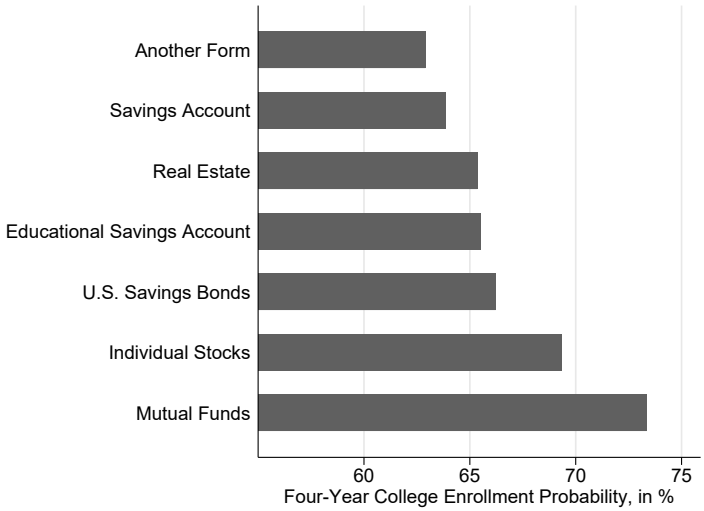
Figure 2. Stock Market Participation and the Post-9/11 GI Bill



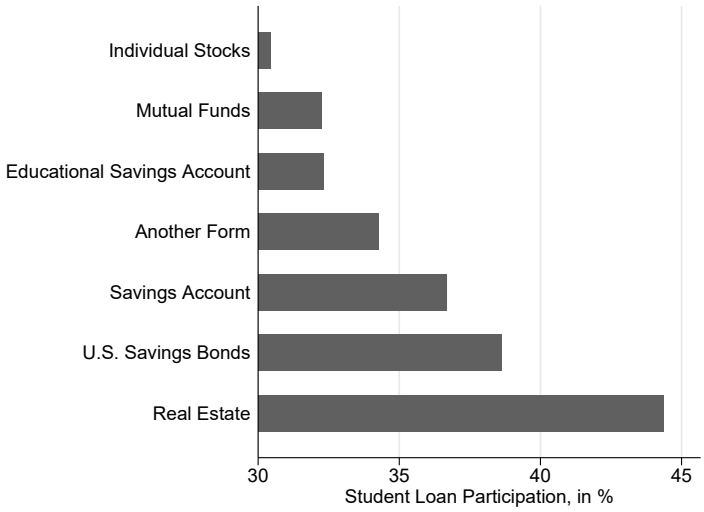
This figure shows the changes in the stock market participation of military families with one child caused by the Post-9/11 GI Bill that eliminated college savings motives. The reported coefficients are estimated using OLS according to the Equation (2). The bars indicate 95% confidence intervals based on standard errors double clustered at the state and year level.

Figure 3. College Enrollment Probability and Student Loan Participation for Different Savings Options

Panel A. College Enrollment Probability and Savings Options



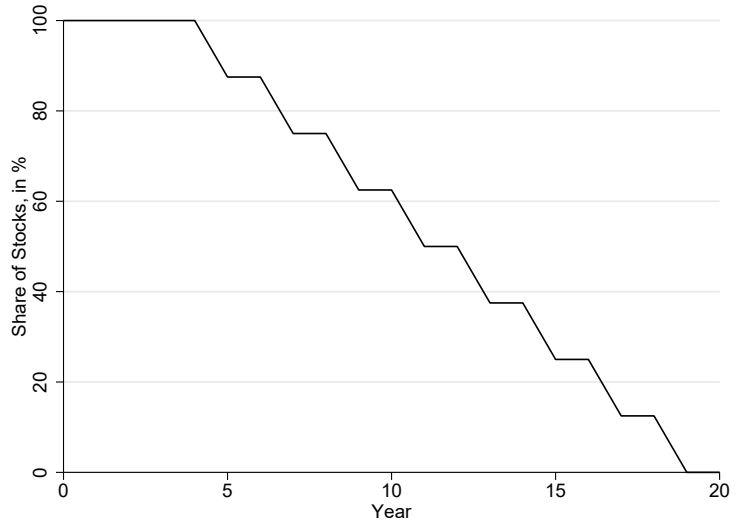
Panel B. Student Loan Participation and Savings Options



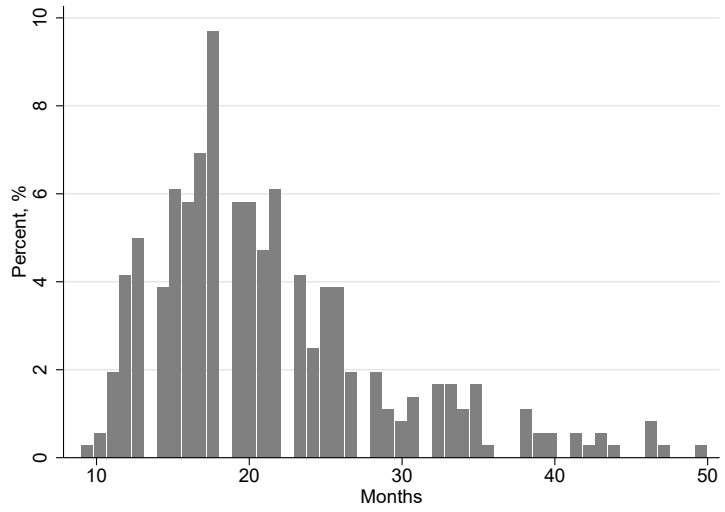
This figure plots four-year college enrollment probability (Panel A) and student loan participation (Panel B) conditional on the use of a specific saving option to save for college for the sample of students in the 10th grade from the Education Longitudinal Study of 2002.

Figure 4. Age-Based Rebalancing in 529 Plans and School-Level Age Range Distribution

Panel A. Typical Rebalancing in 529 Age-Based Portfolios



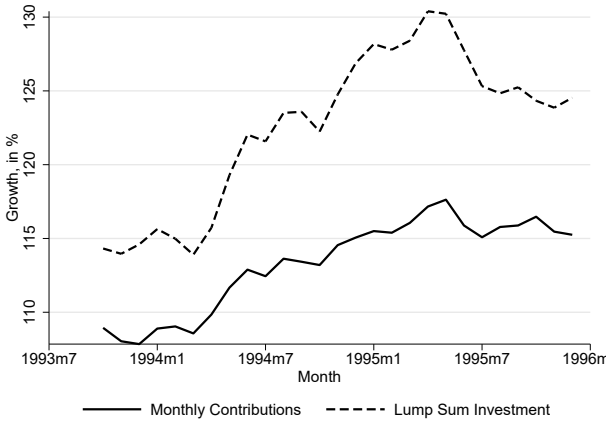
Panel B. School-Level Age Range Distribution



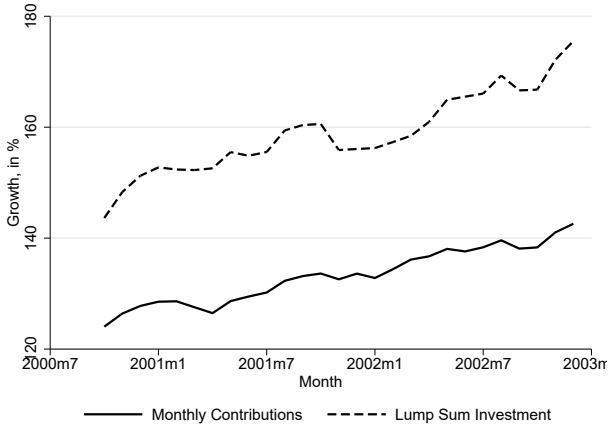
This figure displays a typical rebalancing profile for age-based 529 portfolios in 10 states from the High School Longitudinal Study of 2009 (Panel A) and the distribution of the school-level age range (maximum minus minimum age of students in the same grade) based on the sample of the 10th grade students, who did not repeat or skip any grade and whose parents saved for college, from Education Longitudinal Study of 2002 (Panel B).

Figure 5. Theoretical Simulations: the Effect of Age-Based Rebalancing in 529 Plans on College Savings for Different School Cohorts.

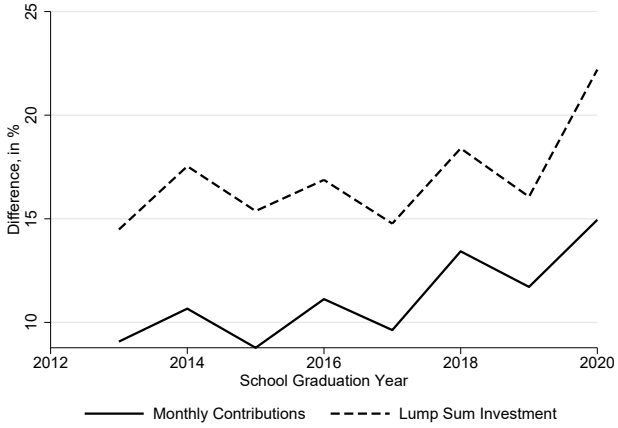
Panel A. 2012-2013 School Graduates



Panel B. 2019-2020 School Graduates



Panel C. Pre-College Difference in the Amount of College Savings between 529 Accounts with the Lowest and Highest Growth



This figure demonstrates the results of theoretical simulations for the effect of age-based rebalancing in 529 plans on college savings for different school cohorts. Panels A and B display the ratio of the pre-college amount of college savings to total contributions for the 2012-2013 and 2019-2020 school graduation cohorts, respectively. Panel C shows a pre-college difference in the amount of college savings between 529 accounts with the lowest and highest growth of college savings among school students in the same cohort. The dash line denotes the case of lump-sum investment made in the beginning of the first grade, while the solid line is for the case of equal monthly contributions made during school years.

Tables

Table I. Summary Statistics: High School Longitudinal Studies

Panel A. Dummy and Continuous Variables

	ELS:2002				HSLS:2009			
	Mean	**Median**	**Min**	**Max**	**Mean**	**Median**	**Min**	**Max**
Allocation of College Savings								
Educational Savings Accounts	0.13	0.00	0	1	0.49	0.00	0	1
Mutual Funds & Stocks	0.62	1.00	0	1				
Real Estate	0.21	0.00	0	1				
U.S. Savings Bonds	0.40	0.00	0	1				
Another Form	0.32	0.00	0	1				
Savings Account	0.79	1.00	0	1				
Student & Family Characteristics								
Male	0.49	0.00	0	1	0.49	0.00	0	1
Born in US	0.93	1.00	0	1	0.06	0.00	0	1
Number of Dependents	2.50	2.00	0	8				
Number of Household Members	.	.	.	.	4.27	4.00	2	11
White	0.68	1.00	0	1	0.65	1.00	0	1
Hispanic	0.09	0.00	0	1	0.10	0.00	0	1
Asian	0.09	0.00	0	1	0.08	0.00	0	1
African American	0.09	0.00	0	1	0.08	0.00	0	1
Parent's Marital Status	0.85	1.00	0	1	0.82	1.00	0	1
Parent's Age	45.21	45.00	32	72	44.44	44.00	28	65
Parent's College Education	0.47	0.00	0	1	0.53	1.00	0	1
Student Debt								
Student Loan Participation	0.37	0.00	0	1	0.74	1.00	0	1
Student Loan Amount, ($)	0.93	1.00	0	1	2,845.77	0.00	0	36,045
Enrollment								
2-Year College	0.24	0.00	0	1				
4-Year College	0.64	1.00	0	1	0.66	1.00	0	1
4-Year Highly Selective					0.28	0.00	0	1
Observations	4723				6312			

Panel B. Categorical Variables

	ELS:2002	HSLS:2009
Total Household Income	$1,000 or less (0.46%), $1,001-$5,000 (0.51%), $5,001-$10,000 (0.46%), $10,001-$15,000 (1.16%), $15,001-$20,000 (1.73%), $20,001-$25,000 (2.99%), $25,001-$35,000 (7.20%),$35,001-$50,000 (14.60%), $50,001-$75,000 (22.90%), $75,001-$100,000 (19.85%) $100,001-$200,000 (21.01%), $200,001 or more (7.11%)	$15,000 or less (2.84%), $15,001-$35,000 (9.07%), $35,001-$55,000 (12.15%), $55,001-$75,000 (14.44%), $75,001-$95,000 (12.93%), $95,001-$115,000 (12.01%), $115,001-$135,000 (9.19%), $135,001-$155,000 (7.42%), $155,001-$175,000 (3.97%), $175,001-$195,000 (2.38%) $195,001-$215,000 (3.55%), $215,001-$235,000 (1.30%) More than $235,000
College Savings	$2,000 or less (12.89%), $2,001-$5,000 (17.83%), $5,001-$10,000 (20.71%), $10,001-$20,000 (18.53%), $20,001-$30,000 (10.44%), $30,001-$50,000 (9.25%), More than $50,000 (10.35%)	$2,000 or less (11.52%), $2,001-$5,000 (18.01%), $5,001-$10,000 (19.47%), $10,001-$15,000 (13.04%), $15,001-$25,000 (12.28%), $25,001-$35,000 (8.19%), $35,001-$60,000 (8.79%), More than $60,000 (8.70%)

This table presents summary statistics for variables from the Education Longitudinal Study of 2002 (ELS:2002) and the High School Longitudinal Study of 2009 (HSLS:2009). The sample includes students, who did not repeat any grade and whose parents report a positive amount of college savings. Student and family characteristics and variables on the allocation of college savings are for the 10th grade students in 2002 from the ELS:2002 and for the 9th grade students in 2009 from the HSLS:2009. Variables on enrollment and student debt were collected 2 years after high-school in the ELS:2002 and 3 years after high school in the HSLS:2009. Panel A reports summary statistics on dummy and continuous variables, while Panel B presents the distributions of categorical variables.

Table II. Summary Statistics: Household-Level Panel Data from the Survey of Income and Program Participation

Panel A. Households with Children (SIPP 2008)

	Mean	Median	Min	Max
Household Head's College Education (%)	31.55	0.00	0	100
Age (years)	42.56	42.00	20	80
Number of Children	1.93	2.00	1	15
Metropolitan Status (%)	77.38	100.00	0	100
Monthly Household Income	6,299.57	5,025.00	0	28,152
Liquid Financial Wealth	24,995.69	1,101.00	0	749,150
Bank Accounts	11,276.49	900.00	0	205,000
Stocks & Mutual Funds	12,880.07	0.00	0	500,000
Stock Market Participation (%)	17.49	0.00	0	100
Wealth Exc. Housing	62,710.82	11,629.00	-21,322	1,586,837
Observations	23927			

Panel B. Households with Children (SIPP 2014/SIPP 2018)

	Mean	Median
Education Savings Account Participation (%)	7.42	0.00
Stock Market Participation (Excluding Education Accounts) (%)	13.87	0.00
Stock Market Participation (Including Education Accounts) (%)	17.59	0.00
Education Savings Accounts	38,390.38	15,000.00
Stocks & Mutual Funds	139,640.67	22,500.00
Observations	35820	

This table presents summary statistics on annual data from the SIPP 2008 (Panel A) and from the SIPP 2014/SIPP 2018 (Panel B). The time periods are 2008-2010 and 2013-2017 for the SIPP 2008 and the SIPP 2014/SIPP 2018, respectively. Information on stock market participation is also available every four months from September 2008 to September 2013 in the SIPP 2008. Variables from the SIPP 2008 are winsorized at the 1%

Table III. 529 Portfolios: Summary Statistics & Stylized Facts

Panel A. The Percentage of Net Assets in Educational Savings Accounts by Account Type

	529 College Savings	529 Prepaid Tuition	Coverdell
Net Assets, %	91.50	6.65	1.85

Panel B. Summary Statistics for Data on 529 Portfolios from Morningstar

	Mean	**Median**	**Min**	**Max**	
Net Assets, Million $	30.72	4.78	0.00	697.66	2,628
Share of Stocks, %	51.20	53.44	0.00	142.29	2,089
Share of Cash, %	11.34	2.78	-125.24	100.00	2,089
1.Age-Based	0.54	1.00	0.00	1.00	2,884
1.Static	0.45	0.00	0.00	1.00	2,884
1.Enrollment-Based	0.00	0.00	0.00	0.00	2,884

Panel C. The Percentage of Net Assets in 529 College Savings Plans by Portfolio Type

	Age-Based	Static	Enrollment-Based
Net Assets (2009), %	65.53	34.47	0
Net Assets (2020), %	46.19	32.96	20.85

This table presents the percentage of net assets in educational savings accounts by account type (Panel A), summary statistics for data on 529 portfolios from Morningstar (Panel B), and the percentage of net assets in 529 college savings plans by portfolio type (Panel C). Data on net assets in Panel A is for 2019 and comes from the College Savings Plans Network and the Investment Company Institute. Summary statistics in Panel B are based on Morningstar data for the 2009-2013 period and for the sample of 529 portfolios in 10 states from the High School Longitudinal Study of 2009. The percentage of net assets by portfolio type in Panel C is also calculated using Morningstar data for 2009 and 2020 years and for the sample of 529 portfolios in 10 states from the High School Longitudinal Study of 2009.

Table IV. Saving for College and Stock Market Participation: Evidence from the Post-9/11 GI Bill

	Stock Participation, %		**Stocks/Financial Wealth, %**	
	(1)	(2)	(3)	(4)
$Treated * Post$	-6.42*	-19.25***	-8.25***	-9.00***
	(3.66)	(4.59)	(2.29)	(3.10)
$Treated * Post * K_2$	7.41*	7.94*	2.15	0.63
	(3.99)	(4.21)	(4.32)	(1.41)
Fixed Effects				
State×Time	Yes	Yes	Yes	Yes
Household	Yes	Yes	Yes	Yes
Observations	9,100	4,444	986	830
R^2	0.759	0.853	0.817	0.908

This table reports the results of OLS regressions that test the effect of the Post-9/11 GI Bill on the probability of stock market participation (Columns (1) and (2)), and the share of stocks in financial wealth (Columns (3) and (4)). Columns (1) and (3) correspond to the full sample, while Columns (2) and (4) are for the matched sample. The sample period is September 2008 - September 2013 for Columns (1) and (2), and 2008-2010 for other columns. *Treated* denotes a dummy variable that equals 1 for the treatment group (households with children, in which at least one parent served in the military during the period 2008-2013) and 0 for the control group (households with children, in which at least one parent served in the military before 2008, and all parents did not serve during the period 2008-2013). *Post* is a dummy variable that equals 1 after September 2010 and 0 otherwise. K_2 is a dummy variable that equals 1 for households with at least two children. Standard errors are double clustered at the state and year level and are reported in parentheses. The fixed effects used in each specification are noted in the table. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table V. Savings Options, College Enrollment, and Student Debt

	2-Year College	**4-Year College**	**Student Loan Participation**	**College Savings**$> 5,000$	**College Savings**$> 20,000$
	(1)	(2)	(3)	(4)	(5)
Educational Savings Accounts	-0.00	0.01	-0.04	0.04**	0.02
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Mutual Funds	-0.03**	0.04***	-0.04**	0.13***	0.09***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Individual Stocks	0.00	0.01	-0.05**	0.17***	0.15***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Real Estate	-0.00	0.00	0.03	0.03	0.01
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
U.S. Savings Bonds	0.01	0.01	0.01	0.00	-0.02*
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Another Form	-0.00	0.01	-0.00	0.09***	0.08***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Fixed Effects & Controls	Yes	Yes	Yes	Yes	Yes
Observations	3,807	3,807	3,374	4,130	4,130
R^2	0.243	0.393	0.215	0.337	0.338

This table reports the results of OLS regression (3) that examines the relationship between the use of specific savings options, college enrollment, student debt, and the accumulated amount of college savings using data from the Education Longitudinal Study of 2002. The sample includes students, who were in the 10th grade in 2002 and whose parents saved for college. The list of dependent variables comprises 2-year college enrollment probability (Column (1)), 4-year college enrollment probability (Column (2)), student loan participation (Column (3)), and the probabilities of having more than $ 5,000 (Column (4)) and more than $ 20,000 (Column (5)) in college savings. The list of independent variables consists of dummy variables that equal 1 if student's parents use one of the following savings options to save for college: educational savings accounts, individual stocks, mutual funds, real estate, U.S. savings bonds, or another form. Each specification includes the school fixed effect, as well as fixed effects for the following student and family characteristics: family income group, parent's level of education, student's ability quartile, parent's marital status, student's gender, student being born in the US, and student's race. Control variables used in each specification are the number of dependents and parent's age. Standard errors are clustered at the school level and are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table VI. The Effect of Age-Based Rebalancing on College Savings

	Savings$> 10,000$			**Savings**$> 25,000$		
	(1)	(2)	(3)	(4)	(5)	(6)
529 Account*D$<$ 199411	-0.14***	-0.14***	-0.13***	-0.09**	-0.09**	-0.13***
	(0.03)	(0.03)	(0.05)	(0.04)	(0.04)	(0.04)
529 Account*D$\geq$ 199411 & $<$ 199503	-0.01	-0.00	-0.03	0.02	0.01	-0.03
	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)	(0.04)
529 Account*D$\geq$ 199503 & $<$ 199507	-0.06	-0.05	-0.09	-0.05	-0.05	-0.08***
	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)
Fixed Effects						
529 Account FE	Yes	No	Yes	Yes	No	Yes
Stud. & Fam. FEs	Yes	No	Yes	Yes	No	Yes
School FEs	Yes	No	Yes	Yes	No	Yes
529 Account FE*Stud. & Fam. FEs	No	Yes	No	No	Yes	No
529 Account FE*School FEs	No	Yes	No	No	Yes	No
Month of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	No	Yes	Yes	No	Yes
Controls*529 Account FE	No	Yes	No	No	Yes	No
Matching	No	No	Yes	No	No	Yes
Observations	2,037	2,037	4,816	2,037	2,037	4,816
R^2	0.161	0.170	0.201	0.208	0.215	0.246

This table reports the results of OLS regression (4) that studies the impact of age-based rebalancing in 529 accounts on the accumulated amount of college savings using data from the High School Longitudinal Study of 2009. The sample includes students, who were in the 9th grade in 2009 and did not repeat or skip any grade, and whose parents started saving before school. The treatment group includes students, who have educational savings accounts, while the control group comprises students, who do not have educational savings accounts. The list of dependent variables contains the probabilities of having more than \$10,000 (Columns (1)-(3)) and more than \$25,000 (Columns (4)-(6)) in college savings. Controls include parents' age and the number of household members. The fixed effects used in each specification are noted in the table. The set of fixed effects for student and family characteristics consists of family income group, parent's level of education, student's ability quintile, parent's marital status, student's gender, being born in the US, and student's race. The set of fixed effects for school characteristics includes location in an urban area, control type, and region. Columns (3) and (6) show the results for the sample based on the propensity score matching with the 3 nearest neighbours. The set of variables used for matching includes control variables (parent's age and the number of household members) and dummies for the following student, family, and school characteristics: student's gender, student's race, low ability student (1st or 2nd ability quintiles), high ability student (5th ability quintile), student was born in the US, family income group, parent's college, parent's marital status, and urban location of school. Standard errors are clustered at the month of birth intersected with group (treatment or control) level and are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table VII. The Effect of Age-Based Rebalancing on 4-Year College Enrollment

	All				Highly Selective			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	Income> 55,000	Income> 55,000	Income> 55,000	All	Income> 55,000	Income> 55,000	Income> 55,000
529 Account*D< 199411	0.02	0.03	0.03	0.01	-0.04	-0.12***	-0.12***	-0.18***
	(0.02)	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)	(0.03)	(0.04)
529 Account*D≥ 199411 & < 199503	-0.04***	-0.02	-0.02	-0.04	0.00	-0.01	-0.01	-0.02
	(0.01)	(0.02)	(0.02)	(0.04)	(0.02)	(0.03)	(0.03)	(0.03)
529 Account*D≥ 199503 & < 199507	-0.03	-0.06**	-0.06**	-0.07*	0.01	-0.01	-0.00	-0.02
	(0.02)	(0.02)	(0.02)	(0.04)	(0.02)	(0.03)	(0.03)	(0.03)
Fixed Effects								
529 Account FE	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Stud. & Fam. FEs	Yes	Yes	No	Yes	Yes	Yes	No	Yes
School FEs	Yes	Yes	No	Yes	Yes	Yes	No	Yes
529 Account FE*Stud. & Fam. FEs	No	No	Yes	No	No	No	Yes	No
529 Account FE*School FEs	No	No	Yes	No	No	No	Yes	No
Month of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Controls*529 Account FE	No	No	Yes	No	No	No	Yes	No
Matching	No	No	No	Yes	No	No	No	Yes
Observations	3,462	2,328	2,328	5,673	3,462	2,328	2,328	5,673
R^2	0.253	0.203	0.206	0.201	0.266	0.239	0.243	0.232

This table reports the results of OLS regression (4) that studies the impact of age-based rebalancing in 529 accounts on 4-year college enrollment using data from the High School Longitudinal Study of 2009. The sample includes students, who were in the 9th grade in 2009, did not repeat or skip any grade, and whose parents started saving before the 7th grade. The treatment group includes students, who have educational savings accounts, while the control group comprises students, who do not have educational savings accounts. The list of dependent variables contains the probabilities of enrollment in 4-year college (Columns (1)-(4)) and in selective 4-year college (Columns (5)-(8)). Columns (2), (3), (4), (6),(7), and (8) demonstrate the results for the sample of students from families with $> \$55,000$ income. Controls include parents' age and the number of household members. The fixed effects used in each specification are noted in the table. The set of fixed effects for student and family characteristics consists of family income group, parent's level of education, student's ability quintile, parent's marital status, student's gender, being born in the US, and student's race. The set of fixed effects for school characteristics includes location in an urban area, control type, and region. Columns (4) and (8) show the results for the sample based on the propensity score matching with the 3 nearest neighbours. The set of variables used for matching includes control variables (parent's age and the number of household members) and dummies for the following student, family, and school characteristics: student's gender, student's race, low ability student (1st or 2nd ability quintiles), high ability student (5th ability quintile), student was born in the US, family income group, parent's college, parent's marital status, and urban location of school. Standard errors are clustered at the month of birth intersected with group (treatment or control) level and are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table VIII. The Effect of Age-Based Rebalancing on Student Loans

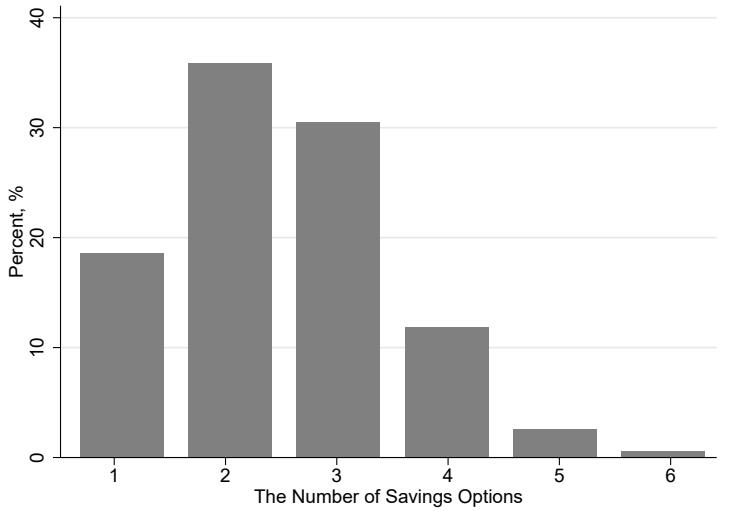
	Student Loan Participation				Log(Student Loans)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	Income> 55,000	Income> 55,000	Income> 55,000	All	Income> 55,000	Income> 55,000	Income> 55,000
529 Account*D< 199411	0.04**	0.09***	0.08***	0.06***	0.08	0.12	0.15	0.16
	(0.02)	(0.02)	(0.02)	(0.02)	(0.10)	(0.13)	(0.13)	(0.12)
529 Account*D≥ 199411 & < 199503	0.06*	0.12***	0.12***	0.14**	-0.08	0.09	0.10	0.08
	(0.03)	(0.04)	(0.04)	(0.06)	(0.07)	(0.10)	(0.11)	(0.10)
529 Account*D≥ 199503 & < 199507	0.01	0.07	0.07	0.08	0.03	0.17	0.17	0.12
	(0.03)	(0.04)	(0.04)	(0.06)	(0.07)	(0.12)	(0.11)	(0.15)
Fixed Effects								
529 Account FE	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Stud. & Fam. FEs	Yes	Yes	No	Yes	Yes	Yes	No	Yes
School FEs	Yes	Yes	No	Yes	Yes	Yes	No	Yes
529 Account FE*Stud. & Fam. FEs	No	No	Yes	No	No	No	Yes	No
529 Account FE*School FEs	No	No	Yes	No	No	No	Yes	No
Month of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Controls*529 Account FE	No	No	Yes	No	No	No	Yes	No
Matching	No	No	No	Yes	No	No	No	Yes
Observations	4,170	2,763	2,763	6,819	666	413	413	1,030
R^2	0.054	0.056	0.058	0.064	0.097	0.142	0.154	0.194

This table reports the results of OLS regression (4) that studies the impact of age-based rebalancing in 529 accounts on student loans using data from the High School Longitudinal Study of 2009. The sample includes students, who were in the 9th grade in 2009, did not repeat or skip any grade, and whose parents started saving before the 7th grade. The treatment group includes students, who have educational savings accounts, while the control group comprises students, who do not have educational savings accounts. The list of dependent variables consists the probability of student loan participation (Columns (1)-(4)) and *log*(Student Loans) (Columns (5)-(8)). Columns (2), (3), (4), (6),(7), and (8) demonstrate the results for the sample of students from families with $> \$55,000$ income. Controls include parents' age and the number of household members. The fixed effects used in each specification are noted in the table. The set of fixed effects for student and family characteristics consists of family income group, parent's level of education, student's ability quintile, parent's marital status, student's gender, being born in the US, and student's race. The set of fixed effects for school characteristics includes location in an urban area, control type, and region. Columns (4) and (8) show the results for the sample based on the propensity score matching with the 3 nearest neighbours. The set of variables used for matching includes control variables (parent's age and the number of household members) and dummies for the following student, family, and school characteristics: student's gender, student's race, low ability student (1st or 2nd ability quintiles), high ability student (5th ability quintile), student was born in the US, family income group, parent's college, parent's marital status, and urban location of school. Standard errors are clustered at the month of birth intersected with group (treatment or control) level and are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

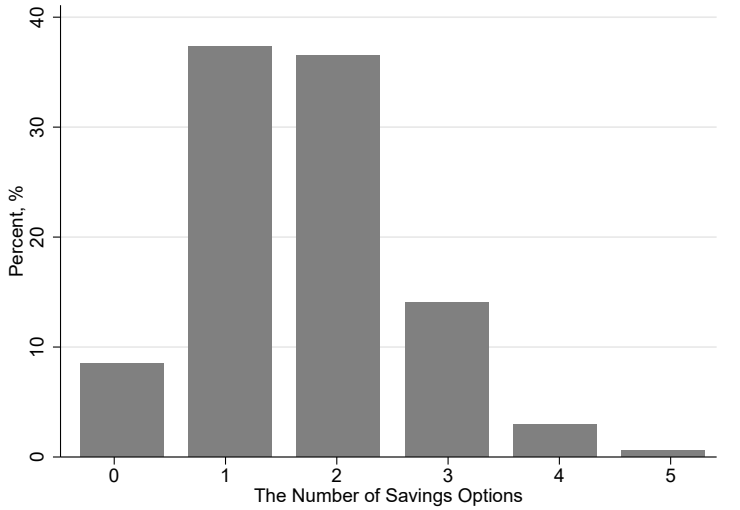
Appendix A. Figures

Figure A.1. Diversification and Saving for College

Panel A. The Number of Savings Options (Including Savings Accounts)

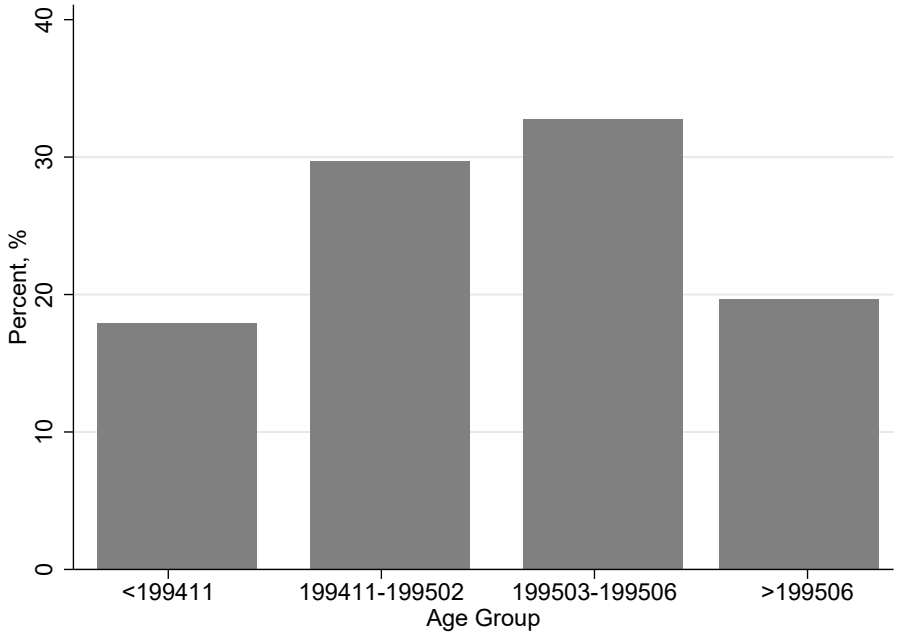


Panel B. The Number of Savings Options (Excluding Savings Accounts)



This figure displays the distribution of the number of savings options used by the parents of the 10th grade school students from the Education Longitudinal Study of 2002. The number of savings options includes savings accounts in Panel A and excludes in Panel B.

Figure A.2. Age Groups Histogram



This figure plots the age distribution of the sample of the 9th grade students, who did not repeat or skip any grade and whose parents saved for college, from the High School Longitudinal Study of 2009.