The Effect of Extended Family Wealth on College Enrollment

Stephan Lefebvre*

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Abstract

I develop a framework for measuring the effect of extended family wealth (EFW) on college enrollment. Exploiting the PSID's family dynasty structure, I find that a one percent increase in EFW is associated with a 0.3 percentage point increase in the probability of attending college. Using propensity score matching, where the binary treatment flags those in the top 25 percent of EFW, I verify common support and estimate that those receiving treatment have a 15.9 percent higher probability of enrolling in college. Finally, I test the relationship between EFW and college graduation, finding significant and positive results here as well.

Keywords: Wealth inequality, college enrollment, racial disparities, extended family

JEL Codes: J15, J62, D31, I24

*American University, Department of Economics, 4400 Massachusetts Ave NW, Washington, DC 20016. Email: stephan.g.lefebvre@gmail.com. I thank Mary Eschelbach Hansen for her generous advising and support. For helpful comments, I thank Paul Sullivan, Natalia Radchenko, Shaianne Osterreich, Elizabeth Kaletski, and the participants of the 2018 DC Regional Student Conference. I am grateful to Michael Lovenheim for providing Stata code.

1 Introduction

Prior research shows a positive relationship between household financial resources and college enrollment for young people: higher levels of parental income are associated with higher rates of college enrollment for high school graduates (Bailey & Dynarski, 2011; Dahl & Lochner, 2012; Lovenheim, 2011). We also know that socioeconomic status, operationalized through measures of wealth such as net worth, is highly correlated between younger and older generations in families (Charles & Hurst, 2011). Because a college education can expand employment opportunities, leading to higher wages and more stable employment, unequal access to college is one way in which socioeconomic status is transmitted from parents to children. In a newer strand of the inequality literature, research is beginning to examine *extended families*—aunts, uncles, and grandparents—and the role that they may play as determinants of the health and economic status of individuals (Chiteji, 2010; LaFave & Thomas, 2017). In particular, extended families may be an important dimension of stratification by race and ethnicity; the presence of extended family members that cross socioeconomic lines beneficially differs by race and ethnicity (Heflin & Pattillo, 2006).

In this paper, I measure the extent to which greater endowments of extended family wealth may increase college enrollment. For the purposes of this study, the extended family of a high school graduate age 17-21 consists of that individual's aunts, uncles, and grandparents, related by blood, adoption, or marriage. In this paper, I document a modest positive correlation between extended family wealth and college enrollment rates for recent high school graduates: a one percent increase in extended family wealth is associated with a 0.3 percentage point increase in the probability of attending college in a model with full controls. As with parental wealth and its effects on higher education outcomes, there are various explanations for this relationship, including the fact that extended families may pay directly for college tuition or provide for enrichment activities during adolescence and childhood that boost the probability of attending college. But there are also subtler channels. Extended family members with higher wealth may act as a financial safety net, thus affecting college enrollment rates without needing to transfer resources. Exploiting the family dynasty structure and panel nature of the PSID, I will be able to identify several of these channels in future work to test the hypothesis that each individually accounts for the observed association between extended family wealth and college enrollment.

With many low-cost options for obtaining a college education, and a range of public policy tools that purport to ease barriers for individuals from low-resource families who may benefit from a college degree, we might expect college enrollment rates to be high and uniformly distributed across wealth groups, but this is not the case. The degree to which wealth contributes to determining higher education outcomes such as enrollment and degree attainment is not well understood. Furthermore, there are multiple channels to disentangle, including the effect of early childhood financial security and wealth versus high school graduates' ability to pay for college and financing limitations. Only parental wealth has received any treatment, and this paper seeks to fill this gap in the literature.

Lovenheim (2011) estimates the effect of one dimension of wealth, private housing equity wealth, on college enrollment by exploiting exogenous variation due to the timing of the strength of the housing boom in the early 2000s. In contrast, this paper studies the relationship between extended family wealth and college enrollment. In the appendix, I present results for an extension of Lovenheim (2011) that adds a measure of extended family wealth to the model. In the core of this paper, I address some of the limitations of Lovenheim (2011) by developing a new conceptual framework that incorporates household and extended family wealth as well as parental and extended family educational attainment. I present results for a multivariate regression and propensity score matching estimation, to show robustness, and I extend the model to investigate college degree attainment. In the last section, I summarize these results and propose ideas for combining a broad measure of extended family wealth with quasi-experimental design. I also discuss the relevance of this work for policy, including federal need-based college aid programs (FAFSA, federal student loans) and tax advantaged savings plans.

1.1 Literature review

Research relating financial resources to college enrollment has been constrained in two ways. First, by a narrow focus on income, and second, by limiting the analysis to the nuclear family. There are two primary hypotheses that help explain why financial resources affect for college enrollment. First, in the neoclassical model of human capital attainment, higher wealth and income resources allow individuals to borrow at lower rates in credit markets. Human capital investment theory hypothesizes that individuals (laborers) borrow until their internal rate of return to schooling investment equals the market rate of return to capital. Because the internal rate of return is different based on the presence of assets that enable borrowing at lower rates—for example, owning a home allows one to borrow using securitized debt—we expect wealthier families to borrow more and thus attend college at higher rates (Becker, 1962). This effect is sometimes referred to as the 'credit constraints' explanation, since it involves imperfections in the credit market (information asymmetries and coordination problems) that result in different borrowing costs for securitized and unsecuritized loans (Lochner & Monge-Naranjo, 2012).

The other hypothesis is related not to human capital investment theory, but consumption theory. Wealthy families consume more education, including college attainment, because they consume more of all goods.[1] For this explanation to hold, college enrollment must hold some non-pecuniary benefit. Research shows that indeed this is the case.

Belley, Frenette, and Lochner (2014) test these alternate hypotheses using family income as a proxy for financial resources and find that families are increasingly becoming credit constrained. The authors find that low income families facing credit constraints increasingly explain the college enrollment differential. They also find that the marginal student deciding whether to attend college or not has a strong dislike of school, so at the margin the relation ship is negative. More income leads to *lower* college enrollment. Belley et al. (2014) interpret

[1] Even when income, not wealth, is measured, this is commonly called "the wealth effect." In my model, wealth and income are treated separately. To avoid confusion, I do not use the term "wealth effect."

this as evidence against the consumption effect hypothesis.

Research supports the existence of a causal link between parental wealth and college enrollment. Lovenheim (2011) builds a model with arguably exogenous wealth shocks and estimates that an additional $10,000 in home equity wealth increases the probability of college enrollment for 18–19 year old high school graduates by 0.7 percentage points on average. For individuals living in households where parental income is less than $70,000, the effect is greater (5.7 percentage points for the same increase in wealth). But this model does not take into account extended family or wealth outside of housing equity.

Most studies leave out the extended family entirely. Heflin and Pattillo (2006), in an analysis of adult siblings, find that kin relationships are an important dimension of racial inequality. The authors characterizing siblings of middle class and poor blacks and whites. Poor African Americans are less likely to have a middle class sibling than poor whites, controlling for individual and family background factors. For the middle class, being black is positively correlated with the probability of having a poor sibling. This work supports other research on black middle class fragility. Chiteji and Hamilton (2002) show how moderate to affluent black families are in a position to face pressure to make transfers to poor relatives. This would be expected to potentially have adverse effects on these families' ability to accumulate wealth, and it may help explain the wealth gaps that many researchers have observed between black and white families in the United States.

In a higher education setting, if need is assessed according to nuclear family income for a middle class (or poor) white versus same-class African American student, the two may be assessed with the same need but face different realities and constraints in their extended families. In the next sections, I describe in detail the theoretical framework and empirical tests used to test whether college enrollment differs based on extended family financial resources.

2 Theoretical framework

2.1 Institutional background

For the purposes of this paper, higher education consists of two year and four year colleges. Individuals regularly pursue these options in order to improve labor market outcomes, including higher wages and entry into otherwise unattainable career paths, although this is done with considerable uncertainty. In addition to investment dynamics, higher education also has consumption good characteristics, and parts of the experience, such as learning itself, may have intrinsic value for individuals.[2] Theoretical models in labor economics have shown that there are important differences between how these consumption and investment dynamics operate. For example, in a neoclassical model with perfect credit markets, we would expect that spending on education is independent of wealth if spending is driven by investment, but the usual income effect would obtain if spending is driven by consumption.

In the U.S., individuals finance their education in a variety of ways. The primary sources of funds are parental resources (income and wealth), parental borrowing, federal aid (subsidized loans and grants), financial aid from the attending institution (need-based and merit-based), student labor market participation (part-time or full-time work), and extended family gifts. This paper is focused on the latter category. These funding options present a challenge for the researcher, as there seem to be a dizzying array of possible funding arrangements. Many of these present the opportunity for adjusting at the margins. For example, federal aid can crowd out student labor-force participation, thereby lowering hours worked or the number of semesters or summers a student works (Meghir, Abbott, Gallipoli, & Violante, 2018). It is an empirical question how much each category affects the decision to attend college or to adjust on a different margin.

The human capital investment decision is further complicated because of heterogeneity of higher education options, even if we limit discussion to two year and four year colleges.

[2] That is, learning is valued, independent of future returns and contemporaneous satisfaction.

Due to differences in school generosity and priorities within financial aid, and the option to attend a nearby college or more distant in-state and out-of-state options, individuals face a range of cost options. And yet, effective costs are often only revealed after a student has applied and been admitted. This helps explain certain stylized facts about higher education in the U.S. For example, the cheapest colleges and universities for low-income students are typically elite private universities, and yet even among high performing high school graduates, low-income students are underrepresented at elite schools (Belley et al., 2014). Another interesting puzzle, and dimension of choice, has to do with degree completion. Research consistently finds higher returns to degree completion and at best modest labor market returns to additional years of education not associated with degree completion. And yet, the numbers of college drop-outs are large. College enrollment rates among recent high school graduates are 66 percent, whereas college completion by 24 is 33 percent.

The ability to pay for college is an important factor determining attainment of higher education. College enrollment can be thought of as a complex choice involving both investment and consumption characteristics. The choice is complex because there are several intensive and extensive margins of adjustment, including 2-year and 4-year college options, the ability to take breaks and finish the degree later, the ability to get one or more jobs and work alongside being a student. There are immediate costs and benefits, as well as potential future costs and benefits. These include monetary costs (e.g. tuition, room, and board), monetary benefits (e.g. anticipated future earnings), non-monetary costs (e.g. meeting graduation requirements), and non-monetary benefits (e.g. campus life, enjoyable aspects of course work).

The decision making process for college can be modeled using neoclassical utility comparison, costs and benefits of attending college and which college to attend are weighed, but there are social and behavioral aspects that are difficult to characterize. Individuals rely on rules of thumb to make their decision. The social values of the families and communities in which they are raised matter for their subjective valuation of various options. In addition, they are faced with constraints. Public education, largely funded by local taxes in the US, is highly unequal, and private education is beyond the reach of many families (for a political economy critique of the U.S. education system, see Folbre (2012)).

2.2 Channels

Liquid wealth is, by definition, a financial resource available to be transfered to family for any purpose, including funding higher education. Income may be transferable in this way, but only if other consumption and spending goals are met. Paying for college, like buying a car or house, is typically one of the largest purchases individuals make. Sending regular, small amounts out of income may be helpful, but the ability to mobilize a large amount to pay for tuition may be closer related to wealth than to income. Undoubtedly, these are related, and we would expect both to be related to college enrollment if any of the below channels are operative.

In this section, I lay out the theory and mechanisms by which extended family wealth may affect college enrollment. In this paper draft, I do not separately test the existence of these channels, but this may be possible using variation in the timing of wealth and the presence or absence of transfers. Some channels are easier to econometrically identify than others. It may be that identification is only possible with a different data set or a survey designed to collect specific information about these quantities. In particular, observing the presence of money or other resource transfers that contribute directly to education or indirectly, through enrichment activities, is important. The data I use for this study, described fully in the next section, can be merged with a 2013 supplement that has information about transfers, including those used to fund education. Further work should fully exploit this information on intra-family transfers to determine the effect of extended family wealth on higher education outcomes such as enrollment and degree completion.

There are several channels by which I expect there to be a relationship between extended family wealth and the probability of matriculating to a college or university. Extended family members may provide (1) **direct tuition support**, that is, effect financial transactions to fund college tuition and related expenses, lowering the cost of attending college.[3] Extended family may provide resources that, in the form of a gift (grant) or subsidized informal loan, can reduce the monetary cost of attending college. Obtaining a gift or informal loan from one or more members of the extended family also saves time and effort required to apply for other forms of financial aid, and may indeed substitute for these alternative financing options. A monetary gift for the purpose of college or university attendance can be made at the time of matriculation and enrollment, or it may be made years in advance as part of a college savings plan. This implies wide variability in observed timing. For example, higher wealth of extended family in a child's early years may increase the probability of enrollment, even if the same family members have low or negative wealth at the time of the child's high school graduation.

If this channel is present, we could—with ideal data—observe money transfers from extended family to the reference individual or their parents, whoever is paying tuition and other expenses, or payments made directly to the college or university by members of the extended family. Note that, in the absence of selection, this channel implies a *negative* relationship between wealth and the probability of enrollment. In other words, $\mathbb{E}[Wealth_i|Give_i = 1] < \mathbb{E}[Wealth_i|Give_i = 0]$ because $Wealth_i = GrossWealth_i - gift$.

I have fully worked through the logic of this channel because it is the most straight forward, but it is not the only possibility. Extended family wealth may also act as (2) **a financial safety net** for the reference individual or their parents. Under this channel, the extended family does not provide gifts or loans. Instead, greater access to extended family wealth lowers the downside risk of investing in higher education. For example, parents may not want to significantly lower their liquid savings to pay for their child's college unless they now that they can rely on their siblings or their own parents (aunts, uncles, and grandparents

[3]Extended family may also contribute resources for living expenses conditional on college enrollment. Conceptually, this type of transfer is similar to payments for room and board. In other words, the distinction we make between "paying for college" and other gifts is somewhat artificial.

of the prospective college student) in case of emergencies. The reference individual or his/her parents may be willing to pay more for college knowing that they can rely on extended family in the case of an emergency.

If extended family wealth acts as a financial safety net, we would not expect to see transfers from the extended family nor direct payments, but we can isolate the effect in terms of timing. Because this channels affects the immediate financing decision, extended family wealth during college years matters, but should be unaffected by wealth levels prior to college-age.

With the exception of the college savings account, the channels discussed thus far rely on the contemporaneous effect of extended family wealth on the decision to matriculate. A third possibility is that extended family wealth during any period preceding the matriculation decision, i.e. prior to high school graduation, may be used (3) **to enhance college preparedness or increase the subjective value of college**. Additional tutoring, test prep programs, or extracurricular activities may increase the reference individual's desire to attend college or the quality of their college application, increasing the probability of being admitted.[4]

In order to detect whether this channel is operative, note that we would expect to see financial transfers for personal development purposes or direct purchases of gifts or experiences prior to high school graduation. Thus, the level or changes in extended family wealth after high school graduation should not matter for this channel.

Extended family wealth may also affect the value of a college education through (4) **an expectations channel**. That is, expectations of future transfers to or obligations from extended family may be different for an individual depending on whether he or she goes to college. For example, expectations of positive post-college wealth transfers may reduce incentives to get a college degree even if such a degree can raise future income because

[4] Admissions selectivity at the college level does not explain a meaningful proportion of students who fail to enroll after high school. In the U.S., there are a range of open enrollment schools, including many community colleges.

getting a degree is costly and individuals may satisfice (have a target wealth) rather than taking decisions to maximize income. On the other hand, expectations of positive post-college wealth transfers may make the individual more likely to attend college if, for example, there is the possibility of becoming an entrepreneur, a career path that benefits from capital investments, whether by the reference individual or their family. Similar stories can be told for family obligations. Wealth-poor extended family may reduce incentives to attend college, since a portion of the increase in individual income may be claimed by other family members, or it may drive a charitable/benevolent individual to pursue college in order to raise their future wage and allow them to better provide for extended family.

As before, we comment on timing and the potential of observing transactions. For this expectations-based channel, we would not observe transfers or purchases by the extended family. Wealth levels during high school or during college, may be relevant for forming expectations about future transfers. An extreme case would be that access to extended family wealth induces an individual to enroll in college through this channel, and a loss in wealth position causes the college student to reevaluate the decision and leave college early, without obtaining a degree or not earning the degree they would have otherwise earned.

The last channel by which extended family wealth may influence college enrollment is through (5) **needy relatives**. Having low wealth aunts, uncles, or grandparents, especially if these family members are living in poverty, may deter high school graduates from going to college. They may be pushed into the labor market, obligated to delay or forgo college in order to provide for their relatives financially, or they may need to take on caregiving roles in the family for elderly or disabled family members. In this case, it is the status of the worst off member of the extended family that determines the effect. We would expect to see transfers from the young person to their extended family, or co-habitation where the reference individual is able to cover living expenses or other expenses for their extended family.

Table 1 summarizes these five non-mutually exclusive channels: (1) the direct tuition support channel, (2) the financial safety net channel, (3) the pre-college preparedness and values channel, (4) the anticipation of transfers channel, and (5) the needy relatives channel. In addition, Table 1 gives information about coefficients in a linear regression-type model that can be used to test the channels.

Table 1 implies an empirical strategy for testing the effect of the different channels. First, we could test the association of each component separately. Consider a two period model where $t = 0$ represents time before high school graduation and $t = 1$ represents the time after. The reference individual, a recent high school graduate aged (17 to 21 years old) may be in college or not. For now, ignore selection, or imagine that both wealth and the presence of transfers from extended family to their relatives for college is assigned randomly. Equation 1 represents a model testing the association between extended family transfers of resources, wealth, and probability of college enrollment in a cross-section

$$\text{Enroll}_i = \beta_0 + \beta_1(W_{i,0} + T_{i,0}) + \beta_2 T_{i,0} + \beta_3(W_{i,1} + T_{i,1}) + \beta_4 T_{i,1} + \epsilon_i \tag{1}$$

where Enroll_i is a dummy variable indicating enrollment in college, $W_{i,t}$ is observed extended family wealth before ($t = 0$) and after ($t = 1$) college, and T_t are transfers from then extended family to the reference individual before and after college, and ϵ_i is an error term. Remember, observed extended family wealth is net of any transfers, so this amount is added back in to obtain a counterfactual wealth quantity. If extended family effects had no effect, we expect $\hat{\beta}_i = 0$ for $i = 1, 2, 3, 4$. If only the direct tuition support channel operated, then we would expect $\hat{\beta}_2 > 0$ and $\hat{\beta}_4 > 0$. To see this, consider that measured wealth (W_t) is counterfactual, no-transfer wealth ($\bar{W}_t$), minus the money transfer (T_t), which is zero for all those individuals who receive no transfers from their extended family: $W_t = \bar{W}_t - T_0$. If only the direct tuition support channel mattered, then we would expect $\hat{\beta}_1 = 0$ because, after accounting for the resource transfer, total wealth would not affect college enrollment. Similar calculations can be made for the other channels, as indicated in the last column of Table 1.

3 Empirical methodology

3.1 Regression using net wealth

In this section, I describe the econometric strategies I use to test the relationship between extended family wealth and college enrollment. The data available in the PSID is rich. While I do not observe transfers between family members,[5] the PSID contains rich information on wealth, income, and education of the aunts, uncles, and grandparents of the reference individual (described more fully in the next section). By controlling for a variety of individual and household characteristics, in addition to extended family education, the estimates obtained through regression and propensity score matching techniques are likely not biased due to endogeneity.

Challenges to correct identification of causal parameters in this case are due to (1) selection and (2) omitted variables. The selection problem would involve non-random assignment of extended family wealth relative to the other variables I use as controls. In the higher education setting, this would importantly involve controlling for ability with high school grade point average (GPA) or college SAT score. My theoretical model implies an easy solution for this problem, mainly, controlling for parental and extended family financial resources in childhood. Rather than controlling for the *outcome* of a possibly endogenous relationship, I can control directly for the causal variable (I know that child high school GPA cannot effect parental income) or incorporate this relationship into the model (first model high school GPA, then include the predicted values in a regression of enrollment on financial resources).

Omitted variables are a concern because children from wealthy households, children whose parents or guardians are wealthy, are more likely to attend college for a variety of reasons, not just their wealth. In other words, wealth is correlated with several other factors, and wealth operates through several channels. Thus, the preferred specification I present will

[5] A supplemental survey administered in 2013 did collect information on transfers and included an option for indicating that the transfer was intended to support education. Future work should exploit this information.

have a full suite of covariates.

In Section 5, I first present results for simple bivariate and multivariate OLS regression. That is, I estimate

$$Enroll_{i,t} = \beta_0 + \beta_1 \mathrm{FR}_{i,t} + \beta_2 State_i + \beta_3 Year_t + \epsilon_{i,t} \tag{2}$$

and

$$Enroll_{i,t} = \beta_0 + \beta_1 \mathrm{FR}_{i,t} + \vec{\gamma}\vec{X}_{i,t} + \beta_2 State_i + \beta_3 Year_t + \epsilon_{i,t} \tag{3}$$

where $\mathrm{FR}_{i,t}$ represents various measures of financial resources, including extended family wealth, extended family income, nuclear family wealth, and nuclear family income. $\vec{X}_{i,t}$ is a vector of household and individual controls including: age, race, sex, and a measure of whether the parents of the reference individual own the home they live in or rent it. I include state fixed effects and year fixed effects in all of the models. Because I allow the estimation to include individuals multiple times (maximum of three times),[6] I used clustered errors at the family level and individual weights.

3.2 Propensity score matching estimation

I also present results for an estimation using propensity score matching (Rosenbaum & Rubin, 1983). While similar to linear regression in that plausible exogeneity is achieved through the inclusion of a rich set of covariates, there are distinct advantages to propensity score matching. First, tests for common support are integrated into the method. That is, it could be the case those individuals with high parental income and wealth also always have large endowments of extended family wealth, or that those with low-resource parents only have low-resource extended family. If this were true, I would be able to estimate a linear

[6] I restrict the estimation to those aged 17 to 21 and estimate over odd years between 2005 and 2015. That means, if an individual was 17 in the 2005, 2007, 2009, or 2011 survey, a high school graduate, and did not graduate from college within those years, they would have been included in the model up to 3 times before they became 22.

regression but identification would depend heavily on parametric assumptions. Propensity score matching in this context is a nonparametric estimation technique that considers individuals who are similar in their *probability* of having high extended family wealth, but who differ along actual wealth endowment.

I construct a binary treatment variable $Top25_{i,t}$ that takes on the value of 1 if the individual is in the top 25 percent of the extended family wealth distribution and 0 otherwise. Using causal inference notation, we can write the average treatment on the treated as

$$ATT = E\left[[E(Enroll_i|\overrightarrow{X}_i, Top25_i = 1) - E(Enroll_i|\overrightarrow{X}_i, Top25_i = 0)]|Top25_i = 1\right] \quad (4)$$

where $\overrightarrow{X}_i$ is a full set of controls and subscripts t have been omitted for concision.

The first step in propensity score matching is to estimate a probit model for the probability of receiving treatment. I estimate $Pr(Top25_i = 1|\overrightarrow{X}_i) = \Phi(\overrightarrow{\beta}'\overrightarrow{X}_i)$. Using the estimated coefficients, we can produce a predicted probability of receiving treatment, which is the propensity score. That is, for each individual, we obtain the probability of having an extended family wealth endowment in the top 25 percent of the distribution. We compare college outcomes therefore among individuals who are otherwise similar in their individual and family characteristics, some of which received a "treatment" (high extended family wealth) while others did not.

4 Data

4.1 PSID

The data used in this study comes from the Panel Study of Income Dynamics (PSID). The PSID is a nationally representative longitudinal survey that began in 1968 and continues through today (the latest data available is 2017). The main focus of the PSID is household-level concepts, but some data is also collected at the individual level. Eligibility for the survey is permanent for all those included in the initial wave, including those who were very young, and eligibility is passed along from parent to child (for life) and between spouses (during cohabitation). The initial 1968 sample consists of 4,802 households and 18,233 individuals, while the 2015 sample consists of 9,048 households representing 24,637 individuals.

Individuals and households move out of the sample due to nonresponse or death. “New” households are added to the sample due to splitoff. Splitoff occurs when a PSID individual leaves their former household and forms a new one, as when children move out of their parents house. In addition, new cohorts have been added to the PSID periodically to account for immigration, which allows the PSID to remain nationally representative. In 1997, the PSID added a group of 441 immigrant households (1,695 individuals) to adjust the sample. The PSID survey was conducted yearly between 1968 and 1997 and every two years thereafter (on odd years).

The PSID is particularly useful for studying family relationships. Because selection into the survey sample is passed from parent to child, the PSID sample includes rich information for individuals across a sample member’s family tree, especially for younger individuals who have more generations of their family in the survey.

The PSID allows us access to information about only one side of a reference individual’s extended family. Consider Figure 1. Individuals 1 and 2 represent an adult couple included in the 1968 cohort. One would have been labeled the “head of household” and the other the “spouse.” They have three children (6, 7, and 8). Furthermore, two children in the second generation have formed their own families and have had a total of five children (individual 6 has children 11 and 12, while individual 8 has children 13, 14, and 15). We expect to have data for all of the individuals mentioned thus far, who are marked blue in Figure 1, from 1968 or from their birth, in the case that individuals in the second or third generation were not born yet.

Individuals 5 and 6 have married into a PSID family. As long as the couple is intact, these individuals fill out the yearly or biannual PSID survey. However, we only have information on these individuals from the time that they join a household including an original PSID individual. Furthermore, we never have access to the parents or siblings of individuals 5 and 9. To see the implications of this, consider what information is available for person 15 as a reference individual. We have rich data about their grandparents (individuals 1 and 2) and their aunts and uncles (individuals 6 and 7 and, for some time periods, 5), but this is only on one side.

Some of the variables used in this study are only available in the Transition to Adulthood Supplement (TAS). The main questionnaire is based on household characteristics, with questions for individuals that are relevant largely for adults (occupation, employment status, income, etc.). The TAS is a supplement designed to introduce questions related to young adults including high school GPA, college major, education and career goals, health, and social environment. The TAS selection criterion consists of four components: (1) ages 18-28, (2) no longer attending high school, (3) participated in at least one Child Development Supplement interview, and (4) family participated in the core PSID interview of the corresponding year.

4.2 Main variables and sample

The sample in the main analysis for this paper consists of high school graduates between the ages of 17 and 22 who do not yet have a bachelors degree. I drop observation-years where the PSID survey was administered over the summer months, when an individual may indicate their primary status as employed (or unemployed) rather than as student. These are individuals who could be attending college, but may or may not do so for various reasons.

The main dependent variable in this study is college enrollment, and the primary covariates of interest are measures of financial resources of the parents (sometimes referred to as household) and the extended family. College enrollment is defined as having more than 12 years of schooling and a primary employment status of "attending school." Alternatively, for the TAS subsample, we are able to more accurately measure college enrollment through a question on school status. For this subgroup, I define college enrollment as having indicated college enrollment directly.[7] The alternatives are the following categories: (1) HS diploma, (2) not enrolled but completed some college, (3) not enrolled, 2-year college graduate.

The main covariate of interest is extended family wealth. Household wealth, which I sometimes refer to as parental wealth, is simply the combined assets minus liabilities for all the individuals in the reference individual's household. In the vast majority of cases this therefore measures the combined wealth of co-resident parents. For the extended family, measuring wealth is more complicated because there may be aunts, uncles, and grandparents in zero, one, or multiple other households. To deal with this, we measure extended family wealth (and income) in two ways: first, I take the maximum of all the households wherein reside members of the reference individual's extended family, and second, I run the same analysis using the average wealth (or income) over these households. In order to create more normally distributed variables and reduce heteroskedasticity, I take the log of all wealth and income variables using the following transformation:

$$\ln(x) = \begin{cases} \frac{\ln(x+1)}{\ln(2)} & \text{if } x > 0 \\ 0 & \text{if } x = 0 \\ \frac{-\ln(-x+1)}{\ln(2)} & \text{if } x < 0 \end{cases}$$

This is a continuous function that adapts the properties of a log transformation while allowing for negative values. The scaling factor, division by ln(2), converts the natural logarithm into base 2 for ease of interpretation.

In addition, I add controls for parent and extended family education. Parent education is measured by the percentage of parents with a college degree. In the case of an individual with only one parent included in the survey (or only one parent with non-missing education), this becomes a dummy variable indicating a college degree. For the extended family, I

[7]The question also asks whether they have completed a prior degree, such as an Associates, and I accept both "no prior degree" and "has prior degree" here.

use the number of college graduates in the extended family. The rationale here is that parents without a college degree matter for determining values around higher education and transmitting information about college. This is captured in the denominator of the ratio. Aunts, uncles, and grandparents without a college degree may not matter, they do not make it harder to learn about college, but extended family that *do* have college degrees can help increase the probability of attending college.

Other covariates include race/ethnicity (dummies for non-Hispanic white, non-Hispanic black, Hispanic, and a residual "other" category), age, and a dummy variable indicating whether the reference individual's parents own the home they live in or rent it.

4.3 Stylized facts and summary statistics

Figure 2 shows the basic unconditional relationship that I am interested in exploring in this paper. Increasing levels of household income and wealth are associated with higher rates of college enrollment. One exception is that the second quintile by wealth has a lower college enrollment rate than the first quintile by wealth. This is in line with other education research. In the U.S. a disproportionate amount of aid is directed at the very needy, thus making the effective cost of college lower for those in the lowest income groups than those just above these (Bailey & Dynarski, 2011). A similar pattern is seen in the graph to the right. Here, greater levels of extended family wealth and income are also generally associated with higher college enrollment rates.

Tables 3 and 4 replicate this data in the first row showing mean enrollment rates by quintiles, and they also provide other summary statistics by quintile. The next rows in Table 3 show the mean wealth (both including and excluding equity) in each quintile. Interestingly, extended family wealth does not have a strong relationship with household wealth in the bottom part of the distribution. Mean extended family wealth in the first quintile ($304,050) is higher than in the second quintile ($288,080). Past the second quintile, extended family wealth rises with parental wealth. Higher wealth in parents is associated with higher wealth in the extended family past the second quintile.

Further, Table 3 shows that whites are overrepresented in the top quintile by wealth (94 percent) and by income (92 percent), while blacks are overrepresented in the bottom quintiles (28 and 18 percent, respectively). Those in the top quintiles by parental wealth and income are more likely to own their homes than those in the lower quintiles.

Finally, both tables present information on education patterns of parents and the extended family. In general, higher levels of parental wealth and income are associated with a higher proportion of parents with a college degree. There is a strong relationship between parental income and the number of extended family members with college degrees. In other words, reference individuals with higher parental wealth are likely to have more aunts, uncles, and grandparents who are college graduates (Table 3). Table 4 shows that those in the lowest quintile by extended family wealth also have the lowest average number of extended family members with college degrees (1.99) compared with the those in the top quintile (2.81).

Table 5 shows the distributions of survey wave, age, years of education, home ownership, and race. In addition, I present a breakdown of the education categories from the TAS (HS diploma, Notenrolled some college, etc.), though observations are missing for 55 percent of the sample. The person-year sample is fairly evenly distributed between 2007 and 2015, with a small number of observations coming from 2005. About half of the sample is between 17 and 19 years old and the rest of the sample is 20 to 21 years old. Also, about 56 percent of the observations come from individuals where the family owns the home in which they live. 49 percent of the sample have a high school degree but no additional tertiary education.

Table 6 shows summary statistics for continuous variables. The average GPA score for the sample is 3.3 (note, this is conditional on providing a GPA). Also, the average wealth, including equity, is $221 thousand. The distribution of wealth is highly skewed as the mean is much greater than the median ($27 thousand).

I include various measures of wealth in Table 6 to show that there is little difference between the measure including housing equity and that one including housing equity but eliminating housing debt (oustanding mortgage debt). This is likely due to data constriants, since not all households with a mortgage provide information on the outstanding amount.

Extended family wealth, because it is based on the maximum of all the households belonging to aunts, uncles, or grandparents of the reference individual, tends to be greater than household wealth. This is not a problem given the theoretical framework. I expect that individuals will receive more help from their aunts, uncles, or grandparents with greater means, all else equal. A refinement to this could account for the number of children and the number of nieces and nephews or the number of grandchildren that each member of the extended family has.

The PSID includes various questions probing why individuals did not begin college or why they are currently not enrolled if they have started some college. Table A.4 shows the not mutually exclusive reasons why individuals are not enrolled in college. Choosing from a list, 32 percent of the sample said that they cannot afford college, 16 percent said that their family responsibilities, and 12 percent said that they are not interested in college. In addition, 44 percent listed "some other reason" contributed to them not being enrolled in college. According to this, individuals 18 to 25 years old self-report many different barriers, with no single reason dominating, though the plurality cite college affordability as an issue. Table A.5 shows that the most important, mutually exclusive, self-reported reason for *stopping* college attendance is financial: 16.3 percent report that college is too expensive and they were not able to secure sufficient financial aid while an additional 21.2 percent cite not being able to fulfill paid work responsibilities alongside school work. Altogether, 37.4 percent of the sample said that they stopped attending college for financial reasons. Another highly cited reason is health, pregnancy, marriage, substance use, or family commitments (26.6 percent).

5 Results

5.1 OLS results

Table 7 shows simple univariate and multivariate regression results for college enrollment and various measures of family financial resources. (1) There is a positive relationship between extended family wealth and college enrollment ($\beta_1 = .005$). The way to read this level-log coefficient is that a one percent increase in extended family wealth is associated with a 0.5 percentage point increase in the probability of attending college (or, a ten percent increase in extended family wealth is associated with a 5 percentage point increase in the probability of college enrollment). (2) There is no statistically significant correlation between extended family income and college enrollment. (3 & 4) Both parental wealth and parental income ("household" income) are positively correlated with college education. The coefficient on parental wealth is greater than the coefficient for extended family wealth, indicating that the relationship is stronger. This is expected: parental wealth matters more for college enrollment than does extended family wealth. (5) The weakly positive relationship between extended family wealth and college enrollment remains when we control for parental financial resources (household wealth and income). (6) And the weakly positive relationship remains when we add additional demographic and education controls.

Model (6) includes the full range of controls and thus is our preferred specification. We see that the dummy variable indicating the reference individual's parents own their own home is positive, large in magnitude, and highly significant. Owning a home is a strong proxy for wealth, income, and other factors related to parents' economic status, but it is not closely related to extended family economic status. This model also includes controls for the education level of parents and extended family. The proportion of parents with a college degree is positively associated with college enrollment. This variable is difficult to interpret,[8]

[8] The variable equals 0 if there are no parents with a college degree, .5 if one parent has a college degree and the other doesn't, and 1 if both parents have a college degree or the sole parent present has a college degree. Effectively, this means that I allow for the presence of a less educated parent to lower the college enrollment rate, but having only one parent is not treated separately

but we can draw a conclusion that parent(s)' education matters for the college enrollment rate of young people, separately from the wealth and income effects of this education.

We also see that the number of college graduates in the extended family is not significant. That is, the number of aunts, uncles, and grandparents who are college graduates is not associated with college enrollment.

Table 8 contains results for a similar exercise, but allowing positive and negative wealth to enter into the regression equation separately. For those with positive extended family wealth, we estimate a coefficient of .013. This is larger and more precisely estimated than the full model. The coefficient on the negative extended family wealth term is -.013. In other words, higher positive extended family wealth increases the probability of attending college, but so does more indebtedness for those with negative net extended family wealth. The same pattern holds for household wealth.

In creating the analysis variables, as mentioned, I am able to remove housing debt from some observations, but not all. This sign switching has to do with households that have high mortgages or other real estate debt. Our measure of net wealth marks these as the poorest in our sample, but in reality they are well off (high total lifetime earnings and wealth potential) and at the beginning of building greater equity wealth. This, being in this group, or being in the high net wealth group, are both associated with higher college enrollment.

5.2 Propensity score matching results

Table 9 shows results for the first stage of the propensity score matching estimation. We see that higher extended family income and higher parental income is associated with receiving treatment or, in this context, being in the top 25 percent of the distribution for extended family wealth. Interestingly, in the model with rich controls, parental wealth is not associated with receiving treatment. Relative to white (and the small catch-all "other" racial category), African Americans have a significantly lower probability of receiving treatment. Females are more likely than males to have extended family wealth in the top 25 percent.

Table 10 shows the final results of the propensity score matching estimation. The estimate obtained, 0.159, is comparable to the coefficient estimate of .003. I interpret this to mean that being in the top 25 percent of the distribution of extended family wealth increases the probability of going to college by 15.9 percentage points. While different orders of magnitude, the coefficient from the linear regression exercise indicates how continuous changes along the distribution of extended family wealth affect the probability of attending college, while the propensity score estimate is a discrete measure.

5.3 Other outcomes: degree attainment

Finally, I extend the work done so far to another dependent variable not discussed thus far: degree attainment. In particular, I estimate a linear regression of a dummy variable indicating BA completion among an older sample from the PSID, those who are 22 to 24 years old. Table 11 shows the results. Extended family wealth, extended family income, and parental income are all associated with higher college completion rates in univariate analysis (with a dummy variable to capture those with no extended family). Further, extended family wealth is positively and significantly associated with college completion in the model with full controls. A one percentage increase in extended family wealth is associated with a .7 percentage point increase in the probability of graduating from college between the ages of 22 and 24. We also see that having more college educated parents and more college graduates in the extended family is also associated positively with graduating college. Model 6 also indicates that blacks, relative to whites and the small "other" category, have a lower probability of graduating college and women have a higher probability than men.

6 Discussion

In this paper, I have developed a framework for studying the effect of extended family wealth on higher education outcomes. In particular, I focused on college enrollment. I presented a theoretical model including five possible channels by which an effect can occur, differing as they do by the presence or absence of transfers and their timing before or after high school graduation.

The results indicate that extended family wealth does impact college enrollment. A one percent increase in extended family wealth is associated with a 0.3 percentage point increase in the probability of attending college (or, a ten percent increase in extended family wealth is associated with a 3 percentage point increase in the probability of college enrollment). This finding was robust to the inclusion of a wide range of control variables for individual and family characteristics. In addition, I estimated the effect of extended family wealth on college enrollment treating positive and negative values of wealth separately and found that greater endowments of *positive* wealth increase enrollment, while greater net debt is also associated with higher college enrollment.

I included several extensions to the model. First, I tested the same question using propensity score matching techniques. I first constructed a binary treatment indicating the individual is in the top 25 percent of the distribution of extended family wealth. The propensity score test yielded sufficient common support, meaning that there is variation in the amount of extended family wealth even conditional on extended family income, parental wealth, and parental income. For those in the top 25 percent of the extended family wealth distribution (average treatment on the treated), they had a 15.9 percent higher probability of enrolling in college because of their extended family. Finally, I also tested the relationship between extended family wealth and college graduation for 22 to 24 year olds, finding that a one percent increase in extended family wealth is associated with a 0.7 percentage point increase in the probability of attending college.

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Tables

Table 1: Hypothesized channels

Channel	Transfers sign	Wealth timing relative to HS graduation	Expected coefficients (see Eq. 1)
Direct tuition support	+	Before & after	$\beta_2 > 0, \beta_4 > 0$
Financial safety net	0	After	$\beta_0 > 0$
Preparedness & values	+	Before	$\beta_2 > 0$
Anticipation of transfers	0	After	$\beta_1 > 0$
Needy relatives	−	After	$\beta_3 > 0$

Note: Channels are as explained in the text above. The second and third columns define the hypothesized channel. (+) indicates positive transfers from extended family to the reference individual, (0) indicates no transfers and (−) indicates transfers from the reference individual to members of their extended family.

Table 2: Summary statistics: counts of family members in the data

	mean	p25	p50	p75	min	max
Number of living aunts/uncles	2.42	0	2	4	0	16
Has living aunts/uncles (dummy)	0.68	0	1	1	0	1
						.
Number of living aunts	1.19	0	1	2	0	10
Has living aunts (dummy)	0.55	0	1	1	0	1
						.
Number of living uncles	1.23	0	1	2	0	9
Has living uncles (dummy)	0.56	0	1	1	0	1
						.
Number of living grandparents	2.34	1	2	4	0	6
Has living grandparents (dummy)	0.84	1	1	1	0	1

N=7705

Table 3: College attendance and other summary statistics, by household wealth and household income quintile

	Q1	Q2	Q3	Q4	Q5	All
By household wealth						
Enrolled (dummy)	0.46	0.43	0.59	0.75	0.80	0.64
Wealth w/ equity (USD 1000)	-30.36	9.36	58.70	157.68	898.73	303.18
Wealth w/o equity (USD 1000)	-22.22	4.90	25.70	66.56	600.35	190.19
Family income (USD 1000s)	52.76	41.89	73.69	97.85	200.95	107.88
XTF: max wealth w/ equity (1000s)	291.95	268.33	308.01	540.57	1062.82	574.43
XTF: max wealth w/o equity (1000s)	202.18	175.52	206.79	403.30	820.04	426.57
XTF: max income (1000s)	82.45	89.92	86.62	110.66	156.29	112.64
Owns home	0.33	0.23	0.72	0.91	0.96	0.70
White, non-Hispanic	0.73	0.70	0.78	0.83	0.92	0.81
Black, non-Hispanic	0.18	0.18	0.15	0.07	0.03	0.10
Hispanic	0.07	0.09	0.07	0.08	0.03	0.06
Other, non-Hispanic	0.03	0.03	0.01	0.03	0.02	0.02
Percent parents college grad	0.44	0.31	0.33	0.40	0.62	0.44
# College graduates in XTF	2.04	2.09	2.33	2.24	2.86	2.38
By household income						
Enrolled (dummy)	0.40	0.56	0.59	0.69	0.80	0.64
Wealth w/ equity (USD 1000)	51.79	110.05	139.28	228.98	710.58	303.18
Wealth w/o equity (USD 1000)	31.59	60.22	68.23	136.38	470.58	190.19
Family income (USD 1000s)	12.39	35.02	58.86	94.47	239.73	107.88
XTF: max wealth w/ equity (1000s)	304.05	288.08	365.01	454.47	1111.41	574.43
XTF: max wealth w/o equity (1000s)	209.43	202.07	255.50	322.60	864.03	426.57
XTF: max income (1000s)	87.07	79.17	91.56	109.29	160.25	112.64
Owns home	0.17	0.54	0.69	0.84	0.93	0.70
White, non-Hispanic	0.67	0.76	0.75	0.82	0.94	0.81
Black, non-Hispanic	0.28	0.15	0.10	0.07	0.02	0.10
Hispanic	0.04	0.07	0.13	0.07	0.02	0.06
Other, non-Hispanic	0.02	0.02	0.02	0.04	0.01	0.02
Percent parents college grad	0.44	0.30	0.35	0.43	0.58	0.44
# College graduates in XTF	2.20	2.24	2.14	2.23	2.81	2.38

Author's calculations using PSID and individual weights. XTF is extended family. N=987.

Table 4: College attendance and other summary statistics, by extended family wealth and extended family income quintiles

	Q1	Q2	Q3	Q4	Q5	All
By extended family wealth						
Enrolled (dummy)	0.57	0.53	0.65	0.69	0.80	0.64
Wealth w/ equity (USD 1000)	236.18	131.25	211.66	303.15	673.29	303.18
Wealth w/o equity (USD 1000)	164.88	77.66	126.69	171.85	433.24	190.19
Family income (USD 1000s)	86.09	73.95	93.18	120.54	174.42	107.88
XTF: max wealth w/ equity (1000s)	-1.24	81.54	208.87	481.58	2296.72	574.43
XTF: max wealth w/o equity (1000s)	-1.15	33.77	99.23	279.92	1875.30	426.57
XTF: max income (1000s)	52.82	78.55	103.54	132.91	211.04	112.64
Owns home	0.64	0.62	0.67	0.75	0.84	0.70
White, non-Hispanic	0.59	0.74	0.88	0.93	0.96	0.81
Black, non-Hispanic	0.28	0.12	0.05	0.03	0.01	0.10
Hispanic	0.09	0.11	0.04	0.04	0.02	0.06
Other, non-Hispanic	0.04	0.02	0.04	0.01	0.00	0.02
Percent parents college grad	0.36	0.39	0.47	0.49	0.52	0.44
# College graduates in XTF	1.99	2.30	2.25	2.64	2.81	2.38
By extended family income						
Enrolled (dummy)	0.55	0.65	0.61	0.67	0.73	0.64
Wealth w/ equity (USD 1000)	165.37	288.33	243.51	370.11	450.36	303.18
Wealth w/o equity (USD 1000)	97.55	207.01	149.81	253.68	250.67	190.19
Family income (USD 1000s)	65.79	94.96	88.22	144.54	147.58	107.88
XTF: max wealth w/ equity (1000s)	171.62	271.77	393.58	477.88	1482.60	574.43
XTF: max wealth w/o equity (1000s)	120.81	193.15	280.30	298.51	1175.10	426.57
XTF: max income (1000s)	23.05	54.95	86.85	125.61	262.32	112.64
Owns home	0.65	0.65	0.65	0.76	0.79	0.70
White, non-Hispanic	0.62	0.77	0.82	0.90	0.94	0.81
Black, non-Hispanic	0.24	0.15	0.08	0.03	0.02	0.10
Hispanic	0.11	0.05	0.08	0.06	0.01	0.06
Other, non-Hispanic	0.02	0.04	0.01	0.01	0.03	0.02
Percent parents college grad	0.33	0.38	0.39	0.50	0.59	0.44
# College graduates in XTF	1.95	1.94	2.32	2.83	2.85	2.38

Author's calculations using PSID and individual weights. XTF is extended family. N=987.

Table 5: Categorical variables summary statistics: frequencies

	mean	sd
Reference year		
2005	0.16	(0.37)
2007	0.17	(0.37)
2009	0.17	(0.38)
2011	0.17	(0.38)
2013	0.17	(0.37)
2015	0.16	(0.36)
Age		
17	0.04	(0.20)
18	0.17	(0.37)
19	0.24	(0.43)
20	0.28	(0.45)
21	0.27	(0.44)
Education		
HS diploma	0.08	(0.27)
Not enrolled, some college	0.08	(0.28)
Not enrolled, 2-yr college graduate	0.01	(0.08)
Not enrolled, 4-yr college graduate	0.01	(0.08)
Not enrolled, graduate degree	0.00	(0.01)
Enrolled, no prior degree	0.26	(0.44)
Enrolled, has prior degree	0.01	(0.08)
Enrolled, grad program	0.00	(0.04)
Owns home	0.56	(0.50)
Race		
White, non-Hispanic	0.47	(0.50)
Black, non-Hispanic	0.43	(0.49)
Hispanic	0.08	(0.28)
Other, non-Hispanic	0.05	(0.21)
Observations	7705	

Table 6: Continuous variables summary statistics

	mean	sd	p10	p50	p90	min	max
High school GPA	3.3	(0.8)	2.5	3.2	3.9	1.0	10.5
Average parent education, in years	13.2	(2.5)	11.0	13.0	16.5	2.0	17.0
Average XTF education, in years	12.9	(2.1)	10.8	12.7	15.8	1.0	17.0
# College graduates in XTF	2.2	(2.2)	0.0	2.0	5.0	0.0	13.0
							.
Age	20	(1)	18	20	21	17	21
							.
Wealth w/ equity (USD 1000)	221	(1015)	-7	27	439	-898	38086
Wealth w/o equity (USD 1000)	151	(932)	-12	8	254	-998	37086
HH wealth, w/o housing debt (USD 1000)	224	(1021)	-7	28	446	-898	38086
HH income (USD 1000s)	79	(160)	12	54	154	-46	6317
							.
XTF: max wealth w/ equity (1000s)	404	(1500)	0	97	875	-318	38086
XTF: max wealth w/o equity (1000s)	294	(1410)	-3	29	673	-286	37086
XTF: average wealth w/ equity (1000s)	315	(1181)	-3	86	709	-318	38086
XTF: average wealth w/o equity (1000s)	221	(1105)	-8	27	498	-286	37086
XTF: max wealth w/o housing debt (1000s)	409	(1504)	0	100	901	-318	38086
XTF: average wealth w/o housing debt (1000s)	320	(1185)	-2	87	719	-318	38086
XTF: max income (1000s)	91	(104)	17	69	175	-2	2134
XTF: average income (1000s)	78	(93)	17	58	152	-2	2134

Author's calculations using PSID and individual weights. HH is household and XTF is extended family. N=7705.

Table 7: OLS estimates for the probability of college enrollment as a function of individual, household, and extended family characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Extended family: log max wealth w/o	.005***				.003*	.003*
housing debt	(.001)				(.001)	(.002)
No extended family	-.011	.134			-.039	-.118
	(.025)	(.123)			(.101)	(.115)
Extended family: log max income		.013			-.000	-.007
		(.008)			(.007)	(.008)
Household wealth, w/o housing			.007***		.004***	.001
debt (log)			(.001)		(.001)	(.001)
Household income				.057***	.049***	.012**
				(.006)	(.006)	(.004)
Owns home						.128***
						(.018)
Age						-.083***
						(.006)
Black, non-Hispanic						-.029
						(.020)
Hispanic						.062
						(.035)
Sex (male=1)						-.066***
						(.015)
Percent parents college grad						.188***
						(.024)
# col grad in XTF						.002
						(.004)
No parent educ yrs						-.136**
						(.041)
No XTF educ yrs						.004
						(.021)
Constant	.561***	.420**	.487***	-.295*	-.205	1.985***
	(.097)	(.155)	(.095)	(.131)	(.158)	(.266)
Observations	6630	6630	6630	6630	6630	4672
Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y

Notes: Wealth and income are measured in log scale according to the transformation $ln(x+1)/ln(2)$ if $x > 0$, $ln(-x+1)/ln(2)$ if $x < 0$, and 0 if $x = 0$. Standard errors are clustered at the family level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: OLS estimates for the probability of college enrollment as a function of individual, household, and extended family characteristics, with positive and negative wealth interaction term

	(1)	(2)	(3)	(4)	(5)	(6)
Positive XTF wealth=0 × Extended family: log max wealth w/o housing debt	-.005				-.017***	-.013*
	(.003)				(.005)	(.005)
Positive XTF wealth=1 × Extended family: log max wealth w/o housing debt	.006***				.015***	.013***
	(.001)				(.003)	(.004)
Extended family: log max income		.005***			-.011***	-.010**
		(.001)			(.003)	(.004)
Positive wealth=0 × Household wealth, w/o housing debt (log)			-.025***		-.020***	-.011***
			(.002)		(.002)	(.002)
Positive wealth=1 × Household wealth, w/o housing debt (log)			.028***		.022***	.010***
			(.002)		(.002)	(.002)
Household income				.057***	.025***	.005
				(.006)	(.005)	(.004)
Owns home						.088***
						(.020)
Age						-.081***
						(.006)
Black, non-Hispanic						-.013
						(.020)
Hispanic						.075*
						(.035)
Sex (male=1)						-.066***
						(.015)
Percent parents college grad						.175***
						(.024)
# College graduates in XTF						.002
						(.004)
No parent educ yrs						-.129**
						(.041)
No XTF educ yrs						.002
						(.021)
Constant	.547***	.555***	.171	-.295*	-.153	1.799***
	(.093)	(.095)	(.111)	(.131)	(.124)	(.245)
Observations	6630	6630	6630	6630	6630	4672
Adjusted R^2	.029	.026	.090	.063	.101	.131
Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y

Notes: Wealth and income are measured in log scale according to the transformation $ln(x+1)/ln(2)$ if $x > 0$, $ln(-x+1)/ln(2)$ if $x < 0$, and 0 if $x = 0$. Standard errors are clustered at the family level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Probit results for propensity score matching estimation

	(1)
Extended family: log max income	.110***
	(.009)
Household wealth, w/o housing debt (log)	.001
	(.001)
Household income	.027**
	(.009)
Owns home	.015
	(.027)
Age	.003
	(.009)
Black, non-Hispanic	-.167***
	(.028)
Hispanic	-.073
	(.056)
Sex (male=1)	-.046*
	(.020)
Percent parents college grad	-.006
	(.028)
# College graduates in XTF	.007
	(.006)
Observations	1177

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Propensity score matching results. Treatment = top 25 percent of extended family wealth distribution

ATT	0.159
Replications	200
Bootstrapped SE	0.066
Bootstrapped t-value	2.413
Number treated	251
Number control	138

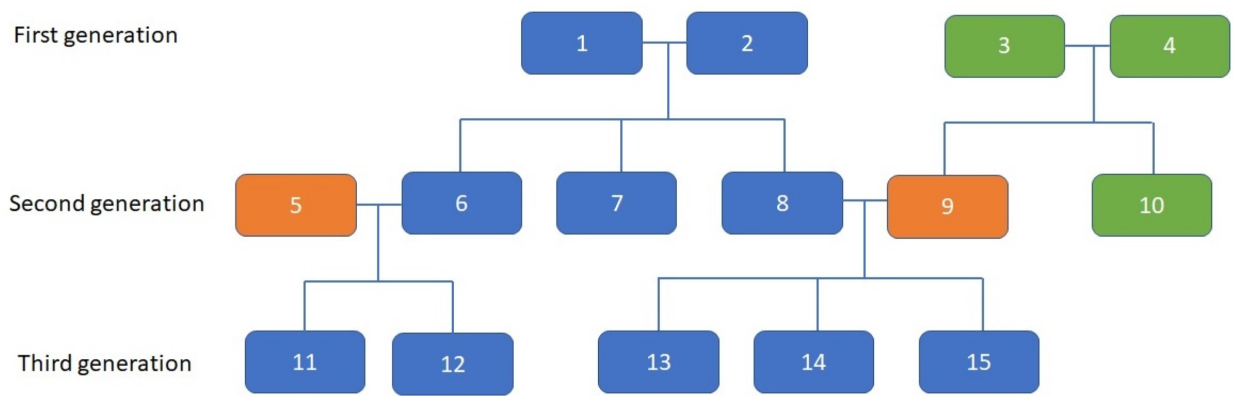
Table 11: OLS estimates for the probability of being a college graduated as a function of individual, househol, and extended family characteristics (22-24 years old)

	(1)	(2)	(3)	(4)	(5)	(6)
Extended family: log max wealth w/o housing debt	.011***				.008***	.007***
	(.002)				(.002)	(.002)
No extended family	.105***	.608***			.534***	.422***
	(.029)	(.148)			(.114)	(.102)
Extended family: log max income		.041***			.029***	.020**
		(.009)			(.007)	(.007)
Household wealth, w/o housing debt (log)			.000		-.001	-.004***
			(.001)		(.001)	(.001)
Household income				.024**	.024**	.008
				(.007)	(.008)	(.007)
Owns home						.061*
						(.026)
Age						.080***
						(.009)
Black, non-Hispanic						-.153***
						(.024)
Hispanic						-.041
						(.043)
Sex (male=1)						-.080***
						(.020)
Percent parents college grad						.260***
						(.030)
# col grad in XTF						.012*
						(.005)
No parent educ yrs						-.228***
						(.052)
No XTF educ yrs						.002
						(.029)
Constant	-.225*	-.723***	-.118	-.459**	-.966***	-2.494***
	(.110)	(.178)	(.109)	(.146)	(.188)	(.247)
Observations	3190	3190	3190	3190	3190	2574
Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y

Notes: Wealth and income are measured in log scale according to the transformation $ln(x+1)/ln(2)$ if $x > 0$, $ln(-x+1)/ln(2)$ if $x < 0$, and 0 if $x = 0$. Standard errors are clustered at the family level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figures

Figure 1: Illustrating data availability in PSID with a hypothetical family



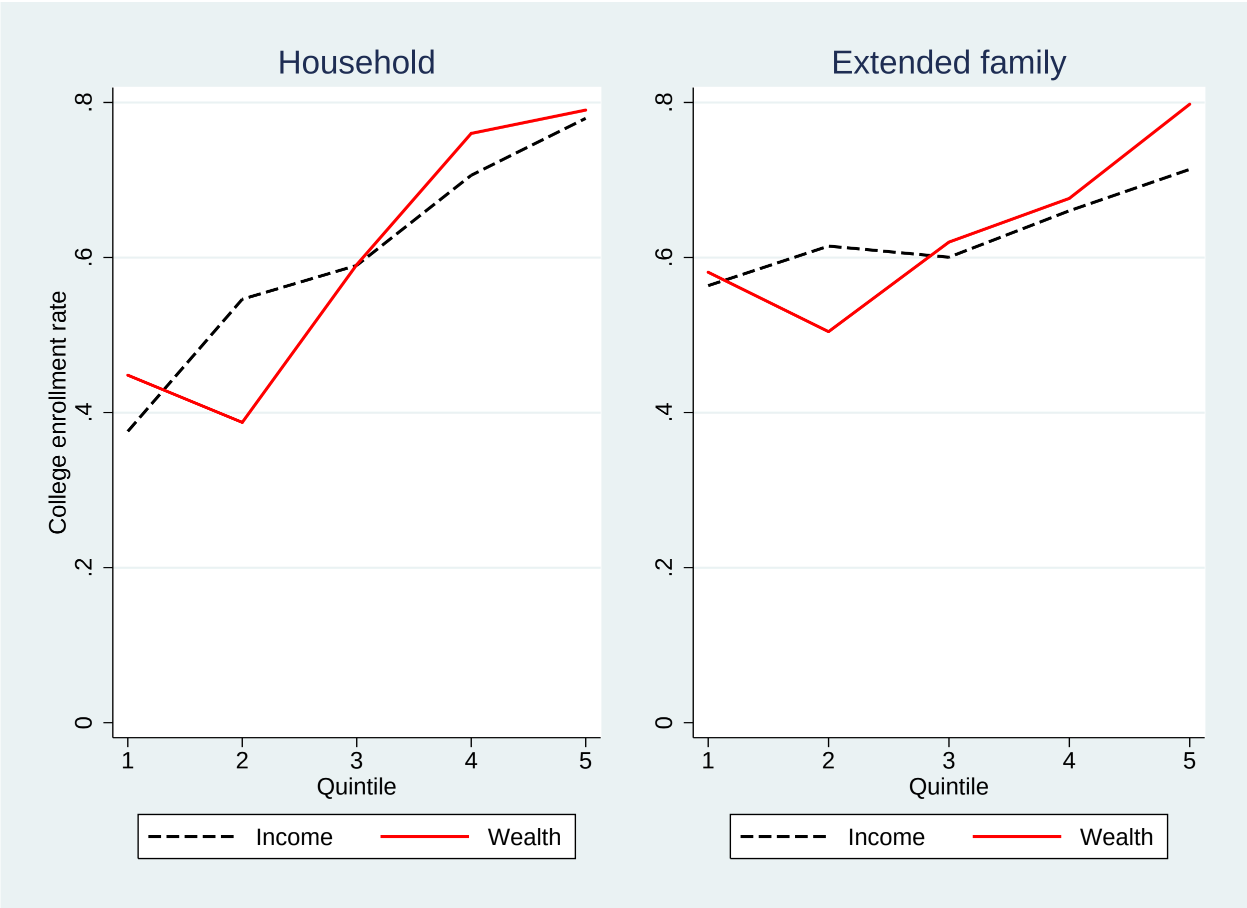


Figure 2: College enrollment rates by parent and extended family income and wealth (w/ equity)

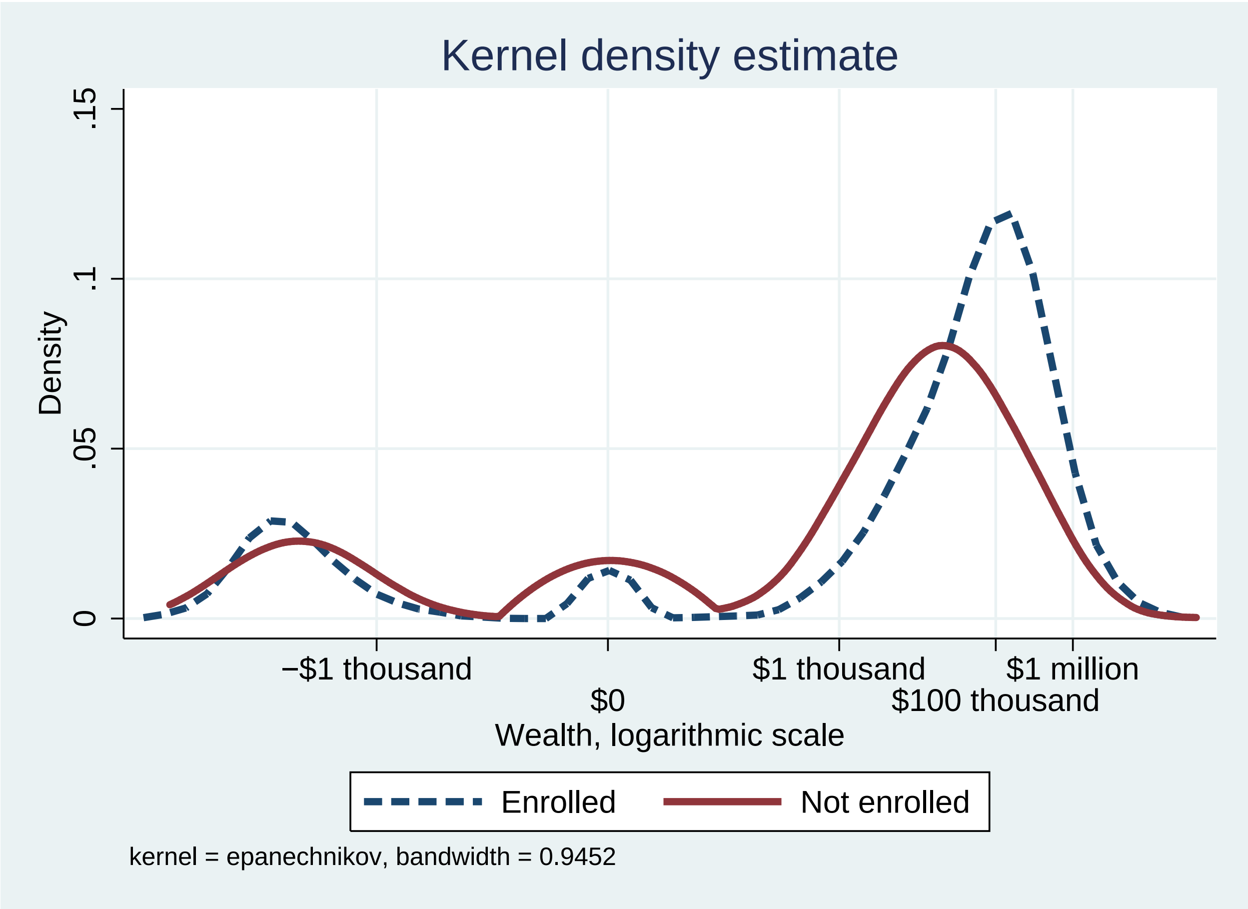


Figure 3: Kernel density of logarithmic scale wealth, by college enrollment

Appendix A. Lovenheim (2011) replication and extension

The baseline model of Lovenheim (2011) estimates the effect household wealth on college enrollment. He uses an OLS regression of the form

$$\text{Enroll}_i = \beta_0 + \beta_1 \text{Own}_i + \beta_2 \text{Equity}_i + \beta_3 Y_i + \gamma X_i + c_i + t_i + \epsilon_i \tag{5}$$

where Enroll_i is a dummy variable equal to one if individual i enrolls in a 2-year or 4-year college, Own_i is a dummy variable equal to one if the household owns its own home in time t, Equity_i refers to real home equity, and Y represents real total family income from all sources. X_i is a vector of household and state labor market measures. Most of the household information included pertains to the head of household: age, sex, education level (less than high school, high school, some college, college graduate or more). Also, he includes the number of minors in the household (0-12 years old). State-level controls include log of average per capital income, log of college-age population (18 to 22 years old), and unemployment rate (see Table A.1). Finally, we include a full range of state and time fixed effects, c_i and t_i, respectively.

Identification comes from exploiting changes in the timing and the strength of the late 1990s to mid 2000's housing boom. Depending on the time at which a young person graduates high school, their parents received an arguably exogenous shock to their housing equity in the form of higher home prices. Thus, an individual who turns 18-19 in 2001 receives a different shock than if they turned 18-19 in 2003, even if they live in comparable homes in the same neighborhood. Similarly, individuals living in different cities and states receive different shocks, even if they turn 18-19 in the same year.

Rather than using observed wealth, the Lovenheim (2011) instruments using the change in equity wealth over the four years immediately preceding high school graduation for the individual. This approach addresses indirect relationships between wealth and college enrollment, such as the effects of family wealth on early childhood education, and the subsequent effect of quality early childhood education on college enrollment.

A second problem occurs because changes in equity wealth may reflect a drawing down of resources, or borrowing against equity wealth, in order to fund college expenses. If families borrow against their equity wealth in order to pay for college, then we would necessarily underestimate the effect of wealth on college enrollment. To overcome this difficulty, the authors construct a measure of counterfactual equity, applying assumptions based on standard 30 year mortgages and prevailing interest rates, to capture the equity position a family would have if they did not borrow against their equity.

The two main limitations of Lovenheim (2011) are that the study does not take into account extended family wealth and that the empirical strategy relies on arguably exogenous changes to household equity. If any of the channels discussed in Section 2 are in effect, the model estimated in Lovenheim (2011) is misspecified. Also, it may be the case that, conditional on all else except for parental and extended family wealth, the marginal student deciding whether to enroll in college or not comes from a family that rents an apartment. In this case, a measure based solely on housing equity will underestimate the importance of wealth on college enrollment.

To address the first limitation, I add a variable capturing extended family wealth to the same model used by Lovenheim (2011). To address the second limitation, I estimate a new regression, using net wealth not limited to housing equity. Future work will aim to develop an identification strategy for extended family wealth.

Results

Table A.1 shows the results of estimating Equation 5 where real (inflation adjusted) home equity is the main independent variable of interest. We note that in the original model (1) and my extension (2), neither parental real home equity nor extended family real home equity is a statistically significant predictor of college enrollment.

Table A.2 shows the results from the instrumental variables regression, where 4 year changes in real home equity instrument for home equity wealth. As described above, because these equity changes reflect the arguably exogenous effects of the housing boom, the estimates can be interpreted as causal. Regression (1) shows the first stage results using only parental (household) home equity. Regression (2) shows the second stage results, where predicted real home equity is statistically significant at the 8.6 percent level. Model (3) and (4) extends the 4-year difference IV strategy, adding a measure of the level of extended family real home equity. The point estimate for parental (household) real home equity is lowered, while the coefficient for (instrumented) extended family real home equity is not significant.[9]

Table A.3 shows the results of the second IV strategy, using counterfactual changes in home equity. As before, regressions (1) and (2) show the first and second stage results for the model excluding extended family home equity. Here, we see that the estimated effect of parental (household) home equity is .0056. This means that a $\$10,000$ change in home

[9]Table A.6 shows the same result, but rather than adding the level of extended family real home equity as an independent variable, it is used as a second IV. Thus, there are two first stages to report. The result is similar. The coefficient for parental (household) home equity is similar, while that for extended family home equity wealth is insignificant.

equity will result in a .56 percent increase in predicted college enrollment. Regressions (3) and (4) add the counterfactual change in home equity for the extended family. We see that the coefficient for parental (household) home equity is unchanged (significance level changes from 3.9 percent to 5.8 percent), while the coefficient for extended family counterfactual changes in home equity is not significant.[10]

Discussion

There are important limitations to the Lovenheim (2011) methodology. The only component of household wealth included in this study is household equity. For households without equity wealth, those that rent, there is no measure of household equity. In terms of the estimates obtained in Table A.1, for example, this means that the coefficient for our variable of interest, β_2, is estimated using only variation in the sample that owns equity.

It may be the case that renters, recent high school graduates from families that rent their home, represent the marginal student. In this case, the fundamental model in Lovenheim (2011) is misspecified. In Lovenheim and Reynolds (2013), which examines the intensive margin of college attendance, the authors use a multinomial model, but again there is little attention paid to the marginal student: the recent high school graduate on the fence about attending a flagship public university, private university, a community college, or a non-flagship public university.

Lovenheim (2011) focuses on equity wealth for three reasons: (1) this is the component of wealth that is associated with a quasi-random experimental design, i.e. exploiting variation in the timing and the strength of the housing boom in the 1990s and early 2000s, (2) the authors state that most college students come from households that own their own home, and (3) home equity is the largest component of wealth for most families.

The first reason is valid, but owing to doubts about whether the marginal student comes from a family that rents, it presents a significant limitation. The second reason is not valid, as it amounts to selecting a sample based on the dependent variable. The third reason biases the study in favor of wealthier families.

There are also reasons to think that exogenous wealth shocks do not correspond well with explanations of differences by wealth. This is a deep point, signaling the limitations of quasi-experimental methods to investigate the role of wealth in determining individual outcomes.

[10]Table A.7 shows a similar result, but instead of adding the counterfactual change in home equity for the extended family as a covariate, we add it as a second instrument. The result is qualitatively similar.

Appendix Tables

Table A.1: OLS Estimates of the Probability of College Enrollment as a Function of Real Home Equity (RHE, $10,000) and Extended Family (Aunt, Uncle, Grandparent) RHE

	(1)	(2)
RHE	.0007	.0003
	(.0014)	(.0014)
Homeowner	.0988*	.0931
	(.0490)	(.0534)
Extended family RHE		.0025
		(.0016)
Real family income ($10,000)	.0026**	.0030***
	(.0008)	(.0008)
Head age	.0003	.0005
	(.0027)	(.0027)
Head sex (male=1)	.0654	.0628
	(.0517)	(.0531)
Head HS grad	.0034	-.0017
	(.0553)	(.0563)
Head some college	.1439*	.1408*
	(.0555)	(.0580)
Head BA or more	.1396*	.1179
	(.0598)	(.0638)
Head educ missing	-.0012	.0047
	(.1261)	(.1224)
Household minors 0-12 y/o	-.0171	-.0162
	(.0130)	(.0135)
Log per capita income, state	1.7399	2.0758*
	(.9194)	(.9587)
Log population ages 18-22, state	.0464	-.4542
	(.7224)	(.7210)
State unemployment rate	-.0070	-.0036
	(.0461)	(.0477)
Constant	-6.7333	-2.5313
	(8.9522)	(9.2193)
Observations	1470	1418

All models include time fixed effects (2001, 2003, 2005; first is omitted), state-level fixed effects (two states dropped because of collinearity), head of household race controls (white, black, hispanic, other; first is omitted), and head relationship status (married, single, divorced; first is omitted).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.2: IV Estimates of the Probability of College Enrollment as a Function of Real Home Equity (RHE, $10,000), Instrumented by the Four Year Change in RHE, and Extended Family (Aunt, Uncle, Grandparent) RHE

	(1) 1st Stage Real home equity	(2) 2nd Stage Enroll	(3) 1st Stage Real home equity	(4) 2nd Stage Enroll
Predicted RHE		.0054		.0037
		(.0032)		(.0026)
4 year RHE difference	.6033***		.6707***	
	(.1312)		(.1176)	
Extended family RHE			.2704***	.0013
			(.0451)	(.0019)
Homeowner	2.8669**	.0833	2.7544**	.0849
	(.9304)	(.0564)	(.9410)	(.0564)
Real family income ($10,000)	.1737	.0014	.1539	.0022*
	(.1033)	(.0012)	(.0938)	(.0009)
Head age	.1599***	-.0002	.1464***	.0002
	(.0456)	(.0025)	(.0378)	(.0026)
Head sex (male=1)	-.2733	.0577	.6999	.0525
	(1.5538)	(.0498)	(1.2165)	(.0514)
Head HS grad	-.3035	.0098	-.8561	.0072
	(.6993)	(.0542)	(.7910)	(.0550)
Head some college	.6878	.1393*	.1698	.1396*
	(.8676)	(.0542)	(.8809)	(.0560)
Head BA or more	3.8293**	.1196	3.0412**	.1097
	(1.1728)	(.0647)	(1.1007)	(.0645)
Head educ missing	-.5914	.0098	-.2663	.0137
	(.8827)	(.1203)	(.9140)	(.1180)
Household minors 0-12 y/o	-.5399	-.0154	-.7028*	-.0147
	(.2963)	(.0126)	(.2701)	(.0131)
Log per capita income, state	-3.5661	1.4884	-3.4633	1.8211
	(44.4131)	(1.0171)	(43.5569)	(1.0040)
Log population ages 18-22, state	-13.3863	-.1151	-31.3352	-.5068
	(25.0492)	(.7737)	(24.4490)	(.7291)
State unemployment rate	-1.2548	-.0064	-1.7210	-.0047
	(2.3010)	(.0532)	(2.2201)	(.0517)
Constant	153.8860	-4.3009	343.0050	-1.3875
	(409.0117)	(9.9715)	(393.2236)	(9.5690)
Observations	1463	1463	1411	1411

All models include time fixed effects (2001, 2003, 2005; first is omitted), state-level fixed effects, head of household race controls (white, black, hispanic, other; first is omitted), and head relationship status (married, single, divorced; first is omitted).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.3: IV Estimates of the Probability of College Enrollment as a Function of Real Home Equity (RHE, \$10,000), Instrumented by the Counterfactual Four Year Change in RHE, and Extended Family (Aunt, Uncle, Grandparent) RHE

	(1) 1st Stage Real home equity	(2) 2nd Stage Enroll	(3) 1st Stage Real home equity	(4) 2nd Stage Enroll
Predicted RHE		.0056*		.0053
		(.0027)		(.0028)
Counterfactual 4 year RHE difference	.7404***		.7203***	
	(.1289)		(.1299)	
Extended family CF 4 year RHE difference				
Homeowner	2.4550**	.0735	2.4255**	.0675
	(.7454)	(.0499)	(.8084)	(.0555)
Real family income (\$10,000)	.1219	.0014	.1159	.0018
	(.0890)	(.0012)	(.0837)	(.0011)
Head age	.1698***	-.0004	.1677***	-.0002
	(.0406)	(.0025)	(.0373)	(.0026)
Head sex (male=1)	1.0145	.0647	1.3382	.0586
	(1.1689)	(.0490)	(1.1246)	(.0504)
Head HS grad	-.6368	.0040	-.9974	.0016
	(.6995)	(.0534)	(.7926)	(.0540)
Head some college	.2846	.1379**	-.0994	.1365*
	(.8366)	(.0534)	(.8266)	(.0554)
Head BA or more	3.0741**	.1116	2.3010*	.0945
	(1.1011)	(.0603)	(1.0221)	(.0635)
Head educ missing	-.4960	.0050	-.3480	.0099
	(.9182)	(.1209)	(.9925)	(.1183)
Household minors 0-12 y/o	-.6007*	-.0150	-.6534**	-.0135
	(.2542)	(.0127)	(.2406)	(.0133)
Log per capita income, state	-13.3521	1.6776	-10.6347	2.0100
	(44.3551)	(1.0466)	(43.7103)	(1.0775)
Log population ages 18-22, state	-17.0270	-.0826	-30.7008	-.4907
	(24.7520)	(.7637)	(24.2013)	(.7336)
State unemployment rate	-1.5549	.0033	-1.9330	.0093
	(2.2683)	(.0520)	(2.2148)	(.0528)
Extended family RHE			.2371***	.0009
			(.0361)	(.0020)
Constant	225.8889	-5.3480	360.6720	-2.2619
	(402.7915)	(9.8903)	(391.7335)	(9.7699)
Observations	1470	1470	1418	1418

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.4: *We're interested in the reasons that people your age may or may not go to college. Can you tell me the reasons that you are not currently enrolled in college?*

	Frequency	Percent
Aready graduated	27	0.01
Attending vocational school	74	0.03
SAT/ACT too low	23	0.01
Can't afford college	793	0.32
Not interested in college	306	0.12
Discrimination	0	0.00
Transportation problems	55	0.02
Family responsibilities	397	0.16
Lack childcare	52	0.02
Disabled	14	0.01
Some other reason	1,102	0.44
Total	2,843	1.14
Observations	2,504	

Table A.5: *Why did you stop attending this school?–Most recent college. (Only asked of respondents who are NOT currently attending college but answering questions about their most recent college.)*

	Frequency	Percent
Academic: grades, too large a challenge	46	5.12
Academic: transferred, need different courses, changed majors	36	4.01
Financial: too expensive, couldn't get financial aid	146	16.26
Financial: needed to get a job, couldn't both work and go to school	190	21.16
Completed courses/program, attended for specific classes only	22	2.45
Distance: moved, too long a commute, too far from home	71	7.91
Personal: health, pregnancy, marriage, substance use, family commitments	239	26.61
Dissatisfied with school, bored, changed goals	135	15.03
Joined armed forces	13	1.45
Total	898	100.00

Table A.6: IV Estimates of the Probability of College Enrollment as a Function of Real Home Equity (RHE, \$10,000) and Extended Family RHE, Instrumented by (1) the Four Year Change in RHE for Parents and (2) the Four Year Change in Extended Family (Aunt, Uncle, Grandparent) RHE

	(1) 1st Stage Real home equity (RHE)	(2) 1st Stage Extended family RHE	(3) 2nd Stage Enroll
Predicted RHE			.0036
			(.0026)
Predicted extended family RHE			.0027
			(.0027)
4 year RHE difference	.6835***	.0437*	
	(.1201)	(.0188)	
Extended family 4 year RHE difference	.1526***	.7375***	
	(.0335)	(.0730)	
Homeowner	2.6970**	-.3995	.0847
	(.9412)	(.4074)	(.0561)
Real family income (\$10,000)	.1536	-.0054	.0022*
	(.0970)	(.0120)	(.0009)
Head age	.1512***	.0289	.0002
	(.0408)	(.0289)	(.0026)
Head sex (male=1)	.5537	-.5217	.0535
	(1.2357)	(.4878)	(.0514)
Head HS grad	-.5635	.9874	.0051
	(.7907)	(.5588)	(.0545)
Head some college	.4178	.6892	.1372*
	(.8977)	(.6533)	(.0559)
Head BA or more	3.4746**	.9594	.1048
	(1.1806)	(.7800)	(.0639)
Head educ missing	-.4492	-.6138	.0149
	(.9369)	(1.5258)	(.1165)
Household minors 0-12 y/o	-.6804*	.0244	-.0152
	(.2828)	(.1020)	(.0131)
Log per capita income, state	-3.2769	3.2390	1.8315
	(45.1245)	(11.1749)	(1.0045)
Log population ages 18-22, state	-24.3203	12.7010	-.6095
	(25.1511)	(8.7080)	(.7440)
State unemployment rate	-1.6624	-.1428	-.0069
	(2.2967)	(.6570)	(.0521)
Constant	268.3157	-145.5667	-.3411
	(406.5721)	(102.6883)	(9.7013)
Observations	1411	1411	1411

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.7: IV Estimates of the Probability of College Enrollment as a Function of Real Home Equity (RHE, $10,000) and Extended Family RHE, Instrumented by (1) the Counterfactual Four Year Change in RHE for Parents and (2) the Counterfactual Four Year Change in Extended Family (Aunt, Uncle, Grandparent) RHE

	(1) 1st Stage Real home equity (RHE)	(2) 1st Stage Extended family RHE	(3) 2nd Stage Enroll
Predicted RHE			.0050
			(.0028)
Predicted extended family RHE			.0029
			(.0028)
Counterfactual 4 year RHE difference	.7371***	.0606*	
	(.1305)	(.0270)	
Extended family CF 4 year RHE difference	.1246***	.6737***	
	(.0244)	(.0986)	
Homeowner	2.3651**	-.3957	.0677
	(.8006)	(.3841)	(.0551)
No extended family RHE			
Real family income ($10,000)	.1150	-.0052	.0018
	(.0863)	(.0120)	(.0012)
Head age	.1737***	.0359	-.0002
	(.0404)	(.0286)	(.0025)
Head sex (male=1)	1.1893	-.6476	.0600
	(1.1416)	(.4857)	(.0505)
Head HS grad	-.7322	1.0377	-.0014
	(.7953)	(.5326)	(.0534)
Head some college	.0866	.5584	.1334*
	(.8356)	(.6025)	(.0555)
Head BA or more	2.6094*	.6754	.0884
	(1.0763)	(.7918)	(.0630)
Head educ missing	-.5047	-.6220	.0113
	(.9371)	(1.4045)	(.1163)
Household minors 0-12 y/o	-.6362*	.0164	-.0142
	(.2536)	(.1005)	(.0133)
Log per capita income, state	-12.4032	-6.2229	2.0296
	(44.7964)	(10.8969)	(1.0743)
Log population ages 18-22, state	-24.3122	15.6634	-.6274
	(24.8763)	(8.9574)	(.7527)
State unemployment rate	-1.8929	-.1665	.0061
	(2.2752)	(.6250)	(.0534)
Constant	299.6252	-142.7134	-.8894
	(403.6215)	(100.8419)	(9.9709)
Observations	1418	1418	1418

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$