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Financially Overextended: College Attendance as a Contributor to Foreclosures During the Great Recession

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Abstract Although subprime mortgage lending and unemployment were largely responsible for the wave of foreclosures during the Great Recession, additional sources of financial risk may have exacerbated the crisis. We hypothesize that many parents sending children to college were financially overextended and vulnerable to foreclosure as the economy contracted. With commuting zone panel data from 2006 to 2011, we show that increasing rates of college attendance across the income distribution in one year predict a foreclosure rate increase in subsequent years, net of fixed characteristics and changes in employment, refinance debt, house prices, and 19-year-old population size. We find similar evidence of college-related foreclosure risk using longitudinal household data from the Panel Study of Income Dynamics. Our findings uncover a previously overlooked dimension of the foreclosure crisis, and highlight mortgage insecurity as an inadvertent consequence of parental investment in higher education.

Keywords Higher education · College spending · Foreclosure · Great Recession · Parental investments

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Introduction

From 2007 through 2009, the United States experienced the largest economic downturn since the Great Depression, made distinctive by a spike in foreclosures (Hout et al. 2011). The housing crisis was spurred by a proliferation of risky subprime loans in the early 2000s, which left many households financially overextended and unable to cover mortgage payments (Immergluck 2009). But the economic slowdown grew beyond the scope of subprime lending: unemployment soared, consumer spending tightened, the stock market plummeted, and the impact of foreclosures spilled over, accelerating house price devaluation (Been et al. 2011). These combined factors brought substantial financial duress to households across the country (Faber and Ellen 2016; Pfeffer et al. 2013; Taylor et al. 2011).

Although subprime lending, unemployment, and falling house prices played key roles in the crisis, they do not fully explain why households experienced foreclosure. The Great Recession pulled back a curtain on various sources of financial risk and an increasing reliance on credit across the income distribution (Rajan 2010).

We investigate a potential source of family[1] financial overextension: the cost of sending children to college. Between 2005 and 2011, 39.9 % of 18- to 24-year-olds enrolled in a two-year or four-year college, an 11.1 percentage point increase compared with 1985 enrollment (Snyder et al. 2016). Over the same period, two- and four-year tuition costs nearly doubled (Ma et al. 2015). And although need-based grants and sliding-scale tuition adjustments have made college more financially accessible than sticker prices suggest (Levine 2014; Long 2014), a large cost remains—the "expected family contribution"—compelling many students to rely on loans and parental support (Goldrick-Rab 2016; Houle 2013). A 2008 poll estimated that parents cover 45 % of college costs and that contribution amounts typically increase with family incomes (Sallie Mae 2009). Parents draw from savings, earnings, and loans to cover expected contributions, and some financial advisors recommend that parents borrow against their homes (Lanza 2015; Lieber 2016). We thus hypothesize that the burden of college attendance costs put some parents in a severe financial bind during the Great Recession, exacerbating the foreclosure crisis.

Our study evaluates whether increases in the likelihood of parents sending their children to college account for subsequent increases in foreclosures during the Great Recession. We leverage a unique panel of aggregated data from 305 commuting zones. Commuting zones (CZs) are aggregations of urban and rural counties defined by common work commute patterns (Tolbert and Sizer 1996).[2] We analyze annual college attendance and foreclosures from 2005 to 2011 among 305 CZs with populations over 100,000.[3] We link foreclosure data from RealtyTrac in each CZ to a data set compiled by Chetty et al. (2014a, 2014a) that draws from 1098-T and federal tax return data to summarize, for each CZ, the relationship between college attendance and parental

[1] We draw from data sources sampling housing units, households, and families; for exposition, we use the terms "households" and "families" interchangeably. Additionally, our use of the term "parent" refers to an adult parent or guardian who was financially responsible for a child between the ages of 15 and 19.

[2] CZs differ from metropolitan statistical areas (MSAs) because they include rural counties. The entire area of the United States is covered by 741 CZs.

[3] The analytical sample covers 84.8 % of the total U.S. population, as of 2000. CZs with fewer than 100,000 persons have low annual counts of 19-year-olds, leading to potentially unreliable estimates of annual college attendance by income percentile (Chetty et al. 2014a); CZs with small populations are also prone to higher rates of missing foreclosure data via RealtyTrac. A list of all sample CZs is available from the authors by request.

income percentile. Our fixed-effects models include controls for local time-varying changes in unemployment, home prices, 19-year-old population size, and refinance debt.

We find that the rate of foreclosures in CZs increased in the year immediately after college attendance increased. We estimate that a 1 % increase in college attendance among 19-year-olds from median-income households nationally was associated with roughly 19,000 additional foreclosures in the following year after controlling for housing and job market dynamics. Interestingly, we find a similar relationship throughout the national income distribution, suggesting that sliding scale tuition and need-based offsets may not sufficiently address the fact that the cost of college is still quite sizable for households relative to their income.[4]

Our findings hold under a range of robustness checks, including a falsification test predicting college attendance by prior foreclosures, interactions between college attendance and age-specific unemployment changes, and controls for state-level changes in student debt burden and tuition. We also address a potential issue of ecological fallacy using household-level data from the Panel Study of Income Dynamics (PSID). We find that PSID households sending children to college were more likely to experience foreclosure than households without college-aged children, even after accounting for unemployment, income, having a high interest rate mortgage, race/ethnicity, marital status, education, region, and the presence of other children. The results are consistent with additional robustness checks using the National Longitudinal Survey of Youth 1979 (NLSY79) and the American Housing Survey (AHS).

Our results suggest a causal relationship between the financial burden of paying for college and increased foreclosure vulnerability for a subset of families. More broadly, these results support a growing concern that college costs have strained the finances of many households (Cooper 2014; Houle 2013). Although our findings do not place college expenses on par with the collapse of the housing or labor markets as a contributor to foreclosures, it is crucial to understand additional sources of financial risk. We show that the burden of college costs likely increased foreclosure risk as the economy contracted, adding to the cascading effects of subprime lending and unemployment. The links between these phenomena provide new insight into a previously overlooked dimension of the foreclosure crisis and highlight mortgage insecurity as an inadvertent consequence of parental investment in higher education.

Background

The Great Recession

In late 2010, approximately 15 % of all households were at least one payment behind their mortgage or in a stage of foreclosure (Mortgage Bankers Association 2010). Scholars find that subprime mortgage lending in the early 2000s was the primary cause of the housing crisis (Been et al. 2011). These loans were foreclosure-prone for many reasons, including ballooning payments (Satter 2009). Subprime loans made up an increasing percentage of

[4] We highlight households at the median of the income distribution for parsimony. Point estimates are largest at the median but are not significantly different from estimates at the 10th, 25th, 75th, and 90th income percentiles.

mortgages and fueled growth in house prices, peaking in 2006 (Faber 2013). When prices began to fall, many highly leveraged households became "under water" (i.e., their homes were worth less than their mortgage), which put them at additional foreclosure risk (Bhutta et al. 2017; Faber and Ellen 2016; Gerardi et al. 2011). With the subprime lending crash and collapse of house prices came unemployment. Joblessness, in turn, made it more difficult for households to keep up with mortgage payments and worsened the foreclosure crisis (Been et al. 2011; Mayer et al. 2009).

Although few areas of the country were left completely unscathed, the severity of the housing crisis varied between regions (Immergluck 2009). The highest foreclosure rates were in California, Arizona, Nevada, and Florida (Hanlon 2009; Lucy 2010). Many scholars have pointed to racial and ethnic disparities in subprime lending (Faber 2013; Gramlich 2007) and unemployment (Hout et al. 2011), as well as the compounding factor of residential segregation (Hwang et al. 2015; Rugh and Massey 2010), for disproportionately high foreclosure rates in black and Latino neighborhoods (Hall et al. 2015; Schloemer et al. 2006). Nonpoor blacks and Latinos may have been particularly vulnerable to foreclosure (Anacker and Carr 2011; Anacker et al. 2012), especially those in housing markets that experienced large expansions during the subprime boom (Bocian et al. 2011).

Higher Education Trends During the Great Recession

Rising house prices and increasing income inequality in the early 2000s occurred within a broader context of economic change and higher education expansion. In the past 40 years, a college degree has become an increasingly important ticket to employment and higher wages (Autor et al. 2008). Today, low-income young adults enroll in college at a higher rate than ever before, with a growing concentration in part-time, community college, and for-profit programs (Dunbar et al. 2011; Fry 2010; Long 2014). Increasing demand and a larger birth cohort size has further fueled an expansion in higher education: from 1987 to 2010, enrollment increased from 13 to 21 million students (U.S. Department of the Treasury 2012).

College is a major household expense that increased in price over the previous 30 years and intensified during the Great Recession (Ma et al. 2015). As the economy contracted in 2008, state revenues decreased, and many public community colleges and universities turned to tuition hikes to cover budget gaps (Barr and Turner 2013). Private four-year tuition rates also increased, and a number of for-profit colleges emerged. However, the cost of college was offset for some by grants and fellowships, which effectively put the net price of college attendance on an income-adjusted sliding scale, based on algorithms that estimate an appropriate "expected family contribution" (Levine 2014; Long 2014).

Student loans are the most common form of college financing, but some parents take out Parent PLUS loans and home equity lines of credit to cover expenses (Lanza 2015; Sallie Mae 2009). In fact, the likelihood of sending children to college increases when parents' house prices appreciate. Lovenheim (2011) showed that during the prerecession housing boom of the early 2000s, low- and middle-income PSID homeowners who experienced a growth in home equity were significantly more likely to send their children to college. A follow-up study using NLSY97 showed that a booming local housing market increased the likelihood that children of low- and middle-income homeowners attended four-year public institutions rather than community colleges (Lovenheim and Reynolds 2013).

The relationship between increasing home equity and household college consumption is consistent with scholarship on wealth stratification (Conley 2001; Pfeffer and Killewald 2016; Shapiro 2004), which has found that wealth enables households to make intergenerational investments above the routine flows of income and expenses. Borrowers riding the wave of soaring house prices may have chosen to refinance—wagering on continued house price growth—in order to cover their children's educational expenses. Other households may have made more aggressive financial decisions, boosted by confidence in the growth of their housing investment and willingness to use other discretionary finances toward their children's educational expenses. In either case, college expenditures supported by financial optimism—and a reliance on the increase in house prices—could have made households vulnerable during the Great Recession, as unemployment, underemployment (i.e., involuntary part time work), a credit freeze, and reduced incomes made it harder to make mortgage payments.

Hypothesis and Analytic Strategy

We hypothesize that many parents paying for their children's college expenses were financially overextended and vulnerable to foreclosure as the economy contracted during the Great Recession. We evaluate this hypothesis using a unique panel data set of CZs to assess how annual changes in rates of college attendance predict annual changes in rates of foreclosure, net of other concurrent changes. The CZ analysis enables us to use rich, age-appropriate data (i.e., college attendance rates of 19-year-olds) in a fixed-effects framework, but it is vulnerable to ecological fallacy. We address this threat of misidentification with several robustness checks, a time-lag design, and corroborating analyses of foreclosure at the household level using data from the PSID, NLSY79, and the AHS.

Data and Methods

Commuting Zone Data

We construct a panel data set of CZs from 2006 to 2011, which include urban and rural counties clustered together by common work commute patterns (Tolbert and Sizer 1996). Each CZ-by-year observation includes data on foreclosure rates and college attendance (described in detail later in this article), as well as variables drawn from additional sources: annual unemployment rates from the U.S. Bureau of Labor Statistics' Local Area Unemployment Statistics (aggregated from county-level data), refinance debt per capita from the Home Mortgage Disclosure Act (aggregated from loan-level data with county identifiers), the population at age 19, and state-level annual (first quarter) House Price Index (HPI) data published by the Federal Housing Finance Agency.[5] Together, these variables capture the variation across CZs in the housing market and economy during the Great Recession.

[5] The state-level measure of HPI introduces imprecision into our estimates because they do not capture housing market variation between CZs within states. Unfortunately, we are limited by data availability.

We analyze CZs with a population of over 100,000 in 2000.[6] This analytical sample ($N = 305$) covers approximately 41 % of all CZs and over 84 % of the U.S. population. We exclude Washington, DC because of inaccuracies in state-level covariate measurement. The panel is balanced with a record for each CZ in each year from 2006 to 2011 (1,830 total CZ-year observations). Summary statistics for the sample are provided in Table 1.

Commuting Zone Foreclosure Rate

Foreclosure activity is matched to each CZ-year observation using RealtyTrac data, which include the address and date of every foreclosure between 2006 and 2011. The foreclosure process includes a sequence of steps leading, potentially, to property seizure; here we define foreclosure as the first notification received by the homeowner. This definition avoids double-counting units that experience multiple steps of the process (RealtyTrac 2011). We also focus on this initial indicator of household financial trouble because the rates at which initial foreclosure notifications end in property loss—as well as the time this process takes—vary across states due in part to foreclosure policy.[7] By focusing on the start of the foreclosure process, we measure the timing of initial foreclosure onset in a spatially consistent way, even though some financially distressed households receiving first notice did not lose their home (Cordell et al. 2008). With GIS software, we geocoded the address of each first foreclosure notification and aggregated the total number of these foreclosure events by year and CZ.

Our outcome of interest is the change over time in the CZ-level rate of foreclosures per 100 housing units. Table 1 provides cross-sectional means of CZ foreclosure rates in 2006, 2009, 2011, and the pooled 2006–2011 period. Prior to 2007, the national annual average rate of foreclosures was not even 1 per 500 housing units. At the peak in 2009, the annual rate increased fourfold.

Table 2 describes variation in the foreclosure rate within CZs over time. Between 2006 and 2011, CZs experienced on average a 0.806 foreclosure rate increase, or roughly 8 homes per 1,000 units. Foreclosure rates were lowest in 2006 and peaked in 2009 for about 38 % of CZs. The difference between minimum and maximum rates of foreclosure varied widely, with a right-skewed distribution. Variation across CZs accounts for 58.2 % of the total variance, and the remaining 41.8 % is explained within CZs over time.

Commuting Zone College Attendance by Parental Income

Our primary explanatory variable measures, for each CZ and year, the likelihood of college attendance among 19-year-old children given their parents' income percentile rank. We obtain this measure from Chetty et al. (2014a), who used Social Security numbers (SSNs) to match parents with their children. Parental income is averaged over the years when the child was 15–19 years old and claimed as a dependent on their

[6] CZs with populations smaller than 100,000 suffer from missing data. Findings are substantively identical when we include an unbalanced sample of CZs missing some years of covariate data.

[7] For example, Mian et al. (2015) showed that the foreclosure timeline is significantly longer in states with a judicial requirement as part of the foreclosure process.

Table 1 Characteristics of sample commuting zones (CZs)

			Mean (SD)			
	Min.	Max.	2006	2009	2011	2006–2011 (pooled)
Foreclosure Rate (per 100 housing units)	0	6.533	.18	.825	.526	.537
			(.247)	(.940)	(.480)	(.696)
Probability of College Attendance						
10th parental income percentile	.035	.427	.206	.216	.228	.213
			(.071)	(.074)	(.074)	(.073)
25th parental income percentile	.144	.512	.319	.326	.334	.323
			(.068)	(.069)	(.069)	(.068)
50th parental income percentile	.245	.677	.507	.510	.510	.507
			(.067)	(.066)	(.067)	(.066)
75th parental income percentile	.345	.854	.695	.694	.687	.690
			(.073)	(.070)	(.071)	(.071)
90th parental income percentile	.405	.973	.807	.804	.793	.800
			(.079)	(.075)	(.077)	(.076)
Unemployment Rate	.022	.281	.049	.096	.091	.074
			(.013)	(.024)	(.023)	(.029)
Refinance Debt per Capita ($1,000)	0.034	40.080	5.523	5.818	3.879	3.959
			(4.773)	(4.121)	(2.772)	(3.753)
Housing Price Index	187.4	725.1	352.6	339.14	306.0	339.1
			(123.4)	(93.199)	(85.1)	(106.5)
19-Year-Old Population	1,113	256,321	10,134.3	11,051.1	10,750.2	10,664.5
			(18,963.9)	(22,034.8)	(21,893.9)	(20,949.6)
Average In-State Tuition ($)	3,401	15,294	9,127.2	10,228.1	10,737.9	9,945.7
			(1,676.8)	(1,831.1)	(1,882.0)	(1,885.5)
Average Student Debt in State ($)	12,860	32,698	20,029.5	23,267.2	25,645.3	22,710.5
			(2,481.6)	(3.390.53)	(3,092.0)	(3,689.7)
Number of Observations			305	305	305	1,830

parents' income tax returns. Residence (CZ) of where the child grew up is also identified by the tax form when they were claimed as a dependent (at earliest age reported between 15 and 19). Child college attendance is measured as an indicator for whether each child, in the year they turned 19, is linked by SSN to a 1098-T form, which college institutions are required to file for all enrolled students.

Access to individual tax return data is strictly regulated due to privacy concerns. Chetty et al. (2014a, 2014a), however, created a public-use Equality of Opportunity (EO) data set that summarizes, for each CZ-by-year observation with a minimum of 250 matched 19-year-olds, the relationship between college attendance and parental income. The EO data set provides the CZ-by-year intercept and slope parameters of a linear probability model capturing the likelihood that an individual 19-year-old child attends any college, based on his/her parents' national percentile rank income. The

Table 2 Variation of foreclosure rates and college attendance within commuting zones over time, 2006–2011

Variable	Range (maximum – minimum within CZ)				% of Variance Between Versus Within CZs
	Mean	SD	Min.	Max.	
Foreclosure Rate per 100 Housing Units, Overall	.806	.849	.006	6.499	58.2
Foreclosure Rate per 100 Housing Units, by Tract Income Quintile					
Bottom quintile	.806	.843	.000	7.578	57.8
2nd quintile	.838	.909	.006	6.775	58.5
3rd quintile	.832	.985	.006	9.160	58.1
4th quintile	.834	.905	.007	6.582	57.8
Top quintile	.805	.827	.000	5.461	57.4
Probability of College Attendance, by Parental Income Percentile					
10th percentile	.062	.032	.013	.238	85.8
25th percentile	.053	.029	.009	.254	87.8
50th percentile	.045	.028	.006	.286	89.8
75th percentile	.048	.035	.005	.326	89.1
90th percentile	.055	.041	.006	.350	87.8

Notes: The range is calculated as the difference between the minimum and maximum level of foreclosures and college attendance observed within each commuting zone ($N = 305$) across all years between 2006 and 2011. The percentage of variance between versus within commuting zones (the intraclass correlation) is estimated with an unadjusted random effects model with CZ-years nested within CZs.

slope parameter identifies how strongly parental income correlates, on average, with the likelihood of college attendance. A slope of 0 predicts no relationship (income–college equality), whereas larger positive slopes indicate increasing levels of inequality by parental income. As Chetty et al. (2014a) described, it is also possible to capture estimations at various income percentile levels by adding the product of the income percentile and slope to the provided intercept parameter. This is made possible by an "almost perfectly linear" relationship between the measures of income percentile and college attendance (Chetty et al. 2014a). In our analysis, we use reported slopes and intercepts to compute the likelihood of college attendance by year and CZ for 19-year-old children of parents at the 10th, 25th, 50th, 75th, and 90th income percentiles.

We chose to analyze the EO data instead of the Integrated Postsecondary Data System (IPEDS) so that we include all 19-year-olds—whether or not they attended college—according to the location where they lived in their middle teenage years. IPEDS does not allow a link to college students' geographic origins and does not have data on students who did not attend college.

A summary of college attendance probabilities for sample CZs is included in Table 1. Consistent with prior findings on income inequality and college attainment (Kane 2004), the probability of college attendance increases with parental income. About 80 % of parents in the 90th income percentile sent their children to college between 2006 and 2011, compared with roughly 21 % of parents in the 10th income percentile. Table 1 also indicates a wide variation in the probability of college attendance by parental income. At the extreme values, in 2010 in Hazard, KY, an estimated

3.5 % of 10th income percentile parents sent their 19-year-old children to college, compared with 42.7 % of 10th income percentile parents in 2010 in San Francisco, CA.

Table 2 describes variation in college attendance probability over time for sample CZs. Although nearly 90 % of variation is observed across CZs, there is still evidence of changes within CZs over time. Median-income college attendance in Little Rock, AR, for instance, declined from 0.532 in 2006 to 0.491 in 2011, whereas it increased in Baltimore, MD from 0.478 in 2006 to a maximum of 0.520 in 2010. Other CZs, like Tulsa, OK, experienced a fluctuation across years, with a peak attendance rate of 0.487 in 2009. These changes within CZs over time provide leverage for understanding the relationship between college enrollment and parents' risk of foreclosure.

Commuting Zone Analysis

We use fixed-effects regressions to estimate how changes in the rate of foreclosures are predicted by 19-year-old college enrollment across the parental income distribution. The fixed-effects approach accounts for heterogeneity of various fixed prerecession dynamics across CZs, such as pre-2006 subprime lending and state-level differences in housing policy (Mian et al. 2015). We also add controls for other time-varying characteristics described in Table 1. Formally, our model is

$$y_{jt} = \beta_1 + \beta_2 College_{50jt} + \beta_3 Unemployment_{jt} + \beta_4 RefinanceDebt_{jt} + \beta_5 HPI_{jt} + \beta_6 PopulationAge19_{jt} + CZ_j + \left(Year_{jt} \times Division_j\right) + \varepsilon_{jt},$$

where y_{jt} is the number of foreclosures per 100 housing units in commuting zone j at time t. We use the EO data to calculate $College_{50jt}$, which is the predicted college enrollment in year t for 19-year-olds from households at the 50th parental income percentile. Our model includes time-varying measures of the CZ-level unemployment rate, changes in the housing market (i.e., CZ-level refinance debt per capita and the state-level housing price index), and changes in the population at age 19,[8] as well as census division-by-year interactions to adjust for other secular trends. To estimate heterogeneity across the income distribution, we run additional models in which the probability of college attendance is estimated for households at the 10th, 25th, 75th, and 90th income percentiles. In additional models (not shown), we verified that results are insensitive to outlier CZs with uncharacteristic changes in college attendance.[9]

Addressing Ecological Concerns With Homeowner Data

The analysis described above relies on aggregated rates by CZ to investigate a micro-level phenomenon and therefore runs a risk of ecological fallacy: parents sending children to college might not be the same homeowners experiencing foreclosure. We

[8] An annual count of 19-year-olds in each CZ is provided in the EO data set (Chetty et al. 2014a). We include this measure to account for general financial strain imposed on parents as their children transition to adulthood. Robustness checks that exclude this measure produce larger positive coefficients for college attendance but lead to substantively similar conclusions.

[9] We calculated within-CZ standard deviations of both foreclosure rate and college attendance. When we estimated models excluding CZs in the top 5 % of either measure, coefficients had similar direction, magnitude, and significance as in models with the full sample.

address this concern with robustness checks using data on foreclosures from the PSID. The PSID is a national panel data set with detailed information about family economic, demographic, educational, and compositional characteristics. An original sample of 4,800 white and black families was interviewed in 1968 and then reinterviewed annually through 1997. Since then, families have been interviewed every two years. The PSID has followed original sample members and also their children and grandchildren as they started their own households.

Beginning in 2009, PSID families were asked the date when any currently mortgaged properties received a foreclosure notice from a bank or lender (going as far back as 2001) and the date when any household member had experienced a foreclosure on another housing unit. We use responses to these retrospective questions to code a binary, time-varying outcome variable indicating whether a foreclosure process started in the prior two years for any housing unit.[10]

We use logistic regression to test whether the financial burden of parents sending their children to college positively predicts foreclosure. We restrict the analysis to household heads who owned their home and were 30 years or older in 2005, 2007, or 2009. Household heads in these three years (t) are followed prospectively over time to measure whether they experience foreclosure in years $t + 2$ or $t + 3$ based on the retrospective question asked at year $t + 4$. We also prospectively measure whether any 16-/17-year-old children living with their parents at time t attended college in years $t + 1$ through $t + 4$ (i.e., between age 17/18 and 20/21); whether the household head reported school or tuition expenditures in year $t + 3$, based on a question asked in year $t + 4$; and whether the household head or spouse experienced a spell of unemployment in year $t + 1$, based on a question asked in year $t + 2$.

Our attention to the prospective timing of foreclosure, college attendance, and unemployment in the PSID provides a robustness check comparable to the CZ-level analysis detailed earlier. Although the PSID does not have 1098-T tax forms to measure college attendance, we leverage longitudinal information about individual children to identify whether they attended college between ages 17/18 and 20/21. We follow children age 16/17 over two survey waves (four years) to observe whether their reported years of education by age 20/21 exceeds 12 years or if they are reported to live away from home at an educational institution. Following Chetty et al. (2014a, 2014a), we then link children to the household head with whom they lived at age 16/17 in base years 2005, 2007, or 2009. We construct a variable coded as 0 if the household head had no coresident children aged 16/17 in the baseline year, 1 if the household head had one or more coresident children aged 16/17 and none attended college by age 20/21, and 2 if the household head had one or more coresident children aged 16/17 and any of them attended college by age 20/21.

We control for household characteristics in the baseline year t that are also associated with foreclosure risk: having a high interest rate mortgage greater than 6.0 %; prior year household income, normalized to 2012 real dollars and transformed into national percentile bins provided by Chetty et al. (2014a, 2014b); income percentile (with a

[10] Foreclosure questions about second or third homes do not identify who within the household experienced the foreclosure. The unit could have been a former home of any household member (including one lost to foreclosure), a vacation home, or a property for rent.

squared term);[11] the number of coresident younger children (Martin and Niedt 2015); race/ethnicity; marital status of household head; and whether the household head or spouse earned a college degree. We also include census region fixed-effects to adjust for spatial variation in foreclosure incidence. Finally, because we pool observations from the 2005, 2007, and 2009 baseline years, we include baseline year dummy variables and robust standard errors clustered by household head.

Even with the inclusion of control variables, the PSID analysis does not identify causal estimates. It is possible that unobserved covariates mutually affect the likelihood of foreclosure and of 19-year-old children attending college. We provide PSID estimates as a secondary supplemental assessment of whether the relationship identified in the ecological, CZ-level analysis is also apparent among individual households.

We also note that attrition and changing household heads in the PSID leads 14.5 % of observations from the baseline year to fall out of the sample by the time foreclosure questions were asked ($t + 4$). We assume attrition to be random and present results both applying and not applying the cross-sectional family survey weights provided by the PSID (Heeringa et al. 2011).[12] Finally, the retrospective nature of the PSID survey question about foreclosures may be imprecise. In additional robustness checks presented in an online appendix, we tested the association between college attendance and mortgage distress or foreclosure using NLSY79 and the AHS.[13] Results from these analyses support the conclusions from the CZ and PSID analyses, even though each data set is representative of different sampling frames, timing, and measures of foreclosure.

Results

College Attendance and Foreclosure Rates

Table 3 displays estimates from CZ fixed-effects models of the relationship between foreclosure rates and rates of college attendance at the median family income. Table 4, discussed in greater detail later, reveals that the findings from Table 3 are consistent across the income distribution.

Model 1 shows that change in unemployment within a CZ was positively associated with foreclosure rates, whereas the change in refinance debt volume had a negative association. The relationship between the unemployment rate and foreclosures is consistent with prior work (Been et al. 2011). The negative correlation between foreclosures and refinance debt suggests that credit markets in the hardest hit CZs

[11] Bayesian information criterion fit statistics confirm that the inclusion of a quadratic income percentile term is preferred to just the linear term or, alternatively, to the natural log of family income. Models fit with these alternative income specifications do not change the magnitude or direction of the coefficient presented for college attendance, but do increase standard errors slightly.

[12] We present results weighted by baseline year. The coefficient of interest is slightly stronger and still significant when weighted by the year when the outcome variable was measured (i.e., $t + 4$).

[13] We also assessed whether the Current Population Survey (CPS) or the Health and Retirement Survey (HRS) could provide appropriate tests. The measurement of foreclosure in the CPS is imprecise, based on whether a person's most recent move was due to eviction or foreclosure. And although the HRS provides a more precise measure of foreclosure, it is limited to an early birth cohort sample with very few respondents who were parents of college-age children during the Great Recession.

Table 3 Fixed-effects model estimates of the relationship between probability of college attendance at the 50th national parental income percentile and foreclosures from 2006 to 2011

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Unemployment Rate	4.104*		3.286	3.357	3.971*	3.957*
	(1.908)		(1.979)	(1.958)	(1.957)	(1.963)
Refinance Debt per Capita ($1,000s)	–0.629***		–0.646***	–0.660***	–0.645***	–0.637***
	(0.100)		(0.099)	(0.101)	(0.100)	(0.099)
Housing Price Index	0.001		0.001	0.001	0.001	0.001
	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)
19-Year-Old Population (log)		0.573	0.658*	0.659*	0.676*	0.685*
		(–0.361)	(0.324)	(0.315)	(0.321)	(0.326)
Probability of College Attendance at 50th Parental Income Percentile		1.207*	0.940			
		(0.523)	(0.479)			
One-year lag of college attendance				1.833***		
				(0.390)		
Two-year lag of college attendance					1.251**	
					(0.475)	
One-year lead of college attendance						–0.346
						(0.493)
CZ-Year Observations	1,830	1,830	1,830	1,830	1,830	1,830
Bayesian Information Criterion	1,073.7	1,346.9	1,077.2	1,060.2	1,073.4	1,082.3

Notes: Robust standard errors are shown in parentheses. All models include year-by-census division interactions.

*$p < .05$; **$p < .01$; ***$p < .001$

tightened up or, alternatively, that foreclosures were more common in places where it was hardest to refinance. Changes in HPI were not significantly correlated with foreclosures, conditional on unemployment and refinance debt controls.

The next two models in Table 3 show that variation in the probability of college attendance for 19-year-olds at the 50th parental income percentile was positively correlated with variation in the rate of foreclosures, although the results lose statistical significance in Model 3 when we control for changes in local labor and housing markets.

We next vary the timing of changes in 19-year-old college attendance. Model 4 uses a one-year lag of college attendance, and Model 5 uses a two-year lag. Both are significant, positive, and larger in magnitude than the contemporaneous measure. Model 4 predicts that a 1 % increase in 19-year-old college attendance at the 50th income percentile is associated with an increase of about 1.8 foreclosures per 10,000 housing units the following year. Importantly, these changes are estimated after we account for variation between CZs in fixed attributes that are predictive of foreclosure, such as subprime lending prior to 2006. Thus, in a CZ like the greater Phoenix, AZ area, with about 1.64 million homes, a 1 % increase in college attendance among 19-year-olds from middle-income parents in a given year predicts 300 excess foreclosures in the following year (175 to 427 foreclosures predicted within a 95 % confidence interval). Nationally, a 1 % increase in median-income 19-year-old college attendance predicts 19,300 excess foreclosures the next year (11,200 to 27,400 predicted within a 95 % confidence interval).

Table 4 Fixed-effects model estimates of the relationship between probability of college attendance and foreclosures from 2006 to 2011 across national parental income percentiles, by timing of college attendance measure

	Two-Year Lag	One-Year Lag	Same Year	One-Year Lead
Probability of College Attendance at 10th Percentile	0.870*	1.342***	0.324	–0.808*
	(0.434)	(0.354)	(0.412)	(0.369)
Probability of College Attendance at 25th Percentile	1.092*	1.650***	0.558	–0.731
	(0.474)	(0.384)	(0.466)	(0.425)
Probability of College Attendance at 50th Percentile	1.251**	1.833***	0.940	–0.346
	(0.475)	(0.390)	(0.479)	(0.493)
Probability of College Attendance at 75th Percentile	1.008*	1.435***	0.980*	0.095
	(0.405)	(0.352)	(0.398)	(0.470)
Probability of College Attendance at 90th Percentile	0.804*	1.126***	0.872*	0.251
	(0.357)	(0.320)	(0.342)	(0.421)

Notes: Robust standard errors are shown in parentheses. Each cell reports coefficients from separate models (each with 1,830 CZ-year observations). Differences between coefficients in each column are not statistically significant at the $p < .05$ level.

*$p < .05$; **$p < .01$; ***$p < .001$

Model 6 provides a critical falsification test by showing that college attendance one year later (the "lead" year) has no positive, significant relationship with foreclosures. The lack of a lead year correlation addresses a potential concern that the relationship between college attendance and foreclosures from Models 2–5 reflects a confounding explanation driving both phenomena, such as the well-documented countercyclical relationship between employment rates and college attendance (Betts and McFarland 1995; Fry 2010). Yet the negative rather than positive correlation (though nonsignificant) in Model 6 reduces this concern of a confounder. Together, Models 3–6 confirm a timing order to the relationship between increasing college attendance and increasing rates of foreclosure, consistent with the hypothesis that parents' college-related financial expenditures in one year contributed to subsequent foreclosure risk.

Table 4 shows results from fixed-effects models in which college attendance is measured for 19-year-olds at the 10th, 25th, 50th, 75th, and 90th parental income percentiles, estimated with the same control variables as Models 3–6 in Table 3. Each cell in Table 4 displays a coefficient and standard error from a separate model.

For example, the first cell shows that a two-year lag of predicted 19-year-old college attendance at the 10th parental income percentile was positively and significantly correlated with foreclosure rates net of controls. The one-year lag of that same variable (coefficient shown in the second column of the first row) was a stronger predictor of foreclosures, whereas the contemporaneous measure was not significantly associated with foreclosures. Although there is some variation across the income distribution, the relationship between college attendance and

foreclosures is consistent. For households at all incomes, the one-year lag has the largest and most precise coefficient. Same-year college attendance is not a significant predictor of foreclosures for low-income families. Importantly, lead measures of attendance are never positively and significantly correlated with our outcome of interest, providing a falsification of reverse causality. In fact, for the three lower parental income percentiles reported, this value is negative, suggesting that college attendance may have declined after households experienced foreclosure. However, the negative lead year coefficient for college attendance is statistically significant only for the 10th parental income percentile, a population for which the loss of housing wealth may have had an especially negative impact on children's prospects of attending college.

We also analyzed the relationship between college attendance and foreclosure for neighborhoods characterized by low, middle, or high levels of median income. We divided census tracts into quintiles (within CZs) based on 2006 measures of median income linearly interpolated from the 2000 decennial census and the 2006–2010 pooled American Community Survey. For each CZ, we then calculated the income-quintile-specific foreclosure rate by dividing the number of foreclosures within each quintile by the number of housing units in that same quintile. College attendance was still estimated at the CZ level (the lowest level of aggregation available). The results, presented in online appendix Table S1, support the general claims of the fixed-effects analysis.

Foreclosure is not the only form of financial distress that households with children in college encounter. As the economy contracted, many students took on student loans to cover the costs of attendance (Lee 2013), and this may have provided relief for households anticipating a shortfall in funds for college. However, public student loans are processed through college financial aid offices and cannot be easily used to cover mortgage payments or other "noneducational expenses" (Goldrick-Rab 2016). Thus, even households who were able to take out student loans may have been vulnerable to foreclosure if their initial financial plan depended on income and leveraged home equity.

Although we cannot test this dynamic directly, in online appendix Table S2, we present robustness checks with additional controls for state student loan debt and state-reported tuition. The relationship between college attendance and foreclosures is positive and significant with or without controls for changes in student debt and/or tuition costs. Increasing rates of student debt are positively associated with foreclosure, perhaps because accumulation of this liability was an additional indicator of financial stress among households sending children to college. We do not find a significant relationship between change in the state-level tuition rate and CZ foreclosure rates. One potential explanation for this null relationship is that in 2006, the mean tuition was $9,127, and the average yearly increase of $334 between 2006 and 2011 had little additional impact on a family's financial risk. In other words, college expenses may have already been sufficiently high to generate financial overextension at the start of the period of study, and a marginal annual increase in tuition price may not have played as large a role in family financial risk above the discrete decision of whether to enroll. Assessing this possibility is beyond the scope of this analysis, given that we are limited by a crude state-level summary of annual state tuition expenses.

In additional models (not shown), we estimated several alternative models to explore variation in the relationship between the probability of college attendance and foreclosures across employment contexts. An interaction between college attendance and unemployment was not statistically significant, suggesting that there was no moderating effect of unemployment. We also stratified measures of unemployment by age, calculating separate unemployment rates for those around college-age (16–24 years) and those likely to be parents of college-age children (45–64 years). Only the parental measure of unemployment was significantly predictive of foreclosures. Interactions between these measures (either lagged or contemporaneous) and college attendance remained insignificant. We also tested for interactions between annual college attendance at the 50th income percentile and the percentage of all home loans within a CZ that were subprime in 2005 and 2006. The interaction terms were insignificant, suggesting no variation in the relationship between college attendance and foreclosures across the distribution of subprime lending. Finally, we tested a number of models adjusting for lag and lead measures of covariates but found that the estimated coefficient for one-year lagged college attendance did not change in direction or statistical significance.

College Attendance and Foreclosure Risk: Associations at the Household Level

We next evaluate foreclosures with data from the PSID. Using logistic regression, we estimate the likelihood of homeowners experiencing foreclosure based on whether they sent a 16-/17-year-old child to college. Table 5 presents results from survey-weighted regressions as odds ratios with robust standard errors clustered by household head shown in parentheses. Online appendix Table S3 provides means and variable measurement information. Online appendix Table S4 reports unweighted results. All models control for additional characteristics associated with variation in foreclosure risk, such as having a mortgage interest rate higher than 6.0 %, unemployment, number of children in the home, income, and census region, as well as household heads' race, college degree attainment, and marital status (for a substantive discussion of these factors, see Martin and Niedt 2015; Rugh et al. 2015).

In Table 5, the key variable of interest is college attendance, which we measure in three ways. In Model 7, a categorical variable shows that homeowners who sent their children to college are predicted to experience foreclosure at 2.172 times greater odds than homeowners without children that age. In Model 8, a simpler binary measure of college attendance leads to a similar conclusion, estimating a 2.079 factor increase in the odds of foreclosure. Finally, Model 9 shows that homeowners making educational expenditures[14] had 1.978 times greater odds of foreclosure. These three findings—all similar in magnitude, statistical significance, and consistency across weighted and unweighted models (see online appendix Table S4)—show that homeowners sending their children to college had a pronounced vulnerability to foreclosure during the Great Recession.

In Model 7, we also find that homeowners who did not send their 16-/17-year-old children to college experienced an increased likelihood of foreclosure than

[14] Educational expenses in the PSID are not reported separately for children in K–12 schools versus those attending college.

Table 5 Robustness check: Estimating the relationship between college attendance and foreclosure using the Panel Study of Income Dynamics (odds ratios)

	Model 7		Model 8		Model 9	
College Attendance						
Categorical (ref. = no children age 16/17)						
Children age 16/17, no college by 20/21	3.794**	(1.800)				
Children age 16/17, attend college by 20/21	2.172*	(0.792)				
Binary: Children age 16/17, attend college by 20/21			2.079*	(0.757)		
Binary: Any expenditures on school/tuition last year					1.978**	(0.447)
Household Characteristics						
Head/spouse unemployed	2.756**	(0.897)	2.706**	(0.881)	2.627**	(0.857)
Mortgage interest rate 6.0 % or higher	3.975***	(0.874)	3.992***	(0.880)	3.899***	(0.873)
Parental income percentile	1.031	(0.023)	1.031	(0.023)	1.030	(0.023)
Parental income percentile squared	1.000	(0.000)	1.000	(0.000)	1.000	(0.000)
Number of children <16 in home	1.460***	(0.104)	1.473***	(0.105)	1.340***	(0.109)
Household Head Characteristics						
Marital status (ref. = married)						
Divorced / separated / widowed	1.707*	(0.463)	1.673	(0.454)	1.673	(0.457)
Single	1.480	(0.558)	1.461	(0.547)	1.444	(0.543)
Race/ethnicity (ref. = white)						
Black	1.683	(0.461)	1.743*	(0.481)	1.685	(0.471)
Latino	2.537*	(1.154)	2.570*	(1.216)	2.355	(1.143)
Other	0.711	(0.473)	0.749	(0.482)	0.798	(0.511)
College-educated head or spouse	0.611	(0.154)	0.594*	(0.149)	0.596*	(0.149)
Census Region (ref. = Northeast)						
Midwest	2.235*	(0.875)	2.247*	(0.885)	2.180*	(0.860)
South	1.592	(0.683)	1.605	(0.693)	1.594	(0.689)
West	3.100**	(1.222)	3.057**	(1.220)	3.003**	(1.196)
Baseline Year (ref. = 2005)						
2007	1.695*	(0.405)	1.711*	(0.408)	1.720*	(0.411)
2009	1.460	(0.380)	1.442	(0.376)	1.449	(0.379)
Household-Wave Observations	9,250		9,250		9,250	
Number of Households	4,139		4,139		4,139	

Notes: Odds ratios reported from logistic regressions; robust standard errors clustered by household head are shown in parentheses. Results are probability-weighted using PSID cross-sectional survey weights in baseline year *t*. The sample is restricted to home-owning household heads age 30 or older living in the United States, as identified in the baseline survey year (year *t*). The outcome variable is whether the household experienced a foreclosure in years $t + 2$ or $t + 3$, as reported retrospectively in year $t + 4$ (203 observed in-sample events between 2007 and 2012). College attendance, school tuition/expenditures, and unemployment are measured in years $t + 4$ and $t + 2$, respectively; all other variables are measured in baseline year *t*. See online appendix Table S3 for additional variable measurement information.

*$p < .05$; **$p < .01$; ***$p < .001$

homeowners without 16-/17-year-old children. This may reflect a general financial vulnerability among parents supporting children as they transition to adulthood. Indeed, the CZ-level analysis also shows that an increase in the 19-year-old population positively predicts foreclosure, in parallel with changing levels of college attendance. However, there is not a statistically significant difference in the odds of foreclosure between PSID homeowners sending versus not sending their 16-/17-year-old children to college, which holds in both weighted (Model 7) and unweighted estimations. This null difference may be an artifact of noisy estimation, given that parents not sending their 16-/17-year-old children to college constitute 1.6 % of the analytical sample and account for only 10 of the 203 observed foreclosure events. Although we are limited to speculation, it is also possible that this null difference expresses unmeasured characteristics driving both the decision for children *not* to attend college and a more general financial vulnerability. We control for a wide range of household characteristics, but the analysis is not well suited for the inclusion of household fixed effects to address this threat of time-invariant residual endogeneity. We therefore reiterate that the PSID analysis cannot provide a causal test comparable to the CZ-level analysis, but it does supply a useful check against ecological fallacy.

Finally, our PSID analysis reveals a well-known higher prevalence of foreclosure for black and Latino compared to white households (Hall et al. 2015; Martin and Niedt 2015). We tested for interactions between household head race/ethnicity and college attendance in the PSID but did not find a statistically significant relationship, which may again reflect an issue of sample size rather than a null effect. Similarly, we do not find any significant interaction between income (measured either continuously or by quintile) and college attendance using the PSID, which supports the CZ-level finding of consistency in the relationship between college attendance and foreclosure across income percentiles.

Discussion

This study showed that increasing rates of college attendance within CZs predicted increases in the rate of foreclosures during the Great Recession. These findings are estimated net of controls for unemployment, refinance mortgage debt, 19-year-old population size, and time-invariant characteristics of commuting zones. We find a similar relationship using data from the PSID: families with college-attending children were significantly more likely to experience foreclosure net of unemployment, income, having a high interest rate mortgage, race/ethnicity, region, education of the household head, marital status, and the presence of younger children.

The findings expose a heretofore unexplored role that higher education costs may have had on household financial risk and resultant foreclosures. This research also suggests that educational expenses may explain why some families with children were more likely to experience foreclosure during the Great Recession than childless households (Allen 2011; Martin and Niedt 2015). While the foreclosure literature has focused on subprime lending, unemployment, and house prices as the primary sources of financial overextension, there has been little attention devoted to the cost of college, despite evidence that college is a source of financial stress (Cooper 2014). Our findings do not suggest that households' decisions to send children to college were as

consequential as housing or labor market dynamics in shaping the Great Recession, but it remains important to understand all contributors to the crisis, especially because the penalties of foreclosure can be substantial and lasting.

Our finding of a connection between college attendance and foreclosures at all points in the income distribution indicates that even nonpoor households can be vulnerable in an era of shifting risk from the state to the individual. Our results must be interpreted with some caution: it is conceivable that both changes in college attendance and foreclosures were driven by unobserved confounders. It is unclear what drove changes in college attendance over time within CZs, although rising home equity during the housing boom is one plausible explanation (Lovenheim 2011; Lovenheim and Reynolds 2013). Changes may have been related to demographic shifts or prior-year unemployment affecting the number of marginal 19-year-olds choosing college, but the results presented here are estimated with controls for the number of 19-year-olds (logged) in each CZ-year observation. We also split our unemployment measure by age and found that parent-age unemployment, but not college-age unemployment, was significantly correlated with foreclosures. The relationship between college attendance and foreclosures was substantively equivalent across these robustness checks.

The CZ-level relationship between college attendance and foreclosures is further corroborated by the time order of the relationship: foreclosures are strongly predicted by change in the probability of college attendance one or two years prior and are not predicted at all by next year's changes. The lack of a positive, statistically significant correlation between foreclosures and future college attendance suggests that our findings are not driven by the countercyclical relationship between economic downturns and college attendance decisions. In fact, the negative (although nonsignificant) lead coefficient in Model 6 of Table 3 suggests that enrollment may have weakened as a result of foreclosures (for an analysis of the effects of the housing bust on subsequent college enrollment decisions, see Charles et al. 2015). Finally, CZ-level findings match associations identified among PSID families and also among NLSY79 and AHS households reported in the online appendix. The general consistency across these data sets eases concern of an ecological fallacy in the CZ analysis.

We are limited by the absence of CZ-level data describing racial/ethnic variation in college attendance or foreclosures, although we consider this an important direction for future research. Numerous studies have shown that black and Latino homeowners are more likely to foreclose and to live in neighborhoods with higher foreclosure rates than whites (Chan et al. 2013; Hall et al. 2015; Rugh et al. 2015). Our household-level findings are consistent with prior research in this respect. It is possible that the combination of college expenses and mortgage debt was most consequential for high-income black and Latino households, who were disproportionately reliant on subprime mortgages (Faber 2013) and saw their wealth disappear during the Great Recession (Faber and Ellen 2016; Taylor et al. 2011). Interactions between race/ethnicity and the presence of a college-aged household member in the PSID, NLSY79, and AHS analyses were not significant, nor were interactions with household income, which supports our finding of consistency of the relationship between college attendance and foreclosure across the income distribution. However, a larger sample size may be required to evaluate heterogeneity by race or income.

Similarly, we are unable to draw any connection between foreclosures and college attendance among households who rent their homes. Our CZ-level measures do not

distinguish between renters or homeowners, and the PSID's measure of foreclosure is unavailable for renters. It is possible that renters were at greater risk of financial distress because they tend to have fewer financial resources than homeowners, and this could have affected payments to landlords who subsequently experienced foreclosure.

In any case, the ecological and household-level results presented together suggest that the cost of college attendance was an important driver of household financial risk across the parental income distribution. This story may have been underreported because of the severity of more direct causes of foreclosure (e.g., toxic mortgages, unemployment, and collapsing home values). The results also help contextualize the relatively ineffective federal policy response to foreclosures (Immergluck 2013, 2015) by showing that foreclosure prevention efforts need to be targeted beyond mortgage terms toward a broader range of financial burdens.

Our findings have implications for calls to make financial aid for college more transparent (Dynarski and Scott-Clayton 2013), flexible, and sufficient (Goldrick-Rab 2016). Although the advertised tuition "sticker price" has continuously risen in recent decades, financial aid packages reduce the net cost of attendance according to student need (Levine 2014; Long 2014). This funding structure effectively uses high-income tuition payments to subsidize costs for low-income students, but the gap between the total cost and the financial aid provided may still be too large for many families across the income distribution to bear. Indeed, the evidence of foreclosure risk presented here shows that a nontrivial sum of parents was financially overextended. Arguments in support of a sliding-scale system of college pricing (Murphy et al. 2017) should therefore consider financial overextension—and its vulnerability to economic downturns—as a possible unintended consequence requiring attention.

Finally, concern over the link between college expenditure and foreclosures should not be limited to the parents who lost their homes during the Great Recession. Indeed, one of the key lessons of the Great Recession—often vocalized by those who admonish the irresponsible debt accumulation of low-income homeowners or the predatory lending practices of mortgage agents and financiers—is that in our intertwined society, risky behavior affects us all. The consequences of financial troubles can ripple across the economy, leading to loss in property values and jobs. This warrants policy attention not only to risky home lending but also to other determinants of financial hazard—such as the cost of college attendance—that can overextend families and render us all vulnerable to future economic crises.

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