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Abstract

A growing public discourse cites the rising cost of education and student debt overhang as a contributor to slow economic growth. A parallel discussion explores the causes of the secular decline in business dynamism and entrepreneurship rates in the US over the past several decades. This study is an attempt to connect these two narratives. I provide early evidence that the growth of public university tuition over the previous two decades is negatively associated with movement into self-employment. Because labor market and education decisions are often made together, I focus on shocks to in-state tuition among parents of near-college-age children, who may internalize the cost of their children's education but are less likely to be attending college themselves. Using state budget surpluses and shortfalls as an instrument for in-state tuition in a triple-difference framework, I find that a 10% increase in the average price of in-state tuition is associated with a 13.9% decrease in new business starts of parents with college-age children in the CPS, relative to both non-parents and parents of younger children. A one percentage-point increase in the growth rate of in-state tuition is associated with a 3.8% decline in new firm births. The effect is similar in size and significance when aggregating to the household level and when including a standard battery of covariates. The instrument is orthogonal to private school tuition rates, and the effects are stronger for households with more children and those with children closest to college age. Taken together, the results indicate that the rising cost of higher education may be partially responsible for the decline in new business starts in the US.

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1 Introduction

What is responsible for the secular decline in self-employment rates in recent decades, and does the rising price of a college degree play any role? Researchers, government actors and public discourse have long been focused on the cause of the decline in business dynamism and new business starts in the US as well as the consequences of price inflation in higher education. However, few studies have explicitly connected these two phenomena.

This paper is an early attempt to demonstrate that higher college tuition rates negatively impact new business starts. I show evidence from the Current Population Survey that movement into self-employment is negatively associated with public university tuition among parents of near-college-age children. I use this group to control for the effect of tuition on educational decisions and skill acquisition, isolating the price effect of higher education on self-employment. I compare households with older children both to non-parents and parents with only younger children in a triple-difference identification strategy. I also instrument for public tuition using state surpluses (and shortfalls), relying on evidence from the education and public finance literature that state governments respond to budget shortfalls by cutting education appropriations, and that public universities in turn raise tuition to make up the difference.

The results show that the rising cost of enrolling as an in-state, full-time student in a 4-year, public university is persistently and significantly associated with a reduction in new business starts. A 10% rise in tuition produces a 13.9% decline in new business starts among parents of near-college-age children. In growth terms, a one percentage-point increase in the growth rate of tuition means a 3.8% decrease in the likelihood of becoming self-employed. These effects are robust to a battery of demographic and economic variables, and are stronger both for households with more children and for those whose children are closest to college age. If entrepreneurship is important for job creation, unemployment, innovation or competitiveness, these results suggest that the rising price of post-secondary education has negative economic consequences through this relatively unexplored channel, in addition to affecting human capital accumulation and student debt burden.

2 Background

Previous literature.

A growing chorus of academic research is concerned that business dynamism in the United States has declined steadily over the previous 30 years, particularly when measured as the rate of new startup firms (Decker et al., 2014). Potential explanations for low rates of entrepreneurship and innovation have ranged from an overly-generous welfare state (Acemoglu et al., 2012) to liquidity constraints (Cagetti and Nardi, 2006; Evans and Jovanovic, 1989), bankruptcy policy (Berkowitz and White, 2004), marginal income tax rates (Meh, 2005; Georgellis and Wall, 2006) and estate taxes (Cagetti and Nardi, 2009).[1]

There are a number of reasons to imagine the cost of college tuition might also affect the birth rate of new firms, and the following section goes into greater detail about these channels. To my knowledge only one other study has examined the link between the cost of higher education and new firm births, though there is substantial interest in developing a research agenda around the topic (Baum, 2015). Ambrose et al. (2015) demonstrate a negative correlation between changes in student loan debt and net business starts for firms at the bottom end of the size distribution. Their estimates suggest a one standard-deviation increase in indebtedness contributes to a 14% decline in firm formation among businesses with one to four employees, and the effects are declining in firm size.

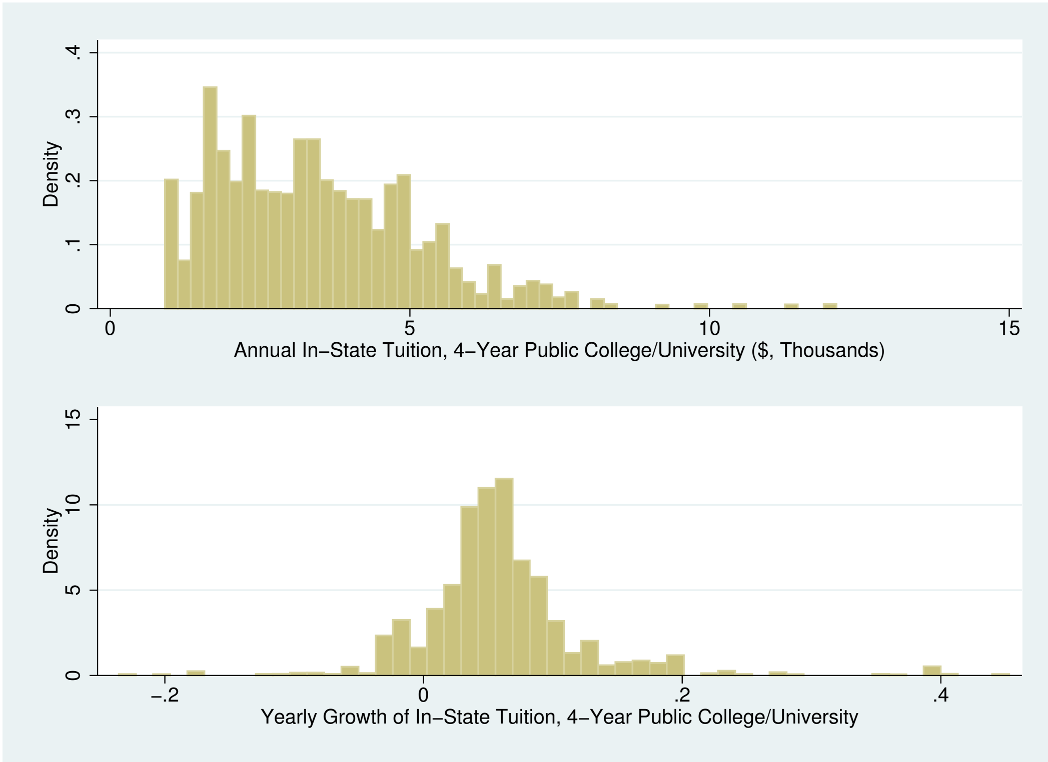
This study aims to supplement the literature in several ways. First, I provide direct evidence of college *tuition* on small business creation, rather than indebtedness, eliminating a step in the link between rising higher education costs and declining business dynamism. Second, I use a triple-difference identification strategy and instrumental variables (described below) to generate comparison groups for the population of interest. While these estimates can only be considered causal under a strong set of assumptions, they eliminate a number of potential sources of bias that might arise when trying to isolate this relationship.

Data.

I use three data sources to attempt to untangle these issues. First, I use microdata from Current Population Survey, which can be linked in successive years to identify whether an individual moved into self-employment. Second, I use tuition data from the Integrated

[1]See Parker (2009) for a thorough overview of the key theoretical contributors to entrepreneurship and the empirical evidence for their importance.

Figure 1: Distribution of In-State College Tuition



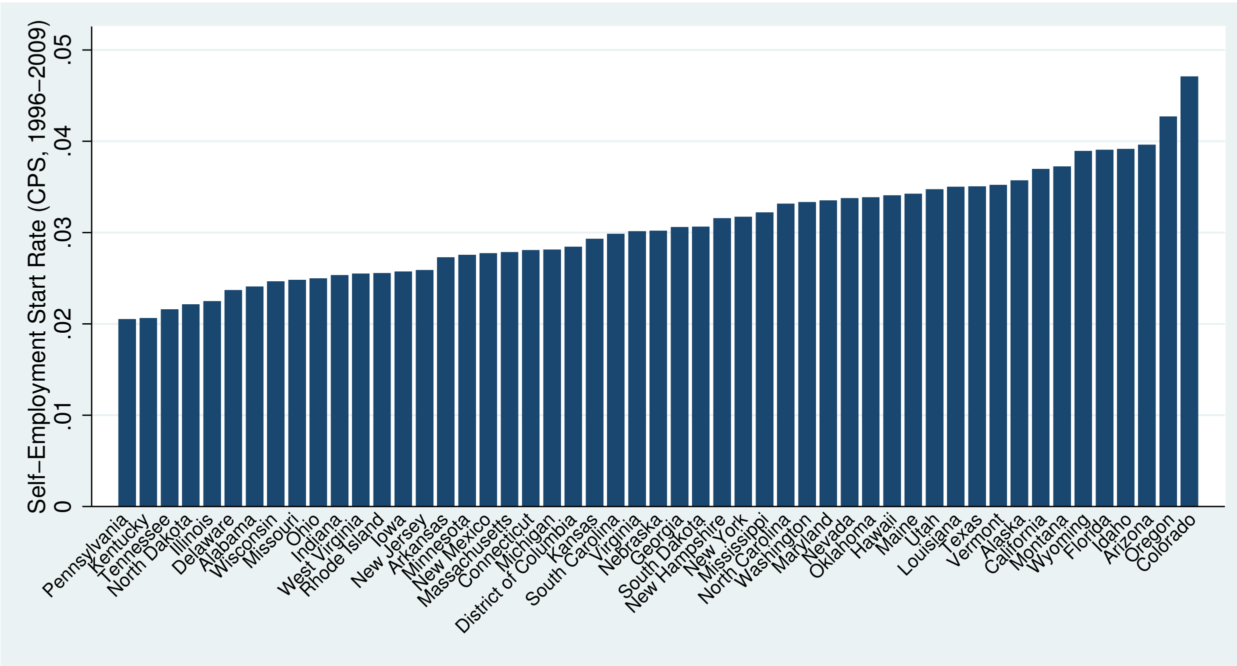
Source: CPS and IPEDS, 1996-2009.

Post-Secondary Education Data System (IPEDS), a detailed survey of the tuition and fees charged by institutions of higher education. Finally, I sue the Annual Survey of State Government Finances for information about state revenues, outlays, and education appropriations.[2]

Before delving into the identification strategy, a basic question remains: Is there any substantial variance in startup rates and public tuition? Figure 1 shows the distribution of in-state tuition levels and growth rates experienced by individuals in the CPS over the period 1996-2009. The distributions shown are the average annual tuition and fees faced by in-state residents, and are calculated using the CPS sample between 25 and 64 which is linked to IPEDS by state of residence. The density displays a long upper tail: while the bulk of the data are below $5,000 per year in tuition and fees, depending on the year and state these values stretch from about a thousand dollars to more than $10,000. The mean growth of 6% per year masks a similarly degree of dispersion, with some states experiencing a decline in the average cost of their public universities and some doubling in cost every two or three years.

[2]See the Appendix for details on variable definitions and summary statistics.

Figure 2: Self-Employment Start Rates by State



Source: CPS and IPEDS, 1996-2009.

Is there a commensurate dispersion in startup rates between states? Figure 2 displays how often the average individual in the state reports being self-employed given that they reported not being self-employed in the previous year. For example, more than 3.5% of Alaskans in the sample who say they are not self-employed report having a business in the following year, compared to whereas barely 2% of Kentucky residents say the same.[3] The data show that individuals exhibit dramatically different startup rates and experience a wide array of tuition prices depending on which state they live in. However, understanding how these two phenomena might be related requires a more sophisticated analysis than simply observing cross-state correlations. The next section lays out an empirical framework for disentangling the other factors driving these distributions.

[3]Given the sample restriction and the absence of person-weights, these figures should be considered illustrative of cross-state heterogeneity rather than representative of the actual small business start rate in any particular state.

3 Empirical Strategy

Disentangling the effect of tuition on self-employment[4] is difficult in part because education decisions and life-time career planning are often carried out concurrently. Further, the transmission mechanism from the cost of education to starting a business is unclear, and a number of inter-related factors might mitigate one another in a reduced-form analysis.

If currently-enrolled students are particularly price-sensitive, higher tuition could induce college drop-out rates to rise, which might encourage self-employment (by reducing the opportunity cost) or discourage it (by damaging skill acquisition). For prospective enrollees, higher tuition could divert students to less-expensive alternatives, which might reduce debt overhang and improve access to small business lending.

On the other hand, if students are not price-sensitive to tuition changes once they are already enrolled, tuition costs are transmitted to student debt burden. By itself a higher debt burden is likely to negatively impact self-employment—at the very least through a decrease in lifetime net worth, which reduces appetite for risky investments like entrepreneurship if individuals have decreasing absolute risk aversion. In addition to demand-side concerns, lenders may tighten credit or require a higher degree of collateralization before issuing small business loans to heavily debt-burdened individuals. While these two factors at least move in the same directly as one another, the various channels complicate the question of what it means for tuition to "have an effect on" new business formation.[5]

The ideal experiment would hold constant all lifetime education and career decisions and randomly shock the cost of a college education, holding constant the returns to a college degree, the demand for high-skilled workers, and the supply of loanable funds for higher education. This would produce an exogenous source of variation in student loan debt, which in turn could be examined from the demand side (the effect on appetite for self-employment risk) and the supply side (the effect on bank lending). However, this is infeasible for a number of reasons: students select colleges and universities in part based on price, and may leave if that cost rises dramatically. Educational attainment may have an effect on self-employment independent of the debt channel, so correlations between tuition and entrepreneurship will be suggestive at best.

[4] I am referring to "self-employment" as the self-identified work status of individuals; all of the results in the paper are robust to using alternative definitions—such as the presence of self-employment income—and there is no indication that self-employment is a proxy for unemployment.

[5] I am explicitly ignoring any general equilibrium effects that might be present and further complicate this analysis. For example, even an exogenous increase in the cost of a college education reduces the number of college graduates, driving up the wage premium and changing the cost of hiring employees and the opportunity cost of starting a firm. These in turn are likely to change the demand for a college education and it's price; understanding these linkages requires a sophisticated model of the market for higher education that is beyond the scope of this paper.

A potential way around this problem is to focus on parents of near-college-age children. Parents have typically already made their own educational investment decisions, and are less likely to be enrolled in a degree program than non-parents. This makes it more feasible that tuition prices affect them only through a price mechanism (as they partially internalize the cost of education for their children), rather than through their effect on long-term career decisions, skill acquisition and the opportunity cost of college.[6]

Comparison groups.

Identifying a reasonable comparison group for this population presents an additional difficulty. One possibility is to look at the self-employment rate of households who do not have children, both before and after a change in the price of college tuition, and contrast this rate to parental households. In order to be reasonably comparable and avoid the problems of tuition affecting enrollment directly, both parental and childless households should be composed of members beyond college age (for example, greater than 25 years old).[7]

For an individual i in household h residing in state s at time t, this continuous-treatment difference-in-differences framework can be implemented in the following way

$$Start_{it} = \beta_0 + \beta_1 HasKids_{ht} \cdot InstTuit_{st} + \beta_2 HasKids_{ht} + \beta_3 InstTuit_{st} + \Gamma X_{ht} + \eta_t + \nu_s + t \cdot \nu_s + \varepsilon_{ist} \quad (1)$$

where $Start_{it}$ is equal to one if an individual reports being self-employed in time t and not self-employed in time $t-1$ and zero when an individual reports being self-employed in both t and $t-1$. The household-level variable $Start_{ht}$ is defined analogously for whether a household has any members at least 25 years old who are self-employed (or none). The household-level variable $HasKids_{ht}$ takes the value one when a household has any members less than 18 years old, and zero otherwise. The state-level variable $InstTuit_{st}$ is the average amount charged by all 4-year public universities and colleges in state s for full-time students enrolled in academic year ending in t. The matrix X_{ht} contains household-level demographic and economic variables (see Appendix for a complete list),

[6]The number of parent-students is by no means zero; a brief by the Institute for Women's Policy Research indicates 23% of college students had dependent children in 2013, and this number has risen in recent years ("College Students with Children are Common and Face Many Challenges in Completing Higher Education", available http://iwpr.org). However, the majority of these are the parents of young children, who will be excluded in some of the analysis below.

[7]According to the NCES, 88% of enrollees in 4-year public undergraduate degree programs and 86% of those in private 4-year programs are less than 25 years of age. (Source: http://nces.ed.gov/programs/coe/indicator_csb.asp.)

the year fixed effect η_t controls for non-linear time variance in self-employment starts, ν_s controls for any time-invariant state-specific effects, and $t \cdot \nu_s$ is a state-specific linear time trend, allowing each state to have different growth trajectories in self-employment. The standard error, ε_{ist}, is clustered at the state level.

A reasonable concern is that households without children—even those of similar age—are markedly different in ways important to entrepreneurship. For example, if attitudes towards risk-taking evolve differently for parents and non-parents over their lifetimes, the parallel trends assumption key to identification under difference-in-differences may be violated. Further, the decision to have a child and start a business may be co-determined if households delay or accelerate child-rearing in anticipation of opening a business. This complication would induce selection into the "treatment" group (parental households), muddying the causality of any observed differences between households with and without children as tuition rates change.

An alternative specification would be to restrict the analysis only to households with children and compare parents of near-college-age children to those with younger offspring. Parents whose children are older likely have greater exposure to changing tuition rates: if their child goes to college and they choose to help pay for his or her education, these outflows are more imminent. Parents of younger children have more time to change their behavior in response to education costs, either by changing their saving rate, planning their mixture of wage and non-wage income differently, or some combination of the two. However, both groups have made the decision to have children (and taking on the all the costs that might entail), making them more similar than parents and non-parents.

Implementing this comparison using an analogous difference-in-differences framework is similarly straightforward. The definition of "near-college-age" is flexible and ultimately arbitrary, but as students typically begin searching for colleges and take the PSAT in their junior year, a convenient cut-off would be age 16. This would amount to the following:

$$Start_{it} = \gamma_0 + \gamma_1 Over16_{ht} \cdot InstTuit_{st} + \gamma_2 Over16_{ht} + \gamma_3 InstTuit_{st} + \Gamma X_{ht} + \eta_t + \nu_s + t \cdot \nu_s + u_{ist} \quad if \quad HasKids_{st} = 1 \quad (2)$$

where all variables are defined as above and $Over16_{ht}$ equals 1 if a household's oldest child is at least 16 years of age. Note the sample is restricted only to households with children, so that γ_1 identifies the average difference between households with older and younger children as the cost of public tuition changes.

Finally, these two approaches can be combined into a triple-difference strategy:

$$Start_{it} = \delta_0 + \delta_1 InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht} + \delta_2 InstTuit_{st} \cdot HasKids_{ht} + \delta_3 HasKids_{ht} \cdot Over16_{ht} + \delta_4 InstTuit_{st} + \delta_5 HasKids_{ht} + \Gamma X_{ht} + \eta_t + \nu_s + t \cdot \nu_s + \epsilon_{ist} \quad (3)$$

Because this method employees the entire sample, $Over16_{ht}$ will be zero if a household does not have children. Note that the two remaining terms that would normally be present in a triple-difference strategy, $InstTuit_{st} \cdot Over16_{ht}$ and $Over16_{ht}$, are collinear with the above variables (i.e. there are no households without children who have children at least 16 years of age) and do not introduce any additional variation.

In this case, δ_1 identifies the relative effect of changes to in-state tuition for households with children over the age of 16, net of how tuition affects both households with younger children and households without children. Both of these relationships are allowed to vary flexibly, meaning that each group could react differently to tuition changes without affecting the estimate for households with older children. I will also consider the effect of tuition growth rates on business starts, in case the fixed effects aren't sufficiently capturing level differences between states (or

Instrumental variables.

Public university tuition is determined by a number of factors, including the short- and long-term financial needs of the institution, disbursements it expects to receive from governments and foundations, and the enrollment it anticipates in coming years. For this reason, state- and nation-wide economic conditions likely have an impact on tuition and fees, either by changing the returns to—and demand for—a college degree, varying the performance of invested endowment funds, or driving fluctuations in student lending and grants.

These same economic factors are important source of variation in small business creation: flagging demand for goods and services reduces the incentives to leave wage employment for entrepreneurship, and a weak economic outlook may induce banks to constrict small business lending. If parents are more exposed to these changes than non-parents, even the triple-difference described above may confound macroeconomic trends with changes in the cost of higher education and new business formation.

In order to address these concerns, I use state government budget surplus (or shortfall) in the previous year as an instrument for tuition and tuition growth rates. There is substantial evidence showing a strong link between tuition rates at public universities and state appropriations for higher education (Koshal and Koshal, 2000; Fortin, 2004) and that appropriates for higher education are negatively related to state budgetary issues such as debt burden (Okunade, 2004). State surplus are a strong instrument if they have a substantial positive effect on tuition rates (by allowing public universities to rely less heavily on students as a source of revenue).

However, besides having a strong effect on the instrumented regressor, a valid instrument must satisfy an exclusion restriction. In this case, exclusion requires that budget surpluses not affect self-employment starts directly, but only through tuition rates. While this might seem like a high bar for something with such wide-reaching effects as a government surplus, the instrument need not affect entrepreneurship only through tuition rates to be validly excluded. Instead, it must be the case that the state budget surplus (or deficit) does not have any direct, *incremental effect* among *parents of older children* above any effects it has on other groups.

To see this more clearly, consider the reduced-form version of Equation (3) using budget surplus as the instrument:

$$\begin{aligned} Start_{it} &= \phi_0 + \phi_1 Surplus_{s,t-1} \cdot HasKids_{ht} \cdot Over16_{ht} + \phi_2 Surplus_{s,t-1} \cdot HasKids_{ht} \\ &+ \phi_3 HasKids_{ht} \cdot Over16_{ht} + \phi_4 Surplus_{s,t-1} + \phi_5 HasKids_{ht} + \Gamma X_{ht} + \eta_t + \nu_s + t \cdot \nu_s + u_{ist} \end{aligned} \tag{4}$$

While $Surplus_{s,t-1}$ is an instrument for $InstTuit_{st}$, the coefficient β_4 is not of interest, so exclusion violation-induced bias is not a concern. The "treatment" effect of central concern is β_1, which is identified by using $Surplus_{s,t-1} \cdot HasKids_{ht} \cdot Over16_{ht}$ as an instrument for $InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$. As long as this exclusion holds—that is, $Surplus_{s,t-1} \cdot HasKids_{ht} \cdot Over16_{ht}$ only affects $Start_{it}$ through $InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$—the instrument is valid.

4 Results

Individual-level results.

Table 1 shows the result of applying Equation (1) to the CPS data. Columns (1) and (2) are the basic OLS results, both with and without the matrix of household-level demographic and economic variables X_{ht}. The coefficient on $InstTuit_{st} \cdot HasKids_{ht}$ is positive and not significant, and the coefficient on $InstTuit_{st}$ is negative and insignificant, which would seem to indicate that in-state public university tuition rates have no effect on an individual's

Table 1: Difference-in-Differences by Parental Status (Individual-Level)

Dependent Variable: $Start_{it}$	OLS		Reduced Form		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$InstTuit_{st} \cdot HasKids_{ht}$	0.0003	0.0002			-0.0079**	-0.0077**
	(0.0005)	(0.0004)			(0.0029)	(0.0028)
$InstTuit_{st}$	-0.0017	-0.0020			0.0233	0.0226
	(0.0038)	(0.0038)			(0.0240)	(0.0241)
$HasKids_{ht}$	-0.0002	-0.0069**	0.0001	-0.0072**	0.0280**	0.0205*
	(0.0021)	(0.0023)	(0.0010)	(0.0017)	(0.0102)	(0.0101)
$Surplus_{s,t-1}$			-0.0001*	-0.0001*		
			(0.0000)	(0.0000)		
$Surplus_{s,t-1} \cdot HasKids_{ht}$			0.0002**	0.0002**		
			(0.0000)	(0.0000)		
Covariates	—	✓	—	✓	—	✓
Observations	194,017	194,017	191,977	191,977	191,977	191,977
R-squared	0.0016	0.0100	0.0016	0.0100	—	0.0080

Difference-in-difference OLS. New business start is self-employment in a year after no self-employment.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

decision to become self-employed. However, as discussed above, there are reasons to think $InstTuit_{st}$ is correlated with a number of other variables that might also affect $Start_{it}$, so it is difficult to interpret this correlation as causal.

Columns (3) and (4) present the reduced-form results, substituting the instrument $Surplus_{s,t-1}$ directly in place of $InstTuit_{st}$ in Equation (1). The coefficient on $Surplus_{s,t-1} \cdot HasKids_{ht}$ indicates that households with children are more likely to move into self-employment when their states have recently posted large surpluses, relative to households without children. To provide a sense of scale, the elasticity implied by this estimate is 0.027 at the means of $Surplus_{s,t-1}$ and $Start_{it}$, and a one standard deviation increase in surplus is associated with a 0.013 standard deviation increase in self-employment starts among parental households.

Columns (5) and (6) report the 2SLS results, using $Surplus_{s,t-1} \cdot HasKids_{ht}$ as an instrument for $InstTuit_{st} \cdot HasKids_{ht}$ and $Surplus_{s,t-1}$ as an instrument for $InstTuit_{st}$ in the two first-stage equations. The coefficient on the instrumented version of $InstTuit_{st} \cdot HasKids_{ht}$ suggests in-state tuition has a significantly negatively association with new business creation in the CPS. The marginal effects imply that a 10% increase of in-state tuition rates is linked to an 8.9% decline in self-employment starts. Reassuringly, the

Table 2: Difference-in-Differences by Child Age (Individual-Level)

Dependent Variable: $Start_{it}$	OLS		Reduced Form		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$InstTuit_{st} \cdot Over16_{ht}$	0.0012	0.0013			-0.0115**	-0.0115**
	(0.0008)	(0.0008)			(0.0041)	(0.0041)
$InstTuit_{st}$	-0.0011	-0.0017			-0.0545+	-0.0492+
	(0.0036)	(0.0036)			(0.0308)	(0.0292)
$Over16_{ht}$	-0.0046	-0.0053	-0.0016	-0.0019	0.0389**	0.0384**
	(0.0032)	(0.0032)	(0.0012)	(0.0013)	(0.0132)	(0.0133)
$Surplus_{s,t-1}$			0.0000	0.0000		
			(0.0000)	(0.0001)		
$Surplus_{s,t-1} \cdot Over16_{ht}$			0.0002**	0.0002**		
			(0.0001)	(0.0001)		
Covariates	—	✓	—	✓	—	✓
Observations	93,383	93,383	92,767	92,767	92,767	92,767
R-squared	0.0020	0.0098	0.0020	0.0098	—	0.0049

Difference-in-difference OLS. New business start is self-employment in a year after no self-employment. Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list. Restricted to households with children. Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

coefficient on $InstTuit_{st}$ is not statistically significant, meaning the self-employment rate among households who do not have children is unaffected by changes in college tuition.

However, as discussed earlier, households without children may be substantively different from households with children on a number of dimensions. If the economic conditions of these two groups are on different trajectories—or if selection into the group is related to the cost of education—any assumptions about parallel trends persisting in the absence of tuition changes would be violated.

Addressing these concerns, Table 2 implements the estimation strategy in Equation (2), restricting the sample to households with children and comparing with children who are near college-age (at least 16) to those with only younger children. Columns (1) and (2) report the OLS results, which show similar effects to those from Table 1: no significant relationship between tuition and movement into self-employment. The reduced-form estimates in columns (3) and (4), however, indicate households with older children are more likely to become self-employed following a state budget surplus. The magnitudes are very similar to those from Table 1, even though the sample and comparison groups are different.

Columns (5) and (6) in Table 2 corroborate the findings from Table 1, showing that every thousand dollar increase in tuition is associated with a 1.2 percentage point decline in new business starts. Because the sample is restricted to only households with children, the expected values of the dependent and independent variables are slightly different that in the previous table. Evaluating this marginal effect at the sample mean, a 10% increase in tuition is linked to a 12.6% decline in new self-employment, relative to households with young children. Not surprisingly, the coefficient on $InstTuit_{st}$ is somewhat negative here, meaning even households with small children are affected to some degree by higher college tuition. This is in keeping with forward-thinking models of labor market entry: parents of younger children have more time to change their behavior in response to price shocks, so the effects are more attenuated.

Combining both of these comparison groups into one estimator, Table 3 presents the results of Equations (3) and (4). Unsurprisingly the marginal effects are very similar in size and significance, with the coefficient on $InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$ in column (5) implying a 10% increase in average in-state tuition is associated with a 13.9% decline in selection into self-employment, relative to both households with younger children and those without any. The total effect for this group is 40% larger when accounting for the coefficient on $InstTuit_{st} \cdot HasKids_{ht}$, but because the exclusion restriction may be invalid for this group it is unclear to what degree these estimates "stack" onto one another. If the two comparison groups are treated as true control groups, who should be wholly unaffected by any relationship between tuition and self-employment, the lower marginal estimate is a more convincing approximation of a causal effect.

In standard-deviation terms, these effects are quite large. A one-standard-deviation increase in tuition reduces the rate of new business starts by 0.12 standard deviations (just over two percentage points). These effects are likely to be non-linear in the tuition distribution, and linear probability models are poor at accounting for this variation. Nevertheless, assuming the marginal effect holds at least for most of the interquartile range, shifting from the median in-state tuition rate to the 75th percentile reduces the flow into self-employment by 54%.

Household-level results.

Individual-level analysis may be inappropriate if households make joint decisions whether a member will enter self-employment. In this case, some individual decisions to start a business may be *negatively* correlated with tuition rates. For example, if within-household self-employment is negatively related to the self-employment of other members—that

Table 3: Triple-Difference by Parental Status and Child Age (Individual-Level)

Dependent Variable: $Start_{it}$	OLS		Reduced Form		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$	0.0012	0.0014+			-0.0123**	-0.0121**
	(0.0008)	(0.0008)			(0.0043)	(0.0043)
$InstTuit_{st} \cdot HasKids_{ht}$	0.0000	-0.0002			-0.0051*	-0.0051*
	(0.0005)	(0.0005)			(0.0025)	(0.0025)
$HasKids_{ht} \cdot Over16_{ht}$	-0.0048	-0.0053	-0.0016	-0.0016	0.0418**	0.0410**
	(0.0033)	(0.0032)	(0.0013)	(0.0013)	(0.0140)	(0.0140)
$InstTuit_{st}$	-0.0017	-0.0019			0.0261	0.0243
	(0.0039)	(0.0038)			(0.0291)	(0.0266)
$HasKids_{ht}$	0.0009	-0.0058*	0.0005	-0.0068**	0.0189*	0.0118
	(0.0023)	(0.0025)	(0.0011)	(0.0018)	(0.0089)	(0.0087)
$Surplus_{s,t-1} \cdot HasKids_{ht} \cdot Over16_{ht}$			0.0002**	0.0002**		
			(0.0001)	(0.0001)		
$Surplus_{s,t-1} \cdot HasKids_{ht}$			0.0001*	0.0001*		
			(0.0000)	(0.0000)		
$Surplus_{s,t-1}$			-0.0001*	-0.0001*		
			(0.0000)	(0.0000)		
Covariates	—	✓	—	✓	—	✓
Observations	194,017	194,017	191,977	191,977	191,977	191,977
R-squared	0.0016	0.0101	0.0017	0.0101	—	0.0064

Difference-in-difference OLS. New business start is self-employment in a year after no self-employment.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

is, one person leaving a wage job makes the others more likely to stay gainfully employed—some of these negative effects would be rolled together with the positive ones in any individual-level analysis, attenuating the estimated coefficient.

Alternatively, household-level decisions might bias the coefficient—making it larger in absolute value—if the movement of an individual into self-employment induces others to become self-employed directly. This would be the case if households tend to start family firms, in which several adults work on the same venture. In that situation, a household of two people would "double-count" what is essentially one event when using individual data.

In order to allow for either of these possibilities, Table 4 repeats the analysis in Table 3 but aggregated to the household level. In this case, each household-year is one observation, and $Start_{ht}$ take the value one if any adult member of the household was self-employed in time t and no members were self-employed in time $t-1$, and zero when no members were self-employed in both t and $t-1$.

While the point estimates are larger than they are at the individual level, household-level entry into self-employment is more likely. While just over 3% of individuals in the CPS move into self-employment in the average year, about 5.3% of households do so, which reduces the marginal effect somewhat. The coefficient in column (5) implies that a 10% increase in tuition results in a 9.2% decrease in new self-employment, and a one-standard-deviation rise if the cost of college pushes down business starts by 0.11 standard deviations.

These findings are very similar in size and significance to the individual-level analysis, suggesting intra-household bargaining about self-employment is not a major source of bias using the IV triple-difference identification strategy. Household-level versions of Tables 1 and 2 are also very similar to their individual-level counterparts (see Appendix).

Tuition growth rates.

Are tuition *levels* the relevant variable for parents thinking about the cost of a college education? Or do parents pay more attention to the *growth rate* of tuition? Parents may respond differently to growth rate changes than level effects depending on how they form expectations about prices. Since tuition rates have outpaced inflation for several decades, parents may come to expect high but steady growth rates, which would produce dramatic level shifts that are not unanticipated shocks from a household's standpoint. Though the analysis so far has included fixed effects and state-specific time trends, these may not adequately absorb the time variation, for example, if growth rates themselves have trends.

Table 4: Triple-Difference by Parental Status and Child Age (Household-Level)

Dependent Variable: $Start_{ht}$	OLS		Reduced Form		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$	-0.0005	-0.0006			-0.0141**	-0.0159**
	(0.0016)	(0.0016)			(0.0053)	(0.0049)
$InstTuit_{st} \cdot HasKids_{ht}$	0.0007	0.0003			-0.0029	-0.0030
	(0.0008)	(0.0008)			(0.0026)	(0.0026)
$HasKids_{ht} \cdot Over16_{ht}$	0.0078	0.0032	0.0048+	-0.0002	0.0547**	0.0557**
	(0.0063)	(0.0064)	(0.0026)	(0.0026)	(0.0162)	(0.0150)
$InstTuit_{st}$	0.0048	0.0045			-0.0644+	-0.0615*
	(0.0050)	(0.0050)			(0.0338)	(0.0291)
$HasKids_{ht}$	0.0036	-0.0055	0.0059**	-0.0046+	0.0166*	0.0068
	(0.0035)	(0.0041)	(0.0016)	(0.0023)	(0.0084)	(0.0083)
$Surplus_{s,t-1} \cdot HasKids_{ht} \cdot Over16_{ht}$			0.0003*	0.0003**		
			(0.0001)	(0.0001)		
$Surplus_{s,t-1} \cdot HasKids_{ht}$			0.0001	0.0001		
			(0.0001)	(0.0001)		
$Surplus_{s,t-1}$			0.0000	0.0000		
			(0.0001)	(0.0001)		
Covariates	—	✓	—	✓	—	✓
Observations	127,270	127,270	125,735	125,735	125,735	125,735
R-squared	0.0031	0.0165	0.0032	0.0164	—	0.0126

Difference-in-difference OLS. New business start is self-employment in a year after no self-employment.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

If this variation is accounted for by parents but not the econometrician, levels regressions might inappropriately assign planned changes in self-employment rates (designed around expected tuition growth rates) to changes in tuition levels.

To account for this potential source of misspecification, Table 5 repeats the individual- and household-level analysis using the triple-differences estimator from Equation (3), except substituting tuition growth rates for levels. The first two columns of each panel show the OLS results with and without covariates, and the remaining two columns present the instrumental variables estimates. Note that the reduced-form equation here is the same as the instrument has not changed (only the variable being instrumented).

The effects of interest are all highly significant and large in size. For example, the point values in Panel A, column (3) imply that a one percentage-point increase in the growth rate of in-state tuition reduces new business starts by 3.8%. Increasing the tuition growth rate by one standard deviation (just under 8.7 percentage points) means a 0.06 standard deviation decline in the number of individuals moving to self-employment (about one percentage point). If these marginal effects are representative of the interquartile range of the tuition growth distribution, a state moving from the 25th percentile of tuition growth rates (about 3% per year) to the 75th percentile (nearly 8% per year) would see a 19% drop in new business starts among parents of older children.

These effects are remarkably similar when the data are aggregated to the household level, as reported in Panel B. A one percentage-point increase in the growth rate of tuition is associated with a 2.9% reduction in the number of households entering self-employment, and a one standard deviation increase in the growth rate means a 0.06 standard deviation decline in starts. Taken as a whole, Table 5 supports the conclusion that whatever relationship exists between public university tuition and parental self-employment is present in both the level and the growth rate of college costs.

Heterogeneity by number of children.

How do these estimates differ for families of different types? One obvious starting point would be to consider families with more or fewer children, since the impact of college tuition is likely to be felt more acutely in larger households. Table 6 explores this prediction by applying the triple-difference IV estimator to households with different numbers of children. For example, the sample in column (2) includes families who either have no children or who have two living in the household.

It is important to note that, by construction, younger families are smaller on average than older families, so the samples in each column will vary along multiple dimensions.

Table 5: Triple-Difference by Parental Status and Child Age (Growth Rates)

Panel A: Individual-Level				
	OLS		IV	
Dependent Variable: $Start_{it}$	(1)	(2)	(3)	(4)
$g(InstTuit)_{st} \cdot HasKids_{it} \cdot Over16_{it}$	-0.0245+	-0.0240+	-0.1155**	-0.1132**
	(0.0135)	(0.0134)	(0.0317)	(0.0310)
$g(InstTuit)_{st} \cdot HasKids_{it}$	-0.0117	-0.0105	-0.0569**	-0.0550**
	(0.0071)	(0.0071)	(0.0213)	(0.0213)
$HasKids_{it} \cdot Over16_{it}$	0.0008	0.0009	0.0061**	0.0060**
	(0.0016)	(0.0016)	(0.0018)	(0.0017)
$g(InstTuit)_{st}$	0.0130+	0.0132+	0.0594**	0.0580**
	(0.0072)	(0.0071)	(0.0211)	(0.0206)
$HasKids_{it}$	0.0017+	-0.0056**	0.0043**	-0.0032+
	(0.0010)	(0.0017)	(0.0013)	(0.0018)
Covariates	—	✓	—	✓
Observations	194,017	194,017	191,977	191,977
R-squared	0.0016	0.0101	0.0012	0.0096

Panel B: Household-Level				
	OLS		IV	
Dependent Variable: $Start_{ht}$	(1)	(2)	(3)	(4)
$g(InstTuit)_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$	0.0081	0.0098	-0.1502*	-0.1671*
	(0.0185)	(0.0191)	(0.0721)	(0.0690)
$g(InstTuit)_{st} \cdot HasKids_{ht}$	-0.0081	-0.0050	-0.0290	-0.0289
	(0.0156)	(0.0151)	(0.0254)	(0.0251)
$HasKids_{ht} \cdot Over16_{ht}$	0.0057*	0.0007	0.0149**	0.0110**
	(0.0027)	(0.0027)	(0.0042)	(0.0042)
$g(InstTuit)_{st}$	0.0192	0.0177	-0.0125	-0.0114
	(0.0138)	(0.0136)	(0.0310)	(0.0303)
$HasKids_{ht}$	0.0065**	-0.0040+	0.0079**	-0.0027
	(0.0016)	(0.0022)	(0.0013)	(0.0018)
Covariates	—	✓	—	✓
Observations	127,270	127,270	125,735	125,735
R-squared	0.0032	0.0165	0.0026	0.0157

Triple-difference OLS and 2SLS. New business start is self-employment in a year after no self-employment.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.
Panels A and B report the results using the year-over-year growth rate of public in-state tuition using individual-level and household-level data, respectively.

Table 6: Heterogeneity by Number of Children (Household-Level)

Dependent Variable: $Start_{ht}$	If $HasKids_{ht} = 1$, number of children in household is ...					Linear Interaction
	One	Two	Three	Four	$\geq$ Five	
	(1)	(2)	(3)	(4)	(5)	(6)
$InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$	-0.0135	-0.0163**	0.0233	-0.1001	-0.0440	-0.0056
	(0.0085)	(0.0057)	(0.0158)	(0.0622)	(0.1328)	(0.0099)
$InstTuit_{st} \cdot HasKids_{ht}$	-0.0024	-0.0013	-0.0157*	0.0111	0.0324	-0.0036
	(0.0051)	(0.0033)	(0.0073)	(0.0133)	(0.0327)	(0.0069)
$InstTuit_{st}$	-0.0402	-0.0103	-0.0232	-0.0514	0.0018	-0.0658+
	(0.0302)	(0.0323)	(0.0400)	(0.0441)	(0.0518)	(0.0345)
$HasKids_{ht} \cdot Over16_{ht}$	0.0515+	0.0641**	-0.0693	0.3298+	0.1197	0.0291
	(0.0284)	(0.0168)	(0.0530)	(0.1879)	(0.4203)	(0.0303)
$HasKids_{ht}$	0.0130	0.0085	0.0639**	-0.0224	-0.0782	0.0129
	(0.0163)	(0.0104)	(0.0236)	(0.0438)	(0.1097)	(0.0221)
$InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht} \cdot Chl_{ht}$						-0.0044
						(0.0045)
$InstTuit_{st} \cdot HasKids_{it} \cdot Chl_{ht}$						0.0004
						(0.0027)
$HasKids_{ht} \cdot Over16_{ht} \cdot Chl_{ht}$						0.0129
						(0.0130)
$HasKids_{ht} \cdot Chl_{ht}$						0.0018
						(0.0085)
$\chi^2(2)$						7.736
$p > \chi^2$						0.0209
Observations	90,822	89,489	76,251	70,238	68,736	125,735
R-squared	0.0016	0.0028	0.0022	—	0.0033	—

Triple-difference OLS. New business start is self-employment in a year after no self-employment.
χ^2 test is for $InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht} \cdot Chl_{ht} = InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht} = 0$.
Columns (1)-(5) compare households with number of children specified to households without children.
Column (6) uses the full sample and interacts number of children (Chl_{ht}) with each variable.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

Households with fewer children should not be treated as reasonable analogues to households with more children since these decisions are endogenous and may be related to self-employment decisions, financial constraints, and other important economic considerations. As a result, the estimates should be treated as suggestive of heterogeneity by number of children, rather than interpreted as implying shocks to the number of children would necessarily change the marginal effect of tuition on self-employment.

The point estimates do support the notion that families with more children are more "exposed" to the cost of college, and should be more sensitive to fluctuations in the price of tuition. The $InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$ coefficient is generally decreasing in number of children, though the coefficient on three-child households is positive and insignificant and the other negative estimates are also insignificant. Households with five or more children show a high sensitivity to the cost of in-state tuition—more than three times the effect for single-child households—though the point estimate is similarly not significant.

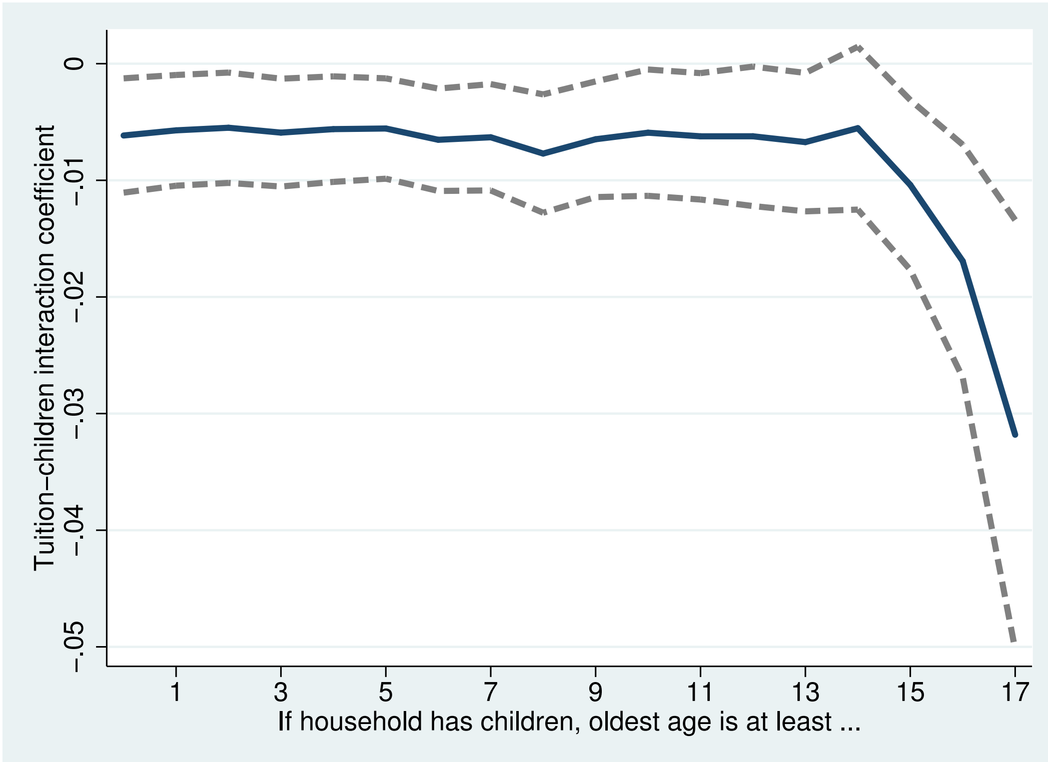
Interacting the number of children with each of the variables in Equation (3) allows the relationship between tuition and self-employment to vary linearly in child headcount, column (5) of Table 6 shows the result of this approach. Each additional child deepens the negative relationship between tuition and self-employment starts by an addition 0.44 percentage points, and a chi-squared test for both $InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$ and its interaction with number of children being zero is significant at the 5% level. The point estimates imply that a household with three children will exhibit an 89% more negative relationship between tuition and self-employment than a single-child family. While not conclusive, these findings are consistent with an occupational choice model in which households account for the cost of a college education when making self-employment decisions, and they are more sensitive to these costs when their exposure is greater.

Heterogeneity by child age.

Another reasonable prediction of this hypothesized link is that households whose children are closer to college age are more negatively affected by the rising cost of tuition. This assumption underlies the intuition for sorting households into "treatment" and comparison groups based on the age of their children, but it can also be tested directly.

Figure 3 repeats the difference-in-difference framework in equation (1) but restricting the sample to households who either (i) have no children, or (ii) have a child who is at least the age specified on the horizontal axis. The solid line represents the point estimate on $InstTuit_{st} \cdot HasKids_{ht}$ using instrumental variables difference-in-differences, and the dashed line is the 95% confidence interval. Moving rightward along the graph, the sample

Figure 3: Heterogeneity by Age of Oldest Child



shifts to pare away households with only young children, where the definition of “young” is becoming more expansive as the horizontal axis increases.

For example, the left-most point is merely a reproduction of Table 1, column (5): it includes households with no children and those with at least one child whose age is greater than zero (i.e. all households with children). When the horizontal axis reads “5”, the plot represents the point estimate of a regression excluding households who children are all under five years of age. The right-most points include only households who either have an older child, or have no children. Because the sample size is monotonically decreasing as the horizontal axis increases, the standard error band increases steadily as well.

The shape of the curve reveals that the all-household effect presented in Table 1 and shown on the left-most side of the graph masks substantial heterogeneity by child age. As successively more households are dropped so that the effects are identified only on those with the oldest children, the point estimates increase dramatically. When the estimator compares households who either have at least one 17-year-old or no kids at all, the effects are more than four times that for the average parental household. The career decisions undertaken by parents of older teenagers appear to be driving most of the relationship between tuition costs and self-employment.

The same pattern appears when plotting the coefficient on $Surplus_{s,t-1} \cdot HasKids_{ht}$ from the reduced-form equation (not reported), and the relative effect sizes are similar: self-employment in households with 17-year-olds are 4-5 times more affected by recent budget surpluses than households with no kids. This is reassuring evidence given a model in which the tuition hikes induced by state budget shortfalls affect households with children about to enter college.

5 Robustness and Falsification

The story that budget shortfalls affect the self-employment decision of parents with college-age children primarily through tuition rates relies on the assumption that state surpluses do not affect the cost of non-public forms of higher education. If they did, the instrument would have a secondary channel through which to affect parental households. Even though this channel has the same intuitive character of the main results—higher tuition costs make parents less likely to start firms—it threatens the identification strategy in the previous section and casts doubt on interpreting the results as anything like causal average treatment effects.

One direct test of this possibility is to see if the instrument predicts private, 4-year, full-time tuition costs in the same way it does for public in-state tuition. Table 7 shows the first-stage regressions underlying the IV results in Tables 1-5, column (1) for the level of tuition and column (2) for the growth rate. The columns (3) and (4) run the same analysis on the average annual tuition and fees for full-time students at 4-year, not-for-profit colleges and universities in state s. The results are different in sign and not statistically significant, and the coefficient on growth rates is several orders of magnitude smaller. I find no evidence in the CPS that budget surpluses and shortfalls are predictors of private college and university tuition, likely because these rates are set by factors largely internal to the school—such as alumni/ae donations, endowment performance, and local labor and administrative costs.

Another source of bias is selection on unobservables, in which households select into both self-employment and child-rearing based on factors unseen to the econometrician. Controlling for observables does not resolve this problem if they are poor at predicting the relevant unobservables, and even instrumented difference-in-differences may not remove this source of bias if differential trends in these unobservables are what drives movement into the “treatment” group.

However, if observables and unobservables are sufficiently correlated, examining differences between the point estimates and the predictive quality of the model with and

Table 7: Public vs. Private Tuition (Individual-Level)

Dependent Variable:	$InstTuit_{st}$	$g(InstTuit)_{st}$	$PrivTuit_{st}$	$g(PrivTuit)_{st}$
	(1)	(2)	(3)	(4)
$Surplus_{s,t-1}$	-0.0016*	-0.0024**	0.0021	0.0000
	(0.0006)	(0.0004)	(0.0025)	(0.0001)
Observations	191,977	191,977	189,484	189,484
R-squared	0.9906	0.2720	0.9900	0.1862

Difference-in-difference OLS. Private tuition refers to private, 4-year, not-for-profit colleges.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

without observables can be instructive in understanding the degree of selection on unobservables. In a true experiment, treatment is orthogonal to demographic characteristics by construction, so the covariates simply increase precision by explaining extraneous variation in the outcome variables. As a result, controlling for observables should narrow the confidence intervals and increase the portion of the data explained by the model, but have no effect on the actual point estimates themselves (Oster, 2013).

Intuitively, if observables are a sufficient proxy for unobservables, including them in the model should have only minimal effects on the point estimates but large effects on the amount of variation explained. In this scenario, the identification strategy is more quasi-experimental, as observables help with estimate precision but assignment of treatment and control groups is closer to random. Comparing point estimates and R-squared values with and without observables provides some suggestive evidence whether the identification strategy hinges on group assignments that are orthogonal to observables (and potentially, unobservables).

For example, the effect sizes in columns (3) and (4) in Table 5, Panels A and B, are largely unaffected by the inclusion of household-level covariates. The coefficient on $g(InstTuit)_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$ changes by 2% in the individual-level regressions and 11% in the household-level analysis, and the standard errors decrease sufficiently that the t-statistics increase in both instances. The corresponding R-squared values, on the other hand, increases by 8-fold and 6-fold, respectively, when including covariates. A similar pattern holds in the reduced-form regressions in Tables 1-4, with point estimates changing very little as R-squared values increase 5- to 10-fold.[8]

[8]The IV estimates sometimes provide unreliable R-squared values because of the high number of regressors, so these are omitted in Tables 1-4.

6 Discussion

The rising cost of a college education and the secular decline in new business starts over the past several decades are both areas of intense public interest. Popular discourse around higher education prices point to the role of debt overhang in constraining employment decisions and damaging the economic security of entire generations of college-goers. Government actors and economists point to flagging business dynamism and entrepreneurship as jeopardizing job creation, innovation, and global competitiveness. While researchers have had long-standing interests on both of these issues, few studies have sought to connect the two phenomena. This paper provides some early evidence that the decision to go into business for oneself is strongly and negatively affected by the cost of college.

Using data from the Current Population Survey, I show that flow into self-employment is negatively associated with both the level and the growth rate of public university tuition in the period 1996-2009. I focus on parents of near-college-age children, since their own educational investments have typically already been made. Parents are affected by college prices by internalizing some of the cost their children (and potentially they) may soon pay, but because they are unlikely to enroll themselves, this manifests as purely a price effect. When examining the decision to start a firm, stripping away the effect of education costs on enrollment helps disentangle the complicated relationship between tuition prices, skill human capital and lifetime career plans.

I employ a number of comparison groups, contrasting parents with non-parents, parents of older children to those with only younger children, and a combination of these two strategies. In addition, I instrument for public tuition levels and growth rates using state surpluses (and shortfalls), exploiting research showing that state governments frequently cut education appropriations to close budgetary gaps and that public universities replace these funds by raising prices.

Using these strategies, I find that budget-driven changes in the cost of tuition are consistently significant in predicting parental entry into self-employment. A 10% increase in annual tuition is associated with a 13.9% decline in new business starts among parents of near-college-age children, relative to non-parents and parents of younger children. A one percentage-point increase in the growth rate of tuition means a 3.8% decrease in new self-employment. These effects are unchanged when including a battery of demographic and economic variables, and there is no evidence that private colleges and universities are similarly affected by state budgets.

The results exhibit substantial heterogeneity by both number of children in a household and the age of a family's oldest child. Households with more children respond more negatively to tuition hikes: allowing the relationship to vary linearly in number of children implies households with three kids are almost twice as sensitive to rising tuition than single-child families when it comes to self-employment entry. I also find that the bulk of the average population effects are driven by households with the oldest children. For example, new business starts from households with 17-year-olds are more than 4 times as sensitive to the cost of college than the average household, suggesting the relationship between the two variables is attenuated when parents have more time to adjust to price fluctuations. Taken together, this cross-household variation is consistent with a model of forward-looking individuals who expect to bear some of the costs of their children's college education and whose career trajectories and appetite for risk adjust accordingly.

While there are a number of potential threats to causal identification when untangling thorny economic relationships such as these, the results provide some strong suggestive evidence that new business starts are negatively impacted by rising tuition rates. There are many channels through which higher education costs might hamper entrepreneurship: debt overhang may reduce the risk tolerance of debtors and increase the collateral requirements of creditors; higher drop-out rates could damage the human capital accumulation necessary for starting a firm; high tuition growth rates may increase uncertainty about future economic conditions and shift workers into less risky investments; and simple wealth effects mean households have to trade off between paying for school or accumulating their startup capital.

This study focuses on price effects by looking at a group whose educational decisions are fixed but whose employment decisions of flexible. However, this comes at the cost of both generalizability and the ability to understand the underlying mechanisms in greater detail. It remains to be determined whether the price effect operates chiefly through wealth—conditional on their planned investments, households are poorer when prices increase, and this wealth decline reduces self-employment entry—or risk tolerance—households are uncertain whether high price growth are temporary or permanent, and respond by increasing their savings and moving out of risky activities. Future work will need to better ascertain how price responses compare to and interact with debt overhang and drop-out rate mechanisms, and whether these reactions are also internalized by college students. Nonetheless, this is an early step towards understanding how the rising cost of higher education and the decline in business dynamism are related in the American economy.

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Appendix

Table A1.1: Summary Statistics (Individual-Level)

Current Population Survey				
Variable	Description	Obs.	Mean	Std. Dev.
$Start_{it}$	0 if not self-employed, 1 if become self-employed	194,017	0.0306416	0.1723453
$Start_{ht}$	0 if no self-employed members, 1 if gained self-employed member	178,759	0.0533903	0.2248112
$HasKids_{ht}$	Household has children (<18) present	194,017	0.4813135	0.499652
$ginc_{ht}$	Gross annual household income ($)	194,017	81164.5	65476.24
$black_{ht}$	Household has African-American member	194,017	0.0918992	0.2888843
$hisp_{ht}$	Household has Hispanic member	194,017	0.1065061	0.3084851
$hsize_{ht}$	Household size	194,017	3.090822	1.456975
$married_{ht}$	Household has married individuals	194,017	0.6936815	0.4609648
$healthins_{ht}$	Household has member with health insurance	194,017	0.8889118	0.3142421
$moved_{ht}$	Household has individuals who moved in the previous year	194,017	0.0211579	0.143911
$urban_{ht}$	Household is located in a city	194,017	0.7894617	0.407692
$renter_{ht}$	Head of household rents domicile	194,017	0.1973641	0.3980105
$school\_hs_{ht}$	Household has member with high school diploma	194,017	0.9195947	0.2719204
$school\_ba_{ht}$	Household has member with bachelor's degree	194,017	0.4326219	0.4954407
$school\_grad_{ht}$	Household has member with graduate degree	194,017	0.1140416	0.3178625
$unempins_{ht}$	Household has individual receiving unemployment insurance	194,017	0.0778592	0.2679505
$disab_{ht}$	Household has individual receiving disability insurance	194,017	0.0116897	0.1074854
vet_{ht}	Household has individual receiving veterans' benefits	194,017	0.0172253	0.1301102
$childsupp_{ht}$	Household has individual receiving child support	194,017	0.0497534	0.2174355
$socsec_{ht}$	Household has individual receiving Social Security	194,017	0.0938114	0.2915669
$medicare_{ht}$	Household has individual receiving Medicare	194,017	0.0059479	0.0768933
$children_{ht}$	Number of children (<18) present in the household	194,017	0.9034054	1.146037
$employed_{ht}$	Household has at least one employed member	194,017	0.9942582	0.0755568
$workers_{ht}$	Number of working adults in the household	194,017	1.984955	0.8645216
$hours_{ht}$	Average number of hours worked by adults in a typical workweek	194,017	40.33257	10.27553
$weeks_{ht}$	Average number of weeks worked by adults in a typical year	194,017	48.41938	9.642591
$age\_maxchild_{ht}$	Age of oldest child (0-17) present in the household	94,095	10.73346	5.026507
$Over16_{ht}$	Household has a child at least 16 years of age present	194,017	0.1096347	0.3124347
Integrated Post-Secondary Education Data System (IPEDS)				
Variable	Description	Obs.	Mean	Std. Dev.
$InstTuit_{st}$	Average instate tuition charged by household state's public, 4-year, not-for-profit colleges ($k)	194,017	3.452903	1.705539
$g(InstTuit)_{st}$	$(InstTuit_{st}/InstTuit_{st-1}) - 1$	194,017	0.0603554	0.0867962
$PrivTuit_{st}$	Average tuition charged by household state's private 4-year colleges ($k)	191,524	14.20156	4.865546
$g(PrivTuit)_{st}$	$(PrivTuit_{st}/PrivTuit_{st-1}) - 1$	191,524	0.0685091	0.0583498
Annual Survey of State Government Finances				
Variable	Description	Obs.	Mean	Std. Dev.
$Surplus_{s,t-1}$	Previous annual budget surplus (deficit) in household's state ($M)	191,977	4.121119	11.10019

CPS data was retrieved from the March Supplement files, available at nber.org.
IPEDS data were retrieved from nces.ed.gov/ipeds.
The Annual Survey of State Government Finances was retrieved from census.gov/govs/state.

Table A1.2: Tuition Growth by State and Year

	Avg. Instate Tuition ($k)		Avg. Tuition Growth			Avg. Instate Tuition ($k)		Avg. Tuition Growth	
State	Mean	Std. Dev.	Mean	St. Dev.	**State**	Mean	Std. Dev.	Mean	Std. Dev.
Alabama	2.7271007	0.81857904	0.06713563	0.04757728	North Carolina	1.507484	0.44716523	0.07575754	0.05238265
Alaska	3.0054455	0.78037672	0.06510561	0.11991387	North Dakota	3.430897	0.95532446	0.06260466	0.06166962
Arizona	2.7220192	0.78897886	0.06398262	0.39622205	Ohio	4.2966725	1.012319	0.02864197	0.03784907
Arkansas	2.2799905	0.70781451	0.07389999	0.03106428	Oklahoma	2.443934	0.77547524	0.05328982	0.07077785
California	1.4641525	0.43858017	0.05669989	0.12491266	Oregon	3.4270107	0.9313687	0.06007449	0.04867152
Colorado	2.9292844	0.64955397	0.0487265	0.05199919	Pennsylvania	6.226552	1.2049887	0.03956464	0.03501354
Connecticut	3.5242549	0.88172689	0.06581442	0.08341901	Rhode Island	4.7208455	1.0848555	0.06091824	0.02246851
Delaware	3.6425059	0.89905817	0.07728481	0.05480581	South Carolina	4.2572559	1.4572069	0.08798133	0.05158836
DC	2.4937696	1.3642224	0.23057344	0.30504139	South Dakota	4.0880986	0.66982006	0.04093286	0.03313502
Florida	1.967146	0.51112644	0.09639094	0.06286264	Tennessee	2.6464609	1.0139892	0.13842936	0.12116841
Georgia	2.0382406	0.53715481	0.08104416	0.05983655	Texas	2.4016656	0.76732153	0.07040988	0.02723153
Hawaii	1.9618247	0.54903837	0.0975562	0.06766021	Utah	2.367066	0.7120544	0.07445203	0.04872824
Idaho	2.8541693	0.67939997	0.0558305	0.02451058	Vermont	9.1045427	1.9103821	0.05187728	0.02396013
Illinois	5.2504259	1.0230193	0.0501605	0.03132442	Virginia	3.4247177	0.84033285	0.05318812	0.08392718
Indiana	4.4902742	1.0474689	0.06118052	0.05664823	Washington	2.7240487	0.6380342	0.05735785	0.01441337
Iowa	3.2371839	0.76270708	0.04883491	0.03658058	West Virginia	2.6434309	0.69704054	0.06135655	0.06452983
Kansas	2.2989406	0.57936986	0.05786209	0.0332211	Wisconsin	3.6674024	0.89707777	0.05345522	0.02037834
Kentucky	4.0188811	1.745403	0.10780426	0.14731458	Wyoming	1.8128739	0.28962164	0.05190831	0.02168867
Louisiana	2.372554	0.53331596	0.04634541	0.02627365					
Maryland	5.3532452	0.7132458	0.03163214	0.03126348	**Year**				
Massachusetts	3.8486072	0.89679268	0.01539572	0.08877676	1997	2.3704598	1.1471126	0.04071962	0.08585891
Michigan	3.8943458	0.95738343	0.05892092	0.02551805	1998	2.5046455	1.2015811	0.04899946	0.06031941
Minnesota	4.4368258	1.1771542	0.05707839	0.02867704	1999	2.5768685	1.200804	0.04490047	0.0870387
Mississippi	2.205386	0.56691998	0.04541692	0.06671568	2000	2.6782777	1.2679247	0.03884838	0.0944318
Missouri	3.9733315	0.84345157	0.04397389	0.06122186	2001	2.8446936	1.2963989	0.08168241	0.17031398
Montana	3.0328969	0.7124536	0.04833602	0.04486073	2003	3.3949522	1.442003	0.1090383	0.09276685
Nebraska	3.0299112	0.78917951	0.0640784	0.02181525	2005	3.7955986	1.5626269	0.05943293	0.0301297
Nevada	2.0486031	0.54449579	0.0767435	0.02974545	2006	4.0293369	1.6445829	0.05831095	0.05403279
New Hampshire	6.1614768	1.2060834	0.06012569	0.03882823	2007	4.1811505	1.7041435	0.04940359	0.03555382
New Jersey	5.0472629	1.2827473	0.06371643	0.03580509	2008	4.4157307	1.8023492	0.04702591	0.06507149
New Mexico	1.6961287	0.29977825	0.0176057	0.100484	2009	4.701515	1.8441388	0.08217926	0.09343499
New York	4.2123505	0.60446984	0.03818697	0.05011644					

Data: CPS, 1996-2009.

Table A1.3: Difference-in-Differences by Parental Status (Household-Level)

Dependent Variable: $Start_{ht}$	OLS		Reduced Form		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$InstTuit_{st} \cdot HasKids_{ht}$	0.0006	0.0002			-0.0062*	-0.0066**
	(0.0009)	(0.0008)			(0.0025)	(0.0025)
$InstTuit_{st}$	0.0047	0.0045			-0.0617*	-0.0637*
	(0.0050)	(0.0050)			(0.0292)	(0.0304)
$HasKids_{ht}$	0.0053	-0.0048	0.0070**	-0.0047*	0.0289**	0.0191*
	(0.0033)	(0.0040)	(0.0014)	(0.0022)	(0.0081)	(0.0080)
$Surplus_{s,t-1}$			0.0000	0.0000		
			(0.0001)	(0.0001)		
$Surplus_{s,t-1} \cdot HasKids_{ht}$			0.0001*	0.0001**		
			(0.0001)	(0.0001)		
Covariates	—	✓	—	✓	—	✓
Observations	127,270	127,270	125,735	125,735	125,735	125,735
R-squared	0.0031	0.0165	0.0031	0.0163	0.0003	0.0134

Difference-in-difference OLS. New business start is self-employment in a year after no self-employment. Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list. Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

Table A1.4: Difference-in-Differences by Child Age (Household-Level)

Dependent Variable: $Start_{ht}$	OLS		Reduced Form		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$InstTuit_{st} \cdot Over16_{ht}$	-0.0003	-0.0005			-0.0136*	-0.0154**
	(0.0016)	(0.0017)			(0.0055)	(0.0051)
$InstTuit_{st}$	0.0004	-0.0002			-0.1395*	-0.1297*
	(0.0068)	(0.0066)			(0.0558)	(0.0517)
$Over16_{ht}$	0.0075	0.0024	0.0050+	-0.0005	0.0528**	0.0535**
	(0.0062)	(0.0065)	(0.0026)	(0.0027)	(0.0171)	(0.0155)
$Surplus_{s,t-1}$			0.0002*	0.0001*		
			(0.0001)	(0.0001)		
$Surplus_{s,t-1} \cdot Over16_{ht}$			0.0003*	0.0003**		
			(0.0001)	(0.0001)		
Covariates	—	✓	—	✓	—	✓
Observations	56,954	56,954	56,535	56,535	56,535	56,535
R-squared	0.0042	0.0173	0.0042	0.0172	—	0.0074

Difference-in-difference OLS. New business start is self-employment in a year after no self-employment. Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list. Restricted to households with children. Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.

Table A1.5: Main Results with Unbalanced Panel (Individual-Level)

Dependent Variable: $Start_{it}$	Reduced Form	IV				
	(1)	(2)	(3)	(4)	(5)	(6)
$Surplus_{s,t-1} \cdot HasKids_{it} \cdot Over16_{it}$	0.0002**					
	(0.0001)					
$Surplus_{s,t-1} \cdot HasKids_{it}$	0.0001+					
	(0.0000)					
$HasKids_{it} \cdot Over16_{it}$	-0.0010			0.0301**	0.0045**	0.0101
	(0.0011)			(0.0101)	(0.0014)	(0.0274)
$Surplus_{s,t-1}$	-0.0001+					
	(0.0000)					
$HasKids_{it}$	0.0023*	0.0217**		0.0153*	0.0049**	0.0240*
	(0.0009)	(0.0078)		(0.0071)	(0.0011)	(0.0109)
$InstTuit_{st} \cdot HasKids_{it}$		-0.0056*		-0.0037+		-0.0078*
		(0.0023)		(0.0021)		(0.0031)
$InstTuit_{st}$		0.0141	-0.0495*	0.0149		0.0161
		(0.0201)	(0.0250)	(0.0203)		(0.0215)
$InstTuit_{st} \cdot Over16_{it}$			-0.0085**			
			(0.0030)			
$Over16_{it}$			0.0287**			
			(0.0096)			
$InstTuit_{st} \cdot HasKids_{it} \cdot Over16_{it}$				-0.0088**		-0.0012
				(0.0031)		(0.0080)
$g(InstTuit)_{st} \cdot HasKids_{it} \cdot Over16_{it}$					-0.0814**	
					(0.0252)	
$g(InstTuit)_{st} \cdot HasKids_{it}$					-0.0391*	
					(0.0177)	
$g(InstTuit)_{st}$					0.0397*	
					(0.0176)	
$InstTuit_{st} \cdot HasKids_{it} \cdot Over16_{it} \cdot Chl_{it}$						-0.0039
						(0.0038)
$InstTuit_{st} \cdot HasKids_{it} \cdot Chl_{it}$						0.0022+
						(0.0012)
$HasKids_{it} \cdot Over16_{it} \cdot Chl_{it}$						0.0101
						(0.0133)
$HasKids_{it} \cdot Chl_{it}$						-0.0046
						(0.0038)
Observations	241,138	241,138	112,296	241,138	241,138	241,138
R-squared	0.0015	0.0004	—	—	0.0012	0.0012

Triple-difference OLS and 2SLS. New business start is self-employment in a year after no self-employment.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.
Column (1) reports the reduced form estimates using the triple-difference strategy.
Column (2) reports the IV difference-in-difference results using household variation by parental status.
Column (3) reports the IV difference-in-difference results using parental households varying by age of oldest child.
Columns (4) and (5) report the IV triple-difference results for tuition levels and growth rates, respectively.
Column (6) reports heterogeneity in the IV triple-difference results by number of children in a household.

Table A1.6: Main Results with Unbalanced Panel (Household-Level)

Dependent Variable: $Start_{ht}$	Reduced Form	IV				
	(1)	(2)	(3)	(4)	(5)	(6)
$Surplus_{s,t-1} \cdot HasKids_{ht} \cdot Over16_{ht}$	0.0003*					
	(0.0001)					
$Surplus_{s,t-1} \cdot HasKids_{ht}$	0.0001*					
	(0.0000)					
$HasKids_{ht} \cdot Over16_{ht}$	0.0042+			0.0549**	0.0144**	0.0584*
	(0.0024)			(0.0150)	(0.0041)	(0.0236)
$Surplus_{s,t-1}$	0.0000					
	(0.0001)					
$HasKids_{ht}$	0.0107**	0.0401**		0.0275**	0.0139**	0.0256
	(0.0014)	(0.0086)		(0.0088)	(0.0014)	(0.0202)
$InstTuit_{st} \cdot HasKids_{ht}$		-0.0080**		-0.0047+		-0.0056
		(0.0026)		(0.0026)		(0.0063)
$InstTuit_{st}$		-0.0530*	-0.1408*	-0.0564+		-0.0559+
		(0.0267)	(0.0555)	(0.0324)		(0.0321)
$InstTuit_{st} \cdot Over16_{ht}$			-0.0139**			
			(0.0052)			
$Over16_{ht}$			0.0533**			
			(0.0160)			
$InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$				-0.0144**		-0.0144+
				(0.0049)		(0.0080)
$g(InstTuit)_{st} \cdot HasKids_{ht} \cdot Over16_{ht}$					-0.1520*	
					(0.0688)	
$g(InstTuit)_{st} \cdot HasKids_{ht}$					-0.0469*	
					(0.0217)	
$g(InstTuit)_{st}$					0.0032	
					(0.0248)	
$InstTuit_{st} \cdot HasKids_{ht} \cdot Over16_{ht} \cdot Chl_{ht}$						-0.0000
						(0.0034)
$InstTuit_{st} \cdot HasKids_{ht} \cdot Chl_{ht}$						0.0005
						(0.0024)
$HasKids_{ht} \cdot Over16_{ht} \cdot Chl_{ht}$						-0.0017
						(0.0095)
$HasKids_{ht} \cdot Chl_{ht}$						0.0009
						(0.0076)
Observations	148,209	143,127	60,188	143,127	143,127	143,127
R-squared	0.003	0.0007	—	—	0.0029	—

Triple-difference OLS and 2SLS. New business start is self-employment in a year after no self-employment.
Includes time- and state-FE and state-specific linear trends trends. See appendix for covariate list.
Data: CPS 1996-2009. ** 0.01, * 0.05, + 0.1. Robust standard errors clustered at the state level.
Column (1) reports the reduced form estimates using the triple-difference strategy.
Column (2) reports the IV difference-in-difference results using household variation by parental status.
Column (3) reports the IV difference-in-difference results using parental households varying by age of oldest child.
Columns (4) and (5) report the IV triple-difference results for tuition levels and growth rates, respectively.
Column (6) reports heterogeneity in the IV triple-difference results by number of children in a household.