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ORIGINAL ARTICLE

Business Cycles, Race, and Investment in Graduate Education

Vicki L. Bogan[1] · **Di Wu**[2]

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Abstract
This paper examines how macroeconomic factors influence household decision making with regard to human capital investment. We provide evidence suggestive of a causal relationship between macroeconomic indicators and the decision to pursue graduate education. Overall, we find graduate school enrollment is counter-cyclical with the business cycle and the magnitude of the relationship between macroeconomic indicators and the specific type of graduate school programs varies. In particular, we find differential racial effects of the business cycle on graduate school enrollment. The magnitude of the effects of the business cycle on graduate school enrollment is greater for some under-represented minority groups.

Keywords Human capital investment · Business cycles · Education

Introduction

> ***"When America catches a cold, minorities catch pneumonia"*** *- Unknown*

During times of economic difficulty, there is evidence to suggest that certain ethnic households in the USA disproportionately suffer economic hardships such as higher unemployment, bankruptcy, and home foreclosure rates. For example, during an expansionary time in 2005, unemployment for college-educated whites was 2.1% while it was 3.5% for college-educated African Americans and 2.9% for college-educated Latinos. In the less robust economy of 2010, the college-educated unemployment rate was 4.3% for whites, 7.9% for African Americans, and 6.0% for Latinos.[1] If the business cycle differentially affects ethnic groups, then responses to the business cycle also may be different by racial group.

There has been considerable literature devoted to investigating how the business cycle affects human capital investment decisions. Generally, the literature focuses on primary, secondary, and undergraduate education forms of human capital investment (see for example, Herman 2010; Dellas and Koubi 2003; Dellas and Sakellaris 2003; Boffy-Ramirez et al. 2010; Betts and McFarland 1995; Higa 2010; Heylen and Pozzi 2007; Blackburn and Varvarigos 2008). However, the opportunity cost (due to lost wages) to pursue an advanced degree is considerably larger than that related to pursuing a high school, associate, or bachelor's degree. Hence, business cycle fluctuations are more likely to affect graduate and professional school enrollment than primary, secondary, or undergraduate enrollment. Nonetheless, the literature examining the effect of the business cycle on graduate school and professional school enrollment is more limited (Bedard and Herman 2008; Wei 2004; Goh 2009). Bedard and Herman (2008) find specific differences for higher levels of education. They find male Ph.D. enrollment is counter-cyclical, male master's degree enrollment is procyclical, and female enrollment is acyclical among various advanced degree categories.

While business cycle effects on enrollment and demographic characteristic effects on enrollment have been separately studied, to our knowledge, the work of Bedard and Herman (2008), using cross-section data, was first to analyze advance degree enrollment patterns across the business cycle by individual characteristics (undergraduate major, undergraduate GPA, gender). Using a panel data set, we build on the work of Bedard and Herman (2008) and

[1] Source - U.S. Census Bureau: http://www.census.gov/compendia/statab/cats/labor-force-employmentearnings.html

✉ Vicki L. Bogan
vlb23@cornell.edu

Di Wu
dwu@edgeworthconomics.com

[1] The Charles H. Dyson School of Applied Economics and Management, Cornell University, 201K Warren Hall, Ithaca, NY 14853, USA

[2] Edgeworth Economics, LLC, 1111 19th Street, NW 12th Floor, Washington, DC 20036, USA

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expand the literature by providing evidence suggestive of a causal relationship between the business cycle and graduate school enrollment. Moreover, using an over-sample of under-represented minority respondents, we analyze the relationship between the business cycle, graduate enrollment, and another salient individual characteristic that has been shown to influence educational choice—race.

Consistent with previous literature, we find that poorer economic conditions drive more people to enroll in graduate school programs and that the magnitude of the relationship between the business cycle and the specific type of graduate school programs varies. More importantly, we find large differential racial effects of the business cycle on graduate school enrollment. Given theory indicates that graduate school enrollment is driven by the opportunity costs to pursue a graduate degree, this evidence suggests lower opportunity costs for minorities. While there are a number of potential explanations for lower minority opportunity costs, this finding is consistent with the presence of a greater degree of wage discrimination.

The rest of the paper is organized as follows. "Data" presents the data used. "Theoretical Framework" discusses the theoretical framework. "Econometric Analysis" and "Robustness Checks" presents the econometric analysis and results. Finally, the last section summarizes key findings and provides concluding remarks.

Data

Overview

The primary data set used in this study is the public use National Longitudinal Survey of Youth (NLSY97).[2] For the NLSY97, in 1997, 8984 individuals born between 1980 and 1984 were interviewed and followed annually. To capture the decade in which this cohort most likely attends college and graduate school, we utilize data from survey years 2000 through 2011. The respondents were in their mid to late twenties at the time of the 2011 survey. Two subsamples comprise the NLSY97 cohort: (1) a sample of 6748 respondents designed to be representative of people living in the USA during the initial survey round and born between January 1, 1980, and December 31, 1984; (2) a supplemental sample of 2236 respondents designed to over-sample Hispanic/Latino and African American people living in the USA during the initial survey round and born during the same period as the main sample. We focus on the college graduate population in the sample and utilize both samples in our analysis to provide a large enough population of college graduate ethnic minorities to generate robust results. Our total number of college graduate observations pooled from twelve waves of data is 2720.

This data set is well suited for our analysis for a number of important reasons. The data set includes detailed information about individual educational history, debts held, income levels, and other demographic characteristics. Specifically with regard to education, the survey asks questions about years of school completed, highest degrees earned, and current school enrollment status. The school enrollment status is categorized by specific type of educational degree: high school, associate, bachelor's, master's, J.D., M.D., and Ph.D., which provides an opportunity to consider various educational groups. We use enrollment as the primary dependent variable due to the data availability and because we want to focus on the realized opportunity costs of attending graduate school. However, there is a very high correlation between annual enrollment and applications ($\rho = 0.9180$) (Allum et al. 2012).

Another key feature of the NLSY97 data is that it contains information about households' asset holding and college debt at the time of the survey. Further, the panel nature of the data enables us to use lagged variables to study the relationship over time. Additionally, the panel nature of the data set allows us to cluster standard errors at the individual level to control for idiosyncratic respondent variation that could influence graduate school enrollment decisions.

To reflect the business cycle fluctuations, we use two different macroeconomic indicators that have previously been used in the context of education and labor market decisions. We use unemployment rates (Bedard and Herman 2008; Boffy-Ramirez et al. 2010) and the S&P 500 Index level (Oyer 2008; Estrella and Mishkin 1998; Chauvet 1998). We obtain unemployment rate data from the Bureau of Labor Statistics and S&P 500 Index data from the US Federal Reserve website.

Descriptive Statistics

Summary statistics of the respondent characteristics in the last year of the NLSY sample (2011) are presented in Table 1. The graduate school enrollment characteristics of the full (unbalanced panel) sample are presented in Table 2. From Table 2, we see that there is a large difference in total graduate school enrollment between whites and African Americans (significant at the 1% level) and whites and Latinos (significant at the 1% level). For master's program enrollment, African Americans and Latinos have a significantly lower enrollment than whites (p values of 0.0000 and 0.0034 respectively). Whites have a significantly higher Ph.D. enrollment than Latinos (p value of 0.0264).

[2]Bureau of Labor Statistics.

Table 1 Summary statistics: respondent characteristics (year 2011)

Respondent characteristics	Full sample		White		African American		Latino/Hispanic		Asian	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Socioeconomic characteristics										
Age	28.17	1.69	28.00	1.46	28.36	1.56	28.55	1.29	28.92	1.35
Age^2	796.69	92.63	786.13	81.55	806.76	87.86	816.99	73.67	838.12	76.61
Percent male	43.86%	49.69%	51.77%	50.15%	34.45%	47.72%	51.35%	50.32%	40.00%	50.00%
Percent married	30.03%	45.90%	20.57%	40.56%	36.13%	48.24%	40.54%	49.43%	32.00%	47.61%
Avg. annual income (previous year)	37,353	27,477	34,102	25,587	35,173	23,682	39,771	24,876	62,668	48,402
Number of children	0.66	0.99	0.35	0.65	1.00	1.18	0.77	1.03	0.24	0.44
Average AFQT[a] score	56,501	25,247	61,774	26,600	50,148	22,236	50,997	23,906	64,672	27,205
Percent with college loans	10.70%	30.96%	15.60%	36.42%	11.76%	32.36%	2.70%	16.33%	0.00%	0.00%
Percent White	36.81%	48.29%	–	–	–	–	–	–	–	–
Percent African American	31.07%	46.34%	–	–	–	–	–	–	–	–
Percent Asian	6.53%	24.73%	–	–	–	–	–	–	–	–
Percent Latino/Hispanic	19.32%	39.53%	–	–	–	–	–	–	–	–
Percent other race	4.44%	20.62%	–	–	–	–	–	–	–	–
Regions (percent living in)										
Rural area	13.58%	34.30%	15.60%	36.42%	14.29%	35.14%	10.81%	31.26%	4.00%	20.00%
Northeast	4.44%	20.62%	4.96%	21.80%	4.20%	20.15%	4.05%	19.86%	4.00%	20.00%
North Central	19.58%	39.74%	17.73%	38.33%	30.25%	46.13%	6.76%	25.27%	20.00%	40.82%
South	30.29%	46.01%	17.02%	37.72%	55.46%	49.91%	25.68%	43.98%	16.00%	37.42%
West	44.65%	49.78%	58.87%	49.38%	10.08%	30.24%	60.81%	49.15%	60.00%	50.00%
Undergraduate major (percent)										
Business	4.44%	20.62%	3.55%	18.56%	5.04%	21.97%	4.05%	19.86%	0.00%	0.00%
Art	1.04%	10.18%	0.00%	0.00%	0.00%	0.00%	2.70%	16.33%	0.00%	0.00%
Social science	5.22%	22.28%	7.80%	26.92%	5.04%	21.97%	4.05%	19.86%	0.00%	0.00%
Science	0.26%	5.11%	0.00%	0.00%	0.84%	9.17%	0.00%	0.00%	0.00%	0.00%
Engineering	1.83%	13.41%	2.84%	16.66%	1.68%	12.91%	1.35%	11.62%	0.00%	0.00%
Pre-med	0.78%	8.83%	0.00%	0.00%	1.68%	12.91%	0.00%	0.00%	0.00%	0.00%
Other major	86.42%	34.26%	85.82%	37.86%	85.71%	35.49%	87.84%	42.36%	100.00%	0.00%
Observations	383		141		119		74		25	

[a]Armed Forces Qualification Test

Table 2 Summary statistics: graduate school enrollment by race— full unbalanced panel (years 2000–2011)

	Full sample	White	African American	Asian	Latino	Other
Total graduate school enrollment (%)	20.63	23.35	13.99	13.21	17.22	21.88
Full-time Ph.D. (%)	2.68	1.94	1.03	5.66	0.26	0.00
Full-time masters degree (%)	15.40	18.37	10.46	7.55	14.91	21.88
Full-time professional degree (%)	3.05	3.62	3.24	0.00	2.06	0.00
Person-year observations	2720	1546	679	106	389	64
Unique individuals	1650	884	445	71	250	46

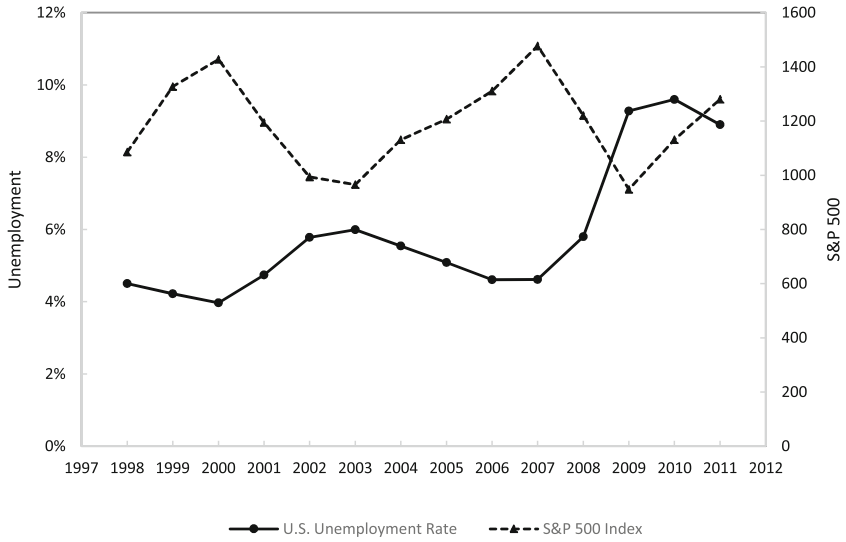

Fig. 1 Summary statistics: macroeconomic variables (1998–2011)

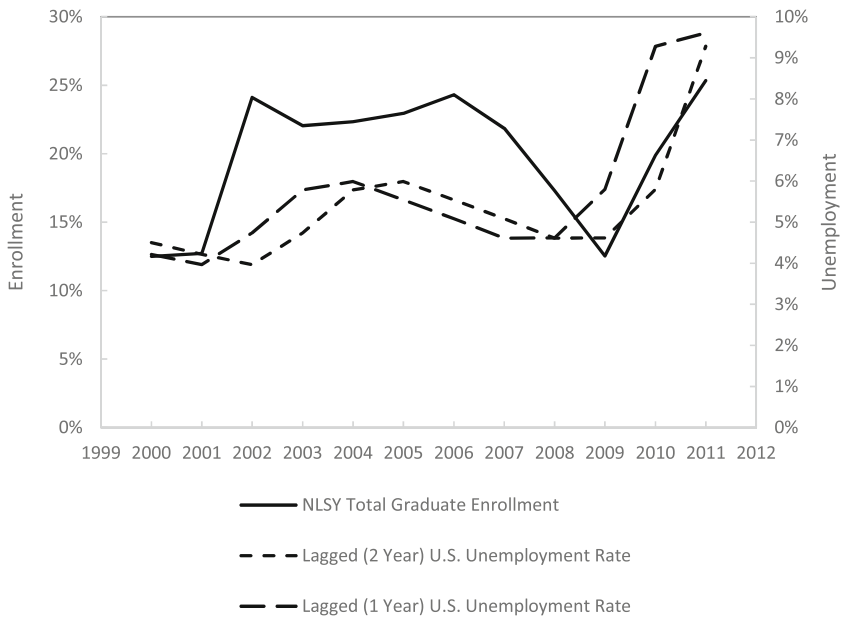

Fig. 2 Lagged unemployment rates and NLSY total graduate school enrollment (2000–2011)

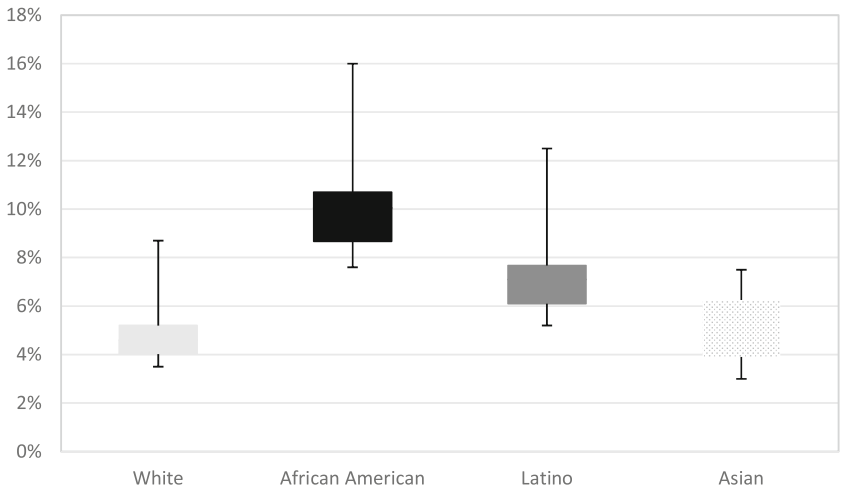

Fig. 3 Unemployment rates by racial group (1998–2011). Note: Asian unemployment rates for the period 2000 to 2011

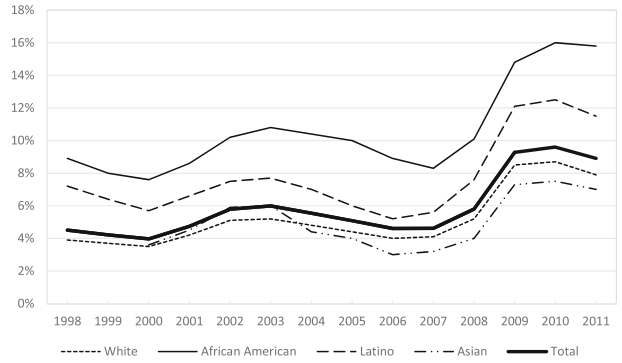

Fig. 4 Unemployment trends by racial group (1998–2011)

Whites also have significantly higher professional school (M.B.A., M.D., J.D., and M.P.A) enrollment than Latinos.[3]

Summary statistics for the relevant macroeconomic variables are presented in Fig. 1. The average national unemployment rate between 1998 and 2011 was 5.90% with a range from 3.97 to 9.60%.[4] The range of the S&P 500 Index was from 948.05 to 1477.19. There was substantial variation in the national unemployment rate and the S&P 500 Index from 1998 to 2011. This time period contains two full business cycle contraction periods (March 2001–November 2001; December 2007–June 2009) and one full business cycle expansion period (November 2001–December 2007) of the economy.[5] Thus, our sample experiences multiple business cycle fluctuations. Figure 2 shows the relationship between the total NLSY graduate school enrollment and the US unemployment rates over our sample period. From Fig. 2, we see that lagged unemployment and graduate school enrollment rates move together.[6]

A box and whisker plot of unemployment rates by race (Fig. 3) shows that, for the period 1998 to 2011, African Americans have the highest median unemployment rate followed by Latinos. Whites and Asians have similar median unemployment rates (4.6 and 4.5 respectively). Further, Fig. 4, which also presents unemployment rates by racial group for the period 1998 to 2011, shows that while white and Asian unemployment trends closely follow the total US unemployment rate, African American and Latino unemployment rates are considerably higher.

Theoretical Framework

Building on the work of Bedard and Herman (2008), we utilize a stylized human capital investment model of a bachelor's degree holder's decision to enroll in a graduate program. We assume that individuals try to maximize their expected lifetime utility and must evaluate the expected monetary and non-monetary returns of graduate education in order to choose the optimal educational route. For all individuals, our model assumes a two-period planning horizon that begins after completion of an undergraduate degree ($t = 1, 2$). The two periods do not have to be the same length. An individual can work in both periods or complete an advanced degree program in period 1 and work in period 2.

We define w_{it}^{n} as the wage of individual i in period t if (s)he does not have an advanced degree and w_{it}^{g} if (s)he does have a graduate degree. Expanding the model of Bedard and Herman (2008), we create a novel extension and define an ethnic labor discrimination penalty as d_{it}^{nr} for individuals without an advanced degree and d_{i2}^{gr} for individuals with an advanced degree. $r \in [0, 1]$ where 1 = White, 0 = Non-White. Without loss of generality, we assume $d_{it}^{n1} = d_{i2}^{g1} = 1$; and $0 < d_{it}^{n0} \leq d_{i2}^{g0} < 1 \ \forall t$. The smaller the factor (d_{it}), the larger the degree of discrimination.

Similar to Bedard and Herman (2008), we define the non-monetary benefits obtained from graduate school as a_{i1}^{s}, from employment available with a graduate degree as a_{i2}^{g}, and from employment available with only an undergraduate degree as a_{it}^{n}. We assume that current period wages are observable. We assume that individuals must form expectations about future wage and benefit levels because they are not observable. Wages, graduate stipends (S_i), and tuition (T) can vary over the business cycle. However, we assume that non-wage benefit levels do not vary with the business cycle. As a simplifying assumption, we let tuition be the same for all students in any given year and assume it is equally time consuming for all undergraduate degree holders to obtain an advanced degree. Using this theoretical framework, individual i will obtain an advanced degree in period 1 if:

$$EU\left(S_i - T + w_{i2}^{g} d_{i2}^{gr}, a_{i1}^{s}, a_{i2}^{g}\right) > EU\left(w_{i1}^{n} d_{i1}^{nr} + w_{i2}^{n} d_{i2}^{nr}, a_{i1}^{n}, a_{i2}^{n}\right), \quad (1)$$

[3] The Asian subsample is very small in the NLSY data set. This precludes us from drawing robust conclusions from any between group differences with the Asian subsample.

[4] We utilize national-level unemployment rates to be consistent with our other macroeconomic indicators. However, in the robustness checks section, we perform a similar analysis using state level unemployment rates and find consistent results.

[5] http://www.nber.org/cycles/cyclesmain.html

[6] We focus on graduate school demand side issues in our analysis. The data indicate that supply side issues (i.e., available graduate school slots) did not fluctuate substantially over the time period studied. Data from the Council of Graduate Schools indicate that the overall US graduate school acceptance rate was 41% in 2000 and 41% in 2011 with a maximum acceptance rate of 46% during the time period studied. ("Graduate Enrollment and Degrees: 1986–2004", 2005; "Graduate Enrollment and Degrees: 2001–2011", 2012). Further, the overall US graduate school acceptance rate had a ($\rho = -0.5574$) correlation with the lagged unemployment rate and a ($\rho = +0.1058$) correlation with the lagged S&P 500 Index.

where all wages are discounted present values and expected lifetime utility is a function of lifetime earnings and non-monetary benefit levels.

From Eq. 1, we see that enrolling in a graduate/professional program is determined by the net wage premium of the expected advanced degree in relation to the net educational costs. Since the macroeconomy can have an effect on wages, the business cycle could have an effect on graduate school enrollment. Further, undergraduate degree holders could face different net wages depending on labor discrimination. Thus, Eq. 1 implies that individuals could make different educational choices depending on r (race). For example, there could be sufficient labor market discrimination such that, $\exists\ d_{i2}^{g0}$ and d_{it}^{n0} where $EU(S_i - T + w_{i2}^g, a_{i1}^s, a_{i2}^g) < EU(w_{i1}^n + w_{i2}^n, a_{i1}^n, a_{i2}^n)$, whites do not pursue graduate education, and $EU(S_i - T + w_{i2}^g d_{i2}^{g0}, a_{i1}^s, a_{i2}^g) > EU(w_{i1}^n d_{i1}^{n0} + w_{i2}^n d_{i2}^{n0}, a_{i1}^n, a_{i2}^n)$, non-whites pursue graduate education. This framework suggests that sufficient labor market discrimination could cause us to find that the magnitude of business cycle effects on graduate school enrollment is greater for non-whites. This is a testable implication that we will explore in the empirical analysis section.

Econometric Analysis

Econometric Model

To document the relationship between the business cycle and graduate school enrollment, we first establish a link between macroeconomic indicators of the business cycle and graduate school enrollment. From Eq. 1, we know that a college graduate will enroll in a graduate/professional program when the expected lifetime utility of obtaining an advanced degree is greater than the expected lifetime utility of not holding an advanced degree. For our empirical analysis, we let $U_{gi} = X_{gi}\beta_g + u_{gi}$ be the indirect utility function when an individual has a graduate degree and let $U_{ni} = X_{ni}\beta_n + u_{ni}$ be the indirect utility function when an individual does not have a graduate degree. The u_i error terms include unobserved individual characteristics that may be important for the graduate school enrollment decision. The X_i's are observable variables pertaining to individual i's characteristics and macroeconomic variables. In practice, the indirect function is not observable. Only graduate enrollment or no graduate enrollment can be observed. Let $E_i = 1$, if $U_{ni} < U_{gi}$. That is, the individual's lifetime utility is higher when having a graduate degree. Let $E_i = 0$ otherwise. Then, we have $P(E_i = 1) = P(U_{ni} < U_{gi})$.

Given the above, we can utilize univariate probit models in which the dependent variable (E_i) is a binary variable for graduate school enrollment (Ph.D., M.A./M.S., or professional degree) and the independent variables include macroeconomic variables and respondent characteristic control variables (age, gender, income, and other socioeconomic characteristics), and region of residence controls. A detailed description of all of the variables used and how they are constructed can be found in Appendix A. The model specification for respondent i at time t is:

$$GradEnrollment_{it} = \beta_0 + \sum_{j=1}^{2} \beta_j MacroVariable_{it-j} + \sum \beta_k X_{itk} + \varepsilon_{it} \quad (2)$$

The dependent variable, $GradEnrollment_{it}$, represents enrollment in graduate school for individual i in year t. $MacroVariable$ represents lagged macroeconomic indicators (unemployment rate or log of S&P 500 Index). X_{itk} is a vector of individual characteristics listed in Table 1 capturing socioeconomic status and demographic characteristics that have previously been shown to influence graduate school enrollment.[7] To address endogeneity concerns with regard to the log of income and have college loans dummy variable, we also have similar specifications that exclude these variables. The results from these specifications are included in Appendix B and show results consistent with our main findings.[8] Due to the panel nature of the data, we use pooled regressions and cluster the standard errors at the individual level.[9]

Our first testable hypothesis is that poor economic conditions lower the opportunity cost of attending graduate school. Thus, graduate school enrollment should be counter-cyclical with the business cycle. Higher unemployment rates and a lower S&P 500 Index are associated with poorer

[7] Income is lagged one year, but for simplicity, we include it in X_{it}. Further, log of income is given a value of zero for respondents with no income. There are three variables in our data set that have missing data (income, AFQT score, and live in a rural area). To identify any potential issues with missing data, we use Little's test. Based upon the Little's test results, we characterize these missing variables as missing at random (MAR) since the pattern of data missingness can be predicted from other control variables in the data set. Since the missingness is conditional on other variables for which we control, we do get a random subset.

[8] We acknowledge that dropping the income and debt variables only provides a weak test of the robustness of the key results. While it addresses endogeneity bias, one could argue that it introduces omitted variable bias. However, there is not an appropriate instrument in the data to enable us to better address this issue.

[9] Given the panel nature of the data, it is theoretically possible to utilize a fixed effects model. Coefficients estimated using the fixed effects logit model could be more likely to capture the causal relationship because unobservable time-invariant characteristics are held constant. However, in the fixed effects logit model, identification hinges on changes in the macroeconomic variable causing changes in graduate enrollment. Thus, we lose a substantial portion of our data (over 95%) in this model such that we cannot obtain significant results.

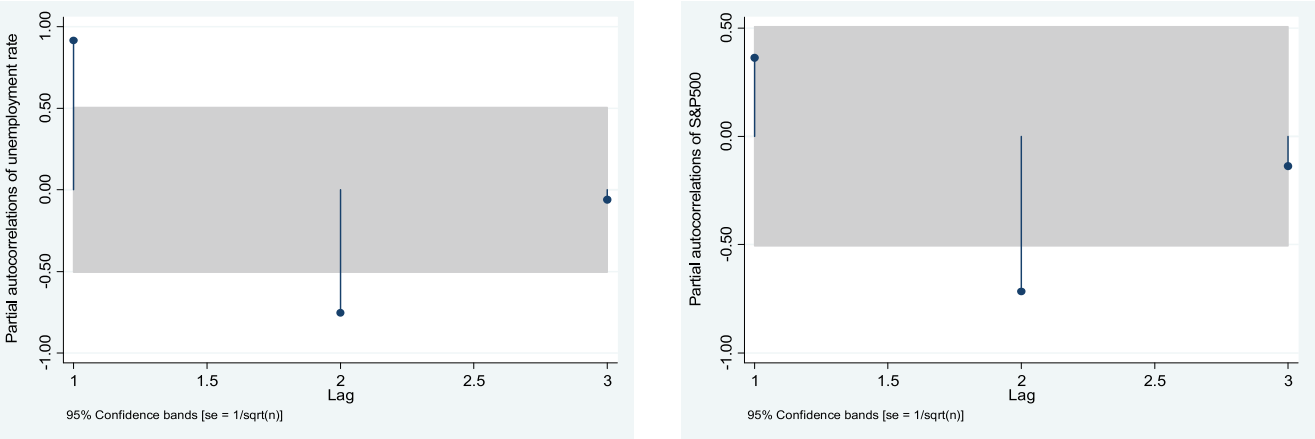

Fig. 5 Partial autocorrelation functions—unemployment and S&P 500 Index

economic conditions. Thus, if poor economic conditions lower the opportunity costs to attend graduate school, we should expect to find that general graduate school enrollment is positively related to unemployment rates and negatively related to the S&P 500 Index.

A key feature of our empirical specification is that we use lagged macroeconomic variables. Given the current graduate school application process, there is a significant time lag between the time that an individual decides to go to graduate school and submits an application and the person's actual enrollment (matriculation) in a graduate program. If poor economic conditions in one year prompt a person to want to return to graduate school, the length and timing of the application process generally precludes the person from attending graduate school in that school year. Hence, our analysis expands the literature by using lagged macroeconomic variables and panel data to allow us to draw inferences about the causal relationship between the business cycle and graduate school enrollment.[10]

While Fig. 2 shows that graduate school enrollment moves with lagged unemployment, to determine the appropriate lag structure, we use a partial autocorrelation function (PACF) (Box et al. 2008). In Fig. 5, our partial autocorrelation coefficients are plotted against yearly lags. From Fig. 5 and corresponding diagnostic tests, we include both the one- and two-year lags in our models.[11] However, in specifications using only the two-year lag, we find results that are consistent with our main results with regard to coefficient sign, magnitude, and significance.

Full Sample Analysis

Tables 3 and 4 show the marginal effects of macroeconomic variables on graduate school enrollment. Overall, from these tables, one can see that total graduate school enrollment is counter-cyclical with the business cycle.[12] This is true for general graduate school enrollment as well as enrollment in master's programs and professional degree programs. Ph.D. enrollment, which is also strongly influenced by procyclical university stipend funding, is significant and positively related to one-year lagged unemployment and significant and negatively related to two-year lagged unemployment.

In Table 3, the marginal effects on total graduate school enrollment are presented in column 1 and the marginal effects on different graduate degree programs are reported in columns 2 through 4. Table 3 shows that a one percentage point increase in the two-year lagged unemployment rate increases the probability of graduate school enrollment by 0.0211. This result is significant at the 1% level. Table 3 also illustrates that business cycle effects are different by type of graduate program. Specifically, a one percentage point increase in the two-year lagged unemployment rate increases the probability of master's enrollment by 0.0315 (significant at the 1% level) and increases the probability of professional school enrollment by 0.0152 (significant at the 1% level) but decreases the probability of Ph.D. enrollment by 0.0195 (significant at the 1% level). We also observe empirical evidence of the aforementioned time lag between the time that an individual decides to go to

[10] Since we utilize a sample of individuals with an undergraduate degree but no graduate degree, we deem the lagged structure to be the most appropriate. However, as a robustness check, we run additional models that also include current unemployment levels/S&P 500 levels. We find that the results of these specifications are consistent with our primary model specifications and these results are included in Appendix B.

[11] In the unemployment model, the one- and two-year lags are statistically significant. In the S&P500 Index model, only the two-year lag is statistically significant. (Any lags that are outside of the gray area (−0.5 to 0.5) are statistically significant at 5% level.) Thus, we include both the one- and two-year lags in our models.

[12] "Trends in Graduate Student Financing" 2015 indicates that the average net (excluding grant aid) price of attendance for graduate students was increasing between 1995–2012.

Table 3 Key marginal effects of unemployment rate on graduate enrollments

	Grad school	Master's	Ph.D.	Professional
Unemployment 1-year lag	0.0166**	−0.0040	0.0149***	0.0010
	(0.0078)	(0.0075)	(0.0026)	(0.0033)
Unemployment 2-year lag	0.0211***	0.0315***	−0.0195***	0.0152***
	(0.0075)	(0.0071)	(0.0036)	(0.0036)
Log (income)	−0.0326***	−0.0202***	−0.0020	−0.0084***
	(0.0071)	(0.0062)	(0.0015)	(0.0028)
Log (AFQT)	0.1782***	0.0971***	0.0723***	0.0637***
	(0.0227)	(0.0183)	(0.0128)	(0.0159)
Age	0.0844*	0.1219**	−0.0372**	0.0184
	(0.0517)	(0.0493)	(0.0173)	(0.0194)
Age^2	−0.0019*	−0.0027**	0.0007**	−0.0004
	(0.0011)	(0.0010)	(0.0003)	(0.0004)
Number of children	−0.0402***	−0.0282*	0.0005	−0.0211*
	(0.0146)	(0.0137)	(0.0035)	(0.0109)
Male dummy variable	−0.0639***	−0.0333	−0.0258**	−0.0151
	(0.0217)	(0.0198)	(0.0107)	(0.0092)
Living in rural area dummy variable	0.0284	0.0287	0.0148	−0.0100
	(0.0255)	(0.0231)	(0.0103)	(0.0103)
Married dummy variable	0.0795***	0.0493**	0.0211**	0.0082
	(0.0228)	(0.0218)	(0.0085)	(0.0091)
Have college loans dummy variable	0.0980***	0.0642**	0.0078	0.0184**
	(0.0299)	(0.0278)	(0.0117)	(0.0089)
African American dummy variable	0.0041	−0.0487	0.0393	0.0123
	(0.0287)	(0.0280)	(0.0093)	(0.0113)
Latino/Hispanic dummy variable	−0.0139	0.0002	−0.0193	0.0011
	(0.0334)	(0.0293)	(0.0212)	(0.0123)
Asian dummy variable	−0.0943	−0.0951	0.0246	–
	(0.0543)	(0.0490)	(0.0179)	–
Other race dummy variable	−0.0303	0.0328	–	–
	(0.0631)	(0.0546)	–	–
College major dummy variables	Yes	Yes	Yes	Yes
Region dummy variables	Yes	Yes	Yes	Yes
Observations	2720	2720	2720	2720
Pseudo R^2	0.1362	0.1040	0.3030	0.2415

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

graduate school and submits an application and the person's actual enrollment (matriculation) in a graduate program. The one-year lagged unemployment rate coefficients are not significant for master's and professional school enrollment.

We find many of the individual characteristic variables are significant and correlated with educational outcomes, as expected. Specifically, previous year's income, which is associated with a higher opportunity cost of graduate school enrollment, is significantly negatively correlated with the probability of graduate school enrollment, master's program enrollment, and professional school enrollment. The marginal effect of the Armed Forces Qualification Test (AFQT) scores is also statistically significant for graduate enrollment. Higher AFQT scores, which indicate greater mental ability and thus more of an aptitude for graduate school, are associated with increased total graduate school enrollment, master's enrollment, Ph.D. enrollment, and professional school enrollment.[13] Being married is

[13]We utilize AFQT scores as an indicator of mental ability because it is a more uniform and unbiased measure of mental ability than undergraduate GPA, which is not available for our sample.

Table 4 Key marginal effects of log (S&P 500 Index) on graduate enrollments

	Grad school	Master's	Ph.D.	Professional
Log (S&P 500 Index) 1-year lag	−0.0870	0.0390	−0.1256***	0.0259
	(0.0605)	(0.0560)	(0.0252)	(0.0277)
Log (S&P 500 Index) 2-year lag	−0.2092***	−0.2305***	0.0919***	−0.1090***
	(0.0553)	(0.0504)	(0.0188)	(0.0275)
Log (income)	−0.0318***	−0.0197***	−0.0019	−0.0081***
	(0.0071)	(0.0062)	(0.0016)	(0.0028)
Log (AFQT)	0.1776***	0.0976***	0.0695***	0.0614***
	(0.0224)	(0.0182)	(0.0126)	(0.0151)
Age	0.0544	0.0982**	−0.0294**	−0.0013
	(0.0520)	(0.0488)	(0.0175)	(0.0204)
Age^2	−0.0010	−0.0021**	0.0006**	0.0001
	(0.0010)	(0.0010)	(0.0003)	(0.0004)
Number of children	−0.0392***	−0.0270*	−0.0001	−0.0213*
	(0.0145)	(0.0136)	(0.0036)	(0.0109)
Male dummy variable	−0.0642***	−0.0331	−0.0254**	−0.0158*
	(0.0217)	(0.0198)	(0.0106)	(0.0093)
Living in rural area dummy variable	0.0282	0.0278	0.0156	−0.0073
	(0.0254)	(0.0230)	(0.0103)	(0.0106)
Married dummy variable	0.0798***	0.0499**	0.0210**	0.0080
	(0.0228)	(0.0218)	(0.0086)	(0.0091)
Have college loans dummy variable	0.1007***	0.0650**	0.0092	0.0215**
	(0.0294)	(0.0273)	(0.0116)	(0.0091)
African American dummy variable	0.0079	−0.0473	0.0407	0.0161
	(0.0285)	(0.0278)	(0.0092)	(0.0111)
Latino/Hispanic dummy variable	−0.0109	−0.0003	−0.0175	0.0019
	(0.0329)	(0.0289)	(0.0208)	(0.0125)
Asian dummy variable	−0.0970	−0.0976	0.0248	–
	(0.0547)	(0.0489)	(0.0179)	–
Other race dummy variable	−0.0285	0.0311	–	–
	(0.0631)	(0.0546)	–	–
College major dummy variables	Yes	Yes	Yes	Yes
Region dummy variables	Yes	Yes	Yes	Yes
Observations	2720	2720	2720	2720
Pseudo R^2	0.1317	0.1010	0.2810	0.2133

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

positively related to the probability of total graduate enrollment by 0.0795 (significant at the 1% level), master's enrollment by 0.0493 (significant at the 5% level), and Ph.D. enrollment by 0.0211 (significant at the 5% level). Being male decreases the probability of total graduate enrollment by 0.0639 (significant at the 1% level) and Ph.D. enrollment by 0.0258 (significant at the 5% level). Having a child is negatively related to the probability of total graduate school enrollment by 0.0402 (significant at the 1% level), master's program enrollment by 0.0282 (significant at the 10% level), and professional school enrollment by 0.0211 (significant at the 10% level). Conversely, having college loans is positively related to the probability of total graduate school enrollment by 0.0989 (significant at the 1% level), master's program enrollment by 0.0642 (significant at the 5% level), and professional school enrollment by 0.0184 (significant at the 5% level).

While educational attainment is generally analyzed with respect to unemployment rates, we also investigate the effects of another macroeconomic variable on graduate school enrollment decisions. Table 4 presents the results in which the log of the S&P 500 Index is the independent macroeconomic variable of interest. An increase in the two-year lagged log (S&P 500 Index) decreases the probability

of total graduate school enrollment by 0.2092 (significant at the 1% level), master's program enrollment by 0.2305 (significant at the 1% level), and professional school enrollment by 0.1090 (significant at the 1% level). The two-year lagged log (S&P 500 Index) is positively related to the probability of Ph.D. enrollment by 0.0919 (significant at the 1% level). The one-year lagged log (S&P 500 Index) coefficients also are not significant for master's and professional school enrollment.

Overall, Tables 3 and 4 suggest some common themes. In general, total graduate school enrollment is counter-cyclical. However, Ph.D. specific enrollment is procyclical with regard to the two-year lagged macroeconomic variables. Also, individual characteristics such as age, income, AFQT scores, gender, marital status, and number of children are related to graduate school enrollment. Notably, the direction of effects, point estimates, and significance levels of the demographic characteristics are consistent across the unemployment rate and S&P 500 Index models.

Analysis by Racial Group

Our other main testable hypothesis is that poor economic conditions differentially affect racial groups and thus we will observe different magnitudes in business cycle effects on graduate school enrollment. Figures 3 and 4 show that unemployment rates are substantially different across racial groups. Recall from Table 2 that there are large significant differences in graduate school enrollments between whites, African Americans, and Latinos. Wald tests indicate that the effects of the other covariates in our model specifications differ by race.[14] Thus, instead of including race and unemployment rate/S&P 500 interaction terms, we stratify our NLSY sample by ethnic group and further estimate regressions similar to those reported in Tables 3 and 4.[15]

Tables 5 and 6 report marginal effects of macroeconomics variables (unemployment and the log of the S&P 500 Index, respectively) on graduate school enrollment by race. We focus on the three largest ethnic groups in our sample— white, African American, and Latino/Hispanic.[16] Overall, there is more evidence that graduate school enrollments are counter-cyclical and significantly affected by macroeconomic conditions. Panel A of Table 5 shows that for the white subsample, the two-year lagged unemployment rate is positively related to total graduate school enrollment (significant at the 1% level), master's enrollment (significant at the 1% level), and professional school enrollment (significant at the 5% level). Similarly, panel A of Table 6 shows that for the white subsample, the two-year lagged log of the S&P 500 Index is negatively related to total graduate school enrollment (significant at the 1% level), master's enrollment (significant at the 1% level), and professional school enrollment (significant at the 1% level). In Table 5, column 1 of panel C shows a one percentage point increase in the two-year lagged unemployment rate increases the probability of graduate school enrollment for Latinos/Hispanics by 0.0684 (significant at the 1% level) while Table 6, column 1, panel C shows a one percentage point increase in the two-year lagged log of the S&P 500 Index decreases the probability of graduate school enrollment for Latinos/Hispanics by 0.5572 (significant at the 1% level).[17] Conversely, the unemployment rate does not have a statistically significant impact on total graduate school enrollment for whites or African Americans. The effect of the macroeconomic variables in the African American subsample depends upon the type of graduate program. Similar to the full sample results in Table 3, the two-year lagged unemployment rate is positively related to professional school enrollment (counter-cyclical) but negatively related to Ph.D. enrollment (procyclical) (both significant at the 1% level). Additionally, The two-year lagged log of the S&P 500 Index is negatively related to professional school enrollment but positively related to Ph.D. enrollment (both significant at the 1% level), similar to Table 4. This is consistent with our previous discussion of the procyclical nature of university stipend funding for Ph.D. students.

Table 5 shows that among the individual demographic characteristic variables, income is significantly negatively related to total graduate school enrollments, master's enrollment, and professional school enrollment for whites. Income is significantly negatively related to total graduate enrollment and professional school enrollment for African Americans. High AFQT scores increase the probability of all types of graduate school enrollment for whites. High AFQT scores increase the probability of total graduate enrollment, professional school enrollment, and Ph.D. enrollment for African Americans and high AFQT scores increase the probability of total graduate enrollment and master's enrollment for Latinos. Marital status seems to matter for whites when they make graduate school enrollment decisions. Being married is positively related to the probability of graduate school enrollment by 0.1400 (significant at the 1% level), master's degree enrollment by

[14] For the white and Latino subgroup comparison, $W = 20.88$. For the white and African American subgroup comparison, $W = 51.28$. For the African American and Latino subgroup comparison, $W = 87.86$.

[15] In specifications using only the two-year lag, we find results that are consistent with our main results with regard to coefficient sign, magnitude, and significance.

[16] Due to the NLSY oversampling of African Americans and Latinos, we have over 100 unique individuals in each of these groups in the sample. We exclude Asians from our NLSY analysis by racial group due to the limited number of unique individuals in the sample (71 respondents).

[17] The Ph.D. and professional school columns of panel C are left blank due to the small sample size.

Table 5 Key marginal effects of unemployment rate on graduate enrollments by race

		Grad school	Master's	Ph.D.	Professional
Panel A: white	Unemployment 1-year lag	0.0178	0.0122	0.0020	0.0048
		(0.0114)	(0.0110)	(0.0033)	(0.0046)
	Unemployment 2-year lag	0.0474***	0.0398***	−0.0041	0.0118**
		(0.0114)	(0.0108)	(0.0050)	(0.0049)
	Log (income)	−0.0378***	−0.0254***	−0.0026	−0.0087**
		(0.0099)	(0.0087)	(0.0021)	(0.0044)
	Log (AFQT)	0.2334***	0.1729***	0.0485***	0.0627***
		(0.0349)	(0.0309)	(0.0175)	(0.0206)
	Age	0.0214	0.0884	0.0100	−0.0535*
		(0.0790)	(0.0761)	(0.0260)	(0.0301)
	Age^2	−0.0007	−0.0021	−0.0003	0.0011*
		(0.0016)	(0.0016)	(0.0005)	(0.0006)
	Number of children	−0.0073	0.0200	0.0005	−0.0391**
		(0.0254)	(0.0230)	(0.0038)	(0.0147)
	Male dummy variable	−0.0605*	−0.0194	−0.0486**	−0.0157
		(0.0308)	(0.0285)	(0.0234)	(0.0130)
	Living in rural area dummy variable	0.0019	0.0095	0.0203	−0.0282*
		(0.0334)	(0.0311)	(0.0107)	(0.0170)
	Married dummy variable	0.1400***	0.0933***	0.0171	0.0234*
		(0.0309)	(0.0306)	(0.0092)	(0.0117)
	Have college loans dummy variable	0.0747*	0.0246	0.0128	0.0232**
		(0.0438)	(0.0430)	(0.0127)	(0.0114)
	College major dummy variables	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	1546	1546	1546	1546
	Pseudo R^2	0.1646	0.1202	0.2534	0.2453
Panel B: African American	Unemployment 1-year lag	0.0284**	−0.0159	0.0370***	−0.0061
		(0.0122)	(0.0118)	(0.0068)	(0.0045)
	Unemployment 2-year lag	−0.0378***	0.0053	−0.0579***	0.0251***
		(0.0169)	(0.0117)	(0.0097)	(0.0058)
	Log (income)	−0.0229*	0.0054	−0.0018	−0.0172***
		(0.0128)	(0.0101)	(0.0047)	(0.0054)
	Log (AFQT)	0.1357***	0.0072	0.1479***	0.0660***
		(0.0380)	(0.0227)	(0.0222)	(0.0189)
	Age	0.0026	−0.0210	−0.0702	0.2649***
		(0.0916)	(0.0762)	(0.0588)	(0.0727)
	Age^2	−0.0001	0.0003	0.0014	−0.0053***
		(0.0018)	(0.0016)	(0.0011)	(0.0014)
	Number of children	−0.0548**	−0.0730**	0.0069	−0.0005
		(0.0221)	(0.0252)	(0.0066)	(0.0103)
	Male dummy variable	−0.1038**	−0.1167**	0.0166	−0.0146
		(0.0446)	(0.0463)	(0.0135)	(0.0171)
	Living in rural area dummy variable	0.0493	0.0274	0.0000	0.0122
		(0.0495)	(0.0395)	(0.0188)	(0.0157)
	Married dummy variable	0.0401	0.0312	0.0101	–
		(0.0462)	(0.0403)	(0.0152)	–

Table 5 (continued)

		Grad school	Master's	Ph.D.	Professional
	Have college loans dummy variable	0.1420***	0.1389***	−0.0235	0.0111
		(0.0517)	(0.0390)	(0.0281)	(0.0204)
	College major dummy variables	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	679	679	679	679
	Pseudo R^2	0.1416	0.1598	0.5358	0.4809
Panel C: Latino	Unemployment 1-year lag	−0.0278**	−0.0257**	–	–
		(0.0185)	(0.0170)	–	–
	Unemployment 2-year lag	0.0684***	0.0583***	–	–
		(0.0169)	(0.0163)	–	–
	Log (income)	−0.0235	−0.0202	–	–
		(0.0193)	(0.0185)	–	–
	Log (AFQT)	0.1720***	0.1284***	–	–
		(0.0471)	(0.0436)	–	–
	Age	0.3160***	0.4306***	–	–
		(0.1244)	(0.1369)	–	–
	Age^2	−0.0064***	−0.0086***	–	–
		(0.0024)	(0.0027)	–	–
	Number of children	−0.0215	0.0008	–	–
		(0.0288)	(0.0270)	–	–
	Male dummy variable	0.0222	0.0394	–	–
		(0.0414)	(0.0401)	–	–
	Living in rural area dummy variable	0.1595*	0.1082	–	–
		(0.0574)	(0.0580)	–	–
	Married dummy variable	−0.0160	−0.0282	–	–
		(0.0490)	(0.0509)	–	–
	Have college loans dummy variable	−0.0674	−0.0427	–	–
		(0.0747)	(0.0730)	–	–
	College major dummy variables	Yes	Yes	–	–
	Region dummy variables	Yes	Yes	–	–
	Observations	389	389	–	–
	Pseudo R^2	0.2474	0.2168	–	–

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

0.0933 (significant at the 1% level), and professional school enrollment by 0.0234 (significant at the 10% level). Number of children seems to matter for the white subsample and the African Americans when they make graduate school enrollment decisions. For African Americans, having an additional child is negatively related to the probability of graduate school enrollment by 0.0548 (significant at the 5% level) and master's degree enrollment by 0.0730 (significant at the 5% level). For whites, having an additional child is negatively related to the probability of professional school enrollment by 0.0391 (significant at the 5% level).

Our theoretical framework suggests that the magnitude of any business cycle effect on graduate school enrollment would be greater for non-whites. We do find different business cycle effects for non-white groups. Our results do show that the magnitude of the business cycle effects can be almost twice as large for non-white groups as for the white group. The business cycle effect on African American professional school enrollment is much larger (more than 2x) than the effect on white professional school enrollment (see Tables 5 and 6). The business cycle effect on Latino total graduate school enrollment and master's degree enrollment is substantially larger than the effect for whites (see Tables 5 and 6). Hence, our empirical evidence is suggestive of lower opportunity costs to attend graduate school for minority groups during the time period studied.

Table 6 Key marginal effects of S&P 500 Index on graduate enrollments by race

		Grad school	Master's	Ph.D.	Professional
Panel A: white	Log (S&P 500 Index) 1-year lag	−0.0444	−0.0404	0.0080	−0.0049
		(0.0862)	(0.0811)	(0.0222)	(0.0432)
	Log (S&P 500 Index) 2-year lag	−0.3666***	−0.3226***	0.0165	−0.0910***
		(0.0768)	(0.0719)	(0.0231)	(0.0353)
	Log (income)	−0.0361***	−0.0238**	−0.0026	−0.0083*
		(0.0099)	(0.0088)	(0.0021)	(0.0043)
	Log (AFQT)	0.2319***	0.1718***	0.0486***	0.0597***
		(0.0349)	(0.0309)	(0.0173)	(0.0201)
	Age	−0.0608	0.0285	0.0051	−0.0758**
		(0.0796)	(0.0758)	(0.0260)	(0.0315)
	Age^2	0.0014	−0.0006	−0.0002	0.0017**
		(0.0016)	(0.0015)	(0.0006)	(0.0006)
	Number of children	−0.0070	0.0206	0.0008	−0.0374**
		(0.0253)	(0.0230)	(0.0038)	(0.0147)
	Male dummy variable	−0.0638**	−0.0216	−0.0490**	−0.0161
		(0.0308)	(0.0285)	(0.0232)	(0.0130)
	Living in rural area dummy variable	0.0032	0.0095	0.0206	−0.0257
		(0.0336)	(0.0310)	(0.0108)	(0.0169)
	Married dummy variable	0.1377***	0.0925***	0.0169	0.0234*
		(0.0311)	(0.0307)	(0.0092)	(0.0117)
	Have college loans dummy variable	0.0852**	0.0306	0.0133	0.0286**
		(0.0420)	(0.0413)	(0.0120)	(0.0119)
	College major dummy variables	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	1546	1546	1546	1546
	Pseudo R^2	0.1522	0.1128	0.2536	0.2302
Panel B: African American	Log (S&P 500 Index) 1-year lag	−0.2722***	0.0799	−0.4050***	0.0434
		(0.1098)	(0.0911)	(0.0892)	(0.0361)
	Log (S&P 500 Index) 2-year lag	0.1925**	0.0123	0.2773***	−0.1857***
		(0.1596)	(0.0767)	(0.0623)	(0.0503)
	Log (income)	−0.0233*	0.0053	−0.0014	−0.0192***
		(0.0127)	(0.0099)	(0.0062)	(0.0059)
	Log (AFQT)	0.1339***	0.0068	0.1418***	0.0673***
		(0.0377)	(0.0229)	(0.0224)	(0.0187)
	Age	0.0305	−0.0089	−0.0149	0.2638***
		(0.0920)	(0.0781)	(0.0785)	(0.0786)
	Age^2	−0.0006	−0.0001	0.0004	−0.0051***
		(0.0018)	(0.0016)	(0.0015)	(0.0015)
	Number of children	−0.0564**	−0.0727**	0.0060	−0.0013
		(0.0220)	(0.0270)	(0.0065)	(0.0099)
	Male dummy variable	−0.1030**	−0.1167**	0.0175	−0.0139
		(0.0445)	(0.0494)	(0.0143)	(0.0169)
	Living in rural area dummy variable	0.0486	0.0292	−0.0015	0.0156
		(0.0493)	(0.0406)	(0.0192)	(0.0172)
	Married dummy variable	0.0426	0.0280	0.0136	–
		(0.0463)	(0.0410)	(0.0155)	–
	Have college loans dummy variable	0.1402***	0.1382***	−0.0202	0.0072
		(0.0516)	(0.0433)	(0.0266)	(0.0193)

Table 6 (continued)

		Grad school	Master's	Ph.D.	Professional
	College major dummy variables	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	679	679	679	679
	Pseudo R^2	0.1396	0.1556	0.4956	0.4213
Panel C: Latino	Log (S&P 500 Index) 1-year lag	0.2232***	0.1784**	–	–
		(0.1482)	(0.1396)	–	–
	Log (S&P 500 Index) 2-year lag	−0.5572***	−0.4909***	–	–
		(0.1596)	(0.1549)	–	–
	Log (income)	−0.0287	−0.0254	–	–
		(0.0188)	(0.0182)	–	–
	Log (AFQT)	0.1735***	0.1301***	–	–
		(0.0470)	(0.0433)	–	–
	Age	0.2941***	0.4370***	–	–
		(0.1238)	(0.1376)	–	–
	Age^2	−0.0058***	−0.0086***	–	–
		(0.0024)	(0.0027)	–	–
	Number of children	−0.0194	0.0009	–	–
		(0.0291)	(0.0272)	–	–
	Male dummy variable	0.0274	0.0445	–	–
		(0.0420)	(0.0408)	–	–
	Living in rural area dummy variable	0.1506	0.1015	–	–
		(0.0594)	(0.0590)	–	–
	Married dummy variable	−0.0118	−0.0243	–	–
		(0.0482)	(0.0502)	–	–
	Have college loans dummy variable	−0.0654	−0.0384	–	–
		(0.0751)	(0.0729)	–	–
	College major dummy variables	Yes	Yes	–	–
	Region dummy variables	Yes	Yes	–	–
	Observations	389	389	–	–
	Pseudo R^2	0.2356	0.2085	–	–

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Robustness Checks

State-Level Unemployment Rate Analysis

The primary analysis in this paper investigates the relationship between national unemployment rates and graduate school enrollment. This is done since state and national unemployment rates are highly correlated (see Fig. 6). However, as geographic mobility across states declined during our sample period,[18] individuals still may be more sensitive to state unemployment rates.[19] Thus, we also perform an analysis using state-level unemployment rates and restricted-use state of residence geocode data from the NLSY97.

Similar to Eq. 2, we use a univariate probit model in which the dependent variable is a binary variable for graduate school enrollment (Ph.D., M.A./M.S., or professional degree), the key independent variable is a measure for state-level unemployment, and the other variables include respondent characteristic control variables (age, gender,

[18]Using data from the Current Population Survey (CPS), Ihrke and Faber (2012) show that the percent of individuals that moved from a different state between 1995 and 2000 was 8.4% while the percent of individuals that moved from a different state between 2005 and 2010 was 5.6%.

[19]The average of the variances of the state unemployment rates is similar to the variance of the national unemployment rate. Between 2000 and 2011, the variance in the national unemployment rate level was 3.54, while the state unemployment rate levels had an average variance of 3.31.

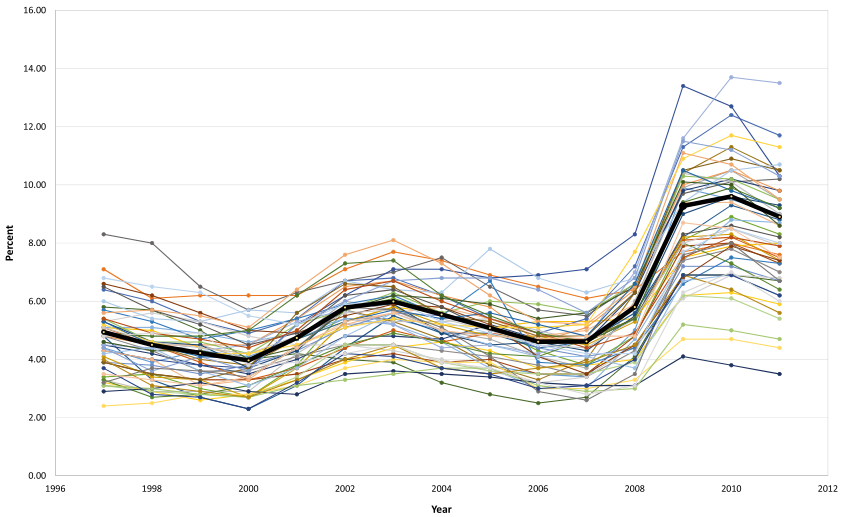

Fig. 6 National and state unemployment rates (1998–2011)

income, and other socioeconomic characteristics), and state of residence dummy variables. (Standard errors are clustered at the state level. We also obtain consistent results when we cluster standard errors at the individual level.) A detailed description of all of the variables used and how they are constructed can be found in Appendix A. The model specification for respondent i at time t is[20]

$$GradEnrollment_{it} = \beta_0 + \sum_{j=1}^{2} \beta_j StateUnempRate_{it-j} + \sum \beta_k X_{itk} + \varepsilon_{it} \quad (3)$$

Tables 7 and 8 present our state unemployment rate results for the full sample analysis and the racial group analysis. In Table 7, the marginal effects on total graduate school enrollment are presented in column 1 and the marginal effects on different graduate degree programs are reported in columns 2 through 4. Table 7 shows that a one percentage point increase in the two-year lagged state unemployment rate increases the probability of total graduate enrollment by 0.0136 (significant at the 5% level), increases master's enrollment by 0.0245 (significant at the 1% level), and increases professional school enrollment by 0.0114 (significant at the 1% level). Similar to Table 3, the two-year lagged state unemployment rate is negatively related to the probability of Ph.D. enrollment by 0.0191 (significant at the 1% level) but the one-year lagged state unemployment rate is positively related to the probability of Ph.D. enrollment by 0.0130 (significant at the 1% level).

In Table 8, column 1 of panel A shows a one percentage point increase in the two-year lagged state unemployment rate increases the probability of graduate school enrollment for whites by 0.0306 (significant at the 1% level) while panel C shows that a one percentage point increase in the two-year lagged state unemployment rate increases the probability of graduate school enrollment for Latinos by more than double (0.0697, significant at the 1% level). In terms of the different types of graduate programs, the state unemployment rate has a statistically significant effect on master's degree enrollment for Latinos. Column 2 of panel C shows a one percentage point increase in the two-year lagged state unemployment rate increases the probability of Latino master's program enrollment by 0.0586 (significant at the 1% level) which is twice the magnitude of the effect for the white subsample. An increase in the two-year lagged state unemployment rate increases the probability of professional school enrollment by 0.0187 for African Americans (significant at the 1% level) and decreases the probability of Ph.D. enrollment by 0.0472 for African Americans (significant at the 1% level). Again, the magnitude of the effects is much larger than that for the white subsample. Thus, the state-level empirical evidence also is suggestive of lower opportunity costs for minority groups during the time period studied.

CPS Data Analysis

For the purposes of our analysis, the NLSY is superior to the Current Population Survey (CPS) and other data sets due to its richer set of control variables and decomposition of graduate enrollment data by type of graduate program. However, the NLSY does only track one single cohort that is between ages 27 and 32 by 2011. Thus, as a robustness check, to separately identify the effect of macroeconomic conditions from the age effects within the cohort, we also utilize an additional data set to complement our primary analysis. The CPS is a monthly survey of 50,000–60,000

[20] Income is lagged one year, but for simplicity, we include it in X_{it}.

Table 7 Key marginal effects of state unemployment rates on graduate enrollments

	Grad school	Master's	Ph.D.	Professional
State unemployment 1-year lag	0.0068	−0.0096	0.0130***	−0.0024
	(0.0061)	(0.0056)	(0.0024)	(0.0024)
State unemployment 2-year lag	0.0136**	0.0245***	−0.0191***	0.0114***
	(0.0068)	(0.0061)	(0.0032)	(0.0029)
College major dummy variables	Yes	Yes	Yes	Yes
State dummy variables	Yes	Yes	Yes	Yes
Person-year observations	2720	2720	2720	2720
Pseudo R^2	0.1146	0.0824	0.2686	0.1875

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 8 Key marginal effects of state unemployment rate on graduate enrollments by race

		Grad school	Master's	Ph.D.	Professional
Panel A: white	State unemployment 1-year lag	0.0002	0.0001	−0.0002	−0.0014
		(0.0087)	(0.0080)	(0.0033)	(0.0037)
	State unemployment 2-year lag	0.0306***	0.0246**	−0.0032	0.0087**
		(0.0106)	(0.0096)	(0.0031)	(0.0042)
	College major dummy variable	Yes	Yes	Yes	Yes
	State dummy variables	Yes	Yes	Yes	Yes
	Observations	1546	1546	1546	1546
	Pseudo R^2	0.1245	0.0832	0.2321	0.1594
Panel B: African American	State unemployment 1-year lag	0.0340***	−0.0118	0.0357***	−0.0058
		(0.0103)	(0.0104)	(0.0055)	(0.0036)
	State unemployment 2-year lag	−0.0263**	0.0170	−0.0472***	0.0187***
		(0.0115)	(0.0115)	(0.0079)	(0.0045)
	College major dummy variables	Yes	Yes	Yes	Yes
	State dummy variables	Yes	Yes	Yes	Yes
	Observations	679	679	679	679
	Pseudo R^2	0.1179	0.1313	0.4939	0.3925
Panel C: Latino	State unemployment 1-year lag	−0.0483***	−0.0437***	–	–
		(0.0123)	(0.0112)	–	–
	State unemployment 2-year lag	0.0697***	0.0586***	–	–
		(0.0115)	(0.0108)	–	–
	College major dummy variables	Yes	Yes	–	–
	State dummy variables	Yes	Yes	–	–
	Observations	389	389	–	–
	Pseudo R^2	0.2531	0.2269	–	–

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 9 CPS summary statistics: respondent characteristics (year 2011)

	Full sample	White	African American	Latino/Hispanic	Asian
Socioeconomic characteristics					
Age	45.89	46.86	45.07	40.52	39.33
Percent age between 20 and 34	33.63	32.15	30.39	41.65	50.94
Percent age between 35 and 49	25.11	23.75	32.16	32.17	25.09
Percent age over 50	41.18	44.01	37.37	26.19	23.84
Percent male	43.68	44.73	34.45	43.00	42.79
Percent married	28.94	31.84	12.72	18.28	23.09
Number of children	0.45	0.44	0.50	0.52	0.36
Family income less than $5000	2.27	2.10	2.65	2.14	3.89
Family income $5000–$7499	1.08	0.98	1.33	1.47	1.38
Family income $7500–$9999	0.82	0.71	1.33	1.24	0.88
Family income $10,000–$12,499	1.67	1.48	3.09	1.92	1.88
Family income $12,500–$14,999	1.56	1.48	1.94	1.92	1.51
Family income $15,000–$19,999	2.69	2.56	2.92	4.06	2.89
Family income $20,000–$24,999	3.45	3.21	4.77	3.72	3.89
Family income $25,000–$29,999	4.28	4.26	5.21	3.95	3.89
Family income $30,000–$34,999	5.25	5.06	6.10	6.77	5.02
Family income $35,000–$39,999	4.96	4.82	5.39	5.98	4.52
Family income $40,000–$49,999	8.89	8.72	10.51	9.37	8.53
Family income $50,000–$59,999	10.36	10.44	10.51	9.37	10.29
Family income $60,000–$74,999	12.95	12.90	12.37	13.54	14.43
Family income $75,000–$99,999	15.72	16.19	14.05	14.33	13.17
Family income $100,000–$149,999	13.95	14.45	10.51	11.51	15.18
Family income Over $150,000	10.10	10.61	7.33	8.69	8.66
Percent white	79.33	–	–	–	–
Percent African American	8.08	–	–	–	–
Percent native American	0.49	–	–	–	–
Percent Asian	5.69	–	–	–	–
Percent Latino/Hispanic	0.09	–	–	–	–
Regions (percent living in)					
Rural area	31.15	35.87	8.48	15.58	12.67
Northeast	23.96	25.97	15.02	17.95	16.94
North Central	22.70	24.98	16.87	9.48	12.80
South	27.91	24.88	57.69	34.09	21.83
West	24.12	22.72	9.45	37.92	47.55
Observations	14,015	11,118	1132	886	797

households sponsored jointly by the US Census Bureau and the US Bureau of Labor Statistics (BLS). The CPS is cross-section data but does provide sufficient variation in cohorts to be able to identify the age effect while holding the cohort effects constant. Further, with regard to the racial group analysis, the CPS has a sufficiently large sample of Asian respondents to provide adequate power for a separate regression analysis of Asian respondents. With

Table 10 CPS graduate school enrollment by race (years 2000–2011)

	Full sample	White	African American	Asian	Latino	Native American	Other
Total graduate school enrollment (%)	3.42	3.18	4.12	4.90	4.01	1.88	5.75
Observations	176,911	146,027	10,188	8451	5983	693	5569

Table 11 Key marginal effects of cohorts and unemployment rate on graduate school enrollment—CPS data

	(A)	(B)
Unemployment 1-year lag	0.0232***	–
	(0.0004)	–
Unemployment 2-year lag	0.0037***	–
	(0.0003)	–
Log (S&P 500 Index) 1-year lag	–	−0.1410***
	–	(0.0036)
Log (S&P 500 Index) 2-year lag	–	−0.1604***
	–	(0.0036)
Cohort dummy variables	Yes	Yes
Demographic and income dummy variables	Yes	Yes
Region dummy variables	Yes	Yes
Observations	176,911	176,911
Pseudo R^2	0.3564	0.2358

regard to the CPS, we use the October Supplement which is an annual addition to the base monthly survey. The October Supplement collects information on the educational attainment of household members 3 years old and older, including highest grade completed. The supplement also collects information on level of current enrollment (grade, year of college, or year of graduate school) and enrollment status (full-time or part-time).[21]

We collect October Supplement data from 2000–2011. Similarly to our NLSY sample, we limit the CPS sample to the college graduate population. For example, in 2011 October Supplement data, there are 135,016 observations. By limiting to the college graduate population and cleaning the missing and error observations, we obtain a sample of 14,015 observations for 2011. For each year from 2000–2011, we implement the same limitations and data cleaning. As a result, our total observations are 176,911 observations pooled from years 2000–2011.[22,23]

The descriptive statistics for the 2011 CPS sample used are presented in Table 9 and the graduate school enrollment characteristics of the full (2000–2011) CPS sample are presented in Table 10. The CPS data set does not have the full set of dependent variables or independent variables that were used in our primary analysis, so the two analyses are not directly comparable. However for the CPS data, we utilize a similar specification as equation (2) in which the dependent variable, $GradEnrollment_{it}$, represents enrollment in graduate school for individual i in year t.[24] $MacroVariable$ represents lagged macroeconomic indicators (unemployment rate or log of S&P 500 Index). X_{itk} is a vector of individual characteristics capturing demographic characteristics and socioeconomic status.[25] The independent variables include age cohort dummy variables, income level dummy variables, a male dummy variable, a married dummy variable, number of children, race dummy variables, and region dummy variables. We cluster the standard errors at the household level. Table 11 shows the key marginal effects of the macroeconomics variables on graduate school enrollment. Consistent with the NLSY analysis, the lagged unemployment variables are positively related to graduate school enrollment and the lagged stock market related variables are negatively related to gradate school enrollment.

The CPS sample has a large enough subsample of non-white respondents to focus on four ethnic groups—white, African American, Latino/Hispanic, and Asian. When the CPS sample is stratified by race, Table 12 shows the pattern is consistent with the findings of the NLSY analysis by race. Overall, white graduate school enrollments are counter-cyclical and significantly affected by macroeconomic conditions. For whites, both the one-year and the two-year lagged unemployment rates are positively related to graduate enrollment and the one-year and two-year lagged log of the S&P 500 Index are negatively related to graduate enrollment (all significant at the 1% level). Similarly for Latinos, we find that graduate school enrollments are counter-cyclical and significantly affected by macroeconomic conditions. Both the one-year and the two-year lagged unemployment rates are positively related to graduate enrollment and the one-year and two-year lagged log of the S&P 500 Index are negatively related to graduate enrollment (all significant at the 1% level). Notably, the magnitudes of marginal effects for the two-year lagged unemployment and two-year lagged log of the S&P 500 Index are significantly larger for the Latino subsample than those for the white subsample. Table 12 also shows

[21] Source: https://nces.ed.gov/statprog/handbook/pdf/cps.pdf

[22] The observations in our sample broken down by year are as follows: 2000—11,644; 2001—15,197; 2002—15,972; 2003—15,804; 2004—15,913; 2005—16,025; 2006—15,860; 2007—14,815; 2008—14,783; 2009—13,022; 2010—13,861; and 2011—14,015.

[23] From "NCES Handbook of Survey Methods: Current Population Survey (CPS) - October Supplement," there are both sampling errors and nonsampling errors for the data. For data cleaning, we have dropped the observations that have at least one missing value or nonresponse value in any of the variables. In addition, we validate the data by checking, for example, if an observation's "Hispanic" variable indicates (s)he is Hispanic, but his/her "race" variable is "Black" only, then we exclude the observations like this. We check region and state and drop the observations with inconsistencies (e.g., A person lives in New York but "region" is "Pacific Division"). We also check school enrollment (after we limit to college graduates) and drop the observations if the current school attendance variable indicates a person is currently enrolled in a college or high school.

[24] Only total graduate enrollment is used as the CPS does not have data on type of graduate school enrollment. The CPS only asked about the type of degree program in which a respondent was enrolled in 1994 and this question was dropped from future waves of the survey.

[25] Income is lagged one year, but for simplicity we include it in X_{it}.

Table 12 Key marginal effects of cohorts and unemployment rate on graduate school enrollment—CPS data

	(A)				(B)			
	White	African American	Latino	Asian	White	African American	Latino	Asian
Unemployment 1-year lag	0.0216***	0.0320***	0.0108***	0.0355***				
	(0.0004)	(0.0016)	(0.0037)	(0.0017)				
Unemployment 2-year lag	0.0047***	−0.0022	0.0420***	−0.0030**				
	(0.0004)	(0.0012)	(0.0041)	(0.0014)				
Log (S&P 500 Index) 1-year lag					−0.1208***	−0.2019***	−0.1254***	−0.2297***
					(0.0038)	(0.0170)	(0.0200)	(0.0204)
Log (S&P 500 Index) 2-year lag					−0.1627***	−0.1224***	−0.2454***	−0.1073***
					(0.0039)	(0.0150)	(0.0221)	(0.0178)
Cohort dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic and income dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	146,027	10,188	5983	8451	146,027	10,188	5983	8451
Pseudo R^2	0.3602	0.3952	0.4344	0.4593	0.2404	0.1960	0.4789	0.2471

that the one- and two-year lagged log of the S&P 500 Index decreases the probability of graduate school enrollment for Asians. For the Asian subsample, the one-year lagged unemployment rate is positively related to the probability of graduate school enrollment but the two-year lagged unemployment rate is negatively related to the probability of graduate school enrollment. For African Americans, we also find evidence that graduate school enrollment is counter-cyclical. The one- and two-year lagged log of the S&P 500 Index decreases the probability of graduate school enrollment for African Americans and the one-year lagged unemployment rate is positively related to the probability of graduate school enrollment.

Table 13 Key marginal effects of state unemployment rates on graduate enrollments—CPS data

	Graduate school enrolment
State unemployment 1-year lag	0.0174***
	(0.0019)
State unemployment 2-year lag	0.0024*
	(0.0013)
Cohort dummy variables	Yes
Demographic and income dummy variables	Yes
State dummy variables	Yes
Observations	176,911
Pseudo R^2	0.3112

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

The state unemployment rate results using the CPS data are presented in Tables 13 and 14. These results show that increases in the one- and two-year lagged state unemployment rates are associated with increases in the probability of total graduate school enrollment by 0.0174 (significant at the 1% level) and 0.0024 (significant at the 10% level) respectively. Table 14 shows that, for whites, a one percentage point increase in the one- and two-year lagged state unemployment rates increase the probability of graduate school enrollment by 0.0157 (significant at the 1% level) and 0.0034 (significant at the 1% level), respectively. Table 14 also shows that a one percentage point increase in the two-year lagged state unemployment rate increases the probability of graduate school enrollment for Latinos/Hispanics by 0.0371 (significant at the 1% level). The two-year state unemployment rate is negatively related to total graduate school enrollment for African Americans and Asians. Given the CPS does not have a decomposition of graduate enrollment by type of graduate program, we are unable to determine which type of graduate school enrollment is driving these results.

Attrition Bias

There is previous research to suggest that "attrition in the NLSY97 appears to be non-random with respect to

Table 14 Key marginal effects of state unemployment rate on graduate enrollments by race—CPS data

	White	African American	Latino	Asian
State unemployment 1-year lag	0.0157***	0.0207***	0.0062	0.0248***
	(0.0018)	(0.0034)	(0.0071)	(0.0038)
State unemployment 2-year lag	0.0034***	−0.0035**	0.0371***	−0.0080***
	(0.0012)	(0.0017)	(0.0087)	(0.0026)
Cohort dummy variables	Yes	Yes	Yes	Yes
Demographic and income dummy variables	Yes	Yes	Yes	Yes
State dummy variables	Yes	Yes	Yes	Yes
Observations	146,027	10,188	5983	8451
Pseudo R^2	0.3079	0.2787	0.3947	0.3379

Table 15 NLSY respondent characteristic summary statistics by year

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Respondent characteristics—means											
Socioeconomic characteristics												
Age	20.00	20.28	20.72	21.19	21.78	22.57	23.48	24.29	25.17	26.10	27.40	28.33
Percent male	37.50%	48.15%	43.75%	38.89%	40.31%	38.70%	39.72%	42.00%	46.37%	39.41%	40.05%	44.74%
Percent married	12.50%	9.26%	17.86%	10.32%	13.78%	16.09%	22.70%	24.00%	26.81%	33.24%	29.30%	31.00%
Number of children	0.00	0.09	0.27	0.24	0.19	0.18	0.22	0.28	0.28	0.49	0.57	0.66
Avg. annual income	13,364	14,995	12,858	14,365	14,499	17,393	20,667	24,156	27,305	29,241	33,595	37,733
Average AFQT score	52,685	53,561	56,054	53,747	60,888	62,883	64,277	62,837	61,602	60,330	54,262	56,344
Percent with college loans	12.50%	9.26%	14.29%	7.94%	13.27%	7.83%	7.45%	4.67%	5.05%	7.06%	11.02%	10.51%
Percent white	62.50%	62.96%	69.64%	59.52%	67.86%	66.09%	65.96%	64.00%	61.83%	63.53%	37.10%	37.47%
Percent African American	25.00%	24.07%	16.07%	22.22%	20.92%	21.74%	19.86%	24.33%	24.29%	23.82%	32.53%	31.81%
Percent native American	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Percent Asian	12.50%	1.85%	4.46%	3.17%	2.55%	3.48%	3.19%	2.33%	1.89%	3.24%	6.45%	6.74%
Percent Latino/Hispanic	0.00%	11.11%	8.93%	12.70%	7.14%	6.52%	9.57%	8.33%	9.78%	7.65%	27.69%	31.27%
Percent other race	0.00%	0.00%	0.89%	2.38%	1.53%	2.17%	1.42%	1.00%	2.21%	1.76%	4.03%	4.31%
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Regions (% living in)												
Rural area	62.50%	16.67%	23.21%	13.49%	12.76%	14.35%	14.18%	14.00%	10.73%	12.06%	11.83%	13.75%
Northeast	12.50%	16.67%	18.75%	19.84%	20.92%	19.57%	18.79%	18.33%	19.56%	19.41%	2.96%	4.58%
North Central	25.00%	33.33%	23.21%	21.43%	24.49%	23.91%	24.47%	20.67%	22.71%	23.53%	21.24%	19.68%
South	50.00%	27.78%	36.61%	34.92%	33.16%	35.65%	34.75%	37.33%	36.28%	34.12%	32.53%	31.00%
West	12.50%	22.22%	21.43%	23.81%	21.43%	20.87%	21.99%	23.67%	21.45%	22.94%	42.20%	43.67%
Undergraduate major (%)												
Business	0.00%	9.26%	9.82%	9.52%	6.63%	6.09%	6.38%	5.00%	3.15%	3.82%	5.91%	4.04%
Art	12.50%	5.56%	5.36%	6.35%	3.57%	4.78%	3.19%	2.00%	1.58%	1.76%	3.23%	0.81%
Social science	0.00%	7.41%	14.29%	11.11%	9.69%	9.57%	5.32%	6.67%	5.36%	4.12%	3.49%	5.39%
Science	0.00%	5.56%	4.46%	3.17%	5.10%	3.04%	1.77%	1.00%	0.32%	0.29%	0.00%	0.27%
Engineering	0.00%	5.56%	6.25%	3.17%	1.02%	0.87%	1.06%	1.00%	1.26%	1.76%	2.42%	1.89%
Pre-med	0.00%	5.56%	9.82%	6.35%	9.69%	6.09%	6.03%	6.00%	4.42%	6.76%	0.00%	0.27%
Observations	8	54	112	126	196	230	282	300	317	340	372	383

Table 16 NLSY differences in means: participants in sample vs. participants that left sample (year by year *t* statistics)

	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011
AFQT score	−0.1699	−2.4229	−1.1527	−3.1339	−2.2351	−0.2082	0.5946	−2.0642
Income	2.7620	1.6519	2.0570	1.0522	0.6705	−1.1115	−1.1092	−5.0719
Male	0.3382	1.7531	2.1300	−0.1761	−1.4966	1.0050	1.5419	−1.9126
Age	0.9136	0.5296	−2.0392	1.5153	2.7168	−0.0456	−0.4808	−0.8731
Live in rural area	−1.0555	1.3585	0.6573	1.8069	−0.2434	−0.7123	1.8446	−1.7848
Marital status	0.2806	1.4746	0.1096	0.3430	−0.3390	−0.5650	2.7006	−0.2020
Number of children	1.1002	3.3909	0.7074	−0.2705	2.7189	−0.9563	0.1061	−0.8200
White	−0.4500	0.0815	0.2311	−1.1047	0.2011	−0.1108	5.5508	2.6046
African American	0.0991	1.0586	−0.3936	0.6617	−0.1546	−0.4297	−1.8684	0.4423
Asian	0.6388	−1.5607	−0.5646	0.4533	−0.3597	−1.6934	−2.7661	−2.1688
Latino	0.2298	−0.2955	1.0371	−0.0222	0.1091	0.8599	−4.3040	−2.0920

socioeconomic status and outcomes in early adulthood" (Aughinbaugh and Gardecki 2007). Thus, the attrition within the NLSY panel data set could lead to a biased sample. Table 15 presents respondent summary statistics for our sample by year and indicates that there was an increase in yearly observations of college graduates over the sample period. Yet, we still check for attrition bias in our sample with difference in means tests.

We use *t* tests to check for statistically significant differences in means for subjects who stayed in the survey versus those who dropped out. Table 16 presents the *t* test results for subjects who stayed in the survey versus those who dropped out for AFQT score, age, gender, income, live in a rural area, marital status, number of children, and race. Of the eighty-eight *t* tests, there are relatively few statistically significant differences. The *t* tests indicate that there are four statistically significant differences in the average AFQT scores. There are three statistically significant differences for income. There are two statistically significant differences each for average age, number of children, white, Asian, and Latino. There is one statistically significant difference each for male and marital status.

Conclusion

This paper contributes to the literature by quantifying the differential effects of the business cycle on graduate school enrollment by racial group and by presenting evidence suggestive of a causal relationship between macroeconomic indicators and the decision to pursue graduate education. Generally, we find that total graduate school enrollment is counter-cyclical with the business cycle. Graduate school enrollment increases due to increases in unemployment levels and decreases due to S&P 500 Index increases. Further, we show that the magnitude of the relationship between macroeconomic indicators and the specific type of graduate school program enrollment varies. Our main results also indicate significant differential racial effects of the business cycle on graduate school enrollment. The magnitude of the counter-cyclical effect of the business cycle on total enrollment is greater for some under-represented minority groups. Since theory indicates that the counter-cyclical effects of the business cycle fluctuations are driven by the opportunity costs to pursue a graduate degree, this evidence suggests lower opportunity costs for minorities. While there are a number of potential explanations for lower minority opportunity costs, this is consistent with the presence of a greater degree of wage discrimination. The results are particularly compelling given our college graduate sample and the panel data which allows us to control for socioeconomic variables and idiosyncratic individual variation.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Appendix A: Definition of Primary Variables Used in Analysis

Education-Related Variables

- Graduate School Enrollment — A dummy variable that is given a value of 1 if the respondent enrolls

in a graduate program in a given year and is set to 0 otherwise. The graduate school programs include full-time master's degree programs, doctoral degree programs, and professional degree programs.

- Full Time Master's Degree — A dummy variable that is given a value of 1 if in a given year the respondent enrolls in a full-time master's degree program including Master of Arts (M.A.) or Master of Science (M.S.). The variable is set to 0 otherwise.
- Full Time Ph.D. — A dummy variable that is given a value of 1 if the respondent enrolls in a full-time Doctor of Philosophy (Ph.D.) program in a given year. The variable is set to 0 otherwise.
- Full Time Professional Degree — A dummy variable is given a value of 1 if in a given year the respondent enrolls in a full-time professional degree program including Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Doctor of Medicine (M.D.), Juris Doctorate (J.D.), or professional degree program in another field. The variable is set to 0 otherwise.

Business Cycle-Related Variables

- Unemployment Rate — The annual national unemployment rate in a given year.
- State Unemployment Rates — The annual state unemployment rates in a given year.
- Log of S&P 500 Index — The natural logarithm of the S&P 500 Index in a given year.

Respondent Characteristic Variables

- Male Dummy Variable — A dummy variable that is given a value of 1 if the respondent is male. The variable is set to 0 for female.
- Age — The age of the respondent.
- Age^2 — The squared age of the respondent to control for non-linear effects of age.
- Married Dummy Variable — A dummy variable that is given a value of 1 if the respondent is married in a given year. The variable is set to 0 otherwise.
- Number of Children — The number of children of the respondent.
- Log of Income — The natural logarithm of the household's total income in the previous year. Total income includes salary, wages, investment income, business income, and other income. (This continuous income level variable is used in NLSY Specifications only. CPS specifications utilize income level dummy variables.)
- Log of AFQT Score — The natural logarithm of the respondent's highest Armed Forces Qualification Test (AFQT) score. AFQT raw scores range from 0 to 100,000.
- Have College Loans Dummy Variable — A dummy variable that is given a value of 1 if the respondent still owes college loans in a given year. The variable is set to 0 otherwise.
- Undergraduate Major Dummy Variables — Dummy variables for the following majors in a given year are used: business, art, social science, science, engineering, law, and pre-med.
- African American Dummy Variable — A dummy variable that is given a value of 1 if the respondent is African American. The variable is set to 0 otherwise.
- Hispanic/Latino Dummy Variable — A dummy variable that is given a value of 1 if the respondent is Hispanic or Latino. The variable is set to 0 otherwise.
- Native American Dummy Variable — A dummy variable that is given a value of 1 if the respondent is Native American. The variable is set to 0 otherwise.
- Asian Dummy Variable — A dummy variable that is given a value of 1 if the respondent is Asian. The variable is set to 0 otherwise.
- Other Race Dummy Variable — A dummy variable that is given a value of 1 if the respondent does NOT classify him/herself as white, African American, Latino/Hispanic, Asian, or Native American. The variable is set to 0 otherwise.
- North Central Region Dummy Variable — A dummy variable that is given a value of 1 if the respondent lives in the north central region of the United States in a given year. The variable is set to 0 otherwise.
- South Region Dummy Variable — A dummy variable that is given a value of 1 if the respondent lives in the southern region of the United States in a given year. The variable is set to 0 otherwise.
- West Region Dummy Variable — A dummy variable that is given a value of 1 if the respondent lives in the west region of the United States in a given year. The variable is set to 0 otherwise.
- Rural Dummy Variable — A dummy variable that is given a value of 1 if the respondent lives in an rural area in a given year. The variable is set to 0 otherwise.
- **CPS Only:** Cohort Dummy Variables — Three dummy variables for age cohorts within the CPS data set. One dummy variable that is given a value of 1 if the respondent is between age 20 and 34 and is set to 0 otherwise. One dummy variable that is given a value of 1 if the respondent is between age 35 and 49 and is set to 0 otherwise. One dummy variable that is given a value of 1 if the respondent is over 49 and is set to 0 otherwise.

Appendix B: Robustness Checks

Endogeneity Robustness Checks

Table 17 Key marginal effects of unemployment rate on graduate enrollments—specification without log (income) and has college loans controls

	Grad school	Master's	Ph..D	Professional
Unemployment 1-year lag	0.0075	−0.0076	0.0121***	−0.0011
	(0.0065)	(0.0061)	(0.0020)	(0.0029)
Unemployment 2-year lag	0.0205***	0.0261***	−0.0162***	0.0162***
	(0.0060)	(0.0055)	(0.0028)	(0.0030)
Log (AFQT)	0.1932***	0.1039**	0.0721***	0.0628***
	(0.0198)	(0.0150)	(0.0121)	(0.0172)
Age	0.0758*	0.0978***	−0.0311**	0.0359
	(0.0440)	(0.0410)	(0.0154)	(0.0199)
Age^2	−0.0019**	−0.0023	0.0006*	−0.0008
	(0.0009)	(0.0009)	(0.0003)	(0.0004)
Number of children	−0.0274**	−0.0210*	−0.0005	−0.0098*
	(0.0131)	(0.0121)	(0.0033)	(0.0078)
Male dummy variable	−0.0493**	−0.0252	−0.0274***	−0.0088
	(0.0196)	(0.0169)	(0.0095)	(0.0100)
Living in rural area dummy variable	0.0134	0.0205	0.0084	−0.0145
	(0.0218)	(0.0193)	(0.0092)	(0.0110)
Married dummy variable	0.0311	0.0164	0.0165**	−0.0032
	(0.0203)	(0.0185)	(0.0078)	(0.0090)
African American dummy variable	0.0345	−0.0263	0.0450	0.0107
	(0.0263)	(0.0232)	(0.0090)	(0.0151)
Latino/Hispanic dummy variable	0.0360	0.0300	−0.0219	0.0095
	(0.0319)	(0.0267)	(0.0191)	(0.0180)
Asian dummy variable	0.0086	−0.0479	0.0371	–
	(0.0487)	(0.0459)	(0.0155)	–
Other race dummy variable	0.0154	0.0443	–	–
	(0.0552)	(0.0489)	–	–
College major dummy variable	Yes	Yes	Yes	Yes
Region dummy variables	Yes	Yes	Yes	Yes
Observations	3772	3772	3772	3772
Pseudo R^2	0.1218	0.1010	0.2943	0.1765

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 18 Key marginal effects of log (S&P 500 Index) on graduate enrollments—specification without log (income) and has college loans controls

	Grad school	Master's	Ph.D.	Professional
Log (S&P 500 Index) 1-year lag	−0.0151	0.0617	−0.1001***	0.0521**
	(0.0496)	(0.0448)	(0.0203)	(0.0228)
Log (S&P 500 Index) 2-year lag	−0.1672***	−0.1819***	0.0789***	−0.0964***
	(0.0469)	(0.0418)	(0.0164)	(0.0232)

Table 18 (continued)

	Grad school	Master's	Ph.D.	Professional
Log (AFQT)	0.1918***	0.1039***	0.0703***	0.0615***
	(0.0197)	(0.0150)	(0.0120)	(0.0168)
Age	0.0492*	0.0824**	−0.0242	0.0119
	(0.0440)	(0.0407)	(0.0158)	(0.0192)
Age^2	−0.0011**	−0.0019**	0.0005	−0.0002
	(0.0009)	(0.0008)	(0.0003)	(0.0004)
Number of children	−0.0266**	−0.0204*	−0.0008	−0.0098
	(0.0131)	(0.0121)	(0.0033)	(0.0076)
Male dummy variable	−0.0494**	−0.0250	−0.0268***	−0.0098
	(0.0196)	(0.0168)	(0.0095)	(0.0101)
Living in rural area dummy variable	0.0134	0.0201	0.0088	−0.0127
	(0.0217)	(0.0193)	(0.0091)	(0.0110)
Married dummy variable	0.0327	0.0171	0.0166**	−0.0018
	(0.0202)	(0.0184)	(0.0078)	(0.0090)
African American dummy variable	0.0369	−0.0259	0.0459	0.0138
	(0.0261)	(0.0230)	(0.0089)	(0.0146)
Latino/Hispanic dummy variable	0.0372	0.0288	−0.0203	0.0112
	(0.0317)	(0.0265)	(0.0189)	(0.0187)
Asian dummy variable	0.0065	−0.0497	0.0367	–
	(0.0488)	(0.0459)	(0.0155)	–
Other race dummy variable	0.0144	0.0424	–	–
	(0.0551)	(0.0491)	–	–
College major dummy variables	Yes	Yes	Yes	Yes
Region dummy variables	Yes	Yes	Yes	Yes
Observations	3772	3772	3772	3772
Pseudo R^2	0.1184	0.0994	0.2773	0.1536

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 19 Key marginal effects of unemployment rate on graduate enrollments by race—specification without log(income) and has college loans controls

	Grad school	Master's	Ph.D.	Professional	
Panel A: white	Unemployment 1-year lag	0.0127	0.0095	0.0005	0.0048
		(0.0094)	(0.0089)	(0.0026)	(0.0039)
	Unemployment 2-year lag	0.0368***	0.0260***	−0.0031	0.0130***
		(0.0090)	(0.0084)	(0.0041)	(0.0042)
	Log (AFQT)	0.2094***	0.1647***	0.0445***	0.0402***
		(0.0301)	(0.0264)	(0.0157)	(0.0178)
	Age	0.0681	0.1012*	0.0170	−0.0225
		(0.0634)	(0.0603)	(0.0230)	(0.0255)
	Age^2	−0.0018	−0.0024*	−0.0004	0.0004
		(0.0013)	(0.0013)	(0.0005)	(0.0005)
	Number of children	−0.0213	0.0005	−0.0017	−0.0191**
		(0.0212)	(0.0192)	(0.0031)	(0.0093)

Table 19 (continued)

	Grad school	Master's	Ph.D.	Professional	
	Male dummy variable	−0.0478*	−0.0166	−0.0376**	−0.0093
		(0.0269)	(0.0240)	(0.0182)	(0.0133)
	Living in rural area dummy variable	0.0037	0.0136	0.0154	−0.0273
		(0.0302)	(0.0274)	(0.0092)	(0.0150)
	Married dummy variable	0.0704**	0.0353	0.0164*	0.0156
		(0.0274)	(0.0261)	(0.0087)	(0.0113)
	College major dummy variable	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	2078	2078	2078	2078
	Pseudo R^2	0.1348	0.1088	0.2420	0.1430
Panel B: African American	Unemployment 1-year lag	0.0166	−0.0182	0.0312	−0.0079
		(0.0104)	(0.0095)	(0.0055)	(0.0045)
	Unemployment 2 years	−0.0294	0.0048	−0.0396***	0.0229***
		(0.0133)	(0.0092)	(0.0065)	(0.0049)
	Log (AFQT)	0.1624***	0.0259	0.1222***	0.0795***
		(0.0301)	(0.0167)	(0.0156)	(0.0224)
	Age	−0.0301	−0.0209	−0.1144**	0.2165***
		(0.0716)	(0.0632)	(0.0443)	(0.0564)
	Age^2	0.0005	0.0003	0.0023***	−0.0044***
		(0.0014)	(0.0013)	(0.0008)	(0.0011)
	Number of children	−0.0359*	−0.0496***	0.0040	0.0103
		(0.0196)	(0.0191)	(0.0057)	(0.0110)
	Male dummy variable	−0.1089***	−0.1174***	−0.0070	0.0018
		(0.0382)	(0.0368)	(0.0140)	(0.0166)
	Living in rural area dummy variable	0.0067	0.0027	−0.0134	0.0114
		(0.0354)	(0.0282)	(0.0155)	(0.0156)
	Married dummy variable	0.0009	0.0107	0.0101	–
		(0.0399)	(0.0363)	(0.0129)	–
	College major dummy variables	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	1038	1038	1038	1038
	Pseudo R^2	0.1501	0.1696	0.4774	0.3824
Panel C: Latino	Unemployment 1-year lag	−0.0256	−0.0240	–	–
		(0.0151)	(0.0136)	–	–
	Unemployment 2 years	0.0668***	0.0554***	–	–
		(0.0133)	(0.0130)	–	–
	Log (AFQT)	0.1705***	0.1049***	–	–
		(0.0404)	(0.0334)	–	–
	Age	0.3191***	0.4233***	–	–
		(0.1085)	(0.1168)	–	–
	Age^2	−0.0066***	−0.0085***	–	–
		(0.0022)	(0.0023)	–	–
	Number of children	−0.0049	0.0041	–	–
		(0.0247)	(0.0225)	–	–
	Male dummy variable	0.0507	0.0889**	–	–
		(0.0444)	(0.0403)	–	–

Table 19 (continued)

	Grad school	Master's	Ph.D.	Professional	
	Living in rural area dummy variable	0.1205*	0.0921	–	–
		(0.0589)	(0.0552)	–	–
	Married dummy variable	−0.0667	−0.0579	–	–
		(0.0405)	(0.0398)	–	–
	College major dummy variables	Yes	Yes	–	–
	Region dummy variables	Yes	Yes	–	–
	Observations	483	483	–	–
	Pseudo R^2	0.2511	0.2137	–	–

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 20 Key marginal effects of S&P 500 Index on graduate enrollments by race—specification without log(income) and has college loans controls

		Grad school	Master's	Ph.D.	Professional
Panel A: white	Log (S&P 500 Index) 1-year lag	−0.0123	−0.0318	0.0074	0.0154
		(0.0695)	(0.0654)	(0.0203)	(0.0318)
	Log (S&P 500 Index) 2-year lag	−0.2849***	−0.2288***	0.0125	−0.0876***
		(0.0657)	(0.0599)	(0.0197)	(0.0322)
	Log (AFQT)	0.2050***	0.1619***	0.0444***	0.0361**
		(0.0297)	(0.0261)	(0.0156)	(0.0166)
	Age	0.0092	0.0663	0.0160	−0.0471*
		(0.0630)	(0.0595)	(0.0244)	(0.0256)
	Age^2	−0.0003	−0.0015	−0.0004	0.0010**
		(0.0013)	(0.0012)	(0.0005)	(0.0005)
	Number of children	−0.0199	0.0015	−0.0016	−0.0182**
		(0.0212)	(0.0192)	(0.0032)	(0.0092)
	Male dummy variable	−0.0502	−0.0184	−0.0377**	−0.0104
		(0.0269)	(0.0239)	(0.0180)	(0.0133)
	Living in rural area dummy variable	0.0040	0.0132	0.0155	−0.0253
		(0.0301)	(0.0272)	(0.0092)	(0.0152)
	Married dummy variable	0.0733***	0.0372	0.0164	0.0176
		(0.0273)	(0.0260)	(0.0086)	(0.0114)
	College major dummy variables	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	2078	2078	2078	2078
	Pseudo R^2	0.1259	0.1053	0.2418	0.1189
Panel B: African American	Log (S&P 500 Index) 1-year lag	−0.1556*	0.0827	−0.3023***	0.0841
		(0.0881)	(0.0678)	(0.0587)	(0.0407)
	Log (S&P 500 Index) 2-year lag	0.1807**	0.0132	0.2231***	−0.1427***
		(0.1235)	(0.0620)	(0.0516)	(0.0381)
	Log (AFQT)	0.1619***	0.0262	0.1177***	0.0810***
		(0.0301)	(0.0167)	(0.0157)	(0.0228)

Table 20 (continued)

		Grad school	Master's	Ph.D.	Professional
	Age	−0.0169	−0.0006	−0.0815	0.1989***
		(0.0717)	(0.0662)	(0.0501)	(0.0547)
	Age^2	0.0002	−0.0003	0.0017	−0.0039***
		(0.0014)	(0.0014)	(0.0010)	(0.0010)
	Number of children	−0.0364*	−0.0493***	0.0027	0.0100
		(0.0196)	(0.0189)	(0.0060)	(0.0106)
	Male dummy variable	−0.1089***	−0.1190***	−0.0052	0.0027
		(0.0383)	(0.0375)	(0.0143)	(0.0168)
	Living in rural area dummy variable	0.0056	0.0043	−0.0116	0.0143
		(0.0354)	(0.0287)	(0.0160)	(0.0158)
	Married dummy variable	0.0023	0.0077	0.0133	–
		(0.0398)	(0.0366)	(0.0132)	–
	College major dummy variables	Yes	Yes	Yes	Yes
	Region dummy variables	Yes	Yes	Yes	Yes
	Observations	1038	1038	1038	1038
	Pseudo R^2	0.1484	0.1628	0.4393	0.3424
Panel C: Latino	Log (S&P 500 Index) 1-year lag	0.3012**	0.2205	–	–
		(0.1167)	(0.1138)	–	–
	Log (S&P 500 Index) 2-year lag	−0.4845***	−0.4425***	–	–
		(0.1235)	(0.1227)	–	–
	Log (AFQT)	0.1727***	0.1044***	–	–
		(0.0416)	(0.0340)	–	–
	Age	0.2545**	0.4008***	–	–
		(0.1086)	(0.1172)	–	–
	Age^2	−0.0052**	−0.0080***	–	–
		(0.0022)	(0.0023)	–	–
	Number of children	−0.0007	0.0050	–	–
		(0.0254)	(0.0229)	–	–
	Male dummy variable	0.0537	0.0904**	–	–
		(0.0445)	(0.0402)	–	–
	Living in rural area dummy variable	0.1122	0.0842	–	–
		(0.0605)	(0.0558)	–	–
	Married dummy variable	−0.0648	−0.0560	–	–
		(0.0404)	(0.0397)	–	–
	College major dummy variables	Yes	Yes	–	–
	Region dummy variables	Yes	Yes	–	–
	Observations	483	483	–	–
	Pseudo R^2	0.2386	0.2071	–	–

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Contemporaneous Macro Variables Robustness Checks

Table 21 Key marginal effects of unemployment rate on graduate enrollments—specification includes contemporaneous unemployment rate

	Grad school	Master's	Ph.D.	Professional
Current unemployment	−0.0179**	−0.0086	−0.0115***	0.0051
	(0.0082)	(0.0075)	(0.0039)	(0.0035)
Unemployment 1-year lag	0.0354***	0.0054	0.0253***	−0.0051
	(0.0105)	(0.0095)	(0.0047)	(0.0049)
Unemployment 2-year lag	0.0086	0.0251***	−0.0284***	0.0190***
	(0.0087)	(0.0077)	(0.0058)	(0.0042)
Log (income)	−0.0325***	−0.0201***	−0.0021	−0.0083***
	(0.0074)	(0.0066)	(0.0016)	(0.0028)
Log (AFQT)	0.1771***	0.0967***	0.0728***	0.0638***
	(0.0238)	(0.0199)	(0.0131)	(0.0165)
Age	0.0887*	0.1228**	−0.0333**	0.0157
	(0.0516)	(0.0507)	(0.0186)	(0.0192)
Age^2	−0.0019*	−0.0026**	0.0007**	−0.0004
	(0.0011)	(0.0011)	(0.0004)	(0.0004)
Number of children	−0.0395***	−0.0279*	0.0015	−0.0216
	(0.0156)	(0.0155)	(0.0034)	(0.0108)
Male dummy variable	−0.0640***	−0.0333	−0.0267**	−0.0152
	(0.0231)	(0.0214)	(0.0113)	(0.0096)
Living in rural area dummy variable	0.0272	0.0280	0.0132	−0.0104
	(0.0277)	(0.0257)	(0.0121)	(0.0103)
Married dummy variable	0.0797***	0.0495**	0.0204**	0.0084
	(0.0243)	(0.0235)	(0.0093)	(0.0101)
Have college loans dummy variable	0.0965***	0.0637**	0.0075	0.0186**
	(0.0299)	(0.0278)	(0.0114)	(0.0090)
African American dummy variable	0.0017	−0.0493	0.0369	0.0126
	(0.0307)	(0.0309)	(0.0090)	(0.0110)
Latino/Hispanic dummy variable	−0.0176	−0.0016	−0.0211	0.0012
	(0.0403)	(0.0364)	(0.0223)	(0.0124)
Asian dummy variable	−0.0977	−0.0964	0.0219	–
	(0.0599)	(0.0540)	(0.0172)	–
Other race dummy variable	−0.0340	0.0310	–	–
	(0.0784)	(0.0675)	–	–
College major dummy variable	Yes	Yes	Yes	Yes
Region dummy variables	Yes	Yes	Yes	Yes
Observations	2720	2720	2720	2720
Pseudo R^2	0.1379	0.1045	0.3192	0.2438

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 22 Key marginal effects of log (S&P 500 Index) on graduate enrollments—specification includes contemporaneous log of S&P 500 Index

	Grad school	Master's	Ph.D.	Professional
Log (S&P 500 Index)	0.1236	0.0718	−0.0115***	−0.0621
	(0.0737)	(0.0646)	(0.0039)	(0.0379)
Log (S&P 500 Index) 1-year lag	−0.1543**	−0.0016	−0.1874***	0.0614**
	(0.0649)	(0.0557)	(0.0301)	(0.0264)
Log (S&P 500 Index) 2-year lag	−0.1324*	−0.1862***	0.1784***	−0.1437***
	(0.0707)	(0.0609)	(0.0314)	(0.0303)
Log (income)	−0.0319***	−0.0198***	−0.0023	−0.0080***
	(0.0074)	(0.0066)	(0.0016)	(0.0028)
Log (AFQT)	0.1775***	0.0975***	0.0708***	0.0613***
	(0.0236)	(0.0199)	(0.0130)	(0.0156)
Age	0.0388*	0.0889**	−0.0444**	0.0049
	(0.0530)	(0.0498)	(0.0188)	(0.0212)
Age^2	−0.0007*	−0.0019**	0.0009**	0.0000
	(0.0011)	(0.0010)	(0.0004)	(0.0004)
Number of children	−0.0387***	−0.0267	0.0009	−0.0217
	(0.0155)	(0.0154)	(0.0035)	(0.0110)
Male dummy variable	−0.0643***	−0.0331	−0.0269**	−0.0156
	(0.0231)	(0.0214)	(0.0111)	(0.0096)
Living in rural area dummy variable	0.0277	0.0276	0.0148	−0.0076
	(0.0276)	(0.0257)	(0.0118)	(0.0106)
Married dummy variable	0.0795***	0.0498**	0.0209**	0.0083
	(0.0243)	(0.0234)	(0.0091)	(0.0101)
Have college loans dummy variable	0.1005***	0.0650**	0.0095	0.0215**
	(0.0296)	(0.0275)	(0.0113)	(0.0092)
African American dummy variable	0.0063	−0.0479	0.0390	0.0167
	(0.0305)	(0.0308)	(0.0090)	(0.0107)
Latino/Hispanic dummy variable	−0.0128	−0.0013	−0.0194	0.0026
	(0.0397)	(0.0358)	(0.0220)	(0.0124)
Asian dummy variable	−0.0972	−0.0977	0.0253	–
	(0.0603)	(0.0536)	(0.0179)	–
Other race dummy variable	−0.0286	0.0310	–	–
	(0.0781)	(0.0672)	–	–
College major dummy variables	Yes	Yes	Yes	Yes
Region dummy variables	Yes	Yes	Yes	Yes
Observations	2720	2720	2720	2720
Pseudo R^2	0.1325	0.1015	0.3006	0.2166

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 23 Key marginal effects of unemployment rate on graduate enrollments by race—specification includes contemporaneous unemployment rate

		Grad school	Master's	Ph.D.	Professional
Panel A: white	Unemployment	−0.0134	−0.0170	−0.0023	0.0014
		(0.0111)	(0.0107)	(0.0107)	(0.0050)
	Unemployment 1-year lag	0.0338**	0.0325**	0.0051	0.0031
		(0.0150)	(0.0141)	(0.0046)	(0.0071)
	Unemployment 2-year lag	0.0355***	0.0250**	−0.0070	0.0130**
		(0.0129)	(0.0118)	(0.0065)	(0.0062)
	Log (income)	−0.0375***	−0.0250***	−0.0026	−0.0088**
		(0.0103)	(0.0092)	(0.0023)	(0.0044)
	Log (AFQT)	0.2334***	0.1728***	0.0486***	0.0627***
		(0.0360)	(0.0324)	(0.0187)	(0.0218)
	Age	0.0210	0.0870	0.0110	−0.0536*
		(0.0833)	(0.0812)	(0.0258)	(0.0309)
	Age^2	−0.0006	−0.0020	−0.0003	0.0011*
		(0.0017)	(0.0017)	(0.0006)	(0.0006)
	Number of children	−0.0060	0.0213	0.0008	−0.0392**
		(0.0267)	(0.0246)	(0.0044)	(0.0159)
	Male dummy variable	−0.0606*	−0.0196	−0.0489**	−0.0157
		(0.0318)	(0.0297)	(0.0250)	(0.0134)
	Living in rural area dummy variable	0.0006	0.0074	0.0200	−0.0283*
		(0.0363)	(0.0346)	(0.0130)	(0.0165)
	Married dummy variable	0.1408***	0.0947***	0.0171	0.0234*
		(0.0320)	(0.0313)	(0.0106)	(0.0130)
	Have college loans dummy variable	0.0732*	0.0232	0.0128	0.0231**
		(0.0434)	(0.0417)	(0.0125)	(0.0110)
	College major and region dummy variable	Yes	Yes	Yes	Yes
	Observations	1546	1546	1546	1546
Panel B: Af. American	Unemployment	−0.0388**	−0.0073	−0.0426***	0.0119**
		(0.0152)	(0.0125)	(0.0097)	(0.0059)
	Unemployment 1-year lag	0.0645***	−0.0082	0.0786***	−0.0222
		(0.0185)	(0.0169)	(0.0184)	(0.0090)
	Unemployment 2-year lag	−0.0600***	−0.0001	−0.1253***	0.0355***
		(0.0154)	(0.0152)	(0.0488)	(0.0072)
	Log (income)	−0.0226*	0.0057	−0.0015	−0.0159***
		(0.0126)	(0.0102)	(0.0045)	(0.0048)
	Log (AFQT)	0.1324***	0.0069	0.1473***	0.0666***
		(0.0380)	(0.0241)	(0.0204)	(0.0185)
	Age	0.0203	−0.0219	0.0019	0.2480***
		(0.0931)	(0.0766)	(0.0584)	(0.0694)
	Age^2	−0.0003	0.0003	0.0002	−0.0050***
		(0.0018)	(0.0016)	(0.0011)	(0.0014)
	Number of children	−0.0540**	−0.0731**	0.0080	−0.0017
		(0.0243)	(0.0301)	(0.0057)	(0.0098)
	Male dummy variable	−0.1077**	−0.1171**	0.0102	−0.0144
		(0.0462)	(0.0496)	(0.0120)	(0.0162)
	Living in rural area dummy variable	0.0482	0.0273	−0.0041	0.0120
		(0.0500)	(0.0398)	(0.0189)	(0.0156)

Table 23 (continued)

		Grad School	Master's	PhD	Professional
	Married dummy variable	0.0358	0.0306	0.0109	–
		(0.0537)	(0.0516)	(0.0125)	–
	Have college loans dummy variable	0.1386***	0.1379***	−0.0293	0.0161
		(0.0509)	(0.0400)	(0.0273)	(0.0192)
	College major and region dummy variables	Yes	Yes	Yes	Yes
	Observations	679	679	679	679
Panel C: Latino	Unemployment	−0.0028	−0.0061	–	–
		(0.0226)	(0.0203)	–	–
	Unemployment 1-year lag	−0.0173	−0.0124	–	–
		(0.0187)	(0.0171)	–	–
	Unemployment 2-year lag	0.0577***	0.0478***	–	–
		(0.0154)	(0.0147)	–	–
	Log (income)	−0.0235	−0.0215	–	–
		(0.0168)	(0.0164)	–	–
	Log (AFQT)	0.1569***	0.1173**	–	–
		(0.0533)	(0.0513)	–	–
	Age	0.2920***	0.3929***	–	–
		(0.1074)	(0.1164)	–	–
	Age^2	−0.0059***	−0.0078***	–	–
		(0.0022)	(0.0023)	–	–
	Number of children	−0.0283	−0.0098	–	–
		(0.0262)	(0.0250)	–	–
	Male dummy variable	0.0274	0.0409	–	–
		(0.0449)	(0.0441)	–	–
	Living in rural area dummy variable	0.1470*	0.1016	–	–
		(0.0644)	(0.0711)	–	–
	Married dummy variable	−0.0224	−0.0328	–	–
		(0.0437)	(0.0452)	–	–
	Have college loans dummy variable	−0.0900	−0.0716	–	–
		(0.0731)	(0.0710)	–	–
	College major and region dummy variables	Yes	Yes	–	–
	Observations	389	389	–	–

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 24 Key marginal effects of S&P 500 Index on graduate enrollments by race—specification includes contemporaneous log of S&P 500 Index

		Grad school	Master's	Ph.D.	Professional
Panel A: white	Log (S&P 500 Index)	0.0764	0.1368	0.0306	−0.0657
		(0.0975)	(0.0914)	(0.0914)	(0.0398)
	Log (S&P 500 Index) 1-year lag	−0.0936**	−0.1278**	−0.0162	0.0362
		(0.0926)	(0.0856)	(0.0247)	(0.0423)
	Log (S&P 500 Index) 2-year lag	−0.3147***	−0.2315**	0.0415	−0.1333**
		(0.0957)	(0.0889)	(0.0276)	(0.0392)
	Log (income)	−0.0360***	−0.0238***	−0.0027	−0.0085**
		(0.0104)	(0.0093)	(0.0022)	(0.0043)
	Log (AFQT)	0.2322***	0.1719***	0.0486***	0.0595***
		(0.0361)	(0.0324)	(0.0186)	(0.0214)
	Age	−0.0704	0.0105	0.0028	−0.0691*
		(0.0859)	(0.0813)	(0.0236)	(0.0334)
	Age^2	0.0015	−0.0002	−0.0001	0.0015*
		(0.0018)	(0.0017)	(0.0005)	(0.0007)
	Number of children	−0.0063	0.0216	0.0011	−0.0381**
		(0.0265)	(0.0245)	(0.0044)	(0.0159)
	Male dummy variable	−0.0636*	−0.0212	−0.0495**	−0.0166
		(0.0318)	(0.0297)	(0.0247)	(0.0133)
	Living in rural area dummy variable	0.0026	0.0083	0.0203	−0.0259*
		(0.0368)	(0.0348)	(0.0129)	(0.0165)
	Married dummy variable	0.1379***	0.0930***	0.0169	0.0235*
		(0.0322)	(0.0313)	(0.0104)	(0.0132)
	Have college loans dummy variable	0.0847*	0.0297	0.0137	0.0284**
		(0.0422)	(0.0405)	(0.0117)	(0.0115)
	College major and region dummy variables	Yes	Yes	Yes	Yes
	Observations	1546	1546	1546	1546
Panel B: Af. American	Log (S&P 500 Index)	0.4113**	0.1117	0.3418***	−0.0913**
		(0.1409)	(0.1057)	(0.0725)	(0.0759)
	Log(S&P 500 Index) 1-year lag	−0.4588***	0.0192	−0.5074***	0.0931
		(0.1178)	(0.0913)	(0.0858)	(0.0338)
	Log (S&P 500 Index) 2-year lag	0.4437***	0.0851	0.5502***	−0.2246***
		(0.1688)	(0.0986)	(0.1262)	(0.0507)
	Log (income)	−0.0229*	0.0053	−0.0034	−0.0184***
		(0.0127)	(0.0101)	(0.0057)	(0.0057)
	Log (AFQT)	0.1327***	0.0066	0.1463***	0.0671***
		(0.0380)	(0.0242)	(0.0218)	(0.0185)
	Age	−0.0286	−0.0261	−0.0844	0.2751***
		(0.0940)	(0.0782)	(0.0693)	(0.0795)
	Age^2	0.0005	0.0003	0.0017	−0.0053***
		(0.0019)	(0.0016)	(0.0013)	(0.0015)
	Number of children	−0.0555**	−0.0725**	0.0075	−0.0019
		(0.0238)	(0.0280)	(0.0062)	(0.0094)
	Male dummy variable	−0.1100**	−0.1177**	0.0094	−0.0108
		(0.0471)	(0.0482)	(0.0124)	(0.0148)
	Living in rural area dummy variable	0.0466	0.0284	−0.0020	0.0156
		(0.0508)	(0.0409)	(0.0183)	(0.0174)
	Married dummy variable	0.0406	0.0275	0.0132	–
		(0.0525)	(0.0512)	(0.0133)	–

Table 24 (continued)

		Grad school	Master's	Ph.D.	Professional
	Have college loans dummy variable	0.1424***	0.1388***	−0.0281	0.0094
		(0.0509)	(0.0360)	(0.0278)	(0.0191)
	College major and region dummy variables	Yes	Yes	Yes	Yes
	Observations	679	679	679	679
Panel C: Latino	Log (S&P 500 Index)	0.0268	−0.0138	–	–
		(0.2146)	(0.1815)	–	–
	Log (S&P 500 Index) 1-year lag	0.1729	0.1502	–	–
		(0.0976)	(0.0907)	–	–
	Log (S&P 500 Index) 2-year lag	−0.4776***	−0.4455***	–	–
		(0.1688)	(0.1573)	–	–
	Log (income)	−0.0273	−0.0246	–	–
		(0.0165)	(0.0164)	–	–
	Log (AFQT)	0.1575***	0.1176**	–	–
		(0.0532)	(0.0511)	–	–
	Age	0.2621***	0.3916***	–	–
		(0.1163)	(0.1230)	–	–
	Age^2	−0.0051***	−0.0076***	–	–
		(0.0023)	(0.0024)	–	–
	Number of children	−0.0261	−0.0092	–	–
		(0.0264)	(0.0249)	–	–
	Male dummy variable	0.0324	0.0452	–	–
		(0.0457)	(0.0452)	–	–
	Living in rural area dummy variable	0.1385*	0.0950	–	–
		(0.0657)	(0.0718)	–	–
	Married dummy variable	−0.0181	−0.0291	–	–
		(0.0412)	(0.0429)	–	–
	Have college loans dummy variable	−0.0898	−0.0695	–	–
		(0.0737)	(0.0711)	–	–
	College major and region dummy variables	Yes	Yes	–	–
	Observations	389	389	–	–

Marginal effects reported. Robust standard errors in parentheses are clustered at the individual level

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

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