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IZA DP No. 10996

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ABSTRACT

Up in STEM, Down in Business: Changing College Major Decisions with the Great Recession*

We use the American Community Survey (ACS) to investigate the extent to which college major decisions were affected during and after the Great Recession with special attention to business and STEM fields, as well as the heterogeneity by gender, race/ethnicity and combinations of race/ethnicity and gender. Several conclusions are reached. First, we see an overall increase in the frequency of STEM majors but a decrease in the frequency of business majors during and after the Great Recession. Second, the increase for STEM fields is spread across several detailed STEM fields, while the decrease in business majors is especially concentrated among finance and management. Third, we find strong heterogeneous effects by gender and race/ethnicity. Males are pushed away from business majors, while both males and females are pushed toward STEM majors; certain racial groups, such as white and Asian, seem to be affected more than others.

JEL Classification: I20, J24

Keywords: Great Recession, college major, business, finance, STEM

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1. Introduction

Every year millions of young adults make important decisions about human capital investments, including whether to attend college, where to attend, and what field to study. These choices affect current and future well-being (Altonji et al. 2012; Arcidiacono et al. 2012; Eide et al. 2016; Kirkeboen et al. 2016). In particular, college major field of study is an important factor for future labor market success, and college major choices can depend on external macroeconomic shocks on labor demand in different fields. The Great Recession is a dominating shock that affected labor demand significantly, altered the desirability of various educational paths and potentially changed student choices about college major (Long et al. 2015; Shu 2016; Weinstein 2017); it is also the focus of this paper.

Many students pursue a college major that they hope will prepare them for a career that is financially rewarding and personally enriching (Freeman and Hirsch 2008; Altonji et al. 2015). However, imperfect information exists both at the microeconomic level in terms of individual interest and ability and at the macroeconomic level in terms of future labor market conditions for specific skills (Zafar 2011; Blom et al. 2015; Wiswall and Zafar 2015a, b; Arcidiacono et al. 2016). Students form expectations and choose the major they expect to be the best for themselves, but incomplete information and factors beyond their control can sometimes lead to undesirable outcomes where students end up in career paths that underutilize their skills or do not fulfill their expectations (Abel and Deitz 2016). There is a growing concern about recent college graduates taking jobs for which they are overeducated or have mismatched skills (Abel et al. 2014). This concern was amplified by difficult labor market conditions during and after the Great Recession. Recent graduates especially struggled, but some fields struggled more than others (Altonji et al. 2016).

The current paper uses data from the American Community Survey (ACS) to investigate the extent to which college major decisions were altered during and after the Great Recession. The overall changes in college major choice during and after the Great Recession are first examined; we then pay special attention to business and STEM fields, which traditionally tend to earn relatively high incomes (Webber 2014, 2016). We also extensively investigate heterogeneous effects by gender, race/ethnicity and combinations of race/ethnicity and gender. College major decisions often differ by sex and race/ethnicity (Zafar 2013; Ransom and Winters 2016; Speer 2017), and the aspects of the Great Recession related to college major have the potential to affect demographic groups differently.

We find that majors in business and STEM fields were uniquely affected during and after the Great Recession. Specifically, we find an overall increase in the frequency of STEM majors but a decrease in the frequency of business majors. The increase for STEM fields is spread across several detailed STEM fields, while the decrease in business majors is especially concentrated among finance and management. Further investigation on differential responses across demographic groups to the Great Recession suggests strong heterogeneity across gender and race/ethnicity. Specifically, males are pushed away from business majors, while both genders are pushed toward STEM majors; certain racial groups, such as white and Asian, seem to be affected more than others. A comprehensive set of robustness checks suggest our results are robust against several potential confounding factors and measurement issues.

Other research on the effects of the Great Recession on college major choices includes working papers by Shu (2016), Weinstein (2017), and Ersoy (2017) but is otherwise limited. Shu (2016) uses administrative data on bachelor's degree recipients from Massachusetts Institute of Technology (MIT) during 1994-2012 and finds that the Great Recession shifted MIT graduates

toward STEM and away from business-related majors. Of course, MIT is a single unique institution and thus findings for MIT may not apply more generally. Weinstein (2017) examines the effects of three sector-specific local labor market shocks on college major decisions including a look at localized effects of the 2008 financial crisis using institution degree conferral counts from the Integrated Postsecondary Education Data System (IPEDS).[1] Weinstein (2017) finds that private universities in high finance employment (in year 2000) geographic areas experienced significant reductions in business degree conferrals after the financial crisis, while public universities in high finance employment areas saw increased business degree conferrals. Additionally, private universities in low finance areas saw moderate decreases in business degree conferrals. The localized effects among private universities may result from migration frictions or information frictions but may also reflect shifting from private to public universities for students interested in business majors in high finance employment geographic areas. Ersoy (2017) also uses IPEDS data to examine effects of the Great Recession on college major choices. She looks across all majors rather than focusing on just STEM and business. Ersoy (2017) connects student major decisions to state-level employment outcomes of occupations most commonly associated with the majors. She finds evidence of student responses toward majors less adversely affected by the recession.

While Shu (2016) and Weinstein (2017) have examined effects of the Great Recession on business and STEM college majors using different data for localized settings, our study makes a substantive contribution and fills an important gap in the research literature. First, our use of a large nationally representative dataset allows us to take a broader look across the country. Relatively narrow administrative datasets make it difficult to know if changes in majors are

[1] The other two shocks examined by Weinstein (2017) are the dot-com crash of 2000 and a policy shock in the 1980s that made Delaware an international financial center.

geographically isolated or widespread. Institutional data may also be affected by changes in the composition of students in the given area or institution as students alter whether and where they attend college in response to geographically heterogeneous economic shocks. The ACS allows us to provide national-level estimates that are not confounded by migration or information frictions. Second, ACS microdata allow us to control for a series of individual characteristics to account for many potential confounding factors and possible changes in student composition. For example, we can control for age effects to prevent our analysis from being confounded by older students returning to school.[2] Third, the ACS contains 38 general 2-digit and 183 detailed 4-digit major categories, allowing a close look at specific majors. We uncover important differences among detailed majors that might be overlooked if only examining broader categories. Finally, the ACS microdata include detailed information on sex and race/ethnicity, allowing for a nuanced analysis.

To our knowledge, Blom et al. (2015) is the only other study using the ACS to examine the effects of business cycles on college major decisions. Our analysis differs from theirs in a number of ways, but the most important is the focus of the paper. They study business cycle effects over a longer period (1960-2011), while we focus on changes in majors during the Great Recession and slow recovery that followed. The Great Recession is often considered the worst recession in the United States since the Great Depression of the 1930s making it a unique event capable of distinctive effects and worthy of detailed study (Brown and Hoxby 2015). One unique feature of the Great Recession is it was exacerbated by a severe financial crisis, which made

[2] This is in contrast to data on degree completion at the institutional level from the IPEDS, which only recently (in 2012) began consistently reporting degree totals by age categories for recipients. Prior to that, degree totals generally include all ages, so that one cannot distinguish between traditional students finishing in a normal timeframe and older adult students who went back and finished at older ages. The college major mix generally differs between traditional and non-traditional students, and these two groups may respond differently to macroeconomic factors such as the Great Recession. This means that IPEDS and similar data have some limitations for examining the effects of macroeconomic factors on individual level decisions about higher education investments.

finance and related occupations less appealing than would occur in a normal economic downturn. Altonji et al. (2016) indicate that labor demand for some high-paying majors like finance was much more adversely affected by the Great Recession than in previous downturns.

While Blom et al. (2015) find that a weak economy generally pushes college students towards majors in finance and other business fields, we find that young people were pushed away from these fields during the Great Recession and slow recovery. We suggest that this occurred for two reasons. First, students reduced their expectations about income and employment prospects in finance related occupations and shifted away from related majors. Second, the finance industry took considerable blame for the Great Recession and financial crisis and this altered the desirability of related majors. Individuals care about the prestige, social status, and self-worth that their college major and eventual occupation bestow, and the financial crisis appears to have significantly affected these. Together these factors shifted college students away from finance and some other business fields and toward some STEM fields.

2. Conceptual Background

Young people face a number of education decisions including what, when, where, and how much to study.[3] Those who complete a college degree do so in a diverse set of major fields of study that they believe is the best major for them. Some major fields are closely linked to one or more related occupations, while others are less connected to any particular occupation (Ransom and Phipps 2016). Classical economics models treat education as an investment in human capital that includes both costs and benefits. The costs are mainly born while education is being pursued and include tuition, course materials, opportunity costs of time, and effort costs.

[3] There is considerable interdependence and path dependence in these decisions. There is also a great deal of uncertainty about the consequences of various educational decisions. See Altonji et al. (2015) for a detailed discussion and literature review.

Benefits accrue both in the present and in the future. Present benefits include personal fulfillment and consumption aspects of learning fun and interesting things. Future benefits are primarily related to the job market in the form of obtaining a good job that is both enjoyable and financially rewarding. Classical human capital models assume that individuals form expectations about various costs and benefits and then choose the educational path that offers them the greatest expected well-being. Of course, individuals have heterogeneous skills, study interests, job preferences, risk preferences, intertemporal discount rates, and expectations about future costs and benefits of various paths. This heterogeneity in individual characteristics induces heterogeneous choices, e.g., in the amount of education and the major field of study.

Individual preferences, expectations, and education decisions can be significantly affected by changing macroeconomic conditions. A weak economy reduces current employment opportunities and lowers the opportunity cost of pursuing higher education. A weak economy can also affect what field an individual chooses to study. In particular, Blom et al. (2015) find that higher unemployment rates cause young people to shift toward majors with higher earnings, better employment rates, and greater connection to specific occupations. Specifically, they find that high unemployment shifts students toward "professional" fields like engineering, computer science, accounting, and finance and away from "non-professional" fields like sociology, psychology, liberal arts, and visual and performing arts. The mechanism is difficult to precisely identify, but it appears that college students are switching toward more professional majors during weak economic conditions because of a cyclical labor market penalty for non-professional majors. During a strong economy, the demand for skilled labor is high, and employers must be less selective and willing to hire and train college graduates educated in less related fields. In contrast, in a weak economy, there is less employer competition for skilled workers, so

employers can be more selective and focus on hiring graduates with college majors closely related to their opening. Furthermore, there is ample evidence that early struggles in the labor market can have scarring effects that last for years or even decades (Kahn 2010; Oreopoulos et al. 2012; Brunner and Kuhn 2014; Altonji et al. 2016). Marginal decision-making students who expect greater labor market difficulty for non-professional majors during weak economies become more likely to choose a professional major during high unemployment periods.

A related issue is that the prestige, social status, and self-fulfillment associated with particular majors can be affected by external factors. For example, a growing information technology industry makes related majors more attractive because of increased income and employment prospects, but a tech boom may also make it cool to be a computer whiz.[4] Choi et al. (2016) document that positively skewed news coverage for an industry's superstar firms can alter student expectations and decisions about college majors and increase their likelihood of choosing majors related to the superstar firms. More generally, a rising demand for a particular skill set can increase its perceived social importance and make related majors more desirable above and beyond the effects on labor market outcomes. Similarly, many individuals seek self-fulfillment through their college major and career. They hope to contribute to the greater good and want a college major and occupation that they themselves deem societally useful. For example, museum curators, zookeepers, and librarians may view their occupations as being especially important for society, even above and beyond how important outsiders view their professions. To many workers, an occupation is a calling and part of their identity. Even those

[4] A tech bust may also have amplified negative effects. Clark (2016) finds strong negative effects of the dot-com bubble bust and 2001-2002 recession on the decision to major in engineering at the University of Texas-Austin. The adverse effects on the engineering labor market ended up being short-lived, and the shift away from engineering majors was much larger than would be predicted solely based on employment concerns with rational expectations. Thus, it appears that either students believed that the adverse tech shock would be more persistent than it actually was or the bust adversely affected the prestige in very pronounced ways.

who do not feel called to a particular vocation typically still want to take pride in what they do. According to Adam Smith (1759) and Russell Roberts (2014), people want to be loved and lovely. "Man naturally desires, not only to be loved, but to be lovely; or to be that thing which is the natural and proper object of love" (Smith 1759, p. 114). Individuals want to be valued and appreciated by others (loved), but they also want to be valuable and worthy of appreciation (lovely). This can significantly affect many choices including college major. In particular, some people will choose a college major in part based on the amount of love and loveliness they expect from it.

Given this background, the Great Recession is likely to be a major factor affecting youth educational choices. The Great Recession is the popular name given to the recession that the National Bureau of Economic Research (NBER) classifies as beginning in December 2007 and ending in June 2009.[5] The U.S. experienced a considerable financial crisis around this time tied to a subprime lending-fueled housing bubble bust that played a major role in causing the recession and amplifying its effects. The financial problems were perceived as relatively limited and the economy had experienced only mild effects until September 2008, when a series of troublesome events with Lehman Brothers, AIG, and other major institutions triggered a global financial crisis (Mishkin 2011). The economic recovery following the official end of the recession was slow and indicators like GDP growth and unemployment rate continued to suggest a struggling economy for years afterward (Taylor 2014).

The events and circumstances surrounding the Great Recession are likely to have affected the desirability of various college majors in numerous ways. According to the theory and empirical findings of Blom et al. (2015), the weak economy likely altered expectations about future employment prospects for various majors, which would tend to shift college students

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

toward more traditionally high-paying and professionally-oriented majors like STEM and business fields. However, the Great Recession was exacerbated by the financial crisis that especially reduced employer demand for finance and related occupations; Weinstein (2017) reports that finance insurance and real estate (FIRE) employment in the U.S. fell by 8 percent between 2007 and 2010. Thus, the expected employment effects of the Great Recession on business and finance majors are somewhat ambiguous, but should be positive on STEM.

Furthermore, many people primarily blamed the financial crisis and recession on legally, ethically, and intellectually questionable behaviors among finance professionals. These professionals were increasingly portrayed by news media and popular culture as greedy, predatory, incompetent, or worse (Strassel 2009; Blinder 2010; Smith 2012). Owens (2012) indicates that American confidence in Wall Street reached historical lows and animosity toward the financial industry was at historical highs. There was considerable anger and resentment under the popular perception that the financial sector had made huge profits and incomes while harming hard-working Americans and then, on the brink of failure, received bailouts from the federal government with failed executives given golden parachutes for a job poorly done. Meanwhile, regular Americans were losing their jobs, their houses, and so much of what they had worked hard to gain. This climate most likely reduced the prestige, social status, and loveliness of finance and related occupations and may have made young people less likely to choose college majors geared towards these occupations. This climate may also have increased the relative prestige, social status, and loveliness for other traditional high-paying occupations, such as STEM. Overall, we suspect that the Great Recession should decrease the probability of young people choosing business and finance related college majors, but increase the odds of picking other traditionally high rewarding majors like STEM.

There is also likely some heterogeneity among business fields with fields most associated with finance likely receiving the most negative effects. There may also be potential heterogeneity in effects across sex and race/ethnicity (Zafar 2013; Ransom and Winters 2016). For example, some demographic groups may be especially career-conscious and thus respond to macroeconomic conditions more strongly than others. Or, some demographic groups may be more concerned about fairness, justice, or social status and may have been particularly turned off by the bad press received by the financial sector. Ultimately, the effects of the Great Recession on college major choice in general and across demographic groups are an empirical question. We outline our empirical approach for studying this in the next section.

3. Data and Empirical Approach

This paper examines changes in college major choices during and after the Great Recession and financial crisis using microdata from the 2009-2015 American Community Survey (ACS) obtained from IPUMS (Ruggles et al. 2015). Prior uses of the ACS to examine other changes in college major decisions include Blom et al. (2015), Sjoquist and Winters (2015), and Ransom and Winters (2016), but none of these specifically focus on the period of the Great Recession. The ACS is an annual survey of one percent of the U.S. population that collects individual information on demographics, education, income, employment, and a number of other characteristics. We combine the individual surveys for years 2009-2015; the 2015 ACS was the most recent survey available at the time our analysis was conducted.

Since 2009 the ACS has asked individuals with a bachelor's degree or higher to report their major field of study for their bachelor's degree. Responses are coded into 183 detailed 4-digit college major categories, which are also grouped into 38 general 2-digit major categories.

We divide these college majors into seven broad major groups including business, STEM, education, health-related, liberal arts, social sciences, and Other Majors.[6] We start by looking at these broad major groups and then proceed to look at detailed majors in business and STEM fields. A mapping between the detailed majors in the ACS and our broad group definitions is provided in Appendix Table A1.

Our primary empirical approach treats the Great Recession, financial crisis, and slow recovery as a single event, which we often just refer to as the Great Recession for simplicity. The Great Recession and financial crisis were closely intertwined making separating them infeasible for our purposes. One could attempt to separate effects on college major between the recession and the slow recovery, but this is no easy task. Major events like the Great Recession can have long lasting effects on people's beliefs and expectations that are hard to untangle temporally.

We construct a binary treatment variable to classify individuals as being either exposed or not exposed to the Great Recession based on the year they reach age 18. Specifically, we define an individual as exposed to the treatment from the recession if the person reaches age 18 in 2008 or later. Persons aged 18 in 2007 or earlier are defined as not treated. Defining treatment in this way assumes that most college graduates chose their college major at age 18 and has been done previously in other research (Sjoquist and Winters 2015; Ransom and Winters 2016). Young people can and do make this decision at different ages. Some choose a college major early, e.g., at age 16 or 17, and stick with it. Others change their college major at older ages so that they are still influenced by macroeconomic events at ages 19, 20, 21, or even older. This further hinders us from cleanly separating the recession from the slow recovery as noted above, but it also means that we may have some difficulty completely isolating early effects of the

[6] We define Other Majors to include all majors that are not included in business, STEM, education, health-related, liberal arts, or social sciences. To avoid ambiguity, we capitalize the first letter when "Other Majors" refers to this broad major group.

recession because later cohorts that we define as untreated by the recession could have been partially affected. We exclude the 2007 year-age-18 cohort from the treatment group because the recession only began in December 2007, the economic effects were still relatively mild in 2007, and there were likely some informational frictions such that the 2007 cohort was minimally affected at age 18. Our preliminary analyses also revealed no major break from trend in 2007.

Year age 18 is not directly asked in the ACS but can be constructed by data users. We define year age 18 as equal to the survey year minus age at the time of the survey plus 18.[7] The ACS is administered continuously throughout a calendar year, but the exact month and day of the survey are unavailable; we know only the year. We also do not know whether an individual had just reached their current age before the survey or is very close to another birthday after the survey. This unavoidably leads to further measurement error in our treatment variable, especially for cohorts defined as age 18 right before and right after 2008. The measurement error in treatment status is likely to attenuate observed pre- and post-treatment differences toward zero. As discussed below, we consider the robustness of our main results to excluding "marginal" cohorts aged 18 in 2007 and 2008. Despite some data limitations, the ACS is still a useful data source for examining changes in college majors during the Great Recession.

We restrict our analytical sample to college graduates between ages 22 and 33 in the 2009-2015 ACS who were either born in the U.S. or immigrated to the U.S. before age 16. This gives us four treated cohorts who selected college major at age 18 in years 2008-2011. We also limit the sample to cohorts who selected college major at age 18 in year 2000 or later, which gives us eight control group cohorts.[8] Table 1 presents the means of the seven broad major group dummies for our full sample and also by gender and race. We see a fair amount of heterogeneity

[7] For example, someone age 25 in survey year 2015 will be defined as age 18 in 2008, 2015 – 25 + 18 = 2008.
[8] We focus on the period between 2000 and 2011, but we also indicate below in the robustness check discussion that this cut-off does not affect our empirical results.

of major choices across gender and race, which suggests the importance of studying the gender-specific and race-specific effects of the Great Recession.

In the empirical analysis, we first visually inspect for the treatment effect of interest and possible pre-event time trends in our broad college major groups and detailed majors in business and STEM. We then estimate regression models that account for the possible pre-event time trends and the fact that different major groups are different in composition on several dimensions, such as age, sex, race/ethnicity, and state of birth. Specifically, we estimate linear probability models (LPM) of the form:

$$P(Y_{isc} = 1) = \gamma GreatRecession_c + \beta X_{isc} + \delta_s T_{sc}$$

, where Y_{isc} is a binary dependent variable corresponding to a specific major for individual i, born in state s (or country s if the individual is a foreigner), from cohort c. $GreatRecession_c$ is a binary explanatory variable equal to one for cohorts year age 18 in 2008 or later and zero otherwise. Our preferred models control for a number of individual characteristics (X_{isc}) including dummy variables for age, sex, race/ethnicity, and state of birth. We also account for pre-event trends by including state-of-birth × year-of-birth linear time trends (T_{sc}). The inclusion of these trends means that our γ coefficient for $GreatRecession_c$ captures changes during and after the Great Recession above and beyond the trends that would have occurred had there been no recession. Failure to account for these trends would likely distort our results. We estimate separate linear probability models for each of our broad major groups and then for detailed majors within business and STEM. Person weights from the ACS are used to make the sample nationally representative.

Interpreting our γ coefficient estimates as causal and unbiased requires assuming that events related to the Great Recession, financial crisis, and slow recovery were the only changes during

this time that would affect college major decisions. This is admittedly a strong assumption and is not testable. Also, our treatment variable is subject to some measurement error, which likely attenuates coefficient estimates toward zero. Thus, we cannot confidently rule out possible bias in our estimates. Instead, we emphasize that the Great Recession, financial crisis and slow recovery were the dominant macroeconomic events during our treatment period, and we expect their influence to be the primary driver of any changes in college majors during this period so that our results should give directionally correct estimates.

4. Empirical Results

4.1 Raw Trends

We first consider the raw differences in percentages of individuals who completed a bachelor's degree in different broad major groups across years before and after the Great Recession in Figure 1; cohort years are based on year age 18.[9] It is most evident that after the onset of the Great Recession, there is an upward trend of individuals choosing STEM majors and a steep downward trend of individuals choosing business majors.[10] We then probe further into the detailed majors in the Business and STEM broad major groups in Figures 2-3 given that these two groups seem to be affected the most by the Great Recession. Figure 2 looks at the raw differences in percentages of individuals who completed a bachelor's degree in different detailed business majors before and after the Great Recession. Most majors within business seem to be somewhat affected by the recession, but it is finance that seems to be hit the hardest. We do the

[9] The time in the figure ends in 2011 because our last year of the ACS sample is 2015 and it normally takes four years to obtain a bachelor's degree.

[10] The 2011 year-age-18 cohort exhibits an increased business percentage, indicating a possible recovery from effects of the Great Recession. However, the 2011 cohort is observed only once, at age 22 in survey year 2015, so the increased business percentage for the 2011 cohort is somewhat noisy and unreliable. Future analysis may revisit this issue as more ACS data becomes available for 2016 and beyond.

same for the detailed STEM majors in Figure 3. The percentages of individuals that obtained a bachelor's degree in biology climbed up the most within STEM after the recession; there is also some increase in a couple of other STEM majors, such as Mathematics and Physical Sciences. These figures suggest there is considerable heterogeneity across and within different broad major groups. Thus, it is important to conduct detailed empirical analysis for both broad major groups and detailed majors to evaluate the heterogeneous effects of the Great Recession on college major choices. Although informative, these figures only look at the raw differences and do not account for the fact that individuals with different bachelor's degrees are also different in composition on several dimensions, such as age, sex, race/ethnicity, and state of birth. Neither do these figures account for that the percentages for some majors appear to have been trending up or down prior to the Great Recession. Thus, we now turn to regression analysis that controls for these confounding factors and pre-recession trends.

4.2 Regression Results

Table 2 reports our basic regression results for the seven broad major group dependent variables; we report results for the full analytical sample and results from separate regressions for females and males. In all regressions, we control for dummies for state of birth, age, sex (except for the gender-specific regressions), race/ethnicity, and state-of-birth by year-of-birth time trends. We include state-of-birth by year-of-birth time trends to account for the possibility of differential trends in college majors across states. Panel A of Table 2 presents estimation results for the full sample for each of the seven broad major groups. Consistent with the conceptual framework, the Great Recession impacts the probability of individuals obtaining a bachelor's degree in several broad majors, namely, business, STEM and Other Majors, conditional on the individuals

obtaining a bachelor's degree.[11] Specifically, the Great Recession statistically significantly reduces the probability of individuals obtaining a bachelor's degree in business by 1.3 percentage points and statistically significantly increases the probability of individuals obtaining a bachelor's degree in STEM and Other Majors by 1.5 and 0.2 percentage points, respectively. The magnitudes of these effects are quite large. The results suggest the percentage changes in the number of college graduates in the major of business, STEM and Other Majors due to the Great Recession are -6.34%, 7.54% and 7.79%, respectively.[12] It seems that, after the Great Recession, young people tended to shift away from business fields and toward STEM fields especially. This potentially reflects the changing societal perspective on the employment expectations and prestige of business and STEM majors during and after the Great Recession.

We next estimate separate regressions for gender-specific effects of the Great Recession since the choice of major often differs by gender (Zafar 2013; Speer 2017); results are reported in Panels B and C of Table 2 for females and males, respectively. The results suggest that males, but not females, experienced a statistically significant decrease in the probability of obtaining a college degree in a business major due to the Great Recession. The estimated effects are quite large and highly significant for males with a percentage change of -10.15% but are much smaller and not statistically significant at conventional levels for females. On the other hand, both males and females experienced significant increases in the likelihood of completing a STEM major as a result of the recession. The relative magnitudes are quite similar for both genders as well, with a percentage change of 7.5% for both females and males. Segmenting the sample also provides insights about other major groups that cannot be seen in the pooled regressions. We find that the

[11] If not otherwise noted, the probabilities mentioned in the paper are all conditional probabilities conditioning on obtaining a bachelor's degree.
[12] This is calculated by dividing the coefficient by the pre-treatment means for the corresponding major dummies and is shown in the braces in the tables.

Great Recession significantly reduces the probability of females obtaining a bachelor's degree in liberal arts by 0.7 percentage points (-2.86% in percentage change), which is consistent with Blom et al. (2015), who find that a weak economy causes young people to shift away from "non-professional" fields. However, while Blom et al. (2015) find that a weak economy generally pushes college students towards majors in business fields, we find that young people were pushed away from these fields during the Great Recession and slow recovery.

Observing that the impacts of the Great Recession on business and STEM are the most evident, we then investigate heterogeneous effects for detailed majors within business and STEM in Tables 3 and 4.[13] Table 3 presents the results for detailed majors within business. Among the detailed business majors, finance is the most affected with a percentage change of -14.71%, followed by business management and administration, with a percentage change of -6.91%, and economics, with a percentage change of -8.83% (coefficient on economics is only marginally significant). This is consistent with expectations that the Great Recession and accompanying financial crisis reduced employer demand for finance-related occupations and likely reduced the prestige, social status, and loveliness of finance-related occupations. We also estimated the regressions separately for females and males and find that it is indeed males who experienced statistically significant decreases in the probability of obtaining a college degree in finance and business management and administration due to the Great Recession. The coefficient estimates on females are generally much smaller than the male counterparts and are not statistically significant at conventional levels in any case.

[13] In results not shown, we also checked the impact of the Great Recession on detailed majors in the Other Majors broad group. The impact concentrates in Environment and Natural Resources (ACS code 13), which is arguably close to our STEM definition. We categorize it in Other Majors because the ACS detailed major code 1303, natural resources management, is more management than science; for example, Sjoquist and Winters (2015) define natural resources management to be in their business broad major. We mostly follow the categorization in Sjoquist and Winters (2015) but also want to keep our definition of business focused. The Environment and Natural Resources major group is relatively small and unique, so we include it in Other Majors. We therefore do not spend much time interpreting the results on Other Majors hereafter.

Similarly, Table 4 presents the results for detailed majors within STEM. We find that individuals are on average more likely to obtain a bachelor's degree in several detailed STEM majors after the onset of the Great Recession, with the largest increase in probability for computer and information sciences (27.65% in percentage change). Gender-specific regressions suggest that the increase in the female probability of obtaining a bachelor's degree in STEM comes mostly from computer and information sciences and engineering, with the percentage changes for both being large and especially large for computer and information sciences. The increased STEM probability for males comes mostly from computer and information sciences with the effect on mathematics and physical sciences being statistically significant as well.

In the previous tables, we found that the effects of the Great Recession on the probability of individuals obtaining bachelor's degrees in business and STEM majors are heterogeneous across gender. We then further study the heterogeneous effects of the Great Recession by estimating separate regressions for different races/ethnicities and for combinations of race/ethnicity and gender for business and STEM broad majors in Table 5. Again, there is significant heterogeneity in the impact of the Great Recession across races and race/gender groups. We see the impacts of the Great Recession on completing a business bachelor's degree are statistically significant for the white and Asian pooled sex samples in column (1); the corresponding coefficient estimates for black and other nonwhite graduates are relatively large in magnitude but somewhat noisily estimated and not statistically significant at the ten percent level. Business results by race/gender again indicate that the effects of the Great Recession are driven by men, with statistically significant decreases for males who are white, Asian, and other nonwhite.

The impacts of the Great Recession on obtaining a STEM bachelor's degree are concentrated among white and Asian graduates as well, with their pooled sex coefficients

statistically significant at the one percent level and the effect on other nonwhite graduates significant at the ten percent level. However, unlike the business results, the impacts on STEM are not just for males. White females also experience significantly increased probability of earning a bachelor's degree in STEM, along with white males and Asian males. Hispanic and other nonwhite males also have positive coefficients significant at the ten percent level.

4.3 Robustness

We consider a series of robustness checks to address several possible concerns. First, we try to account for measurement error in treatment status. Recall that the results presented in previous tables are based on the assignment of individuals to the treatment group if they turned 18 in 2008 or later. However, some individuals choose or change their college major before or after age 18. To account for measurement error due to age at the time of college major choice, we exclude from the sample persons who were ages 18 or 19 in 2008. The earlier analysis assigns those who were 18 years old in 2008 to the treatment group and those who were 19 years old in 2008 to the control group. However, some individuals who were 18 at the onset of the Great Recession could have chosen their majors at younger ages and not been affected by the Great Recession. Similarly, some individuals who were 19 in 2008 could have been affected by the Great Recession if they choose a major after age 18. Table 6 excludes these "marginal" birth cohorts from the analysis (both treatment and control groups) to reduce measurement error problems. The coefficient estimates on business and STEM suggest larger effects of the Recession on these major groups (i.e., larger absolute values) than the previous results, but the main pattern of the results remains. The results on detailed business and STEM majors also reveal qualitatively similar effects of the recession compared with the previous results. One notable difference is that

the broad major coefficient estimates in Panel A for health-related, liberal arts, and social sciences are now statistically significant; these coefficients are directionally similar to Table 2 but now larger in magnitude. The results for these other broad majors are suggestive but the weaker results in Table 2 prevent us from drawing strong conclusions for them. More important for our purposes is that the main results for business and STEM are qualitatively similar with and without the marginal cohorts.

Second, we address the concern that the Great Recession may also affect the probability of obtaining a bachelor's degree and thus change the composition of college graduates.[14] Recall that our main results are conditional on individuals with college degrees. For example, if the Great Recession induced certain marginal individuals to obtain a bachelor's degree, and these affected individuals were less likely to study business majors, then the observed decreased probability of majoring in business would be affected by the potential changing composition of college graduates. We thus re-estimate the main results in Tables 2-4 unconditional on education, i.e., we redefine the sample to include all individuals aged 22 to 33 in the 2009-2015 ACS regardless of their educational level. All college major dependent variables are coded as zero for non-graduates because they have not completed a degree in any field.[15] The results are presented in Table 7. Because now we have a more inclusive sample, the coefficients and implied percentage changes are generally smaller, but the results are qualitatively similar to the main results conditional on earning a bachelor's degree.

[14] We estimated the change in the probability of achieving a bachelor's degree before and after the Great Recession for individuals aged 22-33 (the age range used in our main specification) and find a small but significant reduction in the probability (-1.14% in percent change), which may partially reflect that we are observing the treatment cohorts at younger ages on average so they have had less time to finish degrees. Some students complete bachelor's degrees in five, six, seven, eight, or more years. When we limit our sample to the younger age range of 22-25, we find no significant change in the probability of achieving a bachelor's degree before and after the Great Recession.
[15] The ACS provides no information on attempted major for those with some college but less than a bachelor's degree.

Third, we consider different set-ups of treatment and comparison groups. In our main specification, the control group is the cohorts aged 18 in 2000 to 2007. We change the control group to the cohorts aged 18 in 2005 to 2007 by including a dummy for cohorts aged 18 in 2000 to 2004. This is similar to just excluding the earlier cohorts from the analysis, but it allows them to help control for other things while only affecting the treatment coefficient indirectly. The results are reported in Appendix Table A2 and are very similar to our main results. In results not shown, we also separately examined setting the omitted control group as cohorts aged 18 in 2004 to 2007 and cohorts aged 18 in 2006 to 2007 and obtained very similar results. We also separately estimate the treatment effects for cohorts aged 18 in 2008-2009 and 2010-2011 to see if there is any recovery from the recession at later years. We find no such recovery effects and present these results in Appendix Table A3.

Fourth, we consider alternative time trend specifications. The results thus far assume state-of-birth × year-of-birth linear trends. We also estimated the main results in Tables 2-4 excluding the state-of-birth × year of-birth time trends. The effects on business and STEM majors are qualitatively the same, although the coefficients are a little larger in magnitude. The effects on other broad majors are now noisy and change signs at times. However, our inspection of the raw means in Figures 1-3 revealed that there is likely some pre-recession trend; results that ignore this trend are likely inaccurate. We also try to include one additional trend variable for the time period after the onset of the Great Recession in the regressions in case the time trend changed before and after that time point. One caveat of this additional trend variable is that the treatment effects of the Great Recession may also follow a trend and thus be captured by this kind of trend variable. It reassures us that our main results remain even with this additional demanding trend variable. Another time trend specification we consider is to control for state-specific trends based

on only pre-recession data. We first estimate the trend for each state from pre-recession data and extend it to later years, assuming it continues in the same way as in pre-recession years. We find little change in our main results. The results for these alternative time trend specifications are not reported to save space but are available in the online appendix at the corresponding author's website.[16]

Finally, we have done a few other robustness checks; the results are qualitatively the same in all these final checks (results not reported). The first is that we controlled for survey year fixed effects. This could potentially control for any fixed differences, such as potential unintended sampling differences, across ACS sample years. The second is that we restricted the regression analysis to a 4-year time window around the onset of the Great Recession (2 years before and 2 years after the onset), i.e., we restricted the analysis to individuals who were age 18 between 2006 and 2009. By focusing on this short time window, we minimize the chance that our results are affected by a long-run trend. The third is that we also controlled for current state of residence.[17] The fourth is that we redefined the main sample to a narrower age range of 22-25. Recall that the main sample is individuals who were ages 22-33 and assumed to have chosen their college majors in year 2000 to 2011. This means the treated cohorts reach a maximum age of 25 but the control cohorts reach a maximum age of 33 in our current sample. By restricting the sample to ages 22-25, we define the treated and control cohorts to have similar age composition. The fifth and sixth are that we conducted our main specifications without clustering and without weighting.

5. Conclusion

[16] Similarly, all other results discussed but are not reported in the paper are available in the online appendix at the corresponding author's website.
[17] Recall that in the main specification we only control for state of birth.

We use American Community Survey (ACS) microdata to examine how college major decisions were affected during and after the Great Recession. We examine the nationwide changes in college major choice during and after the Great Recession with special attention to business and STEM fields, as well as the heterogeneity by gender, race/ethnicity and combinations of race/ethnicity and gender. We have multiple important findings. First, we see an overall increase in the frequency of STEM majors but a decrease in the frequency of business majors during and after the Great Recession. Second, the increase for STEM fields is spread across several detailed STEM fields, while the decrease in business majors is especially concentrated among finance and management. Third, it is primarily males that are pushed away from business majors, while both males and females are pushed toward STEM majors. White and Asian graduates seem to be affected more than other racial groups.

The current paper expands our understanding of how student college major choices can and do change in response to external shocks. The Great Recession was a historic event and clearly altered individual decisions on human capital investments. The increased probability of majoring in STEM fields and computer and information sciences in particular offers hope that students are responding in ways that yield long run benefits to themselves in the form of higher earnings and possible benefits to society in the form of increased innovation and technological development. The strong movement of women into STEM and computer fields that occurred is especially encouraging given their historical underrepresentation.

The shift away from finance and related majors is more difficult to interpret. Finance is typically a high-paying field in high demand in the labor market and a long run shift away from finance majors could pose some challenges for the industry and for the aggregate economy. The likelihood that some people shifted away from finance because of the negative public relations

experienced during and after the financial crisis may have both positive and negative aspects. One possible positive aspect is that previous shaming unethical conduct may deter some bad behaviors. Some financial firms may become more serious about ethical conduct to promote a better public image and aid in employee recruitment and retention. However, a possible negative aspect is that the students who shifted away from finance because of the negative public relations may have been the ones most concerned about ethical behavior and the ones who remained may have been students who care less about ethical behavior or how they are perceived by others. If so, the future composition of finance professionals could be altered in ways that are societally harmful.

Given the important role that the financial industry plays in the economy, the shift away from finance majors could be a significant concern. Unfortunately, our study can say relatively little about who moved away from finance fields and who stayed or how their values and preferences differ. We view this as an important direction for future research related to the finance industry, what can be done to encourage more ethical and consumer-friendly financial practices, and how it attracts and retains talent. Future work should also examine if and how quickly finance major rates recover to pre-Recession levels. More generally, college major decisions are an important aspect of the finance workforce pipeline and warrant further study in numerous dimensions.

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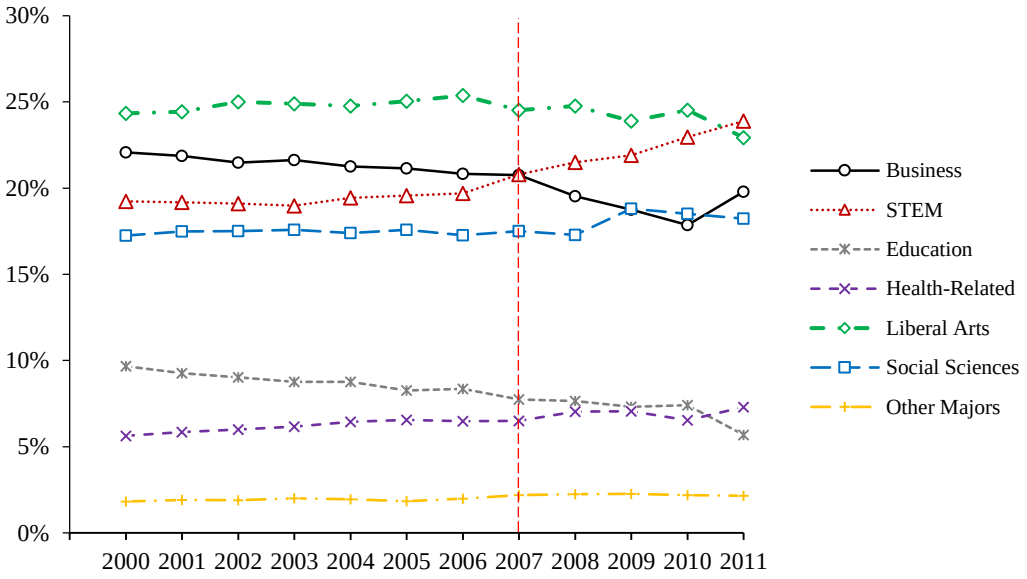
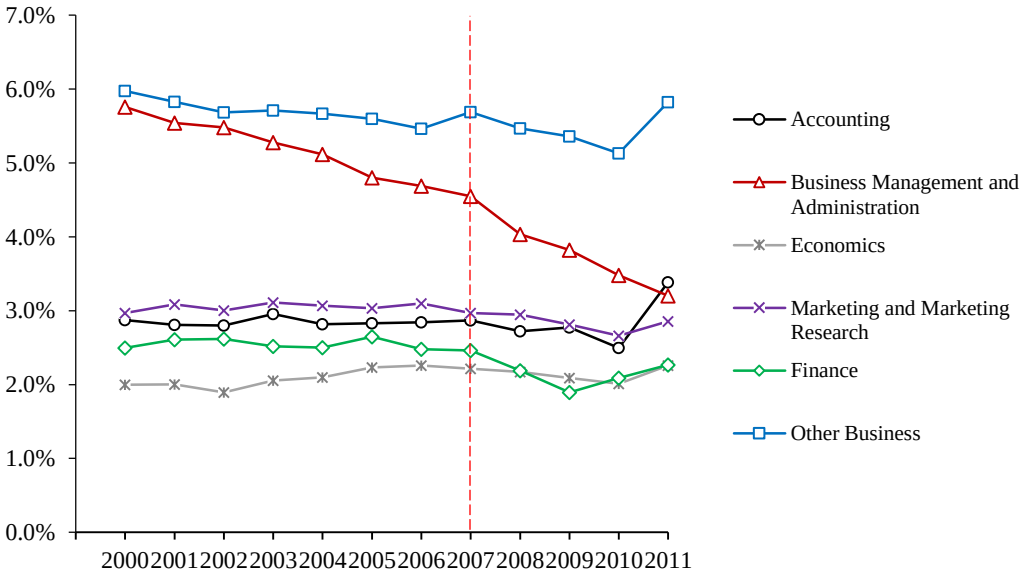
Figure 1: Comparison across Broad Majors



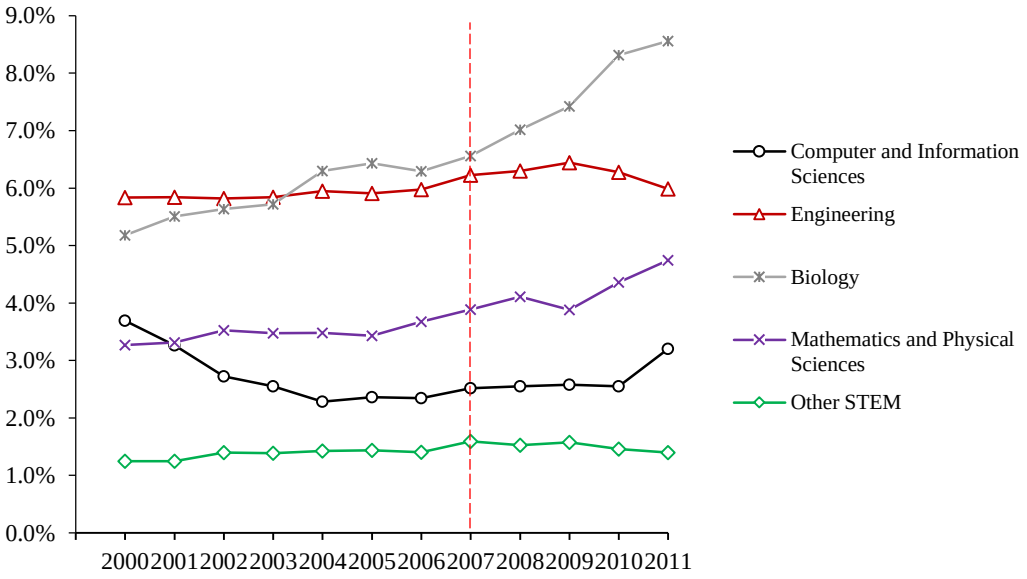
Note: The sample includes college graduates between ages 22 and 33 in the 2009-2015 ACS who were either born in the U.S. or immigrated to the U.S. before age 16. Cohort year is measured based on year age 18.

Figure 2: Comparison across Detailed Business Majors



Note: The sample includes college graduates in business majors between ages 22 and 33 in the 2009-2015 ACS who were either born in the U.S. or immigrated to the U.S. before age 16. Cohort year is measured based on year age 18.

Figure 3: Comparison across Detailed STEM Majors



Note: The sample includes college graduates in STEM majors between ages 22 and 33 in the 2009-2015 ACS who were either born in the U.S. or immigrated to the U.S. before age 16. Cohort year is measured based on year age 18.

Table 1: Broad Major Means for College Graduates and Demographic Groups

	All Graduates	Female	Male	White	Black	Asian	Hispanic	Other Nonwhite
Broad Majors	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Business	0.20	0.17	0.26	0.20	0.22	0.25	0.20	0.18
STEM	0.20	0.13	0.29	0.19	0.17	0.35	0.17	0.22
Education	0.09	0.13	0.04	0.10	0.06	0.02	0.07	0.06
Health-Related	0.06	0.09	0.02	0.06	0.07	0.06	0.06	0.05
Liberal Arts	0.25	0.26	0.23	0.26	0.22	0.17	0.25	0.27
Social Sciences	0.18	0.20	0.14	0.17	0.24	0.14	0.24	0.20
Other Majors	0.02	0.02	0.03	0.03	0.01	0.01	0.01	0.02
Observations	634,147	366,074	268,073	484,785	38,949	43,173	49,688	17,552

Notes: The sample includes college graduates between ages 22 and 33 in the 2009-2015 ACS who were either born in the U.S. or immigrated to the U.S. before age 16. All variables in this table are binary, so we do not report the sample standard deviations.

Table 2: Great Recession Effects on Broad Majors

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Total population	-0.0131***	0.0147***	0.000503	-0.000829	-0.00556	0.00265	0.00171**
	(0.00300)	(0.00264)	(0.00172)	(0.00166)	(0.00343)	(0.00266)	(0.000768)
	{-6.34%}	{7.54%}	{0.55%}	{-1.35%}	{-2.24%}	{1.52%}	{7.79%}
B. Female	-0.00373	0.00988***	0.00152	-0.00220	-0.00743**	0.000191	0.00177*
	(0.00287)	(0.00318)	(0.00238)	(0.00257)	(0.00351)	(0.00379)	(0.00100)
	{-2.21%}	{7.53%}	{1.18%}	{-2.39%}	{-2.86%}	{0.09%}	{11.07%}
C. Male	-0.0262***	0.0211***	-0.000560	0.00101	-0.00299	0.00610*	0.00153
	(0.00527)	(0.00411)	(0.00186)	(0.00148)	(0.00517)	(0.00338)	(0.00139)
	{-10.15%}	{7.49%}	{-1.31%}	{5.14%}	{-1.28%}	{4.53%}	{5.09%}
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sex dummies, race/ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-of-birth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-of-birth × year-of-birth trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Results are from LPM regressions. Each column corresponds to a different dependent variable. Panels A, B, and C are estimated separately for the corresponding sample. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors.

Table 3: Great Recession Effects on Detailed Business Majors

	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others
	(1)	(2)	(3)	(4)	(5)	(6)
A. Total population	-0.00134	-0.00367***	-0.00183*	-0.000847	-0.00363***	-0.00183
	(0.00129)	(0.00135)	(0.000980)	(0.00148)	(0.000899)	(0.00121)
	{-4.76%}	{-6.91%}	{-8.83%}	{-2.91%}	{-14.71%}	{-3.59%}
B. Female	0.000658	-0.00102	-0.000544	-0.00132	-0.000601	-0.000909
	(0.00165)	(0.00172)	(0.000937)	(0.00161)	(0.00106)	(0.00162)
	{2.54%}	{-2.32%}	{-4.57%}	{-4.22%}	{-4.16%}	{-2.21%}
C. Male	-0.00392	-0.00745***	-0.00360	-0.000309	-0.00784***	-0.00307
	(0.00242)	(0.00222)	(0.00237)	(0.00207)	(0.00202)	(0.00284)
	{-12.60%}	{-11.37%}	{-11.02%}	{-1.18%}	{-20.34%}	{-4.78%}
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sex dummies, race/ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes
State-of-birth dummies	Yes	Yes	Yes	Yes	Yes	Yes
State-of-birth × year-of-birth trends	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Results are from LPM regressions. Each column corresponds to a different dependent variable. Panels A, B, and C are estimated separately for the corresponding sample. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors.

Table 4: Great Recession Effects on Detailed STEM Majors

	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others
	(1)	(2)	(3)	(4)	(5)
A. Total population	0.00740***	0.00308**	0.00294*	0.00211*	-0.000860
	(0.00108)	(0.00153)	(0.00171)	(0.00120)	(0.000790)
	{27.65%}	{5.11%}	{4.87%}	{6.18%}	{-6.36%}
B. Female	0.00544***	0.00244*	0.00277	0.000828	-0.00160
	(0.000843)	(0.00136)	(0.00237)	(0.00129)	(0.00103)
	{66.24%}	{12.24%}	{4.36%}	{3.04%}	{-13.00%}
C. Male	0.0100***	0.00394	0.00308	0.00385**	0.000216
	(0.00226)	(0.00313)	(0.00218)	(0.00184)	(0.00139)
	{19.27%}	{3.43%}	{5.50%}	{8.87%}	{1.42%}
Age dummies	Yes	Yes	Yes	Yes	Yes
Sex dummies, race/ethnicity dummies	Yes	Yes	Yes	Yes	Yes
State-of-birth dummies	Yes	Yes	Yes	Yes	Yes
State-of-birth × year-of-birth trends	Yes	Yes	Yes	Yes	Yes

Notes: Results are from LPM regressions. Each column corresponds to a different dependent variable. Panels A, B, and C are estimated separately for the corresponding sample. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors.

Table 5: Great Recession Effects on Business and STEM by Race/Gender

	Business			STEM		
	All	Female	Male	All	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
A. White	-0.0122***	-0.00335	-0.0239***	0.0142***	0.0126***	0.0162***
	(0.00365)	(0.00384)	(0.00601)	(0.00289)	(0.00334)	(0.00525)
	{-6.04%}	{-2.09%}	{-9.29%}	{7.60%}	{10.40%}	{5.91%}
B. Black	-0.0147	-0.0154	-0.0119	0.0109	0.00926	0.0101
	(0.0111)	(0.0135)	(0.0191)	(0.0116)	(0.0136)	(0.0174)
	{-6.55%}	{-7.75%}	{-4.40%}	{6.52%}	{6.92%}	{4.44%}
C. Asian	-0.0310***	0.00972	-0.0792***	0.0266***	-0.0108	0.0732***
	(0.00801)	(0.0131)	(0.0160)	(0.00969)	(0.0123)	(0.0147)
	{-12.14%}	{4.25%}	{-27.58%}	{7.88%}	{-4.04%}	{17.38%}
D. Hispanic	-0.00122	-0.00121	-0.00286	0.00877	-0.000219	0.0229*
	(0.00915)	(0.0117)	(0.0112)	(0.00814)	(0.00849)	(0.0130)
	{-0.59%}	{-0.67%}	{-1.16%}	{5.20%}	{-0.20%}	{8.92%}
E. Other nonwhite	-0.0209	0.00209	-0.0549**	0.0303*	0.0110	0.0621*
	(0.0140)	(0.0168)	(0.0255)	(0.0175)	(0.0175)	(0.0339)
	{-11.44%}	{1.33%}	{-25.10%}	{14.25%}	{7.32%}	{20.69%}
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sex dummies	Yes	No	No	Yes	No	No
Race/ethnicity dummies	No	No	No	No	No	No
State-of-birth dummies	Yes	Yes	Yes	Yes	Yes	Yes
State-of-birth × year-of-birth trends	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Results are from LPM regressions. Each column-panel combination is estimated separately using the corresponding sample and dependent variable. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors.

Table 6: Robustness Test --Excluding "Marginal" Birth Cohorts

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.0160***	0.0224***	-0.0000594	-0.00602***	-0.0135***	0.0102***	0.00294**
	(0.00370)	(0.00433)	(0.00260)	(0.00227)	(0.00407)	(0.00286)	(0.00116)
	{-7.74%}	{11.49%}	{-0.06%}	{-9.81%}	{-5.44%}	{5.85%}	{13.39%}
	Panel B: Detailed Business Majors						
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Post08	-0.00116	-0.00389**	-0.00222*	-0.00180	-0.00546***	-0.00145	
	(0.00163)	(0.00159)	(0.00125)	(0.00140)	(0.00122)	(0.00160)	
	{-4.12%}	{-7.32%}	{-10.71%}	{-6.19%}	{-22.12%}	{-2.85%}	
	Panel C: Detailed STEM Majors						
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Post08	0.0118***	0.00513***	0.00324	0.00308*	-0.000898		
	(0.00175)	(0.00195)	(0.00220)	(0.00178)	(0.00130)		
	{44.09%}	{8.51%}	{5.37%}	{9.03%}	{-6.64%}		

Notes: The sample excludes individuals who were age 18 or 19 in 2008 and includes both genders and all races/ethnicities. Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends are included in all regressions.

Table 7: Robustness Test -- Unconditional on Education

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.00341***	0.00193**	0.000420	-0.00111***	-0.00190*	0.000266	0.00380**
	(0.000878)	(0.000918)	(0.000479)	(0.000390)	(0.000994)	(0.000686)	(0.00181)
	{-5.55%}	{3.23%}	{1.55%}	{-5.90%}	{-2.54%}	{0.50%}	{0.54%}
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
	Panel B: Detailed Business Majors						
Post08	-0.000432	-0.000686**	-0.000494*	-0.000155	-0.000793***	-0.000850**	
	(0.000332)	(0.000340)	(0.000256)	(0.000368)	(0.000249)	(0.000325)	
	{-5.11%}	{-4.44%}	{-7.88%}	{-1.78%}	{-10.88%}	{-5.56%}	
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
	Panel C: Detailed STEM Majors						
Post08	0.00173***	0.000258	0.000191	0.0000768	-0.000323		
	(0.000337)	(0.000424)	(0.000482)	(0.000304)	(0.000216)		
	{21.58%}	{1.41%}	{1.02%}	{0.73%}	{-7.82%}		

Notes: Unconditional on education means that the sample also includes non-college graduates meeting the other sample restrictions; all college major dependent variables are coded as zero for non-graduates. The sample includes both genders and all races/ethnicities. Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends are included in all regressions.

APPENDIX A

Table A1: Classification of American Community Survey Majors into Broad Categories

ACS Code	ACS Code Description
1 Business	
1.1 Accounting	
6201	Accounting
1.2 Business Management and Administration	
6203	Business Management and Administration
1.3 Economics	
5501	Economics
6205	Business Economics
1.4 Marketing and Marketing Research	
6206	Marketing and Marketing Research
1.5 Finance	
6207	Finance
1.6 Other Business	
6200	General Business
6202	Actuarial Science
6204	Operations, Logistics and E-Commerce
6209	Human Resources and Personnel Management
6210	International Business
6211	Hospitality Management
6212	Management Information Systems and Statistics
6299	Miscellaneous Business and Medical Administration
2 STEM	
2.1 Biology	
36	Biology and Life Sciences
2.2 Computer and Information Sciences	
2100	Computer and Information Systems
2101	Computer Programming and Data Processing
2102	Computer Science
2105	Information Sciences
2106	Computer Information Management and Security
2107	Computer Networking and Telecommunications
2.3 Engineering	
24	Engineering
25	Engineering Technologies
38	Military Technologies
2.4 Mathematics and Physical Sciences	
37	Mathematics and Statistics
50	Physical Sciences
2.5 Other STEM	
2001	Communication Technologies
4002	Nutrition Sciences
4003	Neuroscience
4005	Mathematics and Computer Science
4006	Cognitive Science and Biopsychology
51	Nuclear, Industrial Radiology, and Biological Technologies
59	Transportation Sciences and Technologies
6106	Health and Medical Preparatory Programs
6108	Pharmacy, Pharmaceutical Sciences, and Administration

Table A1 (Continued)

ACS Code	ACS Code Description
3 Education	
23	Education Administration and Teaching
4 Health-Related	
6100	General Medical and Health Services
6102	Communication Disorders Sciences and Services
6103	Health and Medical Administrative Services
6104	Medical Assisting Services
6105	Medical Technologies Technicians
6107	Nursing
6109	Treatment Therapy Professions
6110	Community and Public Health
6199	Miscellaneous Health Medical Professions
5 Liberal Arts	
14	Architecture
15	Area, Ethnic, and Civilization Studies
19	Communications
2201	Cosmetology Services and Culinary Arts
26	Linguistics and Foreign Languages
33	English Language, Literature, and Composition
34	Liberal Arts and Humanities
35	Library Science
4008	Multi-disciplinary or General Science
4000	Interdisciplinary and Multi-Disciplinary Studies (General)
4001	Intercultural and International Studies
4007	Interdisciplinary Social Sciences
41	Physical Fitness, Parks, Recreation, and Leisure
48	Philosophy and Religious Studies
49	Theology and Religious Vocations
60	Fine Arts
64	History
6 Social Sciences	
29	Family and Consumer Sciences
32	Law
52	Psychology
53	Criminal Justice and Fire Protection
54	Public Affairs, Policy, and Social Work
5500	General Social Sciences
5502	Anthropology and Archeology
5503	Criminology
5504	Geography
5505	International Relations
5506	Political Science and Government
5507	Sociology
5599	Miscellaneous Social Sciences
7 Other Major	
11	Agriculture
13	Environment and Natural Resources
56	Construction Services
57	Electrical and Mechanic Repairs and Technologies
58	Precision Production and Industrial Arts

Note: The ACS reports majors in two-digit and four-digit codes. When all four-digit majors under a two-digit code belong to the same category in our definition, we only report the two-digit code.

Table A2: Robustness Test – Using Cohorts Aged 18 in 2005 to 2007 as Control Group

Panel A: Broad Majors							
	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post08	-0.0133***	0.0148***	0.000747	-0.00104	-0.00441	0.00168	0.00152*
	(0.00297)	(0.00259)	(0.00187)	(0.00160)	(0.00333)	(0.00261)	(0.000817)
	{-6.58%}	{7.37%}	{0.88%}	{-1.59%}	{-1.76%}	{0.97%}	{6.72%}
Panel B: Detailed Business Majors							
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Post08	-0.00143	-0.00403***	-0.00141	-0.000922	-0.00349***	-0.00200	
	(0.00137)	(0.00148)	(0.000891)	(0.00151)	(0.000932)	(0.00125)	
	{-5.00%}	{-8.42%}	{-6.37%}	{-3.20%}	{-14.30%}	{-3.97%}	
Panel C: Detailed STEM Majors							
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Post08	0.00877***	0.00307**	0.00210	0.00187	-0.00103		
	(0.00116)	(0.00154)	(0.00176)	(0.00123)	(0.000846)		
	{37.80%}	{5.03%}	{3.17%}	{5.16%}	{-7.27%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cohort years are based on year age 18. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, state-of-birth × year-of-birth trends, as well as a dummy for cohorts aged 18 in 2000 to 2004 are included in all regressions.

Table A3: Robustness Test – Separate Treatment for 2008-2009 and 2010-2011

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Broad Majors							
Year08-09	-0.0126***	0.0130***	0.000244	0.000118	-0.00500	0.00243	0.00179**
	(0.00291)	(0.00250)	(0.00157)	(0.00170)	(0.00355)	(0.00287)	(0.000777)
	{-6.10%}	{6.67%}	{0.26%}	{0.19%}	{-2.01%}	{1.39%}	{8.15%}
Year10-11	-0.0164***	0.0243***	0.00201	-0.00634**	-0.00877**	0.00395	0.00121
	(0.00460)	(0.00458)	(0.00335)	(0.00244)	(0.00436)	(0.00392)	(0.00157)
	{-7.93%}	{12.46%}	{2.18%}	{-10.33%}	{-3.53%}	{2.26%}	{5.51%}

	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others
	(8)	(9)	(10)	(11)	(12)	(13)
Panel B: Detailed Business Majors						
Year08-09	-0.00127	-0.00336**	-0.00157	-0.000747	-0.00379***	-0.00185
	(0.00131)	(0.00149)	(0.00107)	(0.00158)	(0.000915)	(0.00121)
	{-4.51%}	{-6.33%}	{-7.58%}	-2.57%}	{-15.36%}	{-3.63%}
Year10-11	-0.00170	-0.00545***	-0.00337**	-0.00143	-0.00267	-0.00175
	(0.00177)	(0.00181)	(0.00146)	(0.00208)	(0.00169)	(0.00228)
	{-6.04%}	{-10.26%}	{-16.26%}	{-4.92%}	{-10.82%}	{-3.43%}

	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others
	(14)	(15)	(16)	(17)	(18)
Panel C: Detailed STEM Majors					
Year08-09	0.00680***	0.00305**	0.00206	0.00165	-0.000545
	(0.00108)	(0.00151)	(0.00164)	(0.00130)	(0.000819)
	{25.41%}	{5.06%}	{3.41%}	{4.84%}	{-4.03%}
Year10-11	0.0109***	0.00328	0.00806***	0.00476**	-0.00269**
	(0.00174)	(0.00251)	(0.00306)	(0.00194)	(0.00105)
	{40.73%}	{5.44%}	{13.36%}	{13.95%}	{-19.90%}

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends are included in all regressions.

APPENDIX B (Online Appendix)

Appendix B is included for journal reviewers but is not intended for journal publication. It will be made available on the corresponding author's website as indicated in the acknowledgements.

Table B1: Great Recession Effects on Detailed Majors within Other Majors

	Agriculture	Environment and Natural Resources	Construction Services	Electrical and Mechanic Repairs and Technologies	Precision Production and Industrial Arts
	(1)	(2)	(3)	(4)	(5)
Post08	0.000529	0.00170***	-0.000478*	-0.0000406	-0.00000114
	(0.000636)	(0.000430)	(0.000268)	(0.000109)	(0.0000132)
	{4.66%}	{23.04%}	{-16.39%}	{-13.67%}	{-6.30%}
Age dummies	Yes	Yes	Yes	Yes	Yes
Sex dummies	Yes	Yes	Yes	Yes	Yes
Race/ethnicity dummies	Yes	Yes	Yes	Yes	Yes
State-of-birth dummies	Yes	Yes	Yes	Yes	Yes
State-of-birth × year-of-birth trends	Yes	Yes	Yes	Yes	Yes

Notes: Results are from LPM regressions. Each column corresponds to a different dependent variable. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors.

Table B2: The Likelihood of Obtaining a Bachelor's Degree

	Age 22-33			Age 22-25		
	Total population	Female	Male	Total population	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
post08	-0.00359**	-0.00267	-0.00454*	-0.00147	-0.00231	-0.000614
	(0.00179)	(0.00203)	(0.00231)	(0.00191)	(0.00248)	(0.00250)
	{-1.14%}	{-0.73%}	{-1.70%}	{-0.56%}	{-0.74%}	{-0.29%}
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sex dummies, race/ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes
State-of-birth dummies	Yes	Yes	Yes	Yes	Yes	Yes
State-of-birth × year-of-birth trends	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Results are from LPM regressions. The sample includes all individuals within the age cut-offs in the 2009-2015 ACS who were either born in the U.S. or immigrated to the U.S. before age 16. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors.

Table B3: Robustness Test – Using Cohorts Aged 18 in 2004 to 2007 as Control Group

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.0134***	0.0146***	0.00179	0.00109	-0.00572*	0.000662	0.001000
	(0.00325)	(0.00253)	(0.00196)	(0.00197)	(0.00333)	(0.00299)	(0.000948)
	{-6.69%}	{7.19%}	{2.14%}	{1.66%}	{-2.28%}	{0.38%}	{4.27%}
	Panel B: Detailed Business Majors						
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Post08	-0.00181	-0.00413***	-0.00103	-0.00105	-0.00395***	-0.00144	
	(0.00139)	(0.00146)	(0.00113)	(0.00165)	(0.00119)	(0.00143)	
	{-6.23%}	{-8.82%}	{-4.65%}	{-3.66%}	{-16.81%}	{-2.87%}	
	Panel C: Detailed STEM Majors						
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Post08	0.00713***	0.00298*	0.00434**	0.00117	-0.00102		
	(0.00127)	(0.00177)	(0.00194)	(0.00136)	(0.000782)		
	{30.48%}	{4.80%}	{6.52%}	{3.17%}	{-7.21%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cohort years are based on year age 18. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, state-of-birth × year-of-birth trends, as well as a dummy for cohorts aged 18 in 2000 to 2003 are included in all regressions.

Table B4: Robustness Test –Using Cohorts Aged 18 in 2006 to 2007 as Control Group

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.0131***	0.0145***	0.000323	-0.000582	-0.00565	0.00284	0.00161**
	(0.00297)	(0.00265)	(0.00171)	(0.00169)	(0.00348)	(0.00269)	(0.000786)
	{-6.46%}	{7.30%}	{0.37%}	{-0.89%}	{-2.26%}	{1.63%}	{7.15%}
	Panel B: Detailed Business Majors						
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Post08	-0.00134	-0.00370***	-0.00186*	-0.000850	-0.00355***	-0.00178	
	(0.00127)	(0.00133)	(0.000983)	(0.00148)	(0.000913)	(0.00121)	
	{-4.71%}	{-7.56%}	{-8.52%}	{-2.96%}	{-14.54%}	{-3.53%}	
	Panel C: Detailed STEM Majors						
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Post08	0.00708***	0.00305*	0.00325*	0.00201	-0.000842		
	(0.00107)	(0.00156)	(0.00173)	(0.00122)	(0.000799)		
	{30.70%}	{5.02%}	{4.98%}	{5.67%}	{-6.00%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cohort years are based on year age 18. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, state-of-birth × year-of-birth trends, as well as a dummy for cohorts aged 18 in 2000-2005 are included in all regressions.

Table B5: Robustness Test – Excluding Time Trends

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Broad Majors							
Post08	-0.0192***	0.0244***	-0.00774***	0.0103***	-0.0104***	-0.00118	0.00375***
	(0.00268)	(0.00199)	(0.00118)	(0.00161)	(0.00264)	(0.00189)	(0.000718)
	{-9.29%}	{12.51%}	{-8.40%}	{16.79%}	{-4.19%}	{-0.68%}	{17.08%}
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Panel B: Detailed Business Majors							
Post08	-0.000851	-0.00911***	-0.00199**	-0.00283**	-0.00545***	0.00102	
	(0.00111)	(0.00130)	(0.000834)	(0.00124)	(0.000855)	(0.00112)	
	{-5.47%}	{-6.12%}	{-6.47%}	{-2.26%}	{-14.75%}	{-4.14%}	
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Panel C: Detailed STEM Majors							
Post08	0.00455***	0.00514***	0.00807***	0.00615***	0.000515		
	(0.000764)	(0.00117)	(0.00140)	(0.00100)	(0.000588)		
	{21.97%}	{4.44%}	{2.19%}	{4.87%}	{-2.08%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, and state-of-birth dummies are included in all regressions.

Table B6: Robustness Test – Adding Post-recession Time Trend

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Broad Majors							
Post08	-0.0125***	0.0113***	0.000763	0.000861	-0.00261	0.000422	0.00185**
	(0.00306)	(0.00262)	(0.00164)	(0.00177)	(0.00370)	(0.00319)	(0.000829)
	{-6.05%}	{5.79%}	{0.83%}	{1.40%}	{-1.05%}	{0.24%}	{8.43%}
Post08 × Time trend	-0.000996	0.00562***	-0.000429	-0.00278***	-0.00484**	0.00366**	-0.000232
	(0.00178)	(0.00165)	(0.00122)	(0.000898)	(0.00197)	(0.00181)	(0.000613)

	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others
	(8)	(9)	(10)	(11)	(12)	(13)
Panel B: Detailed Business Majors						
Post08	-0.00154	-0.00325*	-0.00134	-0.000658	-0.00364***	-0.00211
	(0.00139)	(0.00168)	(0.00120)	(0.00168)	(0.000983)	(0.00135)
	{-5.47%}	{-6.12%}	{-6.47%}	{-2.26%}	{-14.75%}	{-4.14%}
Post08 × Time trend	0.000340	-0.000696	-0.000813	-0.000310	0.0000259	0.000456
	(0.000659)	(0.00100)	(0.000783)	(0.00102)	(0.000705)	(0.000922)

	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others
	(14)	(15)	(16)	(17)	(18)
Panel C: Detailed STEM Majors					
Post08	0.00588***	0.00268	0.00132	0.00166	-0.000281
	(0.00114)	(0.00171)	(0.00177)	(0.00153)	(0.000808)
	{21.97%}	{4.44%}	{2.19%}	{4.87%}	{-2.08%}
Post08 × Time trend	0.00251***	0.000661	0.00266**	0.000737	-0.000951*
	(0.000638)	(0.00116)	(0.00129)	(0.00110)	(0.000518)

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends are included in all regressions.

Table B7: Robustness Test – Alternative Time Trend Based on Pre-Recession Data

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.0131***	0.0158***	0.000182	-0.00129	-0.00631*	0.00305	0.00167*
	(0.00296)	(0.00248)	(0.00171)	(0.00185)	(0.00340)	(0.00275)	(0.000845)
	{-6.34%}	{8.10%}	{-2.10%}	{-2.54%}	{1.75%}	{0.20%}	{7.61%}
	Panel B: Detailed Business Majors						
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Post08	-0.00120	-0.00373**	-0.00192*	-0.000917	-0.00360***	-0.00178	
	(0.00125)	(0.00150)	(0.00107)	(0.00137)	(0.00103)	(0.00121)	
	{-4.26%}	{-7.02%}	{-9.27%}	{-3.15%}	{-14.59%}	{-3.49%}	
	Panel C: Detailed STEM Majors						
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Post08	0.00789***	0.00333**	0.00343**	0.00217*	-0.000986		
	(0.00102)	(0.00139)	(0.00172)	(0.00128)	(0.000757)		
	{29.48%}	{5.52%}	{5.69%}	{6.36%}	{-7.29%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends based on pre-Recession data are included in all regressions.

Table B8: Robustness Test -- Controlling for Survey Year Dummies

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.0125***	0.0147***	0.000793	-0.000936	-0.00643*	0.00282	0.00154*
	(0.00307)	(0.00259)	(0.00175)	(0.00163)	(0.00334)	(0.00274)	(0.000781)
	{-6.05%}	{7.54%}	{0.86%}	{-1.53%}	{-2.59%}	{1.62%}	{7.01%}
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
	Panel B: Detailed Business Majors						
Post08	-0.00128	-0.00356**	-0.00171*	-0.000618	-0.00375***	-0.00157	
	(0.00135)	(0.00137)	(0.000994)	(0.00147)	(0.000892)	(0.00116)	
	{-4.55%}	{-6.70%}	{-8.25%}	{-2.12%}	{-15.19%}	{-3.08%}	
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
	Panel C: Detailed STEM Majors						
Post08	0.00721***	0.00286*	0.00251	0.00312**	-0.00102		
	(0.00110)	(0.00154)	(0.00171)	(0.00121)	(0.000775)		
	{26.94%}	{4.74%}	{4.16%}	{9.15%}	{-7.54%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, state-of-birth × year-of-birth trends, and survey year dummies are included in all regressions.

Table B9: Robustness Test – Symmetrical Time Windows

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Broad Majors							
Post08	-0.0169***	0.0175***	-0.00585***	0.00847***	-0.00530	-0.000348	0.00245***
	(0.00246)	(0.00226)	(0.00130)	(0.00205)	(0.00326)	(0.00279)	(0.000880)
	{-8.15%}	{9.03%}	{-6.28%}	{13.88%}	{-2.13%}	{-0.20%}	{11.29%}
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Panel B: Detailed Business Majors							
Post08	-0.00171	-0.00665***	-0.00166	-0.00163	-0.00419***	-0.00105	
	(0.00117)	(0.00143)	(0.00108)	(0.00155)	(0.00112)	(0.00145)	
	{-6.10%}	{-12.37%}	{-8.07%}	{-5.58%}	{-16.91%}	{-2.06%}	
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Panel C: Detailed STEM Majors							
Post08	0.00343***	0.00438***	0.00713***	0.00213	0.000414		
	(0.000935)	(0.00145)	(0.00154)	(0.00135)	(0.000816)		
	{12.70%}	{7.29%}	{11.97%}	{6.30%}	{3.09%}		

Notes: Results are from LPM regressions. The sample includes college graduates who were age 18 in the years between 2006 and 2009 and includes both genders and all races/ethnicities. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, and state-of-birth dummies are included in all regressions.

Table B10: Robustness Test -- Controlling for Current State of Residence

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Broad Majors							
Post08	-0.0131***	0.0142***	0.000328	-0.000955	-0.00503	0.00281	0.00173**
	(0.00305)	(0.00262)	(0.00171)	(0.00164)	(0.00330)	(0.00265)	(0.000771)
	{-6.34%}	{7.28%}	{0.36%}	{-1.56%}	{-2.03%}	{1.61%}	{7.88%}
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Panel B: Detailed Business Majors							
Post08	-0.00133	-0.00371***	-0.00173*	-0.000866	-0.00359***	-0.00190	
	(0.00132)	(0.00134)	(0.000958)	(0.00149)	(0.000894)	(0.00121)	
	{-4.73%}	{-6.98%}	{-8.35%}	{-2.98%}	{-14.55%}	{-3.73%}	
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Panel C: Detailed STEM Majors							
Post08	0.00732***	0.00289*	0.00287*	0.00206*	-0.000892		
	(0.00108)	(0.00153)	(0.00171)	(0.00121)	(0.000790)		
	{27.35%}	{4.79%}	{4.76%}	{6.04%}	{-6.60%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, state-of-birth × year-of-birth trends, and state-of-living dummies are included in all regressions.

Table B11: Robustness Test -- Narrower Age Range

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.0154***	0.00912***	-0.000489	0.00318	0.00165	0.000517	0.00144
	(0.00343)	(0.00329)	(0.00197)	(0.00244)	(0.00440)	(0.00433)	(0.00111)
	{-7.83%}	{4.47%}	{-0.58%}	{4.99%}	{0.66%}	{0.29%}	{6.34%}
	Panel B: Detailed Business Majors						
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Post08	-0.00264*	-0.00262	-0.00219	0.000487	-0.00374**	-0.00471**	
	(0.00143)	(0.00173)	(0.00143)	(0.00203)	(0.00156)	(0.00191)	
	{-9.45%}	{-5.79%}	{-10.00%}	{1.68%}	{-15.87%}	{-9.59%	
	Panel C: Detailed STEM Majors						
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Post08	0.00241*	0.00295	0.00512**	-0.00182	0.000473		
	(0.00128)	(0.00202)	(0.00220)	(0.00182)	(0.00118)		
	{10.55%}	{4.80%}	{7.41%}	{-4.97%}	{3.32%}		

Notes: Results are from LPM regressions. The sample includes college graduates between ages 22 and 25 in the 2009-2015 ACS who were either born in the U.S. or immigrated to the U.S. before age 16 and includes both genders and all races/ethnicities. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends are included in all regressions.

Table B12: Robustness Test – Without Clustering

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Broad Majors							
Post08	-0.0131***	0.0147***	0.000503	-0.000829	-0.00556*	0.00265	0.00171*
	(0.00277)	(0.00271)	(0.00182)	(0.00167)	(0.00292)	(0.00257)	(0.000940)
	{-6.34%}	{7.54%}	{0.55%}	{-1.35%}	{-2.24%}	{1.52%}	{7.79%}
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Panel B: Detailed Business Majors							
Post08	-0.00134	-0.00367***	-0.00183*	-0.000847	-0.00363***	-0.00183	
	(0.00112)	(0.00139)	(0.000985)	(0.00121)	(0.00104)	(0.00166)	
	{-4.76%}	{-6.91%}	{-8.83%}	{-2.91%}	{-14.71%}	{-3.59%}	
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Panel C: Detailed STEM Majors							
Post08	0.00740***	0.00308*	0.00294*	0.00211	-0.000860		
	(0.00108)	(0.00158)	(0.00169)	(0.00133)	(0.000868)		
	{27.65%}	{5.11%}	{4.87%}	{6.18%}	{-6.36%}		

Notes: Results are from LPM regressions. Robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends are included in all regressions.

Table B13: Robustness Test – Without Weighting

	Business	STEM	Education	Health-Related	Liberal Arts	Social Sciences	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Broad Majors						
Post08	-0.0154***	0.0131***	0.000167	-0.00159	-0.00406*	0.00644***	0.00134*
	(0.00229)	(0.00223)	(0.00155)	(0.00134)	(0.00243)	(0.00234)	(0.000712)
	{-7.45%}	{7.72%}	{-2.59%}	{-1.63%}	{3.69%}	{0.18%}	{6.10%}
	Panel B: Detailed Business Majors						
	Accounting	Business Management and Administration	Economics	Marketing and Marketing Research	Finance	Others	
	(8)	(9)	(10)	(11)	(12)	(13)	
Post08	-0.00184*	-0.00406***	-0.00241***	-0.00134	-0.00292***	-0.00282***	
	(0.000973)	(0.00101)	(0.000774)	(0.00104)	(0.000641)	(0.000901)	
	{-6.54%}	{-7.64%}	{-11.63%}	{-4.61%}	{-11.83%}	{-5.53%}	
	Panel C: Detailed STEM Majors						
	Computer and Information Sciences	Engineering	Biology	Mathematics and Physical Sciences	Others		
	(14)	(15)	(16)	(17)	(18)		
Post08	0.00724***	0.00398***	0.000678	0.00156	-0.000365		
	(0.000878)	(0.00121)	(0.00160)	(0.000978)	(0.000782)		
	{27.05%}	{6.60%}	{1.12%}	{4.57%}	{-2.70%}		

Notes: Results are from LPM regressions. Robust standard errors in parentheses are clustered by state of birth. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The numbers in braces are the coefficient divided by the corresponding pre-treatment means for the respective major dummies and represent the percentage change in the number of college graduates in respective majors. Age dummies, sex dummies, race/ethnicity dummies, state-of-birth dummies, and state-of-birth × year-of-birth trends are included in all regressions.