The Great Recession and the Widening Income Gap Between Alumni of Elite and Less Selective Universities*

Russell Weinstein†

July 5, 2023

Abstract

Using mobility report card data, I show the income gap between alumni of elite and less selective universities widened for cohorts graduating during the Great Recession. This is evident for mean and median incomes, and access to high earning percentiles. Results do not appear driven by differences in student composition, including parental income. Using a unique dataset of recruiting strategies for prestigious firms, I highlight one channel through which university selectivity may have a causal impact: high-wage firms concentrated their recruiting at elite universities during the recession. The results are informative for policies increasing lower-income students' representation at selective universities.

*I thank Peter Cappelli, John Friedman, Jesse Rothstein, and Fabian Slonimczyk, and seminar participants at the IAB/DZHW Conference on Higher Education and The Labour Market, People and Organizations Conference, ICEF Conference on Applied Economics, Association for Education Finance and Policy Annual Conference, Society of Labor Economists Annual Meeting, the IZA/SOLE Transatlantic Meeting of Labor Economists, and the LERA@ASSA Meetings for helpful comments. I thank Jocelyn Griser, Kunio Kohama, Thomas Moshier, and James Ziron for excellent research assistance. A previous version of this paper circulated with the title "Graduating from a Less Selective University During a Recession: Evidence from Mobility Report Cards and Employer Recruiting."

†weinst@illinois.edu. University of Illinois at Urbana-Champaign.

1 Introduction

What is the role of universities in enabling income mobility and income success? Lower-income students are more concentrated at less selective universities, and graduates of these universities have substantially lower incomes (Chetty et al., 2020). As a result, there has been considerable interest in policies that increase representation of middle- and lower-income students at selective universities.[1][2] In this paper I consider a benefit of graduating from a selective university that has received limited attention, and that has implications for these policies: selective universities increase graduates' resilience to negative economic shocks.

This paper has two main objectives. First, I show the income gap between alumni of elite and less selective universities widened for cohorts graduating during the Great Recession. The second objective is to provide insight into the sources of this result. One broad class of explanations is that students at elite universities have individual characteristics correlated with resilience, and another is that elite universities enable resilience to negative labor market shocks. I evaluate whether differences in student composition might explain the results, for a number of student characteristics. There is still limited evidence on the channels through which elite universities causally affect labor market outcomes. In the last part of the paper, I highlight one channel through which university selectivity may have a causal effect on resilience to negative shocks: during recessions prestigious firms concentrate their recruiting at elite universities.

First, I show that for less-selective universities, the 2014 gap in median incomes between recession and pre-recession alumni was larger for universities in areas more severely affected by the recession. These effects are not apparent for alumni of more selective universities. The results are based on income data at the university-birth cohort level from the mobility report

[1] See Hoxby and Avery (2013) for a description of university policies to increase lower-income students' enrollment. Chetty et al. (2020) consider the impacts of students enrolling in college in an income-neutral manner conditional on test scores. Machado, Reyes and Riehl (2022) show that increasing student body diversity (including by parental income) results in worse labor market outcomes for highly-ranked students.

[2] The paper also relates to several papers studying who has access to high-wage jobs at labor market entry (Zimmerman, 2019; MacLeod et al., 2017; Weinstein, 2018, 2022*a*), as well as a large literature on the value of graduating from an elite university.

cards (Chetty et al., 2020), and recession alumni are birth cohorts expected to graduate during and after the recession. Second, I show the income gap between alumni of elite and less selective universities in the same commuting zone (CZ) widened more for recession cohorts at universities in more severely affected areas, relative to mildly affected areas. There is a widening gap in mean and median incomes, as well as likelihood of earning in the highest percentiles of the income distribution. To my knowledge, this is the first paper to establish this fact for U.S. students. Comparing the income gap across selectivity tier in severely versus mildly affected areas helps to identify the effect of the recession, separately from persistent lifecycle differences across university selectivity tiers.

The results do not appear driven by differences across university selectivity in parental income, college majors, racial composition, percentage of in-state and foreign students, labor force participation, and changing composition of SAT scores among students.[3] The identification strategy controls for impacts of unobservable characteristics that differ by university selectivity, if their impact does not depend on recession severity in the university's CZ. If the impact does depend on recession severity, these differences may explain the result.

In the last part of the paper I consider the specific channels through which elite universities might have a causal impact on graduates' resilience. A causal role for universities would be consistent with Chetty et al. (2020), which suggest that at least 80% of the difference in earnings premia across colleges, conditional on test scores, parental income, and race, is explained by colleges' causal effects. However, the extent to which universities have causal impacts is still an open question. For example, Mountjoy and Hickman (2021) suggest estimating university value-added using controls still undercorrects for selection bias.

I focus on one potential source of universities' causal effects on graduates' resilience: high-wage firms concentrate their recruiting at elite universities during recessions. Campus recruiting is an important way in which college students find jobs. In a recent survey of 275 firms across many industries, over 75% conducted on-campus interviews, and nearly

[3]See Oreopolous, von Wachter and Heisz (2012) for a discussion of mechanisms that could explain differential effects by university selectivity.

60% of full-time entry-level college hires were initially interviewed on campus (National Association of Colleges and Employers, 2014). Evidence shows recessions' persistent effects are importantly explained by starting one's career at a lower quality employer (Oreopolous, von Wachter and Heisz, 2012).[4] This underscores the importance of understanding changes in matching at labor market entry.

This is the first paper to empirically document that firms reduce recruiting at less selective universities during recessions, a prediction related to several theoretical models. Given the result that graduates of less selective universities lose access to the highest incomes, losing access to high-wage employers seems like an especially plausible mechanism. I evaluate this mechanism using panel data I collected on the university campuses that employers target for recruiting from 2000-2013, focusing on a sample of prestigious finance, consulting, and Fortune 250 companies recruiting for business positions.

I present several new findings consistent with this mechanism. I show access to high-wage firms becomes more concentrated at more selective universities during the recession. Including recruiting variables as explanatory variables in the income regression reduces the coefficients on selectivity tier by at least 20% depending on the birth cohort. Further, universities which lose access to a greater fraction of their recruiting firms experience more adverse income effects relative to same-tier, same-CZ universities losing access to a smaller fraction.

In addition to this paper's broader contribution to understanding the role of universities in income mobility, it also contributes to the literature showing both immediate and persistent effects of graduating during a recession (Altonji, Kahn and Speer, 2016; Kahn, 2010; Oreopolous, von Wachter and Heisz, 2012; Liu, Salvanes and Sorensen, 2016).[5] While this fact has been well established, there is still limited evidence showing which graduates are

[4]Oyer (2006) shows starting one's career at a lower-ranked university, because of the business cycle, has persistent effects for economists. Liu, Salvanes and Sorensen (2016) find the importance of match quality at one's first employer in Norway from 1986-2007, and Arellano-Bover (2020) shows the importance of starting at a larger firm, conditional on the business cycle.

[5]Forsythe (Forthcoming) shows high unemployment rates reduce the hiring rate of young, but not older, workers.

most affected and why.

Oreopolous, von Wachter and Heisz (2012) is an important exception showing more adverse effects of earlier recessions in Canada for graduates with lower predicted earnings, based on their college, major, and years of study.[6] In addition to presenting evidence in a different setting – graduates of U.S. universities during the Great Recession – I contribute to this literature in several ways. First, I show a widening income gap by university selectivity, even conditional on parental-income quintile. These findings are very relevant for policies that increase access to selective universities. While the Canadian administrative data used in Oreopolous, von Wachter and Heisz (2012) are very rich, they do not match workers and their parents. Thus, their results may reflect parental income differences across colleges and their role in resilience to recessions.

Second, my results contribute to the literature by showing striking widening gaps in access to the very top of the earnings distribution, which was not analyzed in Oreopolous, von Wachter and Heisz (2012), in addition to widening gaps in average and median earnings. This helps provide greater context for the mechanisms that may be important. Finally, I show evidence for one channel through which selective universities may have a causal impact: access to prestigious firms on campus.

Further, I document how employers adjust recruiting intensity during recessions. Starting with Davis, Faberman and Haltiwanger (2013), adjustments in recruiting intensity have been suggested as one reason the standard matching function broke down during the Great Recession. However, there has been limited micro-level evidence. My paper contributes by showing specific ways in which firms adjust their recruiting intensity over the business cycle.

The paper proceeds as follows. Section 2 describes the Chetty et al. (2020) data on incomes by university and birth cohort, as well as the data on employers' campus recruiting

[6] A recent paper by Anstreicher and Miller (2023) also explores differential impacts of graduating during the Great Recession by college quality. Their paper focuses less on the difference between elite and less selective universities and uses individual-level survey data drawn from a sample of college graduates. Altonji, Kahn and Speer (2016) show less negative impacts of graduating in a recession for students in high-paying majors.

strategies. Section 3 shows the widening income gap by university selectivity for recession cohorts. Section 4 shows employer recruiting became more concentrated at elite universities during the recession, and considers the extent to which this might explain the effects in Section 3. Section 5 concludes.

2 Data

2.1 Income Data

To test whether the income gap between alumni of elite and less selective universities widens for recession cohorts, I use the mobility report cards (Chetty et al., 2020). These data are at the university-birth cohort level, and contain 2014 income data for 1980-1991 birth cohorts of alumni, based on administrative data from the Internal Revenue Service and U.S. Department of Education. Income measures include mean, median, and median among positive earners, as well as fraction of the cohort in the top percentiles of the national income distribution for their cohort. The data are based on enrollees of the college, and do not restrict to graduates. Individuals with zero earnings are included when constructing all of the aggregate outcome variables, except when the outcome is the median income conditional on positive earnings.[7][8]

As I will discuss, the identification strategy compares outcomes for individuals in the same birth cohort, regardless of when or whether they graduate from the college. Based on median age at graduation by selectivity tier, for the 1987 birth cohort the median Tier 1 graduation may have been in 2009, but 2010 for Tier 3-5.[9] This is not a large concern, given

[7]None of the dependent variables use the arcsinh transformation nor log of income plus a constant, and thus the results are not subject to the concerns raised about using these transformations (Chen and Roth, 2023; Mullahy and Norton, 2022).

[8]Income is measured as total pre-tax individual earnings, including wage earnings and self-employment income. In the Chetty et al. (2020) data, for individuals who do not file taxes, incomes are obtained from their W-2 forms. See Chetty et al. (2020) for details, including the definition of attendance.

[9]Median age at graduation was 22 for 2007-2008 graduates of top-quartile selectivity universities (based on the National Center for Education Statistics selectivity measure), 23 for lower quartiles, and 25 for open admission universities (U.S. Department of Education, National Center for Education Statistics, 2021*a*).

unemployment rates were 9 to 10% for over two years (April 2009 through September 2011) and 4.5 to 5% for nearly three years before the recession (June 2005 through April 2008).[10]

2.2 Recruiting Data

I collect a unique panel dataset of recruiting strategies using The Internet Archive: Wayback Machine. I focus on the Fortune 250 firms (2010), and Vault's 50 most prestigious consulting and banking firms in 2007 and 2008, respectively.[11] Similar data were used in Weinstein (2022*a*) to study the relationship between firm locations and recruiting.

For each firm I identified whether the firm's website in the Fall of each year contained information on undergraduate target campuses, for 2000 through 2013. I denote whether a firm (f) recruits at a given university (j) in a given year (t) ($Recruit_{fjt}$), for each university in Princeton Review's The Best 376 Colleges (2012).[12] For consistency, for Fortune 250 firms, this is specifically whether they recruit for a business position, allowing me to study firms recruiting for similar jobs across university selectivity tier.

I code *Recruit* as missing if the page is nonarchived. However, a nonarchived page may reflect the page did not exist, and suggest no active recruiting.[13] Excluding these may underestimate recruiting declines during the recession. For robustness, I set to zero the observations set to missing for reasons that may reflect a lack of recruiting (reasons other than blocked pages or nonworking links). I collect panel data on firm office locations and calculate distance between the university and the firm's closest office in each year, as described in Appendix A.3.

Given the number of universities, some Tier 3-5 institutions should be in the top quartile, and none will be open admissions. Among students starting postsecondary education in 2004, whose first degree was at a public two-year institution, median graduation age was 23 (U.S. Department of Education, National Center for Education Statistics, 2021*b*).

[10] If graduation rates are lower from Tier 3-5 universities, and college dropouts are more negatively affected in severely affected CZs, this could also contribute to the widening of the gap between elite and less-selective university enrollees for recession cohorts.

[11] The 2007 ranking of banking firms contained very few firms.

[12] I exclude universities without IPEDS data and test scores, foreign universities, and service academies. I create one observation for the five Claremont Colleges.

[13] Observations with nonarchived recruiting pages, for reasons other than being blocked or nonworking links, increase during the recession (Figure A.45c).

The dataset includes recruiting data for 105 firms. To focus on whether firms dropped their less-selective target campuses during the Great Recession, we focus on a smaller sample of 42 firms who actively recruit on campus in 2007.[14]

3 The Great Recession and Effects by University Selectivity

I start by showing the within-tier differential effects of the recession for alumni of universities in severely relative to mildly affected areas. In section 3.1, I will proceed to estimate a triple-difference across selectivity tiers, identifying within-CZ gaps between elite and less selective universities.

I estimate separately for each tier:

$$Y_{j_{ks}t} = \kappa_j + \gamma_t + \lambda_t Cohort_t * SevereRecession_{j_{ks}} + \mathbf{X_{jt}\delta} + u_{jt} \quad (1)$$

The dependent variable is a measure of income in 2014 for graduates of university j, in birth cohort t, where university j is in selectivity tier k and location s. We include university fixed effects, and so we analyze within-university differences in alumni income in 2014, across birth cohorts.

Since we observe income in 2014 for all cohorts, when comparing incomes across cohorts we compare incomes at different ages. As a result, comparing recession cohorts to pre-

[14] As I will discuss, these firms additionally have non-missing recruiting data for more than one campus in a given year and for a given university in more than one year. Of the 105 firms in the data, 80 have non-missing recruiting data in 2007, of which 45 have $Recruit = 1$ in 2007. Table A.14 shows the firms, and years for each firm, that recruit at least once from 2000-2013, and have nonmissing recruiting data in 2007, and whether they are included in the sample for equation (3). Figures A.44a and A.44b show the overall mean of *Recruit* for the full sample of firm-university pairs, including 105 firms and all universities in the sample, and separately for the sample of firms that recruit at least once over the sample period, and the universities that attract at least one firm over the sample period, and the firm-university pairs that have non-missing recruiting data in 2007. This includes 65 firms and 236 universities.

recession cohorts does not identify the recession's impact. I identify the impact of the recession by comparing differences across cohorts for universities in severely affected areas relative to mildly affected areas, quantified by the coefficients λ_t. Yagan (2019) uses a similar strategy, to identify the recession's longer-run employment impact separately from secular nationwide shocks.

For the main results, I define commuting zones as the local area. I include the following variables in $\mathbf{X_{jt}}$: fraction of students with parents in the first parental-income quintile, fraction in the second, third, and the fourth, and fraction with parents in the top 10% of incomes, top 5%, top 1%, and top .1%, the log of students in the cohort, and the fraction of the cohort that is female.[15]

I define a severely affected CZ as one that experienced an above-median increase in the unemployment rate between 2007 and 2009, using data from Yagan (2019). University tiers k are based on the classifications in Chetty et al. (2020), which are based on the 2009 Barron's classification of universities by selectivity. Tiers include Ivy Plus (12 universities), Barron's Tier 1 (elite) universities excluding the Ivy Plus group (65 universities), Barron's Tier 2 (highly selective) universities (99 universities), Barron's Tier 3-5 (selective) universities (1003 universities), nonselective public and not-for-profit four-year universities (178 universities), and public and not-for-profit two-year colleges (778 colleges).[16]

In estimating (1), the omitted cohort is 1983. Based on the median graduation age by tier discussed above, a large fraction of the 1983 birth cohort at Ivy Plus through Tier 3-5 universities will have graduated shortly before the recession. While many in the 1984 birth cohort also graduated before the recession, some of the students will have graduated during the recession, and moreso at the less selective universities. The coefficient λ_{1987} is the average

[15]The triple difference described below additionally includes interactions between parental-income composition, cohort, and severely affected CZ, and the lower-level terms for these interactions. Because these difference-in-difference regressions include only one tier, I do not include interactions between parental-income composition and cohort, and parental-income composition and severely affected CZ in the main results, though including them yields similar results.

[16]I exclude nonselective for-profit four-year universities and for-profit two-year colleges. These may more likely involve remote instruction with students located far from the institution, and the identification relies on the institution's geography.

additional difference in median incomes for the 1987 birth cohort in severely versus mildly affected CZs, relative to the 1983 cohort. If cohorts graduating before the recession are also affected by the recession, then comparing to the 1983 birth cohort will underestimate the effects. Indeed, Rothstein (2021) finds evidence that the recession had negative effects on employment rates for cohorts graduating before the recession (starting with labor market entrants in 2003), though the effects are much larger for cohorts graduating during the recession.

I show results including only universities with data for each cohort. For comparison purposes Figure 1a uses the same sample as the triple-difference results in Figure 1b, which includes CZ-cohort fixed effects, thus excluding universities that are the only university in their CZ.[17] Tables 2 and A.1 show how the results are affected by sample restrictions and additional controls. I exclude universities for which income is reported for a university system, which may include universities of multiple tiers. This yields 12 Ivy Plus universities, 59 Tier 1 universities, 73 Tier 2 universities, 611 Tier 3-5 universities, 79 nonselective four-year public or not-for-profit universities, and 387 two-year public or not-for-profit colleges. Table 1 shows summary statistics by university tier. Table A.8 shows the number of universities by tier and recession severity. I cluster standard errors at the university level.

Results

Figure A.1 shows raw data with outcomes by university selectivity tier and birth cohort, separately for universities in severely and mildly affected CZs. These figures show that for elite universities there are very similar incomes by birth cohort in mildly and severely affected CZs, for birth cohorts before and after the recession. While this is also true for Tier 3-5 cohorts before the recession, starting with the recession, incomes fall more for cohorts in severely affected areas. For nonselective four-year public and not-for-profit universities, we

[17] Table A.10 shows this leads to dropping 178 universities out of the 1420 universities in the sample without CZ fixed effects. Of the 178 universities that are dropped, one is a Tier 1 university and 80 are Tier 3-5 universities.

see this decline start for the 1983 birth cohort, which is consistent with the substantially older median age at graduation of 25.

Similarly, the differences-in-differences results show that for Ivy Plus, elite, and highly selective universities, alumni from universities in severely affected areas are not differentially affected by the recession by the time of income measurement in 2014 (Figures 1a and A.2). Failure to reject zero difference may reflect small effects at the time of graduation, or large effects at graduation that declined over time.[18]

For alumni of Tier 3-5 universities, there are differentially negative effects for recession cohorts in severely relative to mildly affected areas. For the 1987 birth cohort, incomes are an additional 2% lower for those from universities in severely affected areas, relative to mildly affected areas. For the 1991 cohort incomes are an additional 7.6% lower. Given that the 1987 cohort is roughly five years from graduation at income measurement, they may have suffered similar or worse effects as the 1991 cohort, but partially recovered over the first five years after graduation.[19] Importantly, the effects are flat for the 1983 through 1986 cohorts, mitigating concerns that Tier 3-5 universities in severely affected areas are experiencing differential trends from those in mildly affected areas, separate from the Great Recession. There is some evidence that the differential effects for alumni of universities in severely affected areas declined between 1980 and 1983. This may reflect negative effects of the recession for those graduating just before the recession, consistent with Rothstein (2021).

For alumni of nonselective four-year public and not-for-profit universities, median age at graduation is 25, substantially older than the 22-23 for Tier 3-5 universities. Thus, the 1983 and 1984 birth cohort are graduating during the recession. Consistent with this timing, we

[18] Appendix Figures A.4 and A.5 show the results from estimating regression (2) separately for severely and mildly affected CZs, controlling for interactions between parental income composition, severe recession, and birth cohort. Comparing these plots shows the difference between the 1987 and 1983 cohorts at elite relative to Tier 3-5 universities is less negative in severely affected CZs. This is consistent with more negative effects of the recession on the 1987 cohort at Tier 3-5 universities in severely affected CZs.

[19] Among 1974-2011 graduates, Altonji, Kahn and Speer (2016) find a roughly .04 log point earning loss three years after graduating in a large recession, and no earnings loss after seven years. Graduating in a large recession for post-2004 graduates is associated with a .02 to .06 log point earnings loss three years following graduation.

see differential effects for the 1983 cohort relative to the earlier cohorts (Figure A.2). For the 1983 birth cohort, incomes are an additional 5% lower for alumni of universities in severely versus mildly affected areas, relative to that difference for the 1982 birth cohort. For the 1989 birth cohort, on average graduating in 2014 at the time of income measurement, incomes are 14% lower for those from severely affected areas relative to mildly affected areas, relative to the difference for the 1982 birth cohort.

Finally, median age at graduation for graduates of two-year colleges is 23, and we see differential effects for alumni of universities in severely affected areas starting with the 1985 birth cohort who were 23 in 2008. For these alumni, incomes are 1.4% lower if they attended a college in a severely affected area relative to a mildly affected area (Figure A.2). For the 1991 cohort, these effects are over 4%.

3.1 Changes in the Income Gap Between Elite and Less Selective University Alumni

Figure 1a suggests alumni of less selective universities experience more adverse impacts of graduating in a recession. Conditional on being located in an above- or below-median affected CZ, elite universities may be located in CZs with systematically different recession severity, making it difficult to interpret differences across tier. In order to understand changes in the income gap between alumni of elite and less selective universities, the ideal comparison would compare universities in the same CZ. I estimate a triple-differences model including CZ-cohort fixed effects, to formally show the income gap between alumni of elite and less selective universities widened for birth cohorts who likely graduated during the Great Recession:

$$Y_{j_{ks}t} = \kappa_j + \beta_{st} + \gamma_{kt} + \lambda_{kt} Cohort_t * Tier_j * SevereRecession_{j_{ks}}$$
$$+ (Cohort_t * \mathbf{Z_{jt}} * SevereRecession_{j_{ks}})\boldsymbol{\rho_t} + (Cohort_t * \mathbf{Z_{jt}})\boldsymbol{\psi_t}$$
$$+ (\mathbf{Z_{jt}} * SevereRecession_{j_{ks}})\boldsymbol{\omega} + \mathbf{X_{jt}}\boldsymbol{\delta} + u_{jt} \quad (2)$$

We include university fixed effects, and so we analyze within-university differences in alumni income in 2014, across birth cohorts. We analyze whether the differences across cohorts differ by university selectivity tier, by including birth cohort-selectivity tier fixed effects γ_{kt}. Including local area by cohort fixed effects β_{st}, we compare these differences across university tier among universities in the same area.

Chetty et al. (2020) shows differences across university selectivity tier in how quickly income percentiles stabilize. The triple difference ($Cohort * Tier * Severe$) identifies the additional widening of the gap between elite and less selective universities in severely versus mildly affected areas. Comparing the gaps in severely versus mildly affected areas identifies the effect of the recession, separately from these lifecycle differences across tier.[20]

To interpret the coefficients λ as differential effects of the recession by tier, the main identification assumption is that there were no differential changes at less selective universities in severely affected areas that were timed with the recession, but not related to the recession, and were correlated with 2014 income. One of the main concerns is that there were differential changes in parental incomes by university selectivity, in commuting zones that would be severely affected by the Great Recession. As Chetty et al. (2017) discuss, this was a period of declining real incomes for low-income families, widening inequality, as well as some elite universities actively targeting an increase in low-income student enrollment. Chetty et al. (2017) show substantial heterogeneity in trends in low-income students' access to college over this period, across universities within selectivity tier.[21]

[20] All lower-level terms are shown in equation (2).

[21] Figures A.27 through A.36 indeed show differential trends in parental income composition by selectivity

In equation (2), I include interactions between cohort fixed effects, an indicator for severe recession, and the following time-varying university variables $\mathbf{Z_{jt}}$: fraction of students with parents in the second parental-income quintile, fraction in the third, the fourth, and the fifth, and fraction with parents in the top 10% of incomes, as well as the lower-level terms associated with these interactions.[22] These terms control for changes in parental income composition, as well as changes in the mapping between parental income composition and alumni outcomes. As I will discuss, including the interactions with parental income also incorporate one potential reason that the recession effects vary by selectivity, namely that parental income is correlated with resilience to recessions. In $\mathbf{X}$, I include the noninteracted parental income variables, as well as the log of students in the cohort, and the fraction of the cohort that is female.

Given the triple difference, it is also not a concern that Tier 1 and Tier 3-5 alumni have different potential experience at income measurement. As in (1), I show results including only universities with data for each cohort.[23] I cluster standard errors at the university level.[24]

In addition to showing results by cohort, as in Equation (2), I also estimate a regression using an indicator for whether the birth cohort was graduating during or after the recession, and interacting this with selectivity tier, and *Severe*. I construct this recession indicator using the median age at graduation by tier, as discussed above. This variable is equal to one for birth cohorts starting with 1986 for Ivy Plus through Tier 3-5 universities.[25]

tier, that are different in severely affected areas, and timed with recession cohorts.

[22]The fraction in the first parental-income quintile is the omitted category. For robustness, I also include interactions with the fraction of students whose parents are in the top 5% and in the top 1% (Table A.11).

[23]Figure A.9 shows similar results requiring data only for the 1983 cohort, which yields a larger sample.

[24]These are generally larger for the coefficients of interest relative to those clustered at the CZ level, or those unclustered and robust to heteroskedasticity.

[25]As discussed, some Tier 3-5 universities will be in the top quartile of selectivity. Because of this, and to make the comparison more straightforward to the more selective tiers, I construct the recession variable similarly for Tier 3-5 and more selective universities. The recession variable is one starting with the 1983 cohort for nonselective four-year universities in the sample, and starting with the 1985 cohort for the two-year colleges.

3.1.1 Results

I start by discussing effects on median incomes conditional on positive earners and median incomes, shown in Figures 1b and A.7 respectively. I then discuss effects on the fraction of students with top quintile, top 10%, and top 5% earnings, shown in Figures 2a and 2b.

For the 1987 birth cohort, the difference in median incomes, conditional on positive earners, between Ivy Plus and same-CZ Tier 3-5 alumni is an additional 12% higher in severely versus mildly affected CZs ($p < .1$), relative to the 1983 cohort (Figure 1b). For the 1990 birth cohort, the effect is 15% ($p < .05$). These results are based on 12 Ivy Plus universities. We similarly see a widening gap between Tier 1 (elite) and same-CZ Tier 3-5 universities, among cohorts graduating during the recession. For the 1987 birth cohort, the difference in median incomes of positive earners is an additional 10% higher ($p < .01$) in severely versus mildly affected CZs, and 13% higher for the 1990 cohort, relative to the 1983 cohort. For the 1987 birth cohort, the Tier 1 to Tier 3-5 gap in median incomes of positive earners in mildly affected CZs was roughly 21%. These results are similar for median income, not conditional on positive earners (Figure A.7), and also for mean earnings (Figure A.14), although the Ivy Plus effect for mean earnings is less precise.[26]

We do not see pre-trends, mitigating concerns that the effects are explained by pre-existing differential trends in severely and mildly affected areas. The results become significant only for the 1987 birth cohort, for which the median graduation would be in 2009, amid the highest unemployment rates of the Great Recession. This timing of the effects presents further evidence that these widening gaps are due to the recession.

The effects are slightly larger in magnitude for the 1990 than for the 1987 birth cohort. The 1987 birth cohort graduated at a time with higher unemployment rates. However, by income measurement in 2014, roughly five years after graduation, some of the effects may have dissipated. The 1990 birth cohort graduated when unemployment rates were still substantially elevated relative to pre-recession levels (8.2% in May 2012 and 7.5% in May

[26]We also see very little evidence of an effect on the fraction with zero labor earnings (Figure A.8).

2013), and we observe incomes roughly one to two years after graduation for those cohorts.

The gap in median incomes conditional on positive earners between Tier 2 (highly selective) and Tier 3-5 universities widens more in severely affected areas for the 1987 cohort, relative to the 1984 birth cohort, but not relative to the 1983 birth cohort (Figure A.3).[27] We do not see any statistically significant evidence of a widening gap in severely affected CZs between alumni of Tier 3-5 universities and nonselective four-year universities, or two-year institutions (Figure A.3).[28]

Not only do we see a widening gap in mean and median incomes, but strikingly, the Tier 1 to Tier 3-5 gap in the fraction of students with top quintile, top 10%, and top 5% earnings widens more for recession cohorts in severely affected CZs. We do not see a widening gap in access to the third or fourth income quintiles (Figures 2a, 2b).[29] More than half of the effect on top quintile earnings appears explained by the effect on the likelihood of top 5% earnings. The Tier 1 to Tier 3-5 gap in likelihood of top 5% earnings increased an additional 3.7 percentage points in severely versus mildly affected CZs for the 1987 birth cohort; roughly 23% of the gap for this cohort in mildly affected CZs.

Table 2 shows the results when aggregating cohorts into recession and pre-recession cohorts, and how these results change when including cohort-CZ fixed effects and additional control variables. The gap in median incomes among positive earners between Tier 3-5 and Tier 1 (Elite) and Ivy Plus universities widens an additional 5% more in severely affected CZs, which widens to 8-10% when including birth cohort-CZ fixed effects. The effect stays roughly the same magnitude when additionally including time-varying university controls, and interactions between recession cohort, *Severe*, and parental income variables.[30] The

[27] We had chosen to compare to the 1983 birth cohort because of the possibility that some in the 1984 birth cohort graduated during the recession, which would lead to an underestimate. Here we see a decline between the 1983 and 1984 effect.

[28] Given the differences in median age at graduation, comparing Tier 3-5 to nonselective university graduates requires comparison to the 1982 cohort, which is a pre-recession cohort for both tiers.

[29] Figures A.10 through A.13 show effects relative to all tiers.

[30] Table A.2 shows effects for all tiers of university selectivity, as well as when restricting the sample to Ivy Plus through Tier 3-5 universities. Table A.10 shows the composition of the sample by selectivity tier with and without CZ fixed effects. Despite using within-CZ identification, the sample size in column 2 is larger than in column 3 because university-birth cohort observations in CZs without other universities are

second panel of Table 2 shows similar results when the outcome is ln(median income) without restricting to median earners. The third panel shows the gap between Tier 3-5 and Ivy Plus and Elite universities in the likelihood of earning in the top income quintile widens an additional five percentage points in severely affected CZs.

For robustness, I use alternative measures for recession severity, rather than the indicator for above-median change in unemployment rates between 2007 and 2009. Figure A.6a shows results from interacting tier, cohort, and the change in the unemployment rate between 2007 and 2009. The patterns similarly show that the income gap across tiers widens differentially in CZs where there were greater increases in the unemployment rate. Appendix A.2 discusses using the top quartile of unemployment-rate change, leading to a smaller sample of severely affected universities, but broadly similar results.

3.1.2 Effects by parental-income quintile

In this section, I estimate equation (2) separately for students from each parental-income quintile, and the dependent variables are the fraction of students from that parental-income quintile who earn in the top 20%, and separately top 1%, of incomes for their birth cohort in 2014.[31]

This analysis is important for two reasons. First, a widening gap between lower-parental-income alumni of elite and less selective universities suggests the potential for improving income mobility by increasing lower-income students' access to more selective universities.[32] Second, estimating the specification separately by parental-income quintile further mitigates concerns that differences in parental incomes explain the results.

Figure 3 shows the results conditional on parental-income quintile. Even conditional on

not singletons in column 2 because there are multiple birth cohorts for those universities with $Recession = 1$. In column 3, they become singletons because of the birth cohort-CZ FE. In column 2, these observations are not contributing to identification of the coefficients of interest.

[31]The Chetty et al. (2020) data do not provide the likelihood of top 10% or top 5% incomes conditional on parental-income quintiles. I also show results weighting by the size of the university-birth cohort-parental-income quintile cell (Figures A.21,A.22, A.23, and A.24).

[32]This relates to other papers suggesting that affluent students benefit more from elite networks (Michelman, Price and Zimmerman, 2022; Rivera, 2012; Zimmerman, 2019)

parental-income quintile, the results suggest graduating during the recession widens the gap between alumni of Tier 1 and Tier 3-5 universities in the likelihood of top quintile incomes.[33]

There is not strong evidence that the effects for the most affluent students are larger than for students from lower-income families. Confidence intervals are wider for the lower parental-income quintiles, likely in part because there are fewer students from these quintiles at Tier 1 universities – only 4% of students at Tier 1 universities have parents in income quintile 1, 5% in quintile 2, and 9% in quintile 3.

We can reject the joint test at the 10% level that the effects for parental-income quintiles one through four, for the 1987 through 1991 birth cohorts, are all the same as the effects for the fifth parental-income quintile students.[34] However, this appears driven by effects relative to the fourth parental-income quintile. We cannot reject this test when looking at parental-income quintiles one through three, or when looking separately for each of the first through third quintiles, and the results for the third parental-income quintile look very similar to those for the fifth quintile. Further, Table A.4 shows that when aggregating into recession and pre-recession cohorts, we generally cannot reject the coefficients are equal for all parental income quintiles.

We see similar results when looking at the gaps between Ivy Plus and Tier 3-5 university alumni (Figure A.15). We cannot reject at the 5% level, though we can at the 10% level, that the effects for parental-income quintiles one through four are the same as for quintile five, and when aggregating into recession and pre-recession years we also cannot reject the effects are the same (Table A.4). We do not see clear evidence that the gap widens between Tier 3-5 and other tiers (Figures A.16, A.17 and A.18). The fact that Tier 3-5 alumni are not more or less resilient to the recession than alumni of highly selective (Tier 2) or nonselective universities is

[33]The effect for the top parental income quintile does not appear driven by differential changes in the composition of parental income within the top quintile. These results control for cohort fixed effects interacted with fraction of parents in the top 10% of incomes and an indicator for severe recession. Further, Figure A.25 and A.26 show similar results including interactions between birth cohort, the indicator for severe recession, and fraction with parents in the top 5% of incomes and separately the top 1% of incomes.

[34]To implement the test, I estimate one regression, equivalent to the separate regressions as I allow all of the variables to interact with parental-income quintile.

noteworthy, and potentially indicative of the mechanisms explaining elite university alumni resilience.

The gap in the likelihood of top 1% income widens for students from the top parental-income quintile, comparing Ivy Plus and Tier 3-5 cohorts graduating during the recession in severely versus mildly affected CZs, though not for the most recent cohorts. There is suggestive evidence that the effects were larger for students from the lowest two quintiles (Figure A.19).[35] However, we treat these results as very suggestive as comparing to Ivy Plus universities involves identifying off of a small number of Ivy Plus universities in severely versus mildly affected areas, which have a small number of students from lower-parental-income quintiles. We do not observe these effects when comparing Tier 1 to Tier 3-5 universities (Figure A.20). This is perhaps not surprising, as the fraction of alumni with top 1% incomes is dramatically higher for Ivy Plus institutions (15%) even relative to Tier 1 universities (7%).

3.2 The Role of Differences in Student Composition

The results show the Great Recession more adversely impacted students at less selective universities, especially affecting access to the top of the earnings distribution. This may be explained by differences in student characteristics across university selectivity tier, that are correlated with resilience. In this section, we describe several tests for the role of compositional differences. Our identification strategy compares outcomes across tier, and we control for the potentially greater impact of parental income among recession cohorts in severely affected areas. Further, we continue to see a widening gap once conditioning on parental-income quintile. This suggests parental income differences across tier do not completely explain the result.

Less selective universities may have a greater concentration of students in fields which are less resilient to the recession, or their students may be less responsive to changes in demand

[35] We reject that the effects for the first four parental-income quintiles are the same as for the fifth quintile (Table A.5).

by major.[36] As we describe in Appendix A.1.1, we include interactions between birth cohort, *SevereRecession*, and major share in equation (2), and the results are similar.

Tier 3-5 universities have a much higher proportion of in-state students relative to Ivy Plus and elite universities. If out-of-state students are more likely to seek non-local employment, they may be less negatively affected by the severe recession in the university's CZ. While difficult to isolate this channel, I estimate equation (2), additionally interacting the fraction of in-state students and fraction of foreign students with cohort and severe recession, and the central pattern remains very similar (Appendix A.1.2). Additionally, I control for fraction Black, Hispanic, and Asian students, and include interactions with cohort and severe recession. This yields similar results (Appendix A.1.3). We also do not see differential changes in SAT score from 2001 to 2013 at Tier 1 relative to Tier 3-5 universities that are differentially larger in severely affected CZs (Appendix A.1.4). Finally, results are similar for males and females (Figures A.37 and A.38).[37]

Differences in unobservable characteristics may also explain the result. Importantly, the triple difference will difference these out, if their impact does not depend on the recession severity. However, the differences in unobservables may be correlated with resilience to recessions, and the triple difference does not separately identify this channel.

4 Employer Recruiting During the Great Recession

University selectivity may have a causal effect on resilience to negative shocks. This is consistent with Chetty et al. (2020) finding that universities have important causal impacts, conditional on test score, parental income, and race.

In this section, I focus on one channel through which university selectivity may have a

[36] Several recent papers show college major choice changes with labor market demand and the business cycle, including Blom, Cadena and Keys (2021); Ersoy (2020); Han and Winters (2020); Liu, Sun and Winters (2019); Weinstein (2022*b*)

[37] Students from elite universities may be more likely to continue their schooling rather than enter a labor market during a recession. Altonji, Kahn and Speer (2016) find a small effect of graduating during a recession on graduate degree attainment, but argue it is too small to affect sample selection across years of potential experience.

causal impact on graduates' resilience to negative shocks: prestigious firms stopped recruiting from less selective universities during the recession. Loss of prestigious firms recruiting on campus may have causal effects on students' outcomes due to the immediate effect on wages, and also longer-run effects due to the importance of the first job.[38] The data and empirical strategy will not allow us to separate whether this causal effect of elite universities is explained by the human capital they provide (and to which firms respond), or through their role in signaling.

Firms may stop recruiting from less selective universities during recessions for several reasons. First, recruiting at less selective universities may require more screening, and this may be unprofitable during recessions if worker productivity falls.[39] Second, in the model of Acharya and Wee (2020) firms become more selective during recessions as there are greater losses from hiring lower quality workers, implying they may concentrate their recruiting at more selective universities.

Third, recent work shows that when firms have fewer positions to fill, they may decrease vacancies as well as recruiting intensity per vacancy (e.g., recruit with less effort, or with greater selectivity to reduce the applicant pool).[40] This suggests firms may decrease the number of campuses at which they recruit during the recession. They may specifically pause recruiting at less selective campuses because screening is more costly there, or they have a preference for hiring graduates of elite universities.[41] Related, if firms' offer acceptance rates increase at more selective universities during recessions, the need to recruit at less selective universities falls, related to an upskilling story.

While there are several models that would predict firms reduce recruiting at less-selective universities in a recession, this is the first paper to empirically show that firms adjust their

[38]Even for students who would not have obtained a job at the firm, their outcomes may be worse as their peer network will now less likely include someone at these firms.

[39]This follows from extending the model in Weinstein (2018).

[40]See Davis, Faberman and Haltiwanger (2013); Carillo-Tudela, Gartner and Kaas (2021); Forsythe and Weinstein (2021); Lochner et al. (2021); Hershbein and Kahn (2018); Modestino, Shoag and Ballance (2020).

[41]This may be based on expected productivity, or cultural matching as described in Rivera (2011) and Rivera (2012).

recruiting in this way.[42]

I identify all firm-university pairs for which the firm recruited at the university in 2007. I estimate the within-firm-university pair difference in the likelihood of recruiting in each year relative to 2007, and estimate how that differs across tiers of university selectivity. I estimate:

$$Recruit_{fj_kt} = \alpha_{fj} + \gamma_{kt} + \kappa_{ft} + \epsilon_{fj_kt} \tag{3}$$

Observations are at the firm-university-year level. The dependent variable is an indicator for whether firm f recruits at university j in year t.

I include firm-university pair fixed effects (α_{fj}), and interact year fixed effects with university selectivity tier (γ_{kt}). The omitted tier is the Ivy Plus tier, and the omitted year is 2007. Thus, $\gamma_{Tier3-5,2009}$ is the average within firm-university pair change in recruiting from 2007 to 2009 at Tier 3-5 universities, relative to that change at Ivy Plus universities. Including firm-year fixed effects (κ_{ft}) implies we quantify the differential likelihood of dropping a less selective university, for a given firm's set of target campuses in 2007. Including year fixed effects, instead of firm-year fixed effects, differential declines in recruiting at less-selective universities could be explained by different firms recruiting at these universities. Including firm-year fixed effects thus facilitates interpretation of the results.[43]

For every firm-university-year observation in equation (3), I require that the firm-university pair is in the regression sample in 2007, and that the firm recruited at the university in 2007. Thus, the effect in each year is relative to 2007 for that pair. For the main specification, the sample is not balanced on calendar year, and so the effects should not be evaluated as dynamic effects. I show additional results restricting the sample to firm-university pairs with data in each year for a set of years, in order to test for dynamic effects. Given the nature

[42]Forsythe and Weinstein (2021) show how firms change their plans to hire associate's degree graduates when they plan to increase overall hires, and when their beliefs about labor market tightness change.

[43]Appendix Figure A.45a shows results including year rather than firm-year fixed effects. The results are broadly similar though the pre-recession increase in Figure A.45a is larger in magnitude.

of the data, restricting to pairs with non-missing recruiting data in each year substantially reduces the sample size.

Firms were differentially likely to stop their recruiting at Tier 3-5 universities during the recession, relative to Ivy Plus universities (the omitted group in the regression and the figure) (Figure 4a and Table A.13). The differential decline becomes significant in 2009, and remains significant in later years. In 2009, firms are an additional 30 percentage points more likely to drop their Tier 3-5 target campuses than their Ivy Plus target campuses, significant at the 1% level. They are also roughly 20 percentage points more likely to drop their Tier 3-5 target campuses than their Tier 1 (Elite) target campuses, and roughly 15 percentage points more likely than their Tier 2 (Highly Selective) campuses. Both of these differences are significant at the 5% level, and we can reject all three coefficients are equal at the 5% level.

Differences across tier before 2007 are fairly flat, though between 2005 and 2007 there is an increase in the recruiting likelihood at less selective universities relative to Ivy Plus universities. This may reflect that as firms increased recruiting during an expansion, they added less selective campuses because they already recruited at Ivy Plus universities. This may also reflect changes in what is publicized on firms' websites.

Because there are different firm-university pairs in the regression sample in each year due to missing data, changes in the coefficients over time in Figure 4a may reflect these compositional changes. To evaluate whether the effects are changing over time, I estimate (3) requiring that the firm-university pair is in the sample in 2006, 2007, and 2009. This leads to a large reduction in the sample, and data for 22 firms rather than 42. However, Figure 4b shows the differential likelihood of recruiting at Tier 3-5 universities in 2006 relative to 2007 is not statistically significant, and the magnitude is 85% smaller than the decline in 2009, and they are statistically different at the 5% level.[44]

[44]I additionally estimate (3) requiring that the firm-university pair is in the sample in 2005, 2007, and 2009. This leads to an even larger reduction in the sample, and data for 20 firms. The differential likelihood of recruiting at Tier 3-5 universities in 2005 relative to 2007 is not statistically significant, and the magnitude is less than half the size of the decline in 2009, though they are also not statistically different.

To evaluate persistence, I estimate (3) requiring the firm-university pair is in the sample in 2007, 2009, and 2013. Figure A.45b shows the differential likelihood that a firm has dropped a less selective target campus in 2009 relative to Ivy Plus universities persists until 2013. The difference between Tier 3-5 and Tier 1 and Tier 2 universities also remains statistically significant in 2013. However, this sample restriction yields a sample with 19 firms, relative to the 42 firms in the full sample.

I additionally estimate (3), and include interactions between year fixed effects and tier, as well as between year fixed effects and university characteristics from Chetty et al. (2020). This yields similar coefficients on tier (Figure A.43). There is suggestive evidence that firms are more likely to drop their target campuses that were a greater distance from the firm's office, discussed further in Appendix A.4. Firms are differentially likely to stop recruiting at smaller universities, conditional on university selectivity tier, distance, and other university characteristics (Appendix A.4). There is not strong evidence that firms are differentially likely to stop recruiting at universities where the students have more affluent parents, at public universities, or at universities with a greater fraction of female students, conditional on selectivity tier, distance, and other university characteristics.

4.1 Can changes in recruiting explain some of the widening gap?

In this section, I analyze the extent to which the widening income gap by selectivity for recession cohorts (shown in Section 3) may be explained by these changes in recruiting. I control for access, and lost access, to firms and determine the extent to which this reduces the coefficient on university selectivity. To focus on this mechanism, I limit the sample to the universities for which I have recruiting data, and to those that had access to at least one of the prestigious firms in 2007.

This mechanisms analysis is suggestive as the recruiting data contain universities from the Princeton Review's Best 376 Colleges, a small subset of the universities in Chetty et al.

(2020).[45] Further, universities that lose access to a greater fraction of firms may have worse student outcomes during recessions for other reasons. However, a decline in the coefficients of interest would be consistent with recruiting as a mechanism for the resilience.

I estimate equation (2), and additionally include $Cohort{*}Severe{*}FirmsRecruitingin2007$ interactions, as well as $Cohort * Severe * FractionFirmsLeaving2008\text{-}2013$ interactions. Firms recruiting in 2007 is the number of firms recruiting on campus in 2007. The variable $FractionFirmsLeaving2008\text{-}2013$ is the fraction of firms that recruited at the university in 2007, and for which *Recruit* equals zero in any year between 2008 and 2013. Both $FirmsRecruitingin2007$ and $FractionFirmsLeaving2008\text{-}2013$ are constant across time within universities.[46] Including these interactions provides suggestive evidence of whether the additional gap between Tier 1 and Tier 3-5 universities for recession cohorts in severely-affected CZs is partly explained by Tier 1 universities having more resilient access to firms during the recession, which had differential effects on recession cohorts in severely-affected CZs.

The number of recruiting firms in 2007 is a measure of the university's attractiveness to firms. While we control for $FractionFirmsLeaving2008\text{-}2013$, this may not capture all of the recruiting changes, for example changes in the scale of recruiting. In this case, interactions with the number of firms in 2007 may capture this mechanism. Appendix Figures A.47 and A.48 show results including only the interactions with the fraction dropping the campus, which also reduce the coefficients of interest.

Figure 4c shows the results from estimating (2) without the interactions between parental income, birth cohort, and severe recession, to focus on the base result without other mechanisms.[47] Table A.15 shows results when aggregating into pre-recession and recession cohorts,

[45] In this merged dataset, applying the balance restriction as in (2), there are 12 Tier 1 universities in severely affected CZs that are in the same CZ as a Tier 3-5 university, and 10 Tier 3-5 universities in these CZs. For mildly affected CZs, those numbers are eight and five respectively.

[46] If we observe a firm stop recruiting at a university in 2013, it may have stopped earlier but the data were missing, and so this may reflect an effect on earlier cohorts. We do not use the number of firms recruiting in a given year to capture changes in access, as changes will not necessarily capture firms dropping campuses, given missing firm-university level data.

[47] Table A.16 shows the number of universities by tier in these regressions. Perhaps unsurprisingly given

and how the results change with the inclusion of birth cohort-CZ fixed effects, and additional university controls. The 1987 through 1991 coefficients on selectivity tier are substantially smaller when including the recruiting variables, generally by 20 to 60% depending on the year, and they are not statistically significant (Figure 4c). Without the recruiting interactions, the magnitudes on the coefficients on selectivity tier are very similar to the magnitudes using the main sample from Chetty et al. (2020) (Figure 2a). Unsurprisingly given the much smaller sample, they are not significant, except in 1990.[48] Table A.15 shows that when including the recruiting controls the coefficients of interest decline from .033 to .004, though the confidence intervals are large on each.

The coefficients on the recruiting interactions show that for two same-tier and recession-severity universities, greater loss in access to firms is associated with a particularly negative effect on recession cohorts in severely affected areas, controlling for CZ-cohort fixed effects (Figure A.48). I estimate an additional specification to focus the identification even further on comparison of same-tier universities within the same CZ, including CZ-tier-cohort fixed effects. I estimate:

$$Y_{j_{kst}} = \beta_t FractionFirmsLeaving2008\text{-}2013_j + \gamma_{kst} + \kappa_j + \mathbf{X_{jt}}\boldsymbol{\delta} + u_{j_{kst}} \tag{4}$$

The coefficients β give the average within-CZ-tier-cohort difference in outcomes for universities losing a greater fraction of their recruiting firms, by birth cohort. Given the focus on same-CZ-tier universities, our sample size falls. Identification comes from 36 universities, which are all in the same CZ as another university of the same tier, and nine CZs.[49] I include in $\mathbf{X}$ the same variables I include in equation (2). I also include interactions between birth cohort and fraction of students with parents in the top income quintile, as this may be

the much smaller sample here, if we include the interactions with fraction of students whose parental income is in the top 10% of the income distribution, the coefficients on Tier 1, severe recession, and recession cohorts are no longer positive or statistically significant, but the confidence intervals are very wide and include the effect when we do not include those interactions.

[48] Figures A.46a and A.46b show coefficients on the recruiting interactions.

[49] Two are Ivy Plus, 19 are Elite, nine are highly selective, and 6 are Tier 3-5.

correlated with *FractionFirmsLeaving2008-2013*, and there may be differential effects of parent income for recession cohorts. Results are similar without these interactions (Figures A.49a and A.49b).[50]

Recession cohorts at universities losing access to a greater fraction of their recruiting firms experience more adverse outcomes compared to other same-tier, same-CZ universities (Figure A.49). If the fraction of firms ceasing their recruiting at the university is higher by one standard deviation (.26 percentage points), there is an additional 1.6 percentage point decline in the fraction of the 1987 cohort in the top quintile of incomes for their birth cohort. This is roughly a 3.3% decline for the 1987 birth cohort. The coefficient on the interaction between 1987 birth cohort and *FractionFirmsLeaving2008-2013* is significant at the 10% level.

With the caveats discussed above, these results present suggestive evidence that students are negatively affected by losing access to high-wage firms.

5 Conclusion

This paper presents new facts documenting that the income gap between elite and less selective university alumni widens for cohorts graduating during the Great Recession, comparing universities in severely to mildly affected areas. Using the Chetty et al. (2020) mobility report card data, we see a widening gap in mean and median incomes, as well as a widening gap in access to the very top of the earnings distribution for their cohort. The results may reflect differences in unobservable characteristics across tier that are correlated with resilience, but it could also reflect that university selectivity has a causal effect on enabling resilience to recessions.

[50]Table A.17 shows some evidence of differential trends in X for universities losing more access (through the 1991 birth cohort), particularly for the fraction of students whose parents are in the top income quintile. It does not appear they explain the differential income effects, given that the change in these characteristics remains large for the 1990 and 1991 cohorts, while the income effects become less negative in those years. Further, in our main specification for equation (4) we control for fraction of students with parents in the top income quintile, as well as allow the effects of this variable to vary by birth cohort.

There is still limited evidence highlighting the ways in which elite universities may have causal labor market impacts. I highlight one channel through which university selectivity could have a causal effect on resilience to negative shocks: prestigious firms differentially stopped recruiting at less selective universities during the recession. I use a unique dataset of employer recruiting decisions for prestigious finance, consulting, and Fortune 250 companies.

If the recession's differential impact by university selectivity reflects causal effects of university selectivity, then this is another way in which changing where students attend college could affect economic mobility, as suggested by Chetty et al. (2020). Understanding whether, and why, affluent students benefit more from elite universities remains an important area for research and policy. To the extent that the results reflect compositional differences across selectivity tier, they also suggest which graduates are most at risk of adverse impacts during recessions and in potential need of support from policymakers or their universities. As one example, less elite universities might find ways to allow unlucky recession graduates to participate in on-campus recruiting, once more firms have returned to campus.

References

Acharya, Sushant, and Shu Lin Wee. 2020. "Rational Inattention in Hiring Decisions." *American Economic Journal: Macroeconomics*, 12(1).

Altonji, Joseph G., Lisa B. Kahn, and Jamin D. Speer. 2016. "Cashier or Consultant? Entry Labor Market Conditions, Field of Study, and Career Success." *Journal of Labor Economics*, 34(S1).

Anstreicher, Garrett, and Lois Miller. 2023. "Who Scars the Easiest? College Quality and the Effects of Graduating into a Recession." *EdWorkingPaper: 23-761, Retrieved from Annenberg Institute at Brown University.*

Arellano-Bover, Jaime. 2020. "Career Consequences of Firm Heterogeneity for Young Workers: First Job and Firm Size." *Working Paper.*

Blom, Erica, Brian C Cadena, and Benjamin J Keys. 2021. "Investment over the business cycle: Insights from college major choice." *Journal of Labor Economics*, 39(4): 1043–1082.

Carillo-Tudela, Carlos, Hermann Gartner, and Leo Kaas. 2021. "Recruitment Policies, Job Filling Rates and Matching Efficiency." *Working Paper.*

Chen, Jiafeng, and Jonathan Roth. 2023. "Log-like? Identified ATEs defined with zero-valued outcomes are (arbitrarily) scale-dependent." *Working Paper.*

Chetty, Raj, John N. Friedman, Emmanuel Saez, Nicholas Turner, and Danny Yagan. 2017. "Mobility Report Cards: The Role of Colleges in Intergenerational Mobility." *NBER Working Paper*, No. 23618.

Chetty, Raj, John N. Friedman, Emmanuel Saez, Nicholas Turner, and Danny Yagan. 2020. "Income Segregation and Intergenerational Mobility Across Colleges in the United States." *Quarterly Journal of Economics*, 135(3).

Davis, Steven J., R. Jason Faberman, and John C. Haltiwanger. 2013. "The Establishment-Level Behavior of Vacancies and Hiring." *Quarterly Journal of Economics*, 128(2).

Ersoy, Fulya Y. 2020. "The effects of the great recession on college majors." *Economics of Education Review*, 77: 102018.

Forsythe, Eliza. Forthcoming. "Why Don't Firms Hire Young Workers During Recessions?" *Economic Journal.*

Forsythe, Eliza, and Russell Weinstein. 2021. "Recruiting Intensity, Hires, and Vacancies: Evidence from Firm-Level Data." *IZA Discussion Paper*, No. 14138.

Han, Luyi, and John V Winters. 2020. "Industry fluctuations and college major choices: Evidence from an energy boom and bust." *Economics of Education Review*, 77: 101996.

Hershbein, Brad, and Lisa B. Kahn. 2018. "Do Recessions Accelerate Routine Biased Technological Change? Evidence from Vacancy Postings." *American Economic Review*, 108(7).

Horn, Laura, Emily Forrest Cataldi, and Anna Sikora. 2005. "Waiting to Attend College. Undergraduates Who Delay Their Postsecondary Enrollment. Postsecondary Education Descriptive Analysis Report (NCES 2005-152)."

Hoxby, Caroline, and Christopher Avery. 2013. "The Missing One-Offs: The Hidden Supply of High-Achieving, Low-Income Students." *Brookings Papers on Economic Activity*.

Kahn, Lisa B. 2010. "The Long-Term Labor Market Consequences of Graduating from College in a Bad Economy." *Labour Economics*, 17(2).

Liu, Kai, Kjell G. Salvanes, and Erik O. Sorensen. 2016. "Good Skills in Bad Times: Cyclical Skill Mismatch and the Long-Term Effects of Graduating in a Recession." *European Economic Review*, 84.

Liu, Shimeng, Weizeng Sun, and John V Winters. 2019. "Up in STEM, down in business: changing college major decisions with the great recession." *Contemporary Economic Policy*, 37(3): 476–491.

Lochner, Benjamin, Christian Merkl, Heiko Stüber, and Nicole Gürtzgen. 2021. "Recruiting intensity and hiring practices: Cross-sectional and time-series evidence." *Labour Economics*, 68.

Machado, Cecilia, Germán Reyes, and Evan Riehl. 2022. "Alumni Job Networks at Elite Universities and the Efficacy of Affirmative Action."

MacLeod, W. Bentley, Evan Riehl, Juan E. Saavedra, and Miguel Urquiola. 2017. "The Big Sort: College Reputation and Labor Market Outcomes." *American Economic Journal: Applied Economics*, 9(3).

Michelman, Valerie, Joseph Price, and Seth D. Zimmerman. 2022. "Old Boys' Clubs and Upward Mobility Among the Educational Elite." *Quarterly Journal of Economics*.

Modestino, Alicia Sasser, Daniel Shoag, and Joshua Ballance. 2020. "Upskilling: Do Employers Demand Greater Skill When Workers are Plentiful?" *Review of Economics and Statistics*, 102(4).

Mountjoy, Jack, and Brent Hickman. 2021. "The returns to college (s): Estimating value-added and match effects in higher education." *Working Paper*.

Mullahy, John, and Edward C Norton. 2022. "Why Transform Y? A Critical Assessment of Dependent-Variable Transformations in Regression Models for Skewed and Sometimes-Zero Outcomes." *NBER Working Paper*, No. 30735.

National Association of Colleges and Employers. 2014. "Recruiting Benchmarks: On-Campus Interview." `http://www.naceweb.org/s03192014/on-campus-interview-benchmarks.aspx`, Accessed 6/22/15.

Oreopolous, Philip, Till von Wachter, and Andrew Heisz. 2012. "The Short- and Long-Term Career Effects of Graduating in a Recession." *American Economic Journal: Applied Economics*, 4(1).

Oyer, Paul. 2006. "Initial Labor Market Conditions and Long-Term Outcomes for Economists." *Journal of Economic Perspectives*, 20(3).

Rivera, Lauren A. 2011. "Ivies, extracurriculars, and exclusion: Elite employers' use of educational credentials." *Research in Social Stratification and Mobility*, 29(1): 71–90.

Rivera, Lauren A. 2012. "Hiring as Cultural Matching: The Case of Elite Professional Service Firms." *American Sociological Review*, 77(6): 999–1022.

Rothstein, Jesse. 2021. "The lost generation? Labor market outcomes for post great recession entrants." *Journal of Human Resources*, 0920–11206R1.

U.S. Department of Education, National Center for Education Statistics. 2021*a*. "Baccalaureate and Beyond: 2008/2018 (BB)." Computation by NCES PowerStats on 10/26/2021.

U.S. Department of Education, National Center for Education Statistics. 2021*b*. "Beginning Postsecondary Students: 2004/2009 (BPS)." Computation by NCES PowerStats on 10/26/2021.

Weinstein, Russell. 2018. "Employer Screening Costs, Recruiting Strategies, and Labor Market Outcomes: An Equilibrium Analysis of On-Campus Recruiting." *Labour Economics*, 55.

Weinstein, Russell. 2022*a*. "Firm Decisions and Variation Across Universities in Access to High-Wage Jobs: Evidence from Employer Recruiting." *Journal of Labor Economics*, 40(1).

Weinstein, Russell. 2022*b*. "Local labor markets and human capital investments." *Journal of Human Resources*, 57(5): 1498–1525.

Yagan, Danny. 2019. "Employment Hysteresis from the Great Recession." *Journal of Political Economy*, 127(5).

Zimmerman, Seth. 2019. "Elite Colleges and Upward Mobility to Top Jobs and Top Incomes." *American Economic Review*, 109(1).

Table 1: Summary Statistics by University Tier, 1987 Birth Cohort

University Tier	Ivy Plus	Tier 1, excl. Ivy (Elite)	Tier 2 (Highly Selective)	Tiers 3-5 (Selective)	Nonselect. Four Year (Pub/NFP)	Two Year (Pub/NFP)
Total universities in sample	12	59	73	611	79	387
Median earnings (positive earners), 2014	48,017	43,678	42,533	34,183	26,878	24,203
	[7,338]	[8,593]	[9,954]	[6,343]	[5,143]	[3,209]
Median earnings, 2014	42,983	40,037	40,104	32,430	23,818	21,410
	[7,256]	[8,856]	[10,340]	[6,545]	[5,390]	[3,459]
Mean earnings, 2014	64,789	48,657	43,896	34,441	26,366	23,813
	[11,872]	[11,064]	[10,287]	[6,717]	[5,111]	[3,374]
Fraction of graduates with top 20% earnings	0.51	0.48	0.48	0.33	0.21	0.16
	[.07]	[.11]	[.14]	[.11]	[.09]	[.06]
Fraction of graduates with top 5% earnings	0.29	0.21	0.17	0.08	0.04	0.03
	[.07]	[.09]	[.1]	[.06]	[.03]	[.02]
Number of students	1,468	1,093	1,449	1,066	1,088	1,335
	[600]	[1,055]	[1,639]	[1,266]	[1,327]	[1,151]
Public university	0	0.08	0.22	0.43	0.56	0.99
	[0]	[.28]	[.42]	[.5]	[.5]	[.11]
Fraction with parents in income quintile 1	0.04	0.04	0.04	0.08	0.13	0.16
	[.01]	[.02]	[.02]	[.06]	[.09]	[.07]
Fraction with parents in income quintile 2	0.06	0.05	0.07	0.13	0.17	0.2
	[.01]	[.02]	[.03]	[.06]	[.07]	[.05]
Fraction with parents in income quintile 3	0.09	0.09	0.12	0.19	0.21	0.24
	[.01]	[.02]	[.03]	[.05]	[.05]	[.04]
Fraction with parents in income quintile 4	0.14	0.15	0.2	0.26	0.24	0.25
	[.02]	[.03]	[.04]	[.06]	[.06]	[.06]
Fraction with parents in income quintile 5	0.67	0.66	0.57	0.33	0.24	0.16
	[.05]	[.07]	[.09]	[.14]	[.14]	[.08]
Fraction female	0.5	0.54	0.54	0.58	0.53	0.52
	[.02]	[.14]	[.13]	[.13]	[.15]	[.06]
Fraction in-state students	0.16	0.29	0.52	0.74	0.76	0.96
	[.12]	[.22]	[.28]	[.22]	[.28]	[.07]
Fraction Black students	0.08	0.05	0.04	0.13	0.13	0.14
	[.02]	[.02]	[.02]	[.21]	[.17]	[.14]
Fraction Hispanic students	0.08	0.07	0.06	0.07	0.1	0.1
	[.02]	[.04]	[.04]	[.11]	[.17]	[.14]
Fraction Asian students	0.17	0.12	0.09	0.04	0.03	0.03
	[.04]	[.08]	[.1]	[.06]	[.03]	[.05]

Notes: Summary statistics for the 1987 birth cohort of universities in the regression sample for Figure 1b and Table 2 column 4, except for percent in-state students which is for the 1988 cohort due to data availability. Standard deviations are in brackets. Tables A.6 and A.7 present summary statistics for additional variables. See those tables and text for details.

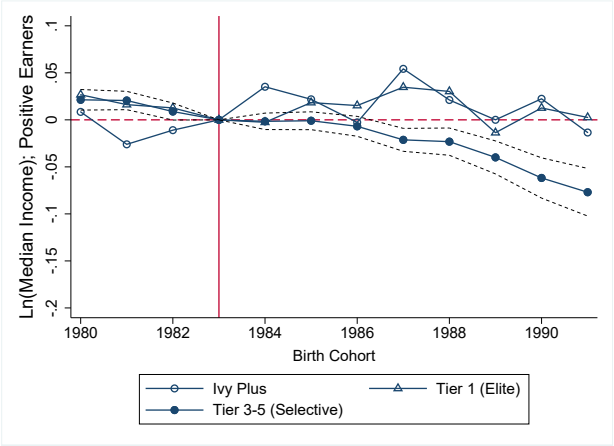
Table 2: Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities

	(1)	(2)	(3)	(4)
Y = Ln(Median Income); positive earners				
Recession*Ivy Plus*Severe	0.062	0.096*	0.088*	0.107*
	(0.041)	(0.051)	(0.051)	(0.059)
Recession*Tier 1*Severe	0.054**	0.087***	0.084***	0.091**
	(0.024)	(0.029)	(0.029)	(0.042)
Observations	17,040	14,904	14,652	14,652
R-Squared	0.724	0.970	0.971	0.971
Y = Ln(Median Income)				
Recession*Ivy Plus*Severe	0.058	0.108*	0.097*	0.122*
	(0.048)	(0.059)	(0.058)	(0.068)
Recession*Tier 1*Severe	0.047	0.092**	0.088**	0.100**
	(0.029)	(0.036)	(0.036)	(0.050)
Observations	17,028	14,892	14,640	14,640
R-Squared	0.730	0.962	0.964	0.965
Y = Fraction in Top Income Quintile				
Recession*Ivy Plus*Severe	0.025	0.046**	0.040*	0.047*
	(0.017)	(0.023)	(0.023)	(0.027)
Recession*Tier 1*Severe	0.033***	0.050***	0.048***	0.049**
	(0.011)	(0.014)	(0.014)	(0.019)
Observations	17,040	14,904	14,652	14,652
R-Squared	0.919	0.949	0.951	0.952
Birth Cohort-CZ Fixed Effects	N	Y	Y	Y
University Controls	N	N	Y	Y
Parental Income*Recession*Severe	N	N	N	Y

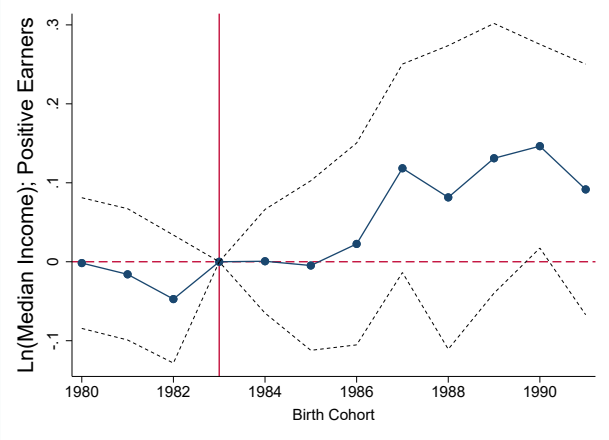
Notes: Regressions include the triple differences shown as well as interactions between *Recession*, *Severe*, and the university selectivity tiers described in equation (1). All lower-level terms are included. *Recession* indicates whether the birth cohort was graduating during or after the Great Recession, which includes the cohorts after and including 1986 for the Ivy Plus universities, Tier 1, Tier 2, and Tiers 3-5 universities. For the nonselective four-year universities, this includes the cohorts after and including 1983, and for the two-year colleges this includes the cohorts after and including 1985. The controls in Column (3) are the $\mathbf{Z_{jt}}$ in equation (2), and the interactions in column (4) are the interactions between *Recession*, *Severe*, and the following parental income variables: fraction of students with parents in the fifth income quintile, in the fourth, the third, and the second, and in the top 10% of the income distribution. Table A.2 shows results for all tiers and Table A.3 shows results keeping the sample fixed as the column 4 sample for all regressions. See text for further details.

Figure 1

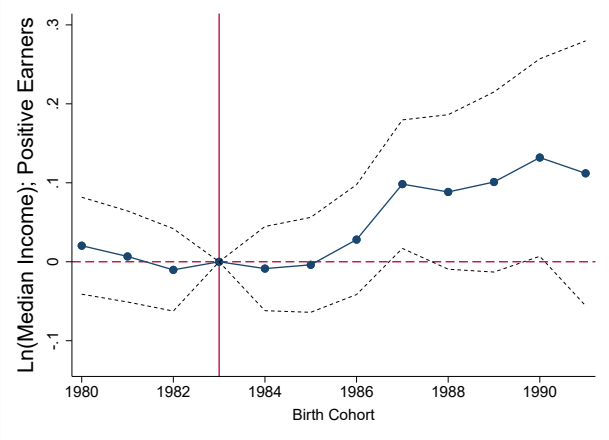
(a) **Differential Effects on Income for Universities in Severely vs. Mildly Affected CZs, by Selectivity Tier**



(b) **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**



Ivy Plus Universities

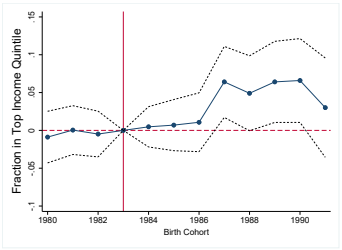


Tier 1 Universities (Elite)

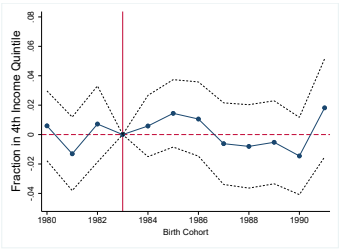
Notes: Plots in (a) are from estimating equation (1) separately for each tier of selectivity, and show coefficients on the interaction between birth cohort fixed effects, and an indicator for severe recession in the CZ from 2007 to 2009. Dashed lines show 95% confidence intervals for Tier 3-5 universities. I include only universities that have data for each cohort. Sample sizes (and R-squared) for each tier in decreasing order of selectivity are 144 (.99), 708 (.97), 7,332 (.97). Results for all selectivity tiers can be found in Figure A.2. Plots in (b) are from estimating equation (2) including all selectivity tiers, and show coefficients on the interaction between birth cohort fixed effects, university tier, and an indicator for severe recession in the CZ from 2007 to 2009. Dashed lines show 95% confidence intervals. I include only universities that have data for each cohort. Sample size is 14,652 and R-squared is .98. Figure A.3 shows the coefficients for all tiers. See text for details.

Figure 2

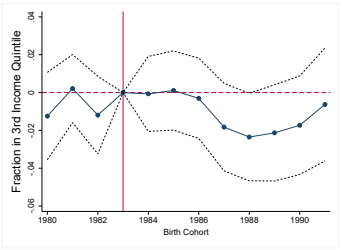
(a) **Likelihood of Earnings in Each Quintile, Tier 1 (Elite) Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**



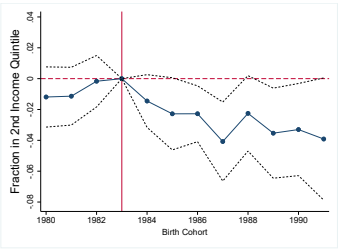
Earnings in Quintile 5



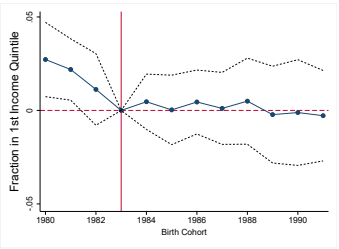
Earnings in Quintile 4



Earnings in Quintile 3

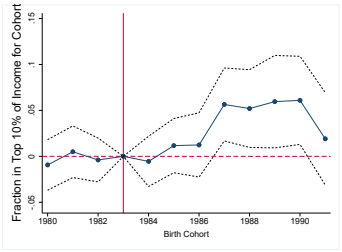


Earnings in Quintile 2

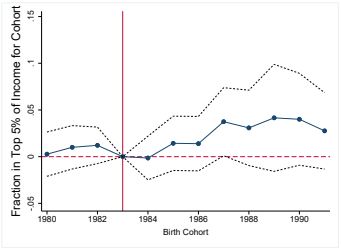


Earnings in Quintile 1

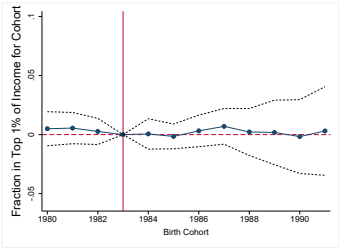
(b) **Likelihood of Top Earnings, Tier 1 (Elite) Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**



Top 10% Earnings



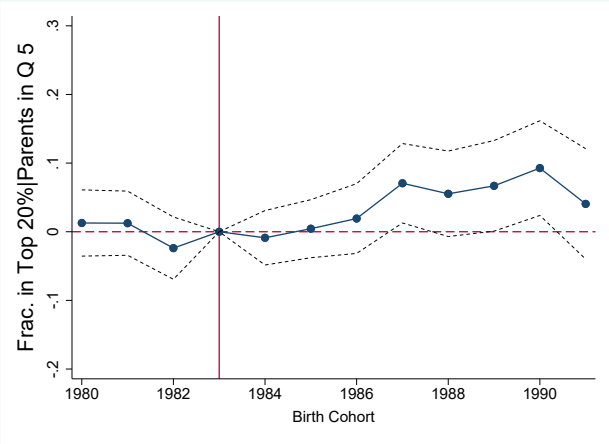
Top 5% Earnings



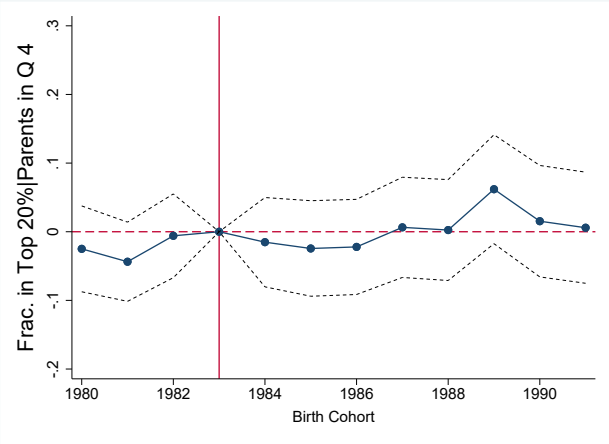
Top 1% Earnings

Notes: Plots are analogous to those in Figure 1b, but with a different dependent variable. Figures A.10 through A.13 show effects on top quintile, top 10%, top 5%, and top 1% earnings for each tier relative to Tier 3-5. See Figure 1b notes and text for details.

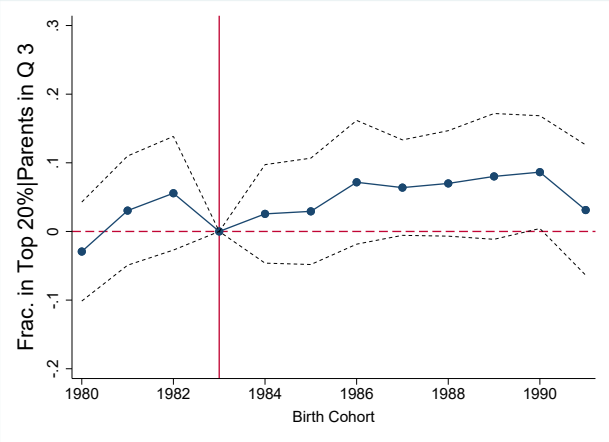
Figure 3: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Tier 1 (Elite) Relative to Selective Universities (Tiers 3-5)**



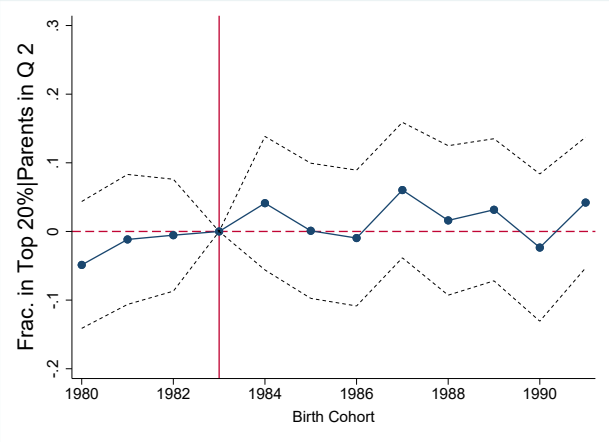
Parental Income in Quintile 5



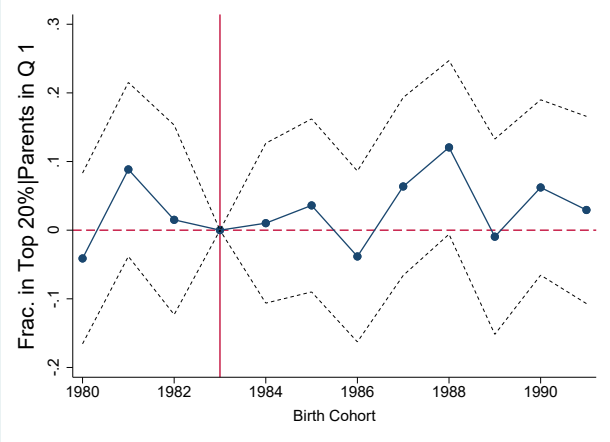
Parental Income in Quintile 4



Parental Income in Quintile 3



Parental Income in Quintile 2

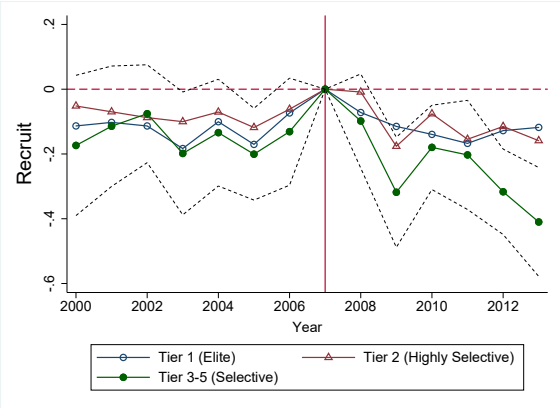


Parental Income in Quintile 1

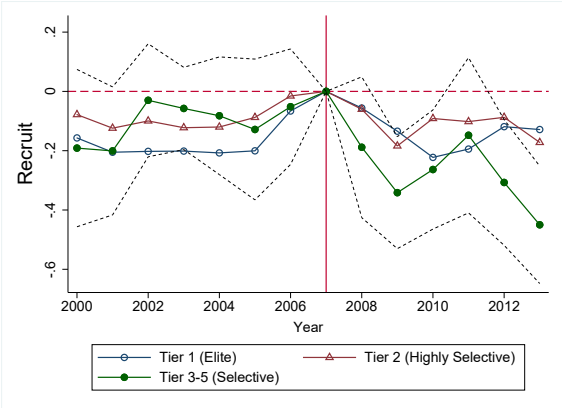
Note: Each plot is from a different regression, in which I estimate equation (2) and the dependent variable is the likelihood of income success conditional on parental income in the given quintile. I show coefficients on the interaction between birth cohort fixed effects, university tier, and an indicator for severe recession in the CZ from 2007 to 2009. See text for details.

Figure 4

Changes in Recruiting Over Time within Firm-University Pairs, by University Tier, Relative to Ivy Plus Universities



(a) Balance: 2007



(b) Balance: 2006, 2007, 2009

Likelihood of Top Quintile Earnings, Tier 1 (Elite) Relative to Tier 3-5 (Selective) Universities, Triple Difference with CZ-Cohort Fixed Effects

Including Interactions Between Cohort, Severe Recession, and Number of Recruiting Firms at the University in 2007 and Fraction of these Firms that Stopped Recruiting Between 2008-2013

(c)

Notes: Plots 4a and 4b are from estimating equation (3). Regression samples include firm-university pairs for which the firm recruited at the university in 2007. Dashed lines are the upper- and lower-bounds of the 95% confidence intervals for the coefficients on Tier 3-5 universities, relative to Ivy Plus universities. Plot 4a requires that for each firm-university pair in the sample, the pair is in the regression sample in 2007. Plot 4b requires that for each firm-university pair in the sample, the pair is in the regression sample in 2006, 2007, and 2009. Figure 4c shows coefficients from estimating equation (2). The regression sample includes all universities that attracted at least one recruiting firm in 2007, among the firms in the recruiting dataset. Both lines in Figure 4c show coefficients on the interactions between birth cohort fixed effects, severe recession in the CZ, and Tier 1 university. The black dashed lines show 95% confidence intervals for the plot with recruiting controls, and the light markers show the intervals for the plot without the controls. Table A.15 shows results aggregating into pre- and post-recession cohorts. See text for details

A Appendix

A.1 Additional Data from IPEDS

A.1.1 College Majors

Table A.7 shows clear differences in major composition between Tier 1 and Tier 3-5 universities, using the broad classifications from the American Community Survey. Tier 1 universities have a higher fraction in the group of majors including science, engineering, and social science, and lower fraction of business majors. Some of this difference is mechanical, as nearly 50% of the Tier 1 universities in the sample do not offer business degrees. This makes it challenging to identify the effect of tier conditional on major composition.

To determine whether the results are explained by differences in major composition across tiers of selectivity, I collect annual data on completions by major from IPEDS. I use the set of institutions in 2002, and collect annual data on first and second majors for those institutions, for associate's and bachelor's degrees, from 2002 through 2013. I collect data for these years as I will merge the birth cohorts in the Chetty et al. (2020) data (1980 through 1991) to completions by field of degree in the birth year + 22. Twenty-two is the median age at graduation for individuals from top-quartile selectivity universities, which should include some Tier 3-5 universities.

In 2002, the CIP codes used to classify majors are based on the 1990 CIP classification. I convert these to CIP codes using the 2000 classification, using the crosswalk from the Department of Education.[51] For each four-digit 1990 CIP code, I obtain the modal two-digit 2000 CIP code. In the case of 20.01 (consumer and homemaking education), there was no corresponding 2000 CIP code as the 1990 CIP code was deleted. I classified 1990 CIP code 20.01 as 2000 CIP code 19, which is where nearly all of 1990 CIP code 20 was assigned. There are 14 universities that report 1990 CIP code 1.99, which does not exist in the crosswalk. I assign 1990 CIP code 1.99 to 2000 CIP code 1, given that all of the 1990 CIP codes in the

[51] This is available at: https://nces.ed.gov/pubs2002/cip2000/crosswalk.asp.

two-digit category of 1 were assigned to 2000 CIP code 1.

Starting in 2010, the CIP classification changed again, but there were no changes at the 2-digit level, except for the deletion of one of the 2000 two-digit CIP codes, CIP 21 (Technology Education/Industrial Arts). However, none of the universities in the data report completions in this code.

I then merge the completions by two-digit 2000 CIP codes for field of study to four-digit ACS codes for field of study, which are assigned to groupings of major used in the 2010 American Fact Finder Tables.[52] These groupings include five broad groups: Science and Engineering (including psychology and social science); Science and Engineering Related Fields; Business; Education; and Arts, Humanities, and Other. There are 15 narrow groups that comprise these five broad groups, one of which is Social Science, and another of which is Psychology.

Once I have completions by year and field of degree, I merge to the Chetty et al. (2020) data, by using the OPEID to Super-OPEID crosswalk in Chetty et al. (2020), as the earnings data in Chetty et al. (2020) are reported by Super-OPEID, rather than OPEID. As in the main estimation of equation (2), I exclude observations for which multiple campuses are reported to one Super-OPEID. There are several universities in the IPEDS data, for which more than one university is assigned to the same Super-OPEID, but they are not coded as multi universities in the Chetty et al. (2020) data. I calculate share of degrees awarded by field of study grouping at the Super-OPEID/year level, by summing all of the degrees awarded in that group across all of the universities in the Super-OPEID/year, and dividing by the sum of all degrees awarded by all of the universities in the Super-OPEID/year.

Field of degree data is missing for seven two-year colleges (and 40 observations) in the main sample from equation (2). For two of those seven colleges, the field of degree data are missing in every year. These colleges were in the IPEDS dataset, but do not report degrees by major. For the other five colleges, these data are only missing in some years.

[52]This crosswalk can be accessed here: https://forum.ipums.org/t/crosswalk-between-degfieldd-and-cip/4209.

I estimate equation (2) additionally including interactions between birth cohort, *SevereRecession*, and major share. I estimate two specifications: one in which I use the five groups from the ACS, and a second in which I group together business with the social sciences as this may reflect a similar set of fields that as a group are available to students across tiers.[53] This latter specification yields very similar results (Figure A.42).[54] If there is a differential causal effect of majoring in business during a recession relative to another similar major, we would want to keep these separate from the other majors as this is a feature of graduating from a Tier 3-5 university. When keeping business in its own category, and grouping social science with science and engineering (as in the ACS groupings), we continue to see positive and large effects though they are slightly smaller in size and less precise. For the 1987 cohort the difference in magnitude is approximately 9%. For the 1990 cohort the difference is approximately 34%. These results suggest differences in major composition are not explaining most of the effects, and may explain very little of the effects.

Very few of the triple interactions between major share, birth cohort, and severe recession are statistically significant; however, in 1990 and 1991 the coefficients on the triple interactions with share in science (grouped with social science) are large and positive, while the triple interactions with business are large and negative. These are consistent with the larger decline in the coefficients on Tier 1 for these cohorts (Figure A.42). When including social science with business, the triple interaction with percent in science becomes less positive, consistent with the increase in the coefficient on Tier 1.

Results are also not explained by differences in composition of majors, using the composition in 2000 and the data and classifications from Chetty et al. (2020) (Tables A.7 and A.11). I estimate equation (2) additionally including interactions between birth cohort, *SevereRecession*, and major share in 2000. I include interactions with the three largest major shares in Tier 3-5 universities. Alternatively, I include interactions with all eight major

[53]Table A.7 shows that the sum of the fraction in social science and business is similar at Tier 1 and Tier 3-5 universities.

[54]The sample size falls by 84 in these regressions because we drop every observation for the seven universities that have missing field of degree data in at least one year.

shares, but omitting one. Both yield results similar to the main specification.

A.1.2 Fraction In-State, and Fraction Foreign Students

Universities report to IPEDS the state of residence of students (or whether they were foreign) when the students were first admitted, for first-time freshman in the given year. These data are required only in even years. Unlike the Chetty et al. (2020) data, these data are not at the birth cohort level, but by entering-class cohort. Data from the Beginning Postsecondary Students Survey suggest a very large fraction of students enter college without a delay from high school (Horn, Cataldi and Sikora, 2005).[55] Thus, for each university-birth cohort I assign the fraction in-state and fraction foreign students for the entering class in the Fall 18 years after their birth year.

I estimate equation (2), additionally interacting the fraction of in-state students and fraction of foreign students with cohort and severe recession. These coefficients are identified by within-tier-cohort-severe recession variation in fraction of in-state and foreign students.

Figure A.39 shows the results of two specifications. In the first, I use the fraction in-state and foreign for the 1988 cohort because universities are only required to report these data in even years, and 99.8% of universities in the main sample report these data for the 1988 cohort. Universities may report these data in odd years, and roughly 65% to 80% do so. For the second specification, I interact with the fraction in-state and foreign for that cohort, using only the even cohorts since universities are required to report these data. I include only universities that report these data for each of the even cohorts so the sample is balanced.

Including these interactions leads to a slight reduction in the coefficients of interest, and makes them less precise, but the central pattern remains very similar (Figure A.39).[56]

[55] For people beginning their postsecondary education in 1995-1996, 16% delay their entry from high school to college for those enrolling in public four-year universities, and this figure is 12% at private not-for-profit four-year institutions. Of those who delay, a large fraction are delaying for just one year (Horn, Cataldi and Sikora, 2005).

[56] Figure A.2 is consistent with differences across tier in geographic mobility as a mechanism, as there are no statistically significant differential effects for students at elite universities in severely relative to mildly affected areas, though the confidence intervals are wide. Of course, this is consistent with other mechanisms as well.

A.1.3 Racial Composition

There are also differences in racial composition across selectivity tiers, with Tier 1 universities having a higher fraction of Asian students and lower fraction of Black students relative to Tier 3-5 universities (Table A.6).

To test for the role of racial composition, and changes in racial composition, I obtain annual data from IPEDS on enrollment of Black, Non-Hispanic; Hispanic; and Asian or Pacific Islander students. I collect these data for undergraduate, degree/certificate-seeking, first-time students. Again, because the data are by cohort of first-time students, rather than birth cohort, for each birth cohort I assign the racial composition for the entering class in the Fall 18 years after their birth year.

Including interactions between racial composition, birth cohort, and severe recession yields similar results (Figure A.40).

A.1.4 SAT Scores

The mobility report cards include the average SAT scores by university in 2001 and 2013. As discussed in Table A.6, we only have SAT data for 368 of the 611 Tier 3-5 universities. There is some evidence of a widening gap in SAT scores between Ivy Plus and Tier 3-5 universities over the years from 2001 to 2013, that is larger in more severely affected areas (Table A.12). However, in order to explain the income results, this differential increase would need to begin precisely for the 1987 cohort, and be flat beforehand.

A.2 Alternative measure of recession severity

Figure A.6b shows results interacting tier, cohort, and an indicator for 2007 to 2009 unemployment-rate change in the top quartile. There are only 16 Tier 1 universities in the top-quartile-affected CZs that are also in CZs with Tier 3-5 universities, making it difficult to identify an effect. The patterns are generally similar, but there is some more evidence of a downward trend between 1980 and 1985.

A.3 Employer Recruiting and Location Data

I collect locations for each firm in each year, similarly to the collection of recruiting strategies. I obtain the latitude and longitude of the office locations using the Census Gazetteer place and county subdivision files, merging on the city name and state. For cities that could not be merged, I manually obtained the latitude and longitude. I additionally obtain university latitude and longitude from IPEDS.

For each firm/university pair, in each year I calculate the distance between the university and every office location of the firm in that year.[57] In addition to some firms having unarchived or broken location pages, there is some variation within firms across years in the types of locations they report. I code location as missing for firm/years in which the reporting of locations seems inconsistent with other years.[58]

Some universities report as a system, and the tier is associated with the largest university in the system. In estimating equation (3), I include the 17 universities reporting as a system, given they are likely the largest in their system based on their inclusion in the Princeton Review's ranking of the best 362 universities. Results are also very similar when excluding these universities. When including the other university covariates from the Chetty et al. (2020) data in equation (3), I exclude these universities that report as a system, as the covariates pertain to all universities in the system while the recruiting variables do not.

A.4 Changes in recruiting by firm-university distance and university size

Figure A.43b shows suggestive evidence that firms are more likely to drop their target campuses that were a greater distance from the firm's office. For example, in 2009 firms were

[57] Specifically, I compute the lengths of the great circle arcs connecting each university and each office location for a given firm, located on the surface of a sphere. The arc length, measured in degrees, is then converted to statute miles as measured along a great circle on a sphere with radius 6371 kilometers, the mean radius of the earth. These calculations are performed using the arclen and deg2sm commands in MATLAB.

[58] Details are available upon request.

roughly 10 percentage points more likely to drop their target campuses that were 50-200 miles from their office relative to their campuses that were within 50 miles, conditional on tier and other university characteristics. The magnitude is similar in 2010, and the effects in 2009 and 2010 are jointly significant from zero at the 10% level, as are the effects in 2008, 2009, and 2010. Magnitudes also suggest firms are more likely to drop their campuses more than 200 miles away, though those effects are not statistically significant except in 2008. Including interactions with a continuous measure of distance also yields statistically significant negative coefficients in 2008 and 2009 (at the 1% and 5% level respectively), and a similar magnitude in 2010, and the effects in 2008, 2009, and 2010 are jointly significant with $p = .01$.

Figure A.43c also shows firms are differentially likely to stop recruiting at smaller universities, conditional on university selectivity tier, distance, and other university characteristics. The coefficient on ln(students in cohort) in 2009 implies that all else equal, the likelihood of recruiting in 2009 at a 2007 target campus at the 75th percentile of size (4146 students) is roughly 17 percentage points higher than at the 25th percentile of size (1161 students), with a mean recruiting likelihood at 2007 targets in 2009 of roughly 45%.

A.5 Recruiting as a Mechanism

In Section 4.1, we use the fraction of firms to which the university lost access, rather than the number of firms to which the university lost access. Recruiting in 2007 for the firms in the sample is more prevalent at elite relative to Tier 3-5 universities.[59] Figure 4a shows the probability of dropping a target campus is higher for Tier 3-5 universities, but the number of recruiting firms falls more at elite universities. This suggests a larger percentage decline in the fraction of students with top quintile earnings. It also suggests a larger percentage point decline if the greater likelihood of dropping a less-selective campus extends to the high-wage firms not in our recruiting dataset, and these firms are more likely to recruit at less selective

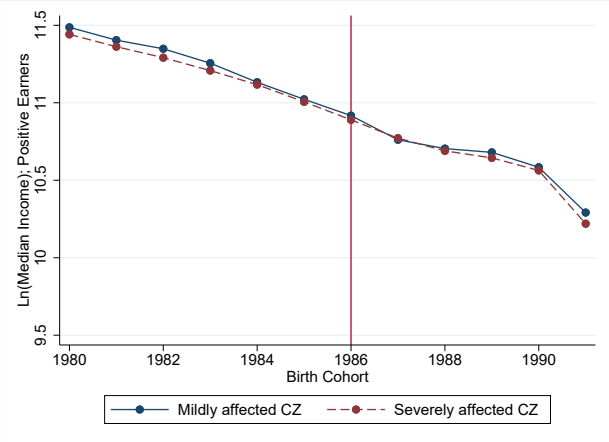
[59] Among the recruiting relationships in 2007 when estimating (3), 257 are at the 44 elite universities in this recruiting sample and 186 are at the 62 Tier 3-5 universities in this sample.

universities.[60]

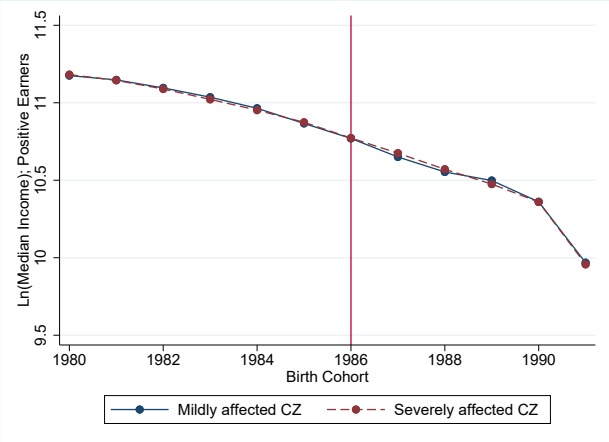
The role of lost access to firms may be captured by both the interactions with recruiting firms in 2007, and the fraction of firms pausing their recruiting. Number of recruiting firms in 2007 is a measure of how attractive the university is to firms, implying firms may be less likely to decrease their recruiting at these more attractive universities. While we control for the fraction of firms dropping the university as a target, this may not capture all of the changes in recruiting, for example changes in the scale of recruiting at the university. In this case, the number of firms recruiting in 2000 will also capture some of the mechanism of interest. Appendix Figures A.47 and A.48 show the results including only the interactions with the fraction dropping the campus, which also reduce the coefficients of interest.

[60]The sample firms are not the only ones enabling top earnings (for the 1987 birth cohort, the cutoff for top 5% earnings in 2014 was $68,100). Other high-wage firms may recruit more at Tier 3-5 universities, and more likely drop these as target campuses, similar to the firms in our sample.

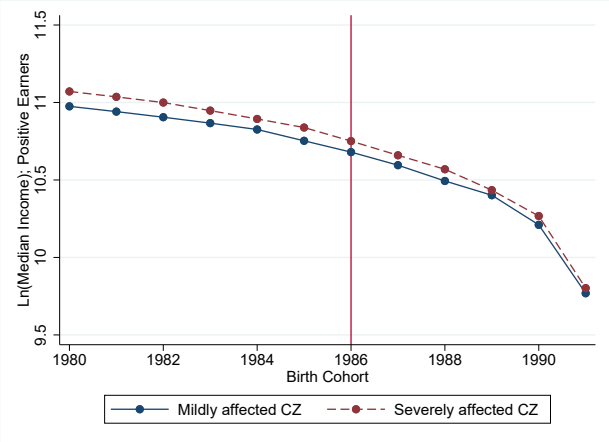
Figure A.1: **Median Incomes by Birth Cohort and University Selectivity**



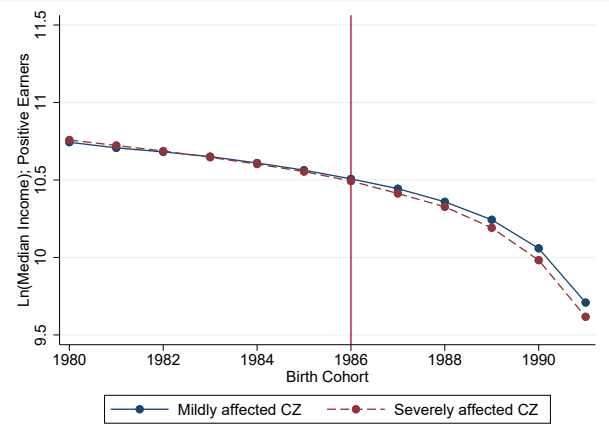
(a) Ivy Plus Universities



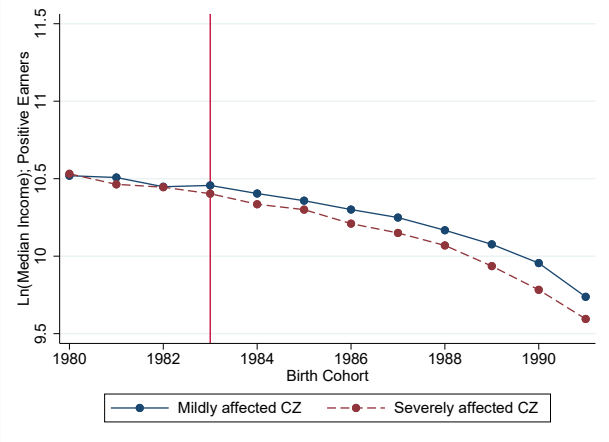
(b) Tier 1 Universities (Elite)



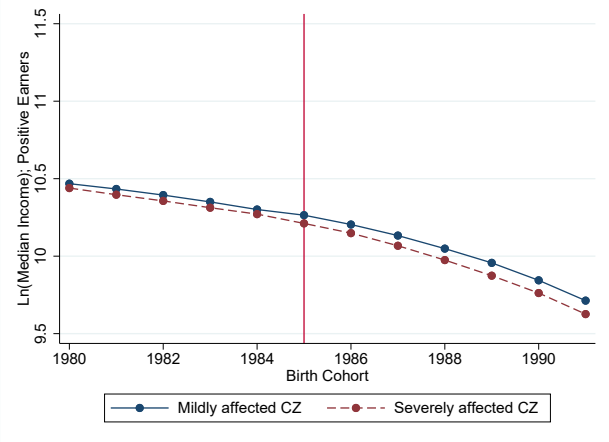
(c) Tier 2 Universities (Highly Selective)



(d) Tier 3-5 Universities (Selective)



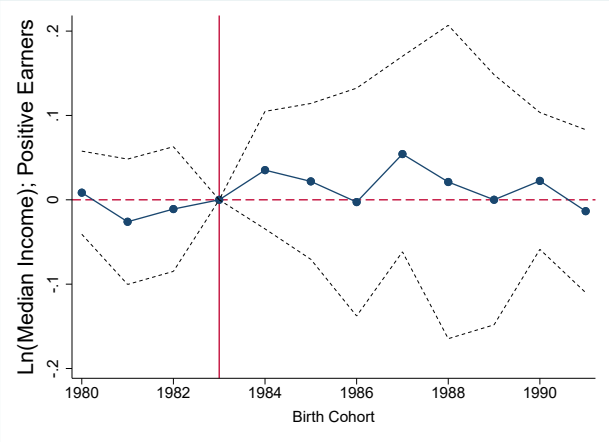
(e) Nonselective Four-Year Univ. (Public/NFP)



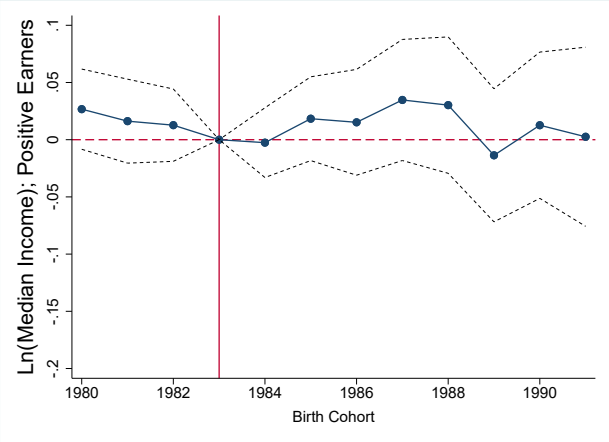
(f) Two-Year Colleges (Public/NFP)

Notes: Plots show the average log median income, conditional on positive earners, within birth cohort and university selectivity tier, separately for universities in severely and mildly affected areas. Vertical lines show birth cohorts that were graduating after the start of the recession, based on median age at graduation by tier. See text for details.

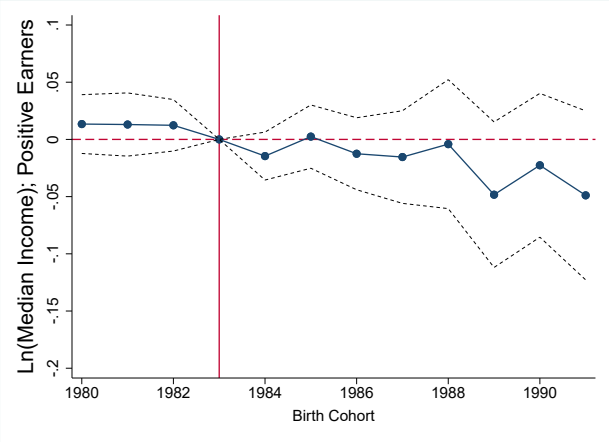
Figure A.2: **Recession Effects by University Selectivity**



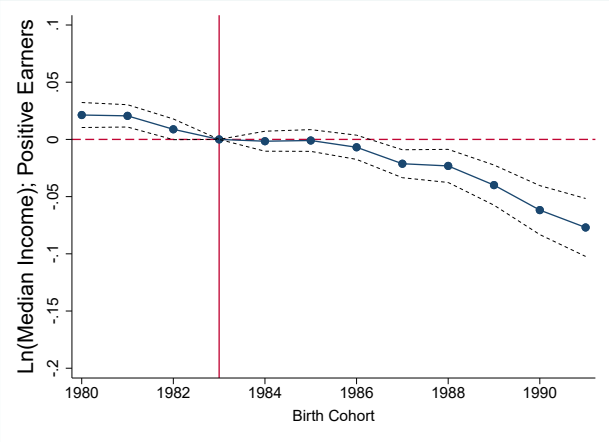
(a) Ivy Plus Universities



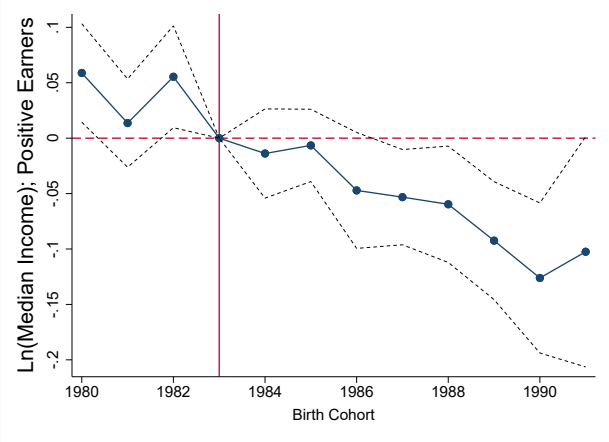
(b) Tier 1 Universities (Elite)



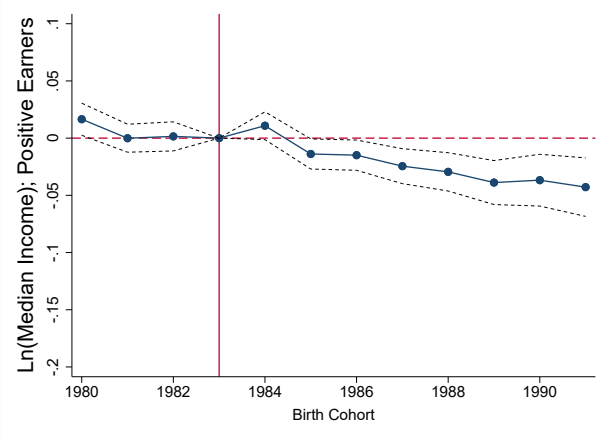
(c) Tier 2 Universities (Highly Selective)



(d) Tier 3-5 Universities (Selective)



(e) Nonselective Four-Year Univ. (Public/NFP)



(f) Two-Year Colleges (Public/NFP)

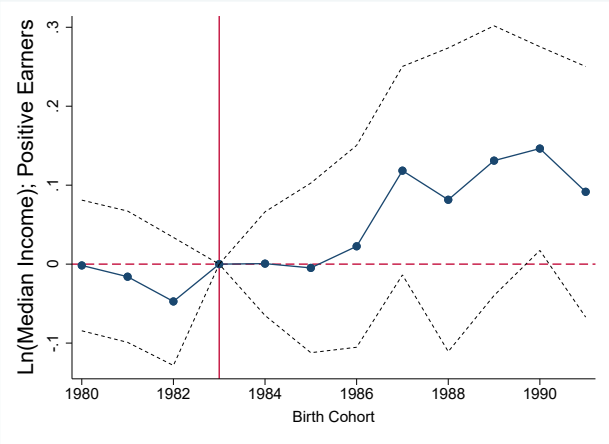
Notes: Plots are from estimating equation (1) separately for each tier of selectivity, and show coefficients on the interaction between birth cohort fixed effects, and an indicator for severe recession in the CZ from 2007 to 2009. Dashed lines show 95% confidence intervals. I include only universities that have data for each cohort. Sample sizes (and R-squared) for each tier in decreasing order of selectivity are 144 (.99), 708 (.97), 876 (.97), 7,332 (.97), 948 (.92), 4,644 (.96). Because of the wide confidence intervals for Ivy Plus universities, this plot is on a slightly different scale.

Table A.1: Recession Effects by University Selectivity

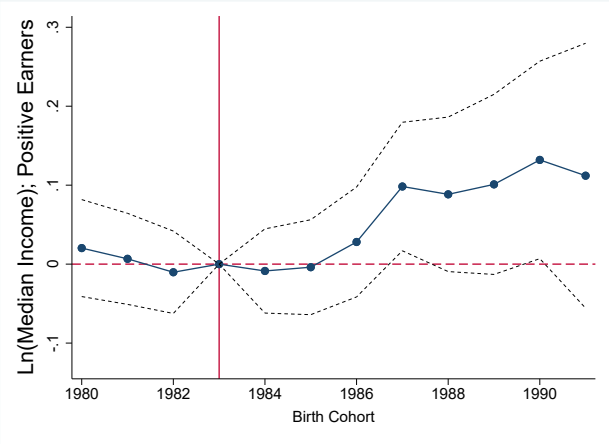
Y = Ln(Median Income); positive earners	(1)	(2)	(3)
Recession*Severe, Ivy Plus	0.011	0.006	0.006
	(0.043)	(0.040)	(0.040)
Observations	144	144	144
R-Squared	0.762	0.987	0.987
Recession*Severe, Tier 1	0.002	-0.001	0.002
	(0.023)	(0.022)	(0.022)
Observations	720	720	708
R-Squared	0.730	0.972	0.971
Recession*Severe, Tier 2	-0.029	-0.026	-0.030
	(0.021)	(0.021)	(0.022)
Observations	960	948	876
R-Squared	0.689	0.973	0.973
Recession*Severe, Tier 3-5	-0.051***	-0.043***	-0.046***
	(0.006)	(0.006)	(0.007)
Observations	8,412	8,304	7,332
R-Squared	0.632	0.965	0.965
Recession*Severe, Nonselective Four-Year	-0.072***	-0.093***	-0.096***
	(0.024)	(0.019)	(0.022)
Observations	1,176	1,128	948
R-Squared	0.521	0.923	0.920
Recession*Severe, Two-Year	-0.039***	-0.035***	-0.034***
	(0.006)	(0.006)	(0.007)
Observations	5,628	5,556	4,644
R-Squared	0.662	0.960	0.962
University Fixed Effects	Y	Y	Y
University Controls	N	Y	Y
Cohort Fixed Effects	N	Y	Y
Table 2, Column 4 Sample	N	N	Y

Notes: This table shows results from estimating equation (1), but aggregating cohorts into recession and pre-recession cohorts. Each coefficient is from a separate regression. *Recession* indicates whether the birth cohort was graduating during or after the Great Recession, which includes the cohorts after and including 1986 for the Ivy Plus universities, Tier 1, Tier 2, and Tiers 3-5 universities. For the nonselective four-year universities, this includes the cohorts after and including 1983, and for the two-year colleges this includes the cohorts after and including 1985. The controls in Columns (2) and (3) are the $\mathbf{Z_{jt}}$ in equation (2). See text for further details.

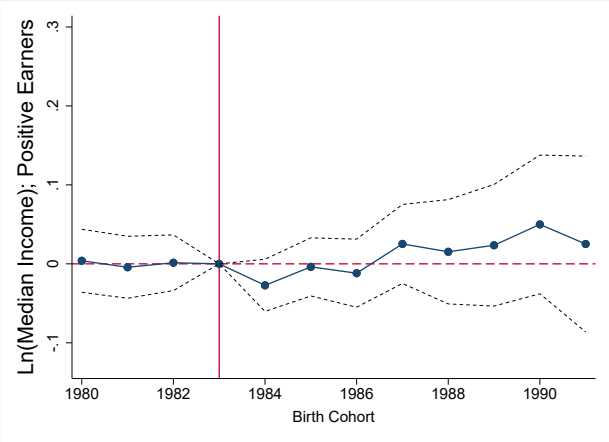
Figure A.3: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**



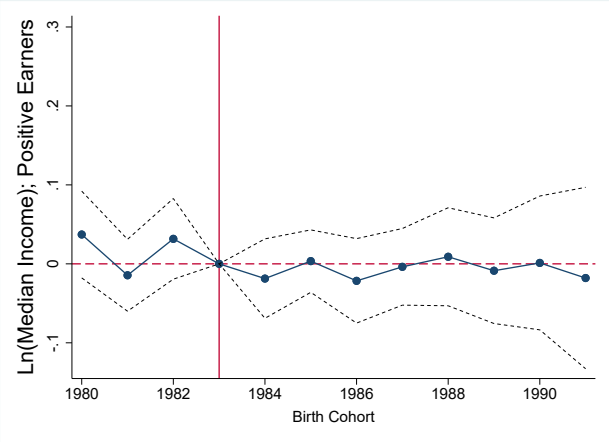
(a) Ivy Plus Universities



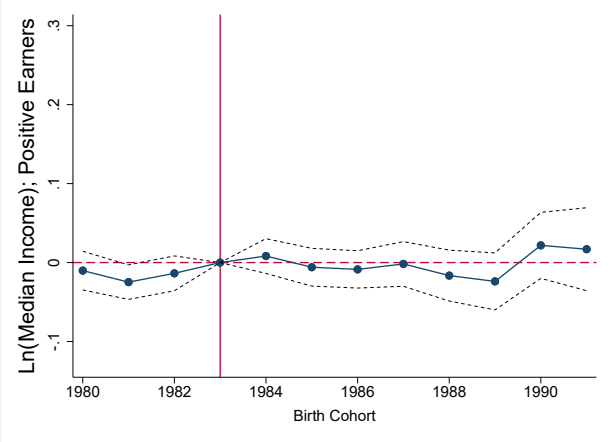
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)



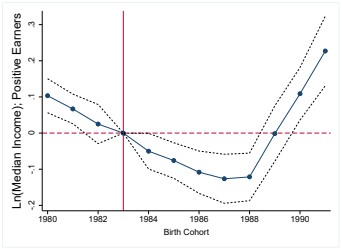
(d) Nonselective Four-Year Univ. (Public/NFP)



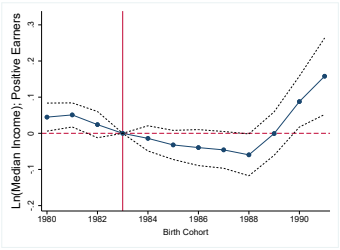
(e) Two-Year Colleges (Public/NFP)

Notes: Plots are from the same regression, equation (2), and show coefficients on the interaction between birth cohort fixed effects, university tier, and an indicator for severe recession in the CZ from 2007 to 2009. Dashed lines show 95% confidence intervals. I include only universities that have data for each cohort. Sample size is 14,652 and R-squared is .98. See text for details.

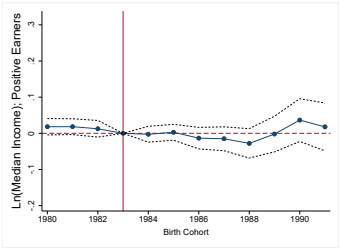
Figure A.4: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: Severely Affected CZs**



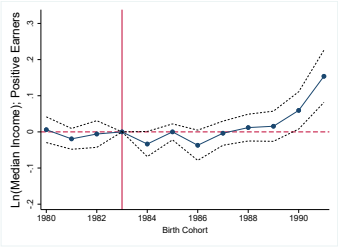
(a) Ivy Plus Universities



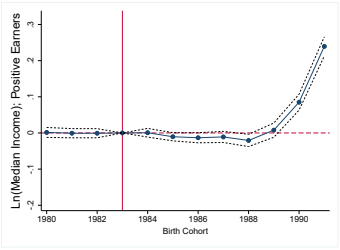
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)

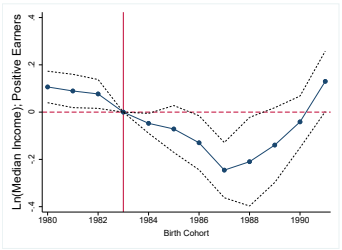


(d) Nonselective Four-Year Univ. (Public/NFP)

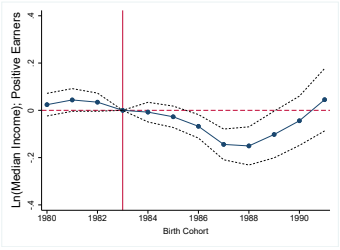


(e) Two-Year Colleges (Public/NFP)

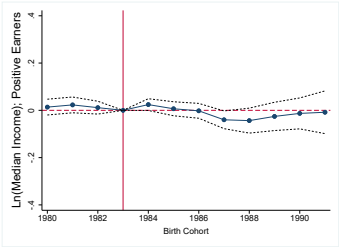
Figure A.5: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: Mildly Affected CZs**



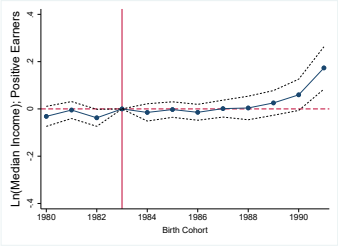
(a) Ivy Plus Universities



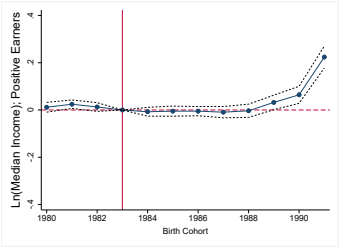
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)



(d) Nonselective Four-Year Univ. (Public/NFP)

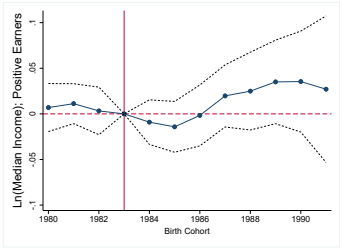


(e) Two-Year Colleges (Public/NFP)

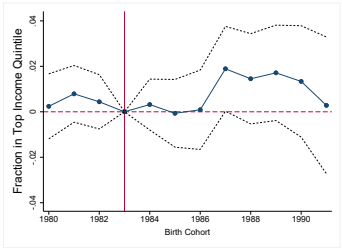
Notes: Plots show results from estimating (2) separately for severely and mildly affected CZs. See text for details.

Figure A.6

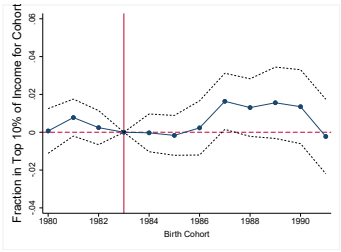
(a) **Recession Effects on Income, Tier 1 (Elite) Relative to Tier 3-5 (Selective) Universities: Using Change in Unemployment Rate as Alternative Measure of Shock**



Ln(Median Income), Positive Earners

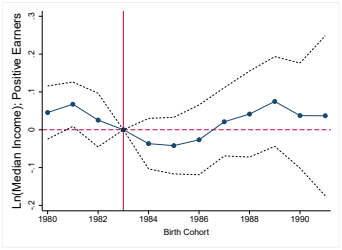


Fraction in Top Quintile

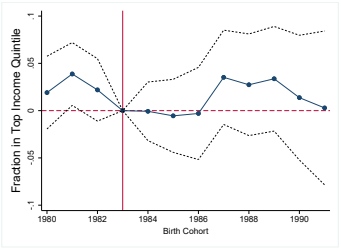


Fraction in Top 10%

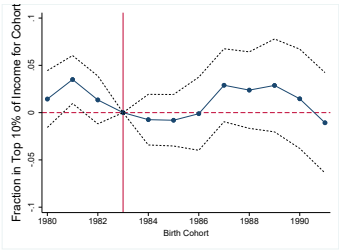
(b) **Recession Effects on Income, Tier 1 (Elite) Relative to Tier 3-5 (Selective) Universities: Indicator for Top Quartile of Unemployment Rate Change as Alternative Measure of Shock**



Ln(Median Income), Positive Earners



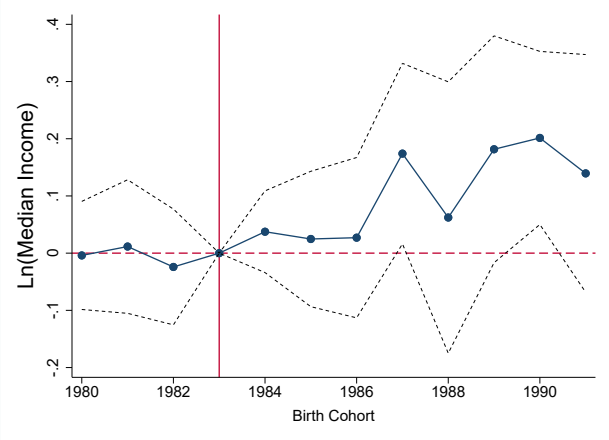
Fraction in Top Quintile



Fraction in Top 10%

Notes: Plots are analogous to those in Figures 2a and 2b, but with alternative measures of the Great Recession shock instead of indicator for above-median change in unemployment rate between 2007 and 2009. Figure A.6a interacts tier and cohort with the change in unemployment rate in the CZ between 2007 and 2009, and Figure A.6b interacts tier and cohort with an indicator for the CZ being in the top quartile of unemployment rate changes between 2007 and 2009. There are only 16 Tier 1 universities in top-quartile-affected CZs, that are also in a CZ with a Tier 3-5 university. See text for details.

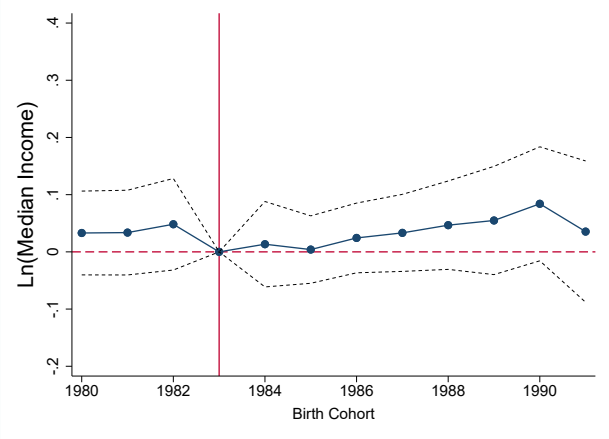
Figure A.7: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects, Not Restricting to Positive Earners**



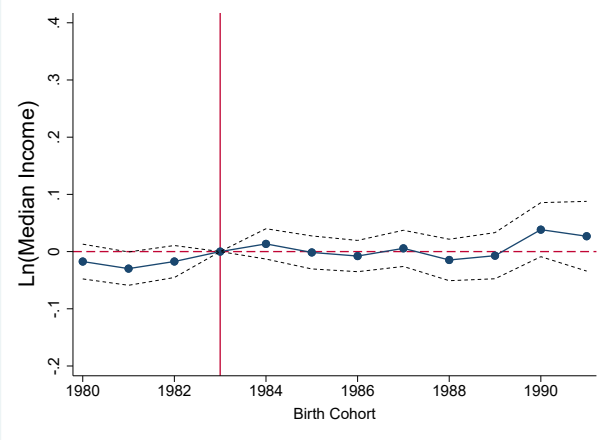
(a) Ivy Plus Universities

(b) Tier 1 Universities (Elite)

(c) Tier 2 Universities (Highly Selective)



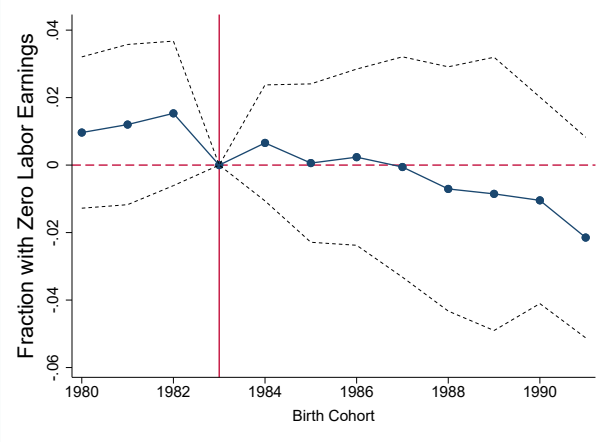
(d) Nonselective Four-Year Univ. (Public/NFP)



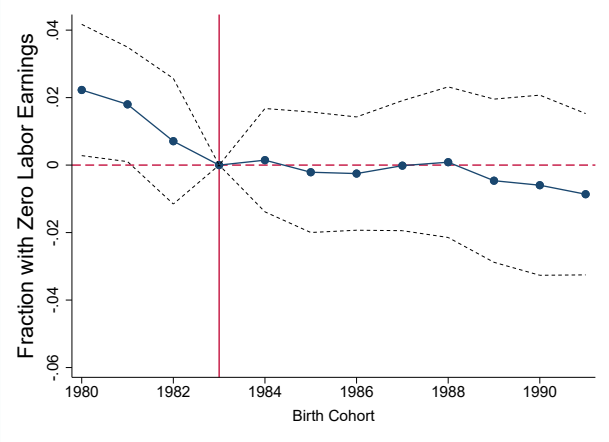
(e) Two-Year Colleges (Public/NFP)

Notes: Plots are analogous to those in Figure A.3, but the dependent variable is log of median income without restricting to positive earners. There is one nonselective university that does not have balanced data for this variable, but does when restricting to positive earners, so the sample size in this regression is 14,640. See Figure A.3 for details.

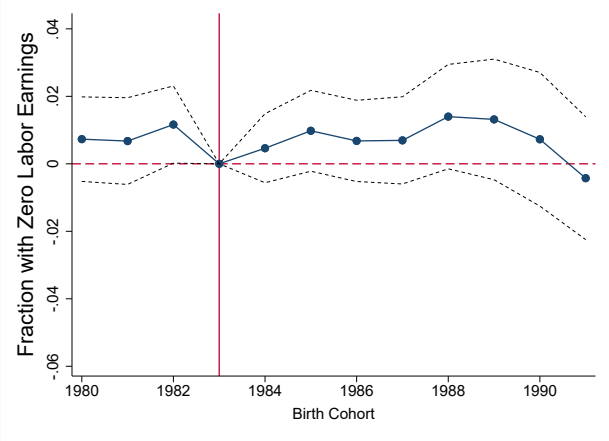
Figure A.8: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects, Fraction with Zero Labor Earnings**



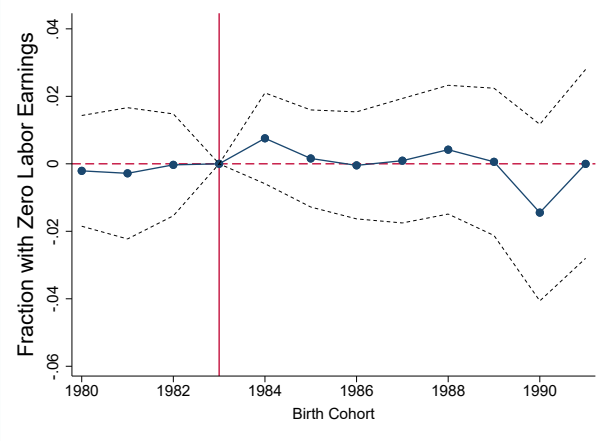
(a) Ivy Plus Universities



(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)

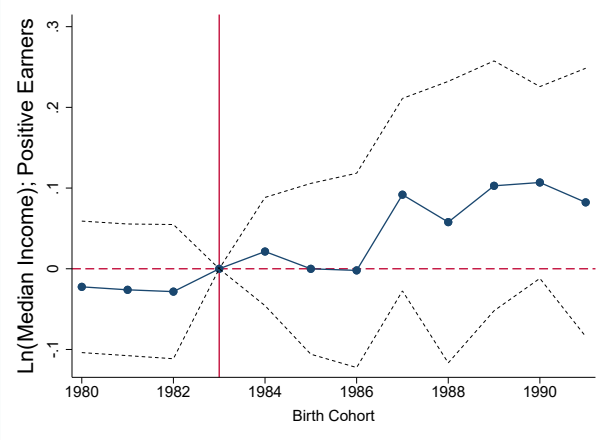


(d) Nonselective Four-Year Univ. (Public/NFP)

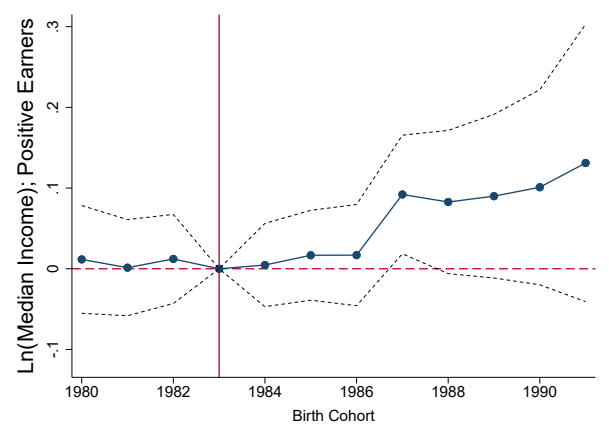
(e) Two-Year Colleges (Public/NFP)

Notes: Plots are analogous to those in Figure A.3, but the dependent variable is the fraction of students with zero labor earnings. See Figure A.3 for details.

Figure A.9: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects, Sample with Data for 1983 Birth Cohort**



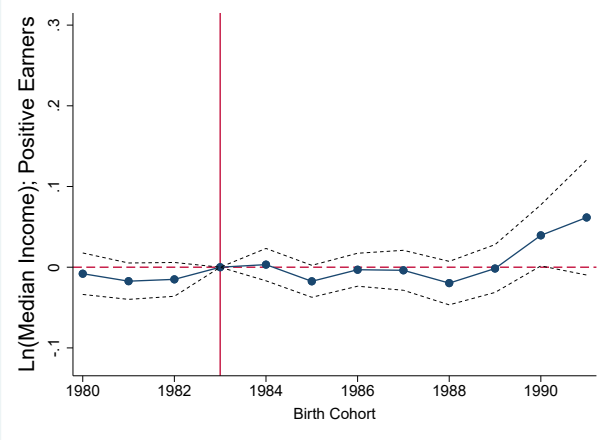
(a) Ivy Plus Universities



(b) Tier 1 Universities (Elite)

(c) Tier 2 Universities (Highly Selective)

(d) Nonselective Four-Year Univ. (Public/NFP)

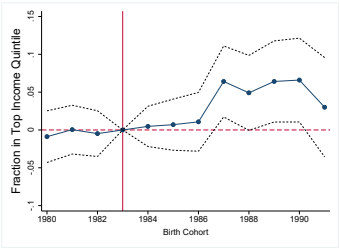


(e) Two-Year Colleges (Public/NFP)

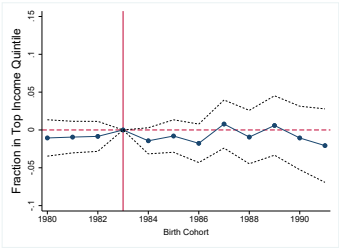
Notes: Plots are analogous to those in Figure A.3, but the regression includes only universities that have data for the 1983 cohort, rather than requiring the sample is completely balanced. Sample size is 19,297 and R-squared is .976. See Figure A.3 notes and text for details.

Figure A.10: **Likelihood of Top Quintile Earnings, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**

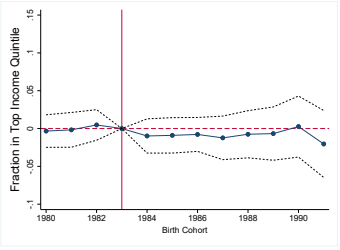
(a) Ivy Plus Universities



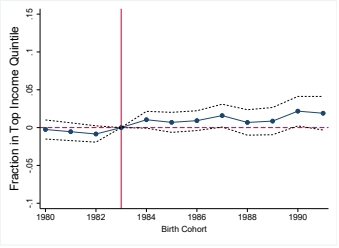
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)



(d) Nonselective Four-Year Univ. (Public/NFP)

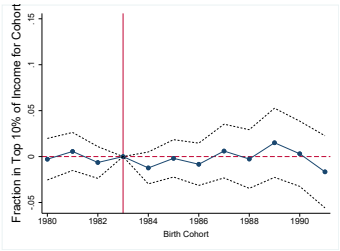


(e) Two-Year Colleges (Public/NFP)

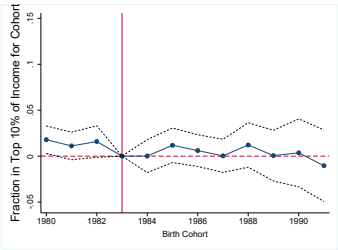
Figure A.11: **Likelihood of Top 10% Earnings, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**

(a) Ivy Plus Universities

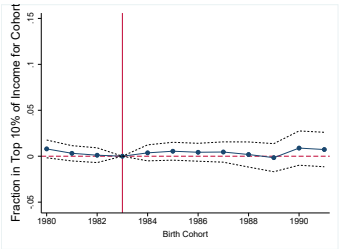
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)



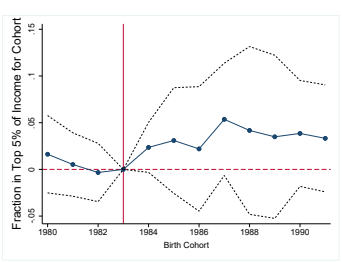
(d) Nonselective Four-Year Univ. (Public/NFP)



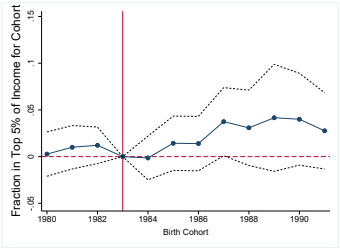
(e) Two-Year Colleges (Public/NFP)

Notes: Plots are analogous to those in Figure A.3, but with a different dependent variable. See Figure A.3 notes and text for details.

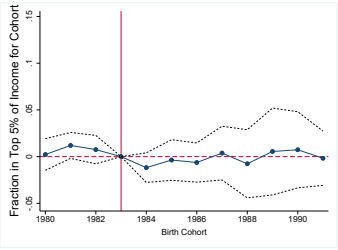
Figure A.12: **Likelihood of Top 5% Earnings, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**



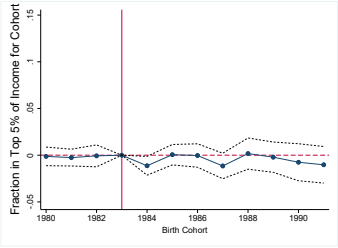
(a) Ivy Plus Universities



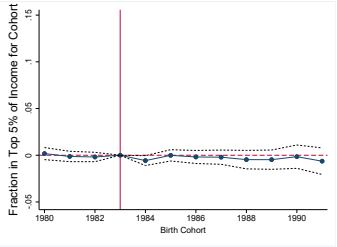
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)

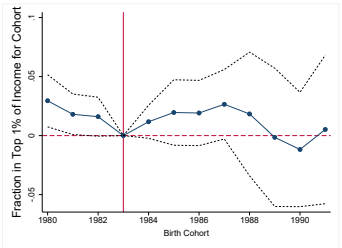


(d) Nonselective Four-Year Univ. (Public/NFP)

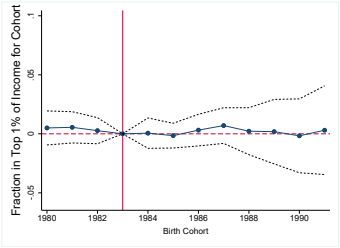


(e) Two-Year Colleges (Public/NFP)

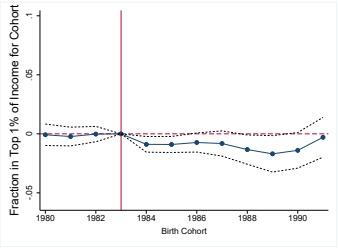
Figure A.13: **Likelihood of Top 1% Earnings, Relative to Tier 3-5 (Selective) Universities: Triple Difference with CZ-Cohort Fixed Effects**



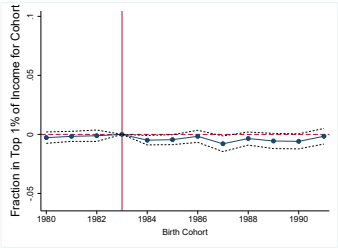
(a) Ivy Plus Universities



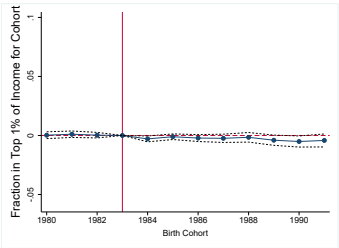
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)



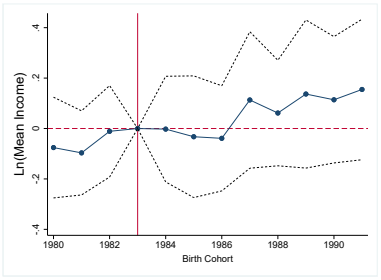
(d) Nonselective Four-Year Univ. (Public/NFP)



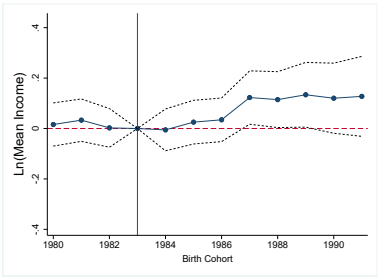
(e) Two-Year Colleges (Public/NFP)

Notes: Plots are analogous to those in Figure A.3, but with a different dependent variable. See Figure A.3 notes and text for details.

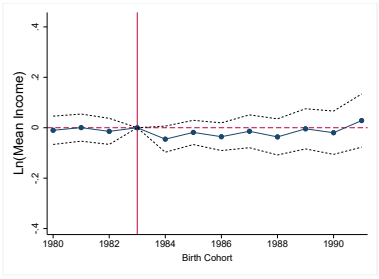
Figure A.14: **Average Income by University Selectivity, Relative to Tier 3-5 (Selective) universities: Triple Difference with CZ-Cohort Fixed Effects**



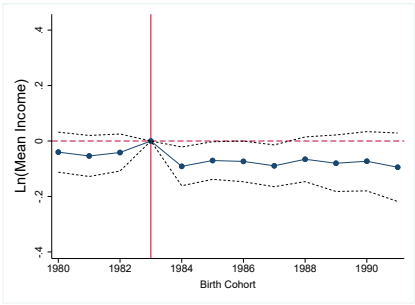
(a) Ivy Plus Universities



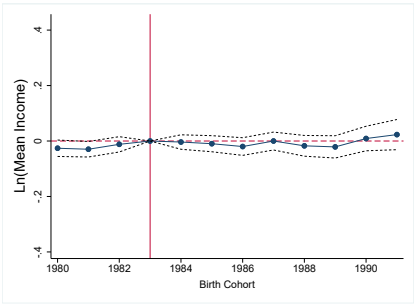
(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)



(d) Nonselective Four-Year Univ. (Public/NFP)



(e) Two-Year Colleges (Public/NFP)

Notes: Plots are analogous to those in Figure A.3, but with a different dependent variable. Table A.6 shows that for the Tier 1 and Ivy Plus universities, mean earnings is substantially higher than the median among positive earners, as is the standard deviation. Chetty et al. (2020) show the mean prediction error is higher for mean earnings. See Figure A.3 notes and text for details.

Table A.2: Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities

	(1)	(2)	(3)	(4)	(5)	(6)
Y = Ln(Median Income); positive earners						
Recession*Ivy Plus*Severe	0.062	0.097**	0.096*	0.088*	0.107*	0.100*
	(0.041)	(0.047)	(0.051)	(0.051)	(0.059)	(0.057)
Recession*Tier 1*Severe	0.054**	0.087***	0.087***	0.084***	0.091**	0.084**
	(0.024)	(0.027)	(0.029)	(0.029)	(0.042)	(0.041)
Recession*Tier 2*Severe	0.022	0.029	0.030	0.024	0.026	0.035
	(0.022)	(0.023)	(0.025)	(0.025)	(0.029)	(0.029)
Recession*Nonselective Four-Year*Severe	-0.021	0.002	-0.002	-0.031	-0.024	
	(0.025)	(0.028)	(0.035)	(0.032)	(0.030)	
Recession*Two-Year*Severe	0.012	0.017*	0.016	0.009	0.005	
	(0.009)	(0.009)	(0.011)	(0.011)	(0.013)	
Observations	17,040	17,040	14,904	14,652	14,652	8,136
R-Squared	0.724	0.728	0.970	0.971	0.971	0.979
Y = Ln(Median Income)						
Recession*Ivy Plus*Severe	0.058	0.108**	0.108*	0.097*	0.122*	0.116*
	(0.048)	(0.054)	(0.059)	(0.058)	(0.068)	(0.069)
Recession*Tier 1*Severe	0.047	0.092***	0.092**	0.088**	0.100**	0.093*
	(0.029)	(0.033)	(0.036)	(0.036)	(0.050)	(0.050)
Recession*Tier 2*Severe	0.008	0.021	0.022	0.015	0.020	0.031
	(0.027)	(0.027)	(0.030)	(0.030)	(0.036)	(0.036)
Recession*Nonselective Four-Year*Severe	0.004	0.034	0.041	-0.008	0.004	
	(0.029)	(0.033)	(0.041)	(0.033)	(0.031)	
Recession*Two-Year*Severe	0.020*	0.026**	0.025*	0.016	0.017	
	(0.011)	(0.011)	(0.013)	(0.013)	(0.016)	
Observations	17,028	17,028	14,892	14,640	14,640	8,136
R-Squared	0.730	0.735	0.962	0.964	0.965	0.972
Y = Fraction in Top Income Quintile						
Recession*Ivy Plus*Severe	0.025	0.045**	0.046**	0.040*	0.047*	0.050*
	(0.017)	(0.021)	(0.023)	(0.023)	(0.027)	(0.027)
Recession*Tier 1*Severe	0.033***	0.050***	0.050***	0.048***	0.049**	0.052***
	(0.011)	(0.013)	(0.014)	(0.014)	(0.019)	(0.019)
Recession*Tier 2*Severe	-0.001	0.005	0.006	0.003	0.002	0.011
	(0.011)	(0.011)	(0.013)	(0.013)	(0.015)	(0.016)
Recession*Nonselective Four-Year*Severe	-0.009	-0.002	-0.004	-0.012	-0.007	
	(0.010)	(0.011)	(0.014)	(0.014)	(0.013)	
Recession*Two-Year*Severe	0.011**	0.016***	0.016***	0.013**	0.014**	
	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	
Observations	17,040	17,040	14,904	14,652	14,652	8,136
R-Squared	0.919	0.929	0.949	0.951	0.952	0.948
Recession-CZ Fixed Effects	N	Y	Y	Y	Y	Y
Birth Cohort-CZ Fixed Effects	N	N	Y	Y	Y	Y
University Controls	N	N	N	Y	Y	Y
Parental Income*Recession*Severe	N	N	N	N	Y	Y

Notes: Columns 1 through 5 show results from the same regression as described in Table 2, but showing the coefficients on all tiers of university selectivity. Column 6 shows results from estimating the regression in column 5, but including only Ivy Plus, Tier 1, Tier 2, and Tiers 3-5, for which the *Recession* birth cohorts are the same across all tiers. See Table 2 for details.

Table A.3: Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities, Fixed Sample

Y = Ln(Median Income); positive earners	(1)	(2)	(3)	(4)	(5)	(6)
Recession*Ivy Plus*Severe	0.063	0.097**	0.097*	0.088*	0.107*	0.100*
	(0.041)	(0.046)	(0.051)	(0.051)	(0.059)	(0.057)
Recession*Tier 1*Severe	0.057**	0.086***	0.087***	0.084***	0.091**	0.084**
	(0.024)	(0.026)	(0.029)	(0.029)	(0.042)	(0.041)
Recession*Tier 2*Severe	0.021	0.027	0.027	0.024	0.026	0.035
	(0.023)	(0.023)	(0.025)	(0.025)	(0.029)	(0.029)
Recession*Nonselective Four-Year*Severe	-0.039	-0.020	-0.030	-0.031	-0.024	
	(0.025)	(0.026)	(0.033)	(0.032)	(0.030)	
Recession*Two-Year*Severe	0.015	0.014	0.012	0.009	0.005	
	(0.010)	(0.009)	(0.011)	(0.011)	(0.013)	
Recession-CZ Fixed Effects	N	Y	Y	Y	Y	Y
Birth Cohort-CZ Fixed Effects	N	N	Y	Y	Y	Y
University Controls	N	N	N	Y	Y	Y
Parental Income*Recession*Severe	N	N	N	N	Y	Y
Observations	14,652	14,652	14,652	14,652	14,652	8,136
R-Squared	0.727	0.732	0.970	0.971	0.971	0.979

Notes: This table is the same as Table A.2, but keeping the sample the same as the sample in Column 4 of Table 2 for all regressions. See Table 2 and A.2 for details.

Table A.4: Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities, Conditional on Parental Income Quintile

Y = Likelihood of Top Quintile Income	(1)	(2)	(3)	(4)
Recession*Ivy Plus*Severe, Parent Quintile = 5	0.020	0.042	0.039	0.045
	(0.019)	(0.027)	(0.027)	(0.032)
Recession*Tier 1*Severe, Parent Quintile = 5	0.035***	0.056***	0.057***	0.056**
	(0.012)	(0.016)	(0.016)	(0.023)
Observations	17,040	14,904	14,652	14,652
R-squared	0.805	0.880	0.885	0.887
Recession*Ivy Plus*Severe, Parent Quintile = 4	0.026*	0.054**	0.047**	0.053*
	(0.016)	(0.023)	(0.023)	(0.028)
Recession*Tier 1*Severe, Parent Quintile = 4	0.020*	0.042***	0.040***	0.036*
	(0.011)	(0.016)	(0.015)	(0.021)
Observations	17,040	14,904	14,652	14,652
R-squared	0.834	0.889	0.891	0.893
Recession*Ivy Plus*Severe, Parent Quintile = 3	0.002	0.018	0.016	0.011
	(0.020)	(0.026)	(0.026)	(0.031)
Recession*Tier 1*Severe, Parent Quintile = 3	0.042***	0.056***	0.054***	0.045**
	(0.012)	(0.017)	(0.017)	(0.021)
Observations	17,040	14,904	14,652	14,652
R-squared	0.828	0.874	0.877	0.879
Recession*Ivy Plus*Severe, Parent Quintile = 2	0.037***	0.051***	0.044**	0.068**
	(0.013)	(0.019)	(0.019)	(0.027)
Recession*Tier 1*Severe, Parent Quintile = 2	-0.001	0.012	0.009	0.027
	(0.017)	(0.020)	(0.020)	(0.026)
Observations	17,040	14,904	14,652	14,652
R-squared	0.795	0.845	0.849	0.850
Recession*Ivy Plus*Severe, Parent Quintile = 1	0.007	0.029	0.023	0.020
	(0.025)	(0.033)	(0.032)	(0.039)
Recession*Tier 1*Severe, Parent Quintile = 1	0.025	0.040**	0.037*	0.025
	(0.016)	(0.020)	(0.020)	(0.026)
Observations	17,040	14,904	14,652	14,652
R-squared	0.728	0.790	0.795	0.796
Recession-CZ Fixed Effects	N	Y	Y	Y
Birth Cohort-CZ Fixed Effects	N	Y	Y	Y
University Controls	N	N	Y	Y
Parental Income*Recession*Severe	N	N	N	Y
P-value, Test for Equality of Effects Across all Quintiles				
Ivy Plus Relative to Tier 3-5	0.1	0.15	0.34	0.18
Tier 1 (Elite) Relative to Tier 3-5	0.02	0.14	0.1	0.66

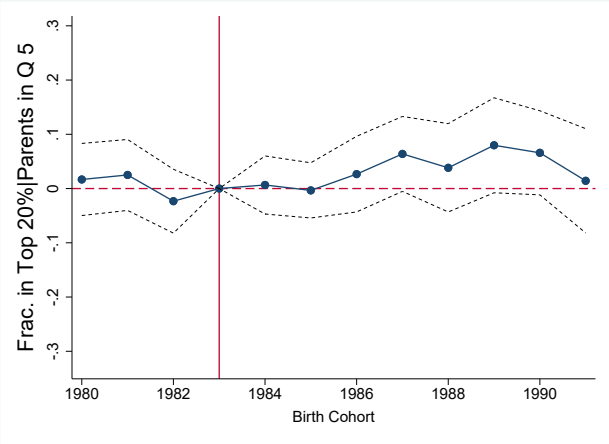
Notes: This table presents results from estimating the regressions displayed in Table 2, separately by the parental income quintile of the students. See Table 2 for details. Regressions include the triple differences shown as well as interactions between *Recession*, *Severe*, and the university selectivity tiers described in equation (1). All lower-level terms are included.

Table A.5: Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities, Conditional on Parental Income Quintile

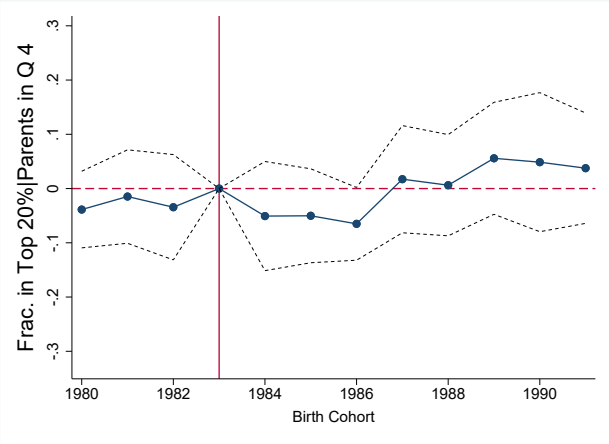
Y = Likelihood of Top 1% Income	(1)	(2)	(3)	(4)
Recession*Ivy Plus*Severe, Parent Quintile = 5	-0.002	-0.001	-0.002	-0.009
	(0.015)	(0.018)	(0.018)	(0.017)
Recession*Tier 1*Severe, Parent Quintile = 5	0.010	0.009	0.008	0.000
	(0.007)	(0.009)	(0.009)	(0.011)
Observations	17,040	14,904	14,652	14,652
R-squared	0.813	0.867	0.870	0.874
Recession*Ivy Plus*Severe, Parent Quintile = 4	0.017	0.017	0.016	0.007
	(0.015)	(0.018)	(0.018)	(0.017)
Recession*Tier 1*Severe, Parent Quintile = 4	0.013*	0.012	0.011	0.002
	(0.007)	(0.008)	(0.008)	(0.010)
Observations	17,040	14,904	14,652	14,652
R-squared	0.749	0.799	0.803	0.806
Recession*Ivy Plus*Severe, Parent Quintile = 3	-0.014	-0.015	-0.016	-0.020
	(0.019)	(0.022)	(0.022)	(0.023)
Recession*Tier 1*Severe, Parent Quintile = 3	0.015**	0.014*	0.014*	0.009
	(0.007)	(0.008)	(0.008)	(0.011)
Observations	17,040	14,904	14,652	14,652
R-squared	0.710	0.766	0.770	0.772
Recession*Ivy Plus*Severe, Parent Quintile = 2	0.013	0.010	0.010	0.011
	(0.026)	(0.032)	(0.032)	(0.034)
Recession*Tier 1*Severe, Parent Quintile = 2	-0.007	-0.006	-0.006	-0.006
	(0.008)	(0.009)	(0.009)	(0.011)
Observations	17,040	14,904	14,652	14,652
R-squared	0.594	0.662	0.666	0.667
Recession*Ivy Plus*Severe, Parent Quintile = 1	-0.007	-0.014	-0.015	-0.016
	(0.026)	(0.029)	(0.028)	(0.030)
Recession*Tier 1*Severe, Parent Quintile = 1	-0.005	-0.009	-0.010	-0.010
	(0.010)	(0.010)	(0.010)	(0.013)
Observations	17,040	14,904	14,652	14,652
R-squared	0.529	0.611	0.615	0.616
Recession-CZ Fixed Effects	N	Y	Y	Y
Birth Cohort-CZ Fixed Effects	N	Y	Y	Y
University Controls	N	N	Y	Y
Parental Income*Recession*Severe	N	N	N	Y
P-value, Test for Equality of Effects Across all Quintiles				
Ivy Plus Relative to Tier 3-5	0.01	0.01	0.01	0.08
Tier 1 (Elite) Relative to Tier 3-5	0.03	0.13	0.14	0.56

Notes: This table presents results from estimating the regressions displayed in Table 2, separately by the parental income quintile of the students. See Table 2 for details. Regressions include the triple differences shown as well as interactions between *Recession*, *Severe*, and the university selectivity tiers described in equation (1). All lower-level terms are included.

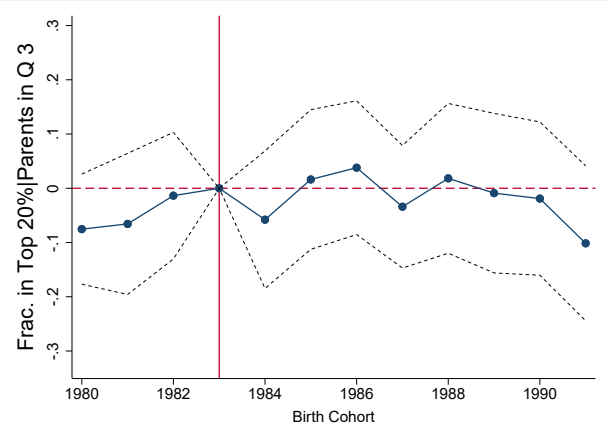
Figure A.15: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Ivy Plus Relative to Selective Universities (Tiers 3-5)**



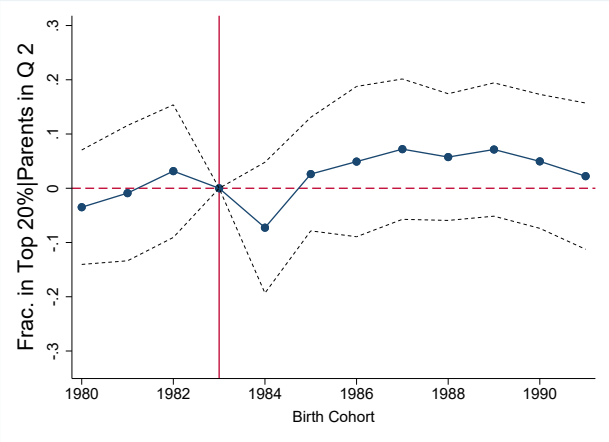
Parental Income in Quintile 5



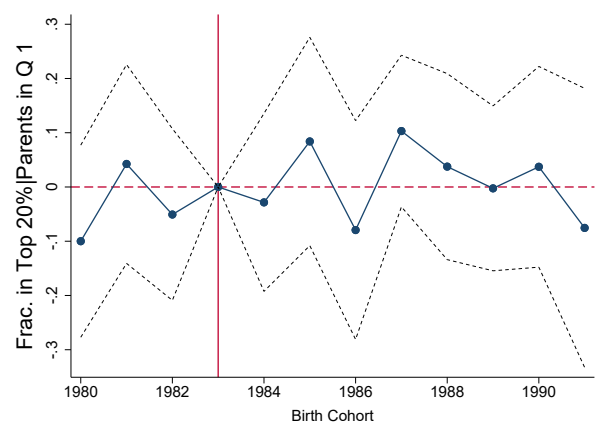
Parental Income in Quintile 4



Parental Income in Quintile 3



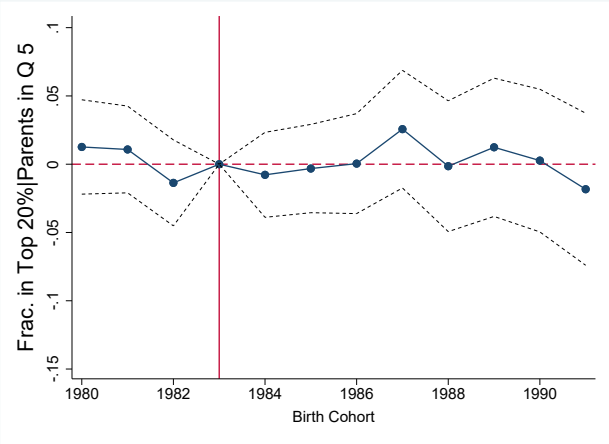
Parental Income in Quintile 2



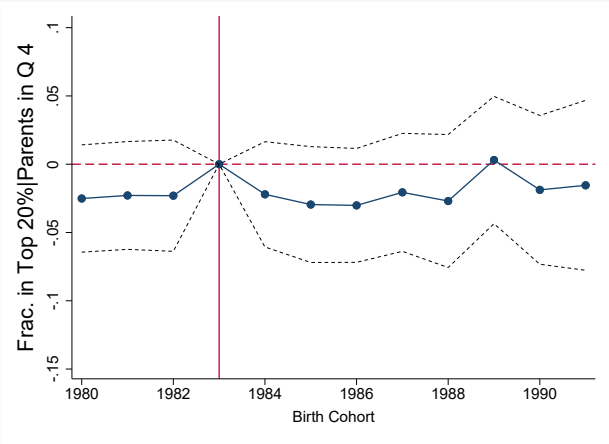
Parental Income in Quintile 1

Notes: Plots are analogous to Figure 3, but comparing Ivy Plus to Tier 3-5 universities. See Figure 3 for details.

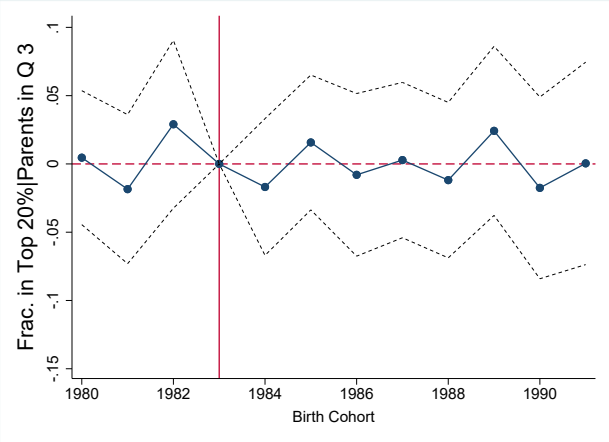
Figure A.16: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Highly Selective Relative to Selective Universities (Tiers 3-5)**



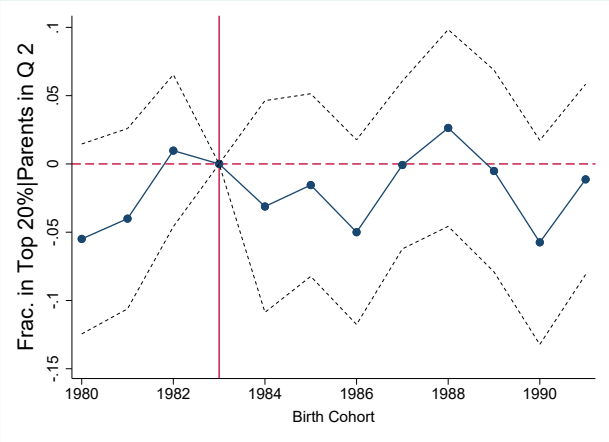
Parental Income in Quintile 5



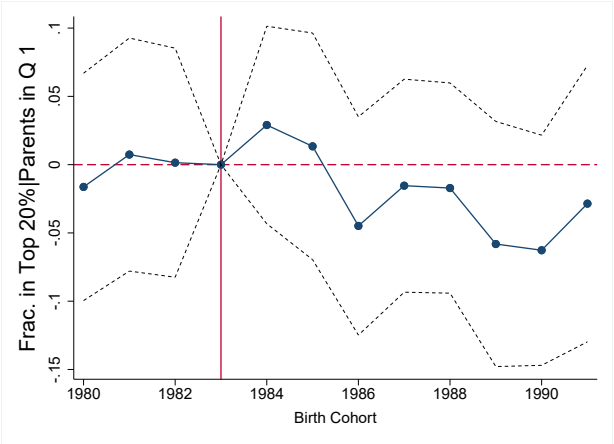
Parental Income in Quintile 4



Parental Income in Quintile 3



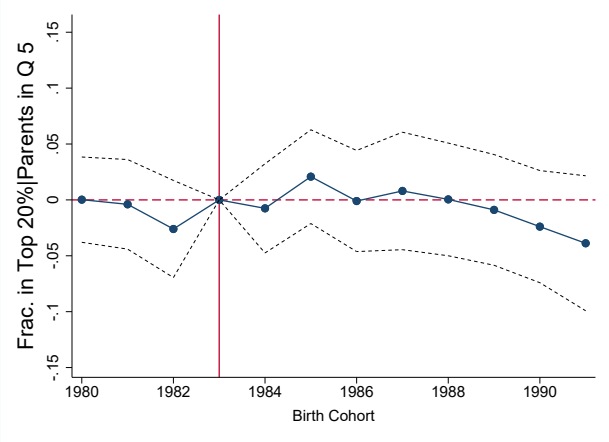
Parental Income in Quintile 2



Parental Income in Quintile 1

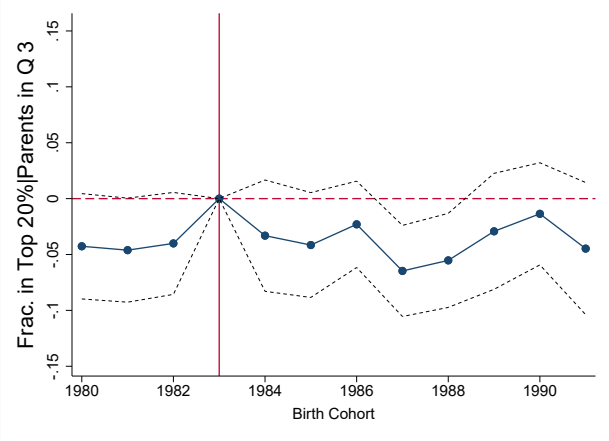
Notes: Plots are analogous to Figure 3, but comparing Highly Selective (Tier 2) to Tier 3-5 universities. See Figure 3 for details.

Figure A.17: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Nonselective Four-Year (Public/NFP) Relative to Selective Universities (Tiers 3-5)**

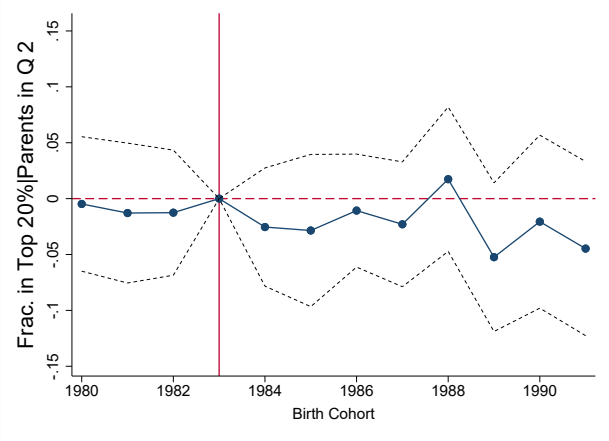


Parental Income in Quintile 5

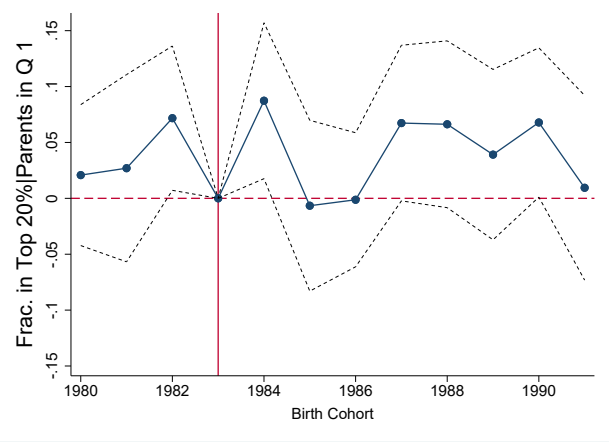
Parental Income in Quintile 4



Parental Income in Quintile 3



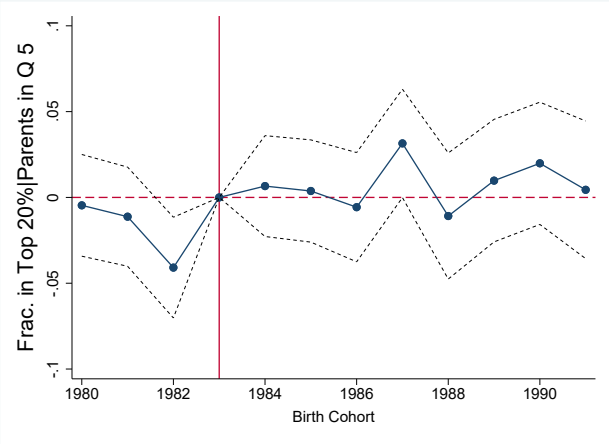
Parental Income in Quintile 2



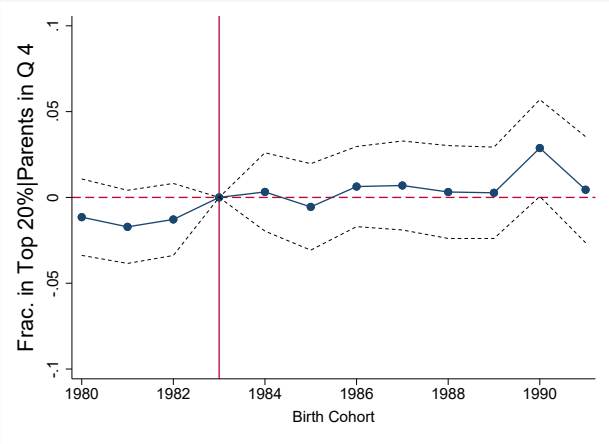
Parental Income in Quintile 1

Notes: Plots are analogous to Figure 3, but comparing nonselective four-year public and not-for-profit universities to Tier 3-5 universities. See Figure 3 for details.

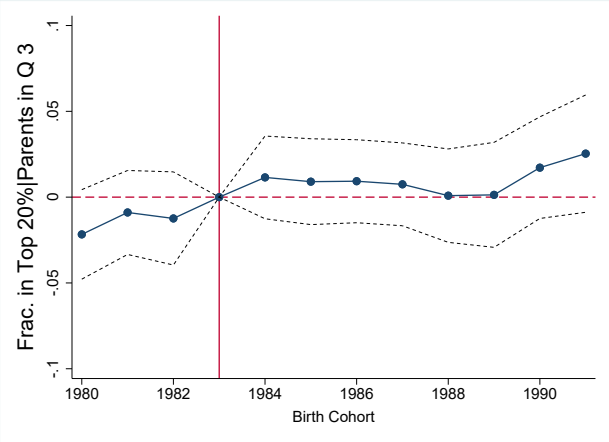
Figure A.18: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Two-Year (Public/NFP) Relative to Selective Universities (Tiers 3-5)**



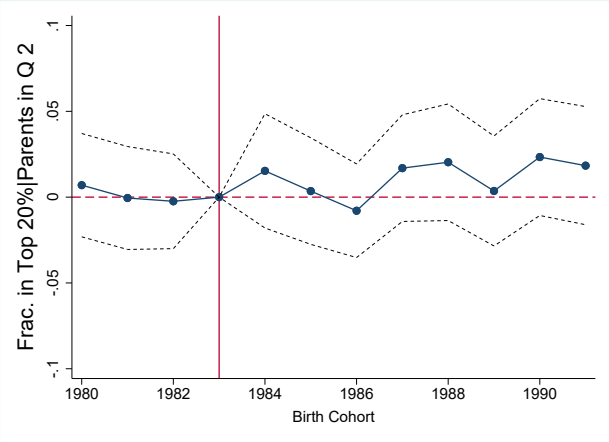
Parental Income in Quintile 5



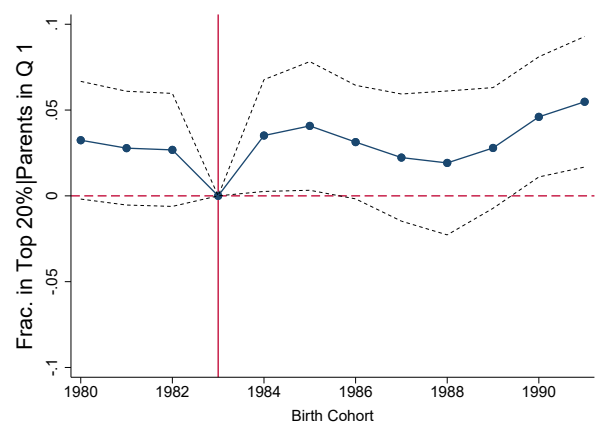
Parental Income in Quintile 4



Parental Income in Quintile 3



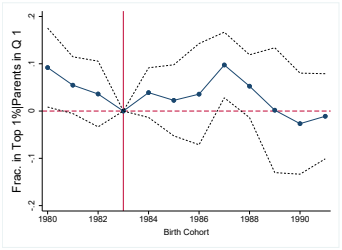
Parental Income in Quintile 2



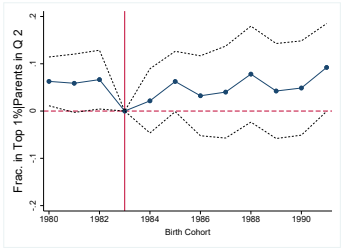
Parental Income in Quintile 1

Notes: Plots are analogous to Figure 3, but comparing two-year public and not-for-profit colleges to Tier 3-5 universities. See Figure 3 for details.

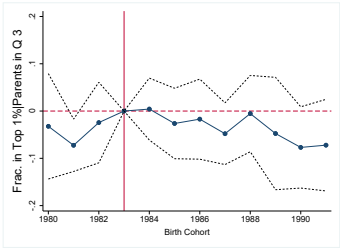
Figure A.19: **Likelihood of Top 1% Income, Conditional on Parental-Income Quintile: Ivy Plus Relative to Selective Universities (Tiers 3-5)**



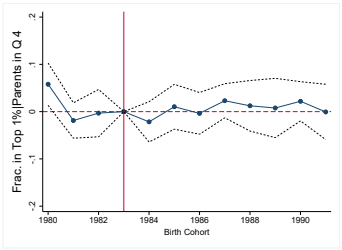
(a) Ivy Plus; Parents in Income Quintile 1



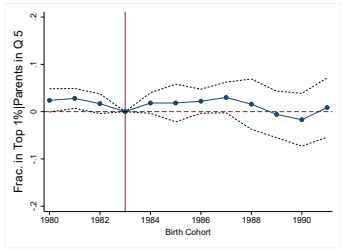
(b) Ivy Plus; Parents in Income Quintile 2



(c) Ivy Plus; Parents in Income Quintile 3

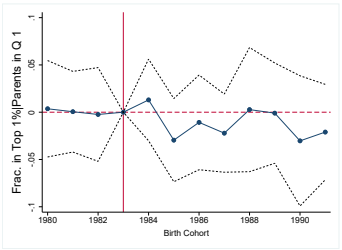


(d) Ivy Plus; Parents in Income Quintile 4



(e) Ivy Plus; Parents in Income Quintile 5

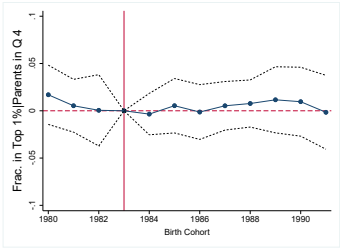
Figure A.20: **Likelihood of Top 1% Income, Conditional on Parental-Income Quintile: Tier 1 (Elite) Relative to Selective Universities (Tiers 3-5)**



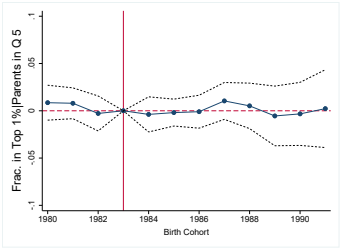
(a) Tier 1; Parents in Income Quintile 1

(b) Tier 1; Parents in Income Quintile 2

(c) Tier 1; Parents in Income Quintile 3



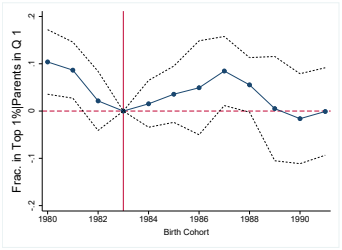
(d) Tier 1; Parents in Income Quintile 4



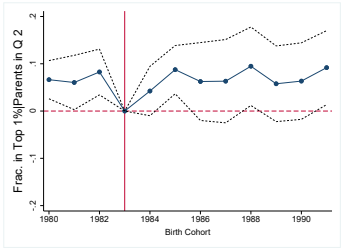
(e) Tier 1; Parents in Income Quintile 5

Notes: Plots are analogous to Figure 3, but with a different dependent variable. See Figure 3 for details.

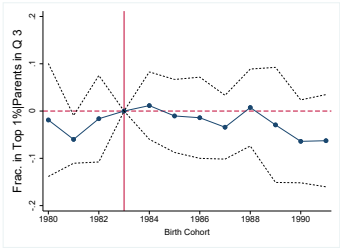
Figure A.21: **Likelihood of Top 1% Income, Conditional on Parental-Income Quintile: Ivy Plus Relative to Selective Universities (Tiers 3-5), Weighted**



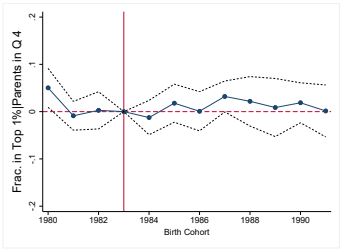
(a) Ivy Plus; Parents in Income Quintile 1



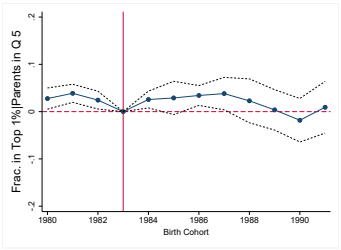
(b) Ivy Plus; Parents in Income Quintile 2



(c) Ivy Plus; Parents in Income Quintile 3



(d) Ivy Plus; Parents in Income Quintile 4



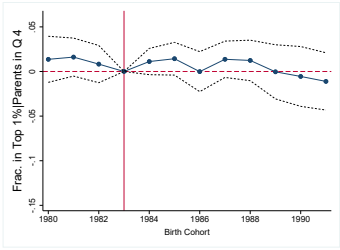
(e) Ivy Plus; Parents in Income Quintile 5

Figure A.22: **Likelihood of Top 1% Income, Conditional on Parental-Income Quintile: Tier 1 (Elite) Relative to Selective Universities (Tiers 3-5), Weighted**

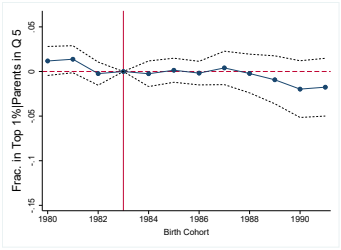
(a) Tier 1; Parents in Income Quintile 1

(b) Tier 1; Parents in Income Quintile 2

(c) Tier 1; Parents in Income Quintile 3



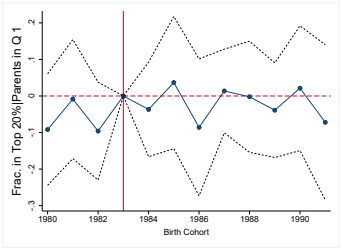
(d) Tier 1; Parents in Income Quintile 4



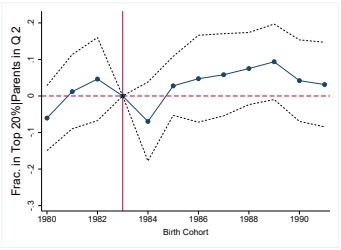
(e) Tier 1; Parents in Income Quintile 5

Notes: Plots are analogous to those in Figure A.19 and A.20, but observations are weighted by the size of the birth cohort-university-parental-income quintile cell.

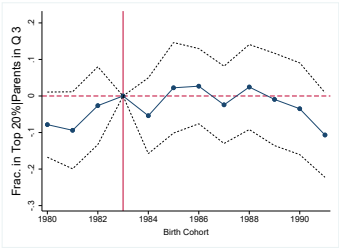
Figure A.23: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Ivy Plus Relative to Selective Universities (Tiers 3-5), Weighted**



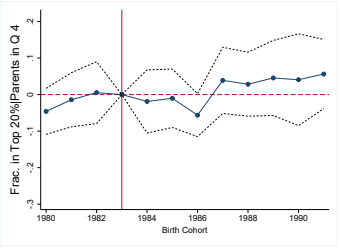
(a) Ivy Plus; Parents in Income Quintile 1



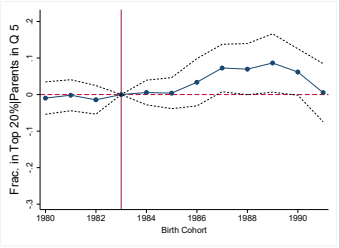
(b) Ivy Plus; Parents in Income Quintile 2



(c) Ivy Plus; Parents in Income Quintile 3



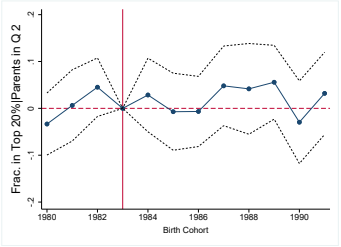
(d) Ivy Plus; Parents in Income Quintile 4



(e) Ivy Plus; Parents in Income Quintile 5

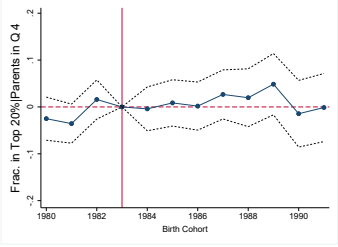
Figure A.24: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Tier 1 (Elite) Relative to Selective Universities (Tiers 3-5), Weighted**

(a) Tier 1; Parents in Income Quintile 1

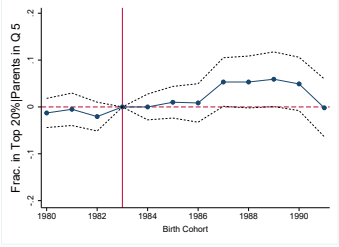


(b) Tier 1; Parents in Income Quintile 2

(c) Tier 1; Parents in Income Quintile 3



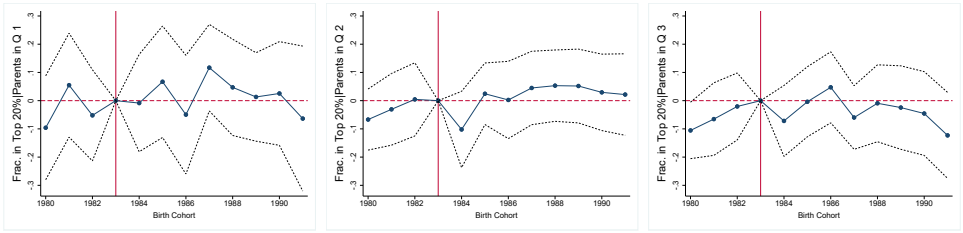
(d) Tier 1; Parents in Income Quintile 4



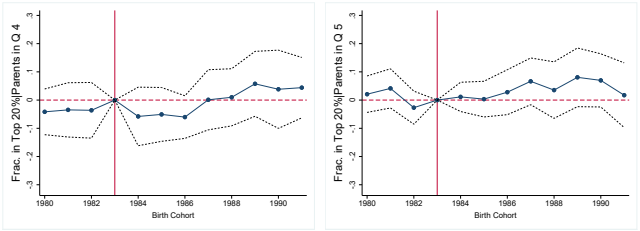
(e) Tier 1; Parents in Income Quintile 5

Notes: Plots are analogous to those in Figure 3 and A.15, but observations are weighted by the size of the birth cohort-university-parental-income quintile cell.

Figure A.25: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Ivy Plus Relative to Selective Universities (Tiers 3-5), Including Interactions with Fraction Parents in Top 5 and Top 1%**

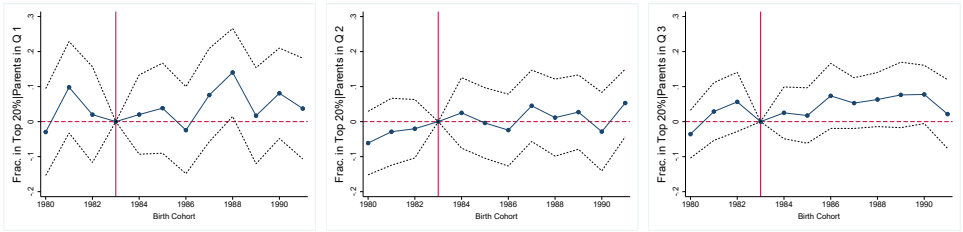


(a) Ivy Plus; Parents in Income Quintile 1 (b) Ivy Plus; Parents in Income Quintile 2 (c) Ivy Plus; Parents in Income Quintile 3

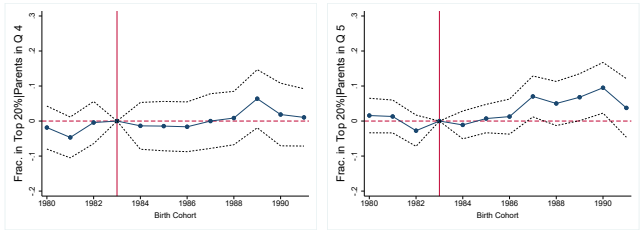


(d) Ivy Plus; Parents in Income Quintile 4 (e) Ivy Plus; Parents in Income Quintile 5

Figure A.26: **Likelihood of Top Quintile Income, Conditional on Parental-Income Quintile: Tier 1 (Elite) Relative to Selective Universities (Tiers 3-5), Including Interactions with Fraction Parents in Top 5 and Top 1%**



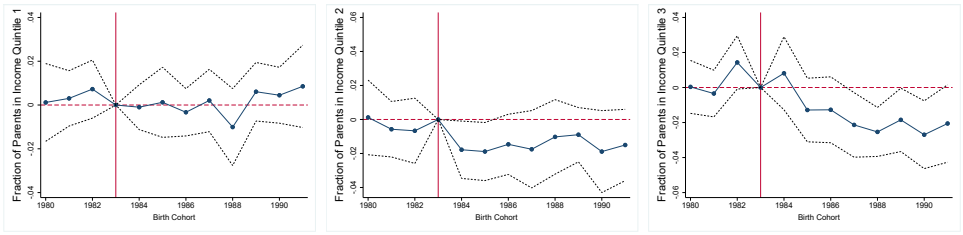
(a) Tier 1; Parents in Income Quintile 1 (b) Tier 1; Parents in Income Quintile 2 (c) Tier 1; Parents in Income Quintile 3



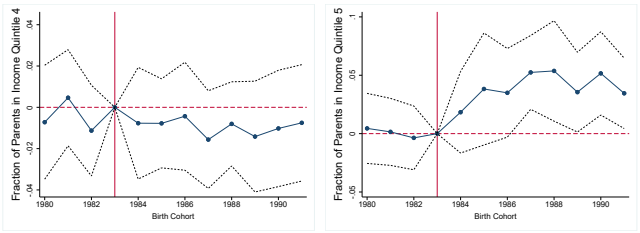
(d) Tier 1; Parents in Income Quintile 4 (e) Tier 1; Parents in Income Quintile 5

Notes: Plots are analogous to those in Figure 3 and A.15, but additionally include interactions between birth cohort, severe recession in the CZ, and fraction with parents in the top 5% of incomes, and separately in the top 1% of incomes.

Figure A.27: **Fraction of Students with Parents in Each Income Quintile, Ivy Plus Relative to Tier 3-5 (Selective) Universities**

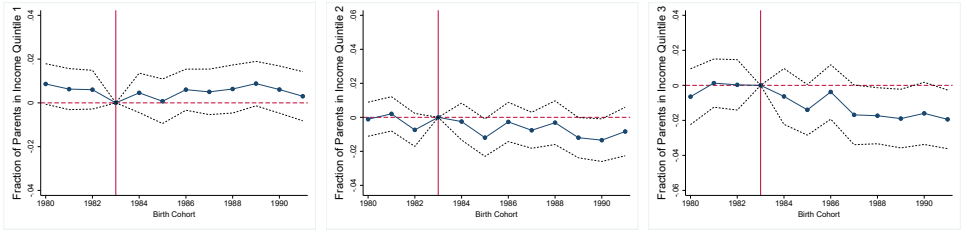


(a) Fraction of Parents in Income Quintile 1 (b) Fraction of Parents in Income Quintile 2 (c) Fraction of Parents in Income Quintile 3

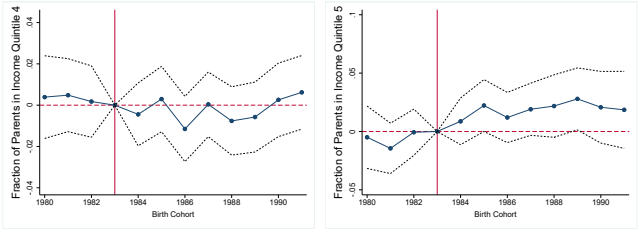


(d) Fraction of Parents in Income Quintile 4 (e) Fraction of Parents in Income Quintile 5

Figure A.28: **Fraction of Students with Parents in Each Income Quintile, Tier 1 Relative to Tier 3-5 (Selective) Universities**



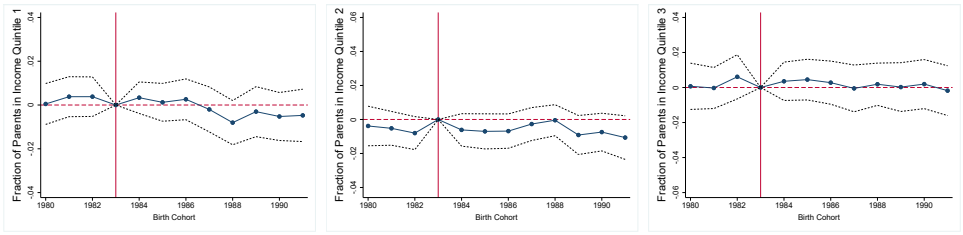
(a) Fraction of Parents in Income Quintile 1 (b) Fraction of Parents in Income Quintile 2 (c) Fraction of Parents in Income Quintile 3



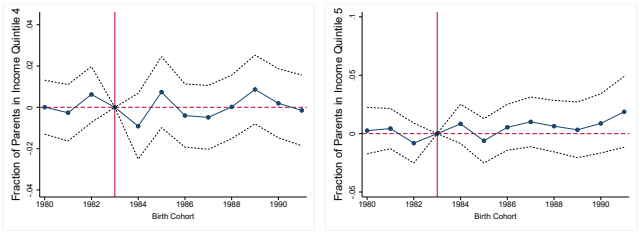
(d) Fraction of Parents in Income Quintile 4 (e) Fraction of Parents in Income Quintile 5

Notes: Each plot is from estimating a version of Equation (2), in which the dependent variable is the fraction of students with parents in the given income quintile. The coefficients are on the interaction between birth cohort, selectivity tier, and an indicator for severe recession in the CZ. The regression also includes birth cohort-selectivity tier fixed effects, birth cohort-CZ fixed effects, and university fixed effects, but does not include the other covariates in Equation (2). Standard errors are clustered at the university level.

Figure A.29: **Fraction of Students with Parents in Each Income Quintile, Tier 2 Relative to Tier 3-5 (Selective) Universities**

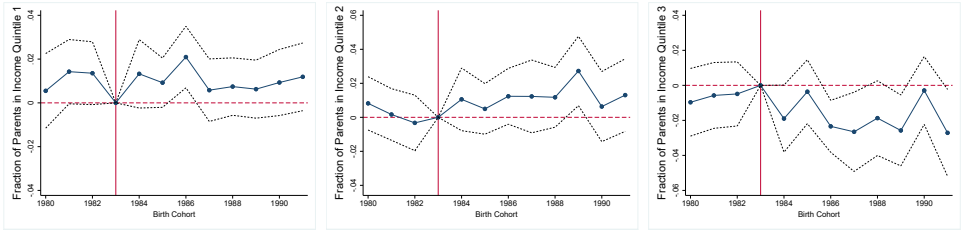


(a) Fraction of Parents in Income Quintile 1 (b) Fraction of Parents in Income Quintile 2 (c) Fraction of Parents in Income Quintile 3

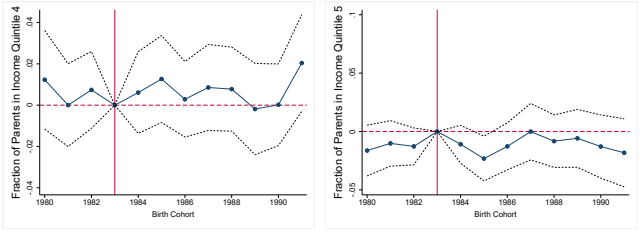


(d) Fraction of Parents in Income Quintile 4 (e) Fraction of Parents in Income Quintile 5

Figure A.30: **Fraction of Students with Parents in Each Income Quintile, Nonselective Relative to Tier 3-5 (Selective) Universities**



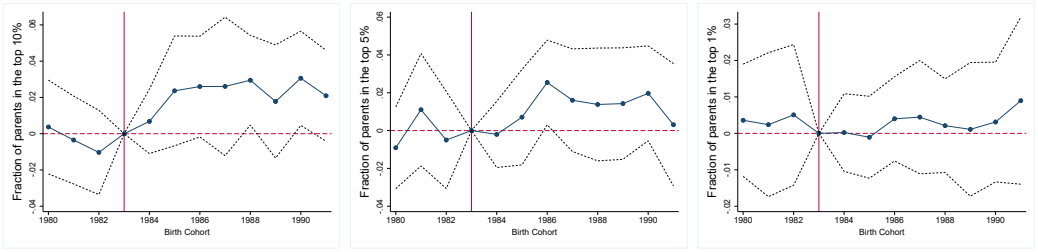
(a) Fraction of Parents in Income Quintile 1 (b) Fraction of Parents in Income Quintile 2 (c) Fraction of Parents in Income Quintile 3



(d) Fraction of Parents in Income Quintile 4 (e) Fraction of Parents in Income Quintile 5

Notes: Plots are analogous to those in Figure A.28, but showing comparisons of Tier 2 universities to Tier 3-5 universities, and nonselective four-year public and not-for-profit universities to Tier 3-5 universities. See Figure A.28 and text for details.

Figure A.31: **Fraction of Students with Parents in Top Income Percentiles, Ivy Plus Relative to Tier 3-5 (Selective) Universities**

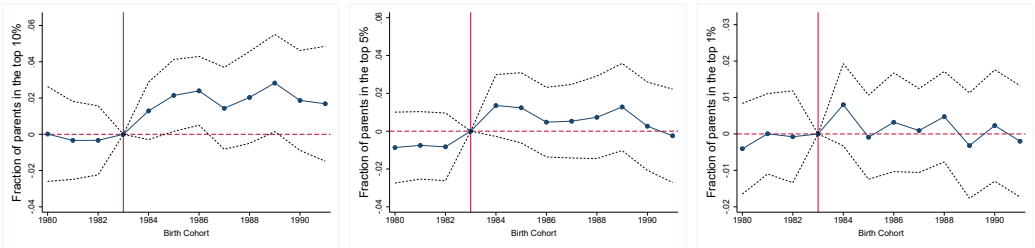


(a) Fraction of Parents in Top 10%

(b) Fraction of Parents in Top 5%

(c) Fraction of Parents in Top 1%

Figure A.32: **Fraction of Students with Parents in Top Income Percentiles, Tier 1 Relative to Tier 3-5 (Selective) Universities**



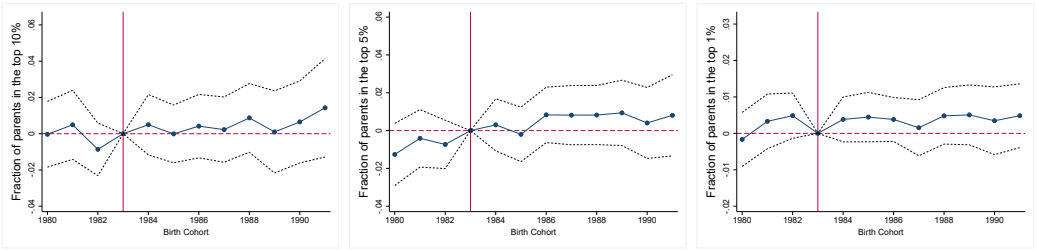
(a) Fraction of Parents in Top 10%

(b) Fraction of Parents in Top 5%

(c) Fraction of Parents in Top 1%

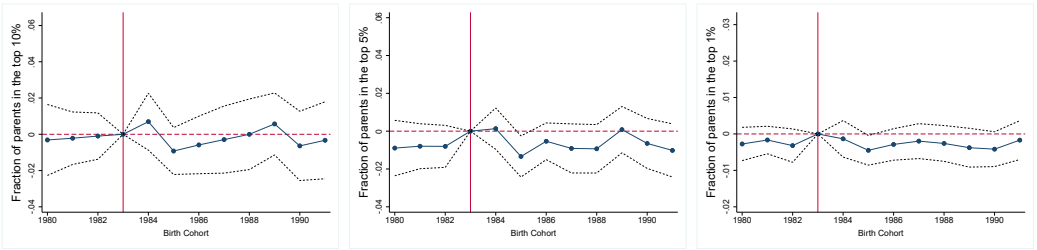
Notes: Plots are analogous to those in Figure A.27 and A.28, but the dependent variables are the fraction of students with parents in top income percentiles. See Figures A.27 and A.28 and text for details.

Figure A.33: **Fraction of Students with Parents in Top Income Percentiles, Tier 2 Relative to Tier 3-5 (Selective) Universities**



(a) Fraction of Parents in Top 10% (b) Fraction of Parents in Top 5% (c) Fraction of Parents in Top 1%

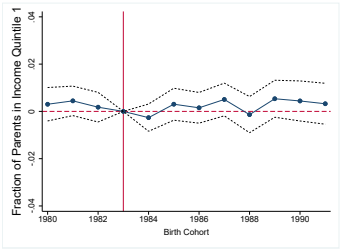
Figure A.34: **Fraction of Students with Parents in Top Income Percentiles, Nonselective Relative to Tier 3-5 (Selective) Universities**



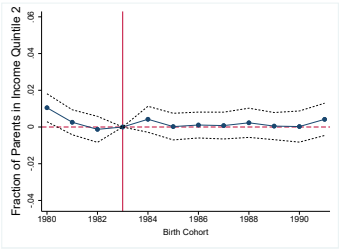
(a) Fraction of Parents in Top 10% (b) Fraction of Parents in Top 5% (c) Fraction of Parents in Top 1%

Notes: Plots are analogous to those in Figure A.29 and A.30, but the dependent variables are the fraction of students with parents in top income percentiles. See Figures A.29 and A.30 and text for details.

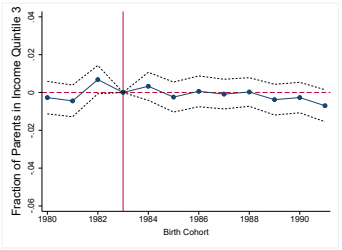
Figure A.35: **Fraction of Students with Parents in Each Income Quintile, Two-Year Relative to Tier 3-5 (Selective) Universities**



(a) Fraction of Parents in Income Quintile 1

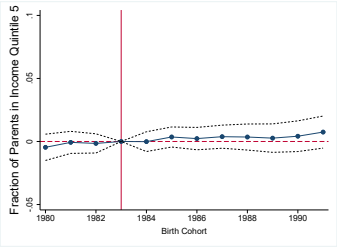


(b) Fraction of Parents in Income Quintile 2



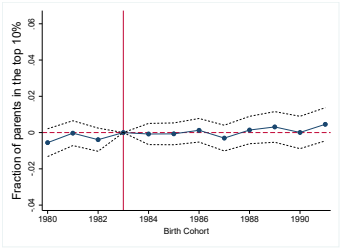
(c) Fraction of Parents in Income Quintile 3

(d) Fraction of Parents in Income Quintile 4

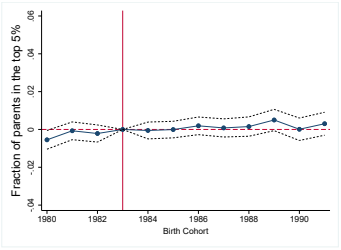


(e) Fraction of Parents in Income Quintile 5

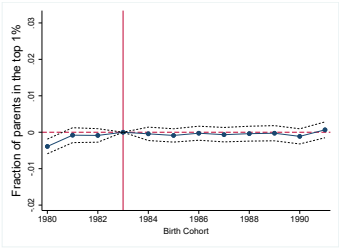
Figure A.36: **Fraction of Students with Parents in Top Income Percentiles, Two-Year Relative to Tier 3-5 (Selective) Universities**



(a) Fraction of Parents in Top 10%



(b) Fraction of Parents in Top 5%



(c) Fraction of Parents in Top 1%

Notes: Plots are analogous to those in Figures A.27 and A.31, but showing comparisons between two-year public and not-for-profit colleges and Tier 3-5 universities. See Figures A.27 and A.31, and text for details.

Table A.6: Summary Statistics by University Tier, 1987 Birth Cohort

University Tier	Ivy Plus	Tier 1, excl. Ivy (Elite)	Tier 2 (Highly Selective)	Tiers 3-5 (Selective)	Nonselect. Four Year (Pub/NFP)	Two Year (Pub/NFP)
Total universities in sample	12	59	73	611	79	387
Median earnings (positive earners), 2014	48,017	43,678	42,533	34,183	26,878	24,203
	[7,338]	[8,593]	[9,954]	[6,343]	[5,143]	[3,209]
Median earnings, 2014	42,983	40,037	40,104	32,430	23,818	21,410
	[7,256]	[8,856]	[10,340]	[6,545]	[5,390]	[3,459]
Mean earnings, 2014	64,789	48,657	43,896	34,441	26,366	23,813
	[11,872]	[11,064]	[10,287]	[6,717]	[5,111]	[3,374]
Fraction of graduates with top 20% earnings	0.51	0.48	0.48	0.33	0.21	0.16
	[.07]	[.11]	[.14]	[.11]	[.09]	[.06]
Fraction of graduates with top 10% earnings	0.39	0.33	0.3	0.17	0.09	0.07
	[.07]	[.11]	[.14]	[.09]	[.05]	[.03]
Fraction of graduates with top 5% earnings	0.29	0.21	0.17	0.08	0.04	0.03
	[.07]	[.09]	[.1]	[.06]	[.03]	[.02]
Fraction of graduates with top 1% earnings	0.15	0.07	0.04	0.01	0.01	0
	[.03]	[.04]	[.03]	[.02]	[.01]	[0]
Number of students	1,468	1,093	1,449	1,066	1,088	1,335
	[600]	[1,055]	[1,639]	[1,266]	[1,327]	[1,151]
Admissions rejection rate, 2013	0.91	0.73	0.47	0.33	0.33	.
	[.03]	[.11]	[.14]	[.14]	[.18]	[.]
Average SAT, 2001	1429	1327	1207	1037	.	.
	[36]	[64]	[59]	[89]	[.]	[.]
Average annual cost of attendance, 2000	25,488	21,511	16,651	9,641	6,255	1,971
	[618]	[6,208]	[7,282]	[6,152]	[6,499]	[1,475]
Flagship university	0	0.03	0.07	0.02	0	0
	[0]	[.18]	[.25]	[.15]	[0]	[0]
Public university	0	0.08	0.22	0.43	0.56	0.99
	[0]	[.28]	[.42]	[.5]	[.5]	[.11]
Instructional expenditures per student, 2000	27,306	16,349	8,774	4,890	4,146	2,522
	[8,935]	[8,957]	[2,955]	[2,039]	[3,312]	[1,140]
Fraction with parents in income quintile 1	0.04	0.04	0.04	0.08	0.13	0.16
	[.01]	[.02]	[.02]	[.06]	[.09]	[.07]
Fraction with parents in income quintile 2	0.06	0.05	0.07	0.13	0.17	0.2
	[.01]	[.02]	[.03]	[.06]	[.07]	[.05]
Fraction with parents in income quintile 3	0.09	0.09	0.12	0.19	0.21	0.24
	[.01]	[.02]	[.03]	[.05]	[.05]	[.04]
Fraction with parents in income quintile 4	0.14	0.15	0.2	0.26	0.24	0.25
	[.02]	[.03]	[.04]	[.06]	[.06]	[.06]
Fraction with parents in income quintile 5	0.67	0.66	0.57	0.33	0.24	0.16
	[.05]	[.07]	[.09]	[.14]	[.14]	[.08]
Fraction with parents in top 1% of incomes	0.15	0.12	0.07	0.01	0.01	0
	[.04]	[.05]	[.05]	[.02]	[.02]	[0]
Fraction female	0.5	0.54	0.54	0.58	0.53	0.52
	[.02]	[.14]	[.13]	[.13]	[.15]	[.06]
Fraction in-state students	0.16	0.29	0.52	0.74	0.76	0.96
	[.12]	[.22]	[.28]	[.22]	[.28]	[.07]
Fraction foreign students	0.09	0.05	0.03	0.01	0.01	0
	[.02]	[.03]	[.04]	[.03]	[.03]	[.01]
Fraction Black students	0.08	0.05	0.04	0.13	0.13	0.14
	[.02]	[.02]	[.02]	[.21]	[.17]	[.14]
Fraction Hispanic students	0.08	0.07	0.06	0.07	0.1	0.1
	[.02]	[.04]	[.04]	[.11]	[.17]	[.14]
Fraction Asian students	0.17	0.12	0.09	0.04	0.03	0.03
	[.04]	[.08]	[.1]	[.06]	[.03]	[.05]

Notes: Summary statistics for the 1987 birth cohort of universities in the regression sample for Figure 1b, except for percent in-state and percent foreign students which are for the 1988 cohort due to data availability. Standard deviations are in brackets. Not all universities have data for each variable. I omit average SAT score in columns (5) and (6), and average rejection rate for column (6) because of the small sample sizes. Only 15 of the 79 nonselective four-year universities, and three of the 387 two-year colleges, have SAT scores. Forty of the nonselective universities, and seven of the two-year colleges, have rejection rates. See text for details.

Table A.7: Distribution of Majors by University Tier, 1987 Birth Cohort

University Tier	Ivy Plus	Tier 1, excl. Ivy (Elite)	Tier 2 (Highly Selective)	Tiers 3-5 (Selective)	Nonselect. Four Year (Pub/NFP)	Two Year (Pub/NFP)
Total universities in sample	12	59	73	610	77	383
Percent of majors in:						
Science and Engineering (incl. Social Science)	68.4	60.2	47.4	26.7	8.7	9.2
	[11.1]	[13.8]	[19.5]	[13.]	[12.1]	[11.1]
Social Science	26.4	25.1	16.4	6.9	1.1	1.3
	[9.8]	[11.1]	[9.8]	[5.7]	[2.8]	[4.7]
Science and Engineering Related	2.8	2.9	3.7	10.7	15	25.2
	[2.8]	[4.1]	[5.5]	[11.5]	[16.2]	[12.4]
Business	4	7.1	16.6	22.2	14.4	13.6
	[7.5]	[9.9]	[17.]	[11.8]	[18.4]	[7.5]
Education	0.1	0.9	2	8.7	2.7	3.2
	[.3]	[2.9]	[3.4]	[7.7]	[6.3]	[4.9]
Arts, Humanities, and Other	24.7	29	30.4	31.7	59	48.4
	[8.6]	[10.]	[15.3]	[12.1]	[29.3]	[17.5]

Notes: Summary statistics for the 1987 birth cohort of universities in the regression sample for Figure 1b. Standard deviations are in brackets. See text for details.

Table A.8: Overlap in Commuting Zone, Across University Tier

	Severe Recession		Mild Recession	
	Univ. in Sample	Univ. in CZ with Tier 3-5 Univ.	Univ. in Sample	Univ. in CZ with Tier 3-5 Univ.
Ivy Plus	8	8	4	4
Tier 1 excluding Ivy (Elite)	36	32	23	22
Tier 2 (Highly Selective)	41	35	32	30
Tiers 3-5 (Selective)	402	402	209	209
Nonselective four year (Public/NFP)	56	52	23	20
Two year (Public/NFP)	278	248	109	96

Notes: This table shows the number of universities in the main regression sample (equation (2)), by selectivity tier, whether they are located in a severe- or mild-recession CZ, and whether they are in the same CZ as a Tier 3-5 university. See text for details.

Table A.9: Overlap in Commuting Zone, Across University Tier, 1983 Balance

	Severe Recession		Mild Recession	
	Univ. in Sample	Univ. in CZ with Tier 3-5 Univ.	Univ. in Sample	Univ. in CZ with Tier 3-5 Univ.
Ivy Plus	8	8	4	4
Tier 1 excluding Ivy (Elite)	38	36	25	25
Tier 2 (Highly Selective)	51	46	36	33
Tiers 3-5 (Selective)	544	544	302	302
Nonselective four year (Public/NFP)	94	84	38	33
Two year (Public/NFP)	398	354	180	155

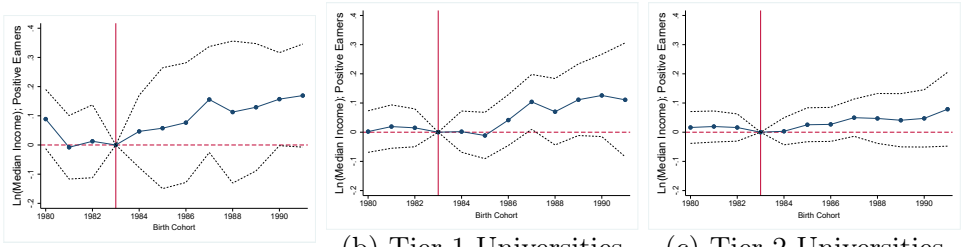
Notes: This table shows the number of universities in the regression sample (equation (2)), when requiring the university has data in 1983 rather than for every cohort, by selectivity tier, whether they are located in a severe- or mild-recession CZ, and whether they are in the same CZ as a Tier 3-5 university. See text for details.

Table A.10: Number of Universities in Sample With and Without CZ FE, Across University Tier

	Severe Recession		Mild Recession	
	Without CZ FE	With CZ FE	Without CZ FE	With CZ FE
Ivy Plus	8	8	4	4
Tier 1 excluding Ivy (Elite)	37	36	23	23
Tier 2 (Highly Selective)	45	42	35	32
Tiers 3-5 (Selective)	442	404	259	217
Nonselective four year (Public/NFP)	68	57	30	26
Two year (Public/NFP)	317	280	152	113

Notes: This table shows the number of universities in the regression sample with and without including CZ fixed effects (columns 1 and 2 of Table A.2 versus column 3), by selectivity tier, whether they are located in a severe- or mild-recession CZ. See text for details.

Figure A.37: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities, Males**



(a) Ivy Plus Universities

(b) Tier 1 Universities (Elite)

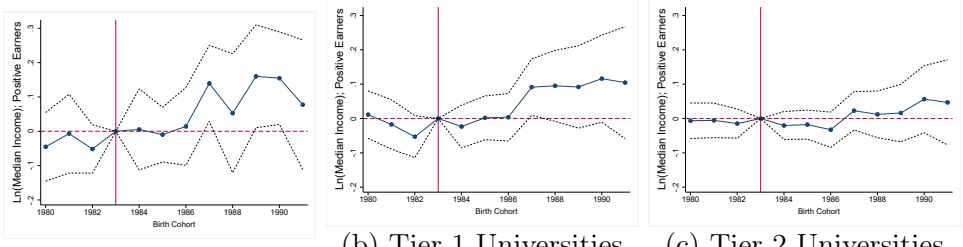
(c) Tier 2 Universities (Highly Selective)

(d) Nonselective Four-Year Univ. (Public/NFP)

(e) Two-Year Colleges (Public/NFP)

Notes: Plots are analogous to those in Figure A.3, but the dependent variable is specific to males. The explanatory variables are specific to males. For example, instead of the proportion of students with parents in the first quintile as an explanatory variable, we include the proportion of males with parents in the first quintile. One exception is that we include ln(students in cohort), in addition to ln(males in cohort). See text and Figure A.3 for details.

Figure A.38: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities, Females**



(a) Ivy Plus Universities

(b) Tier 1 Universities (Elite)

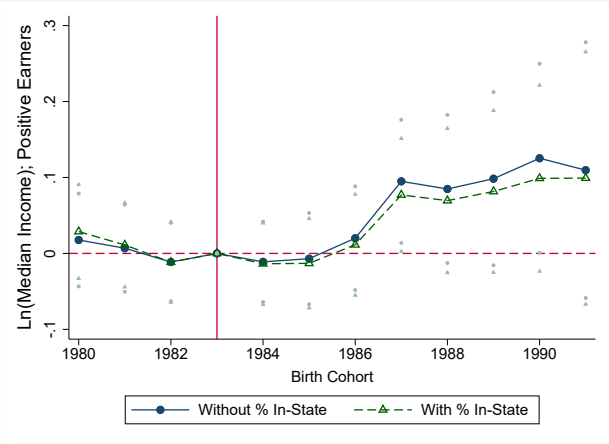
(c) Tier 2 Universities (Highly Selective)

(d) Nonselective Four-Year Univ. (Public/NFP)

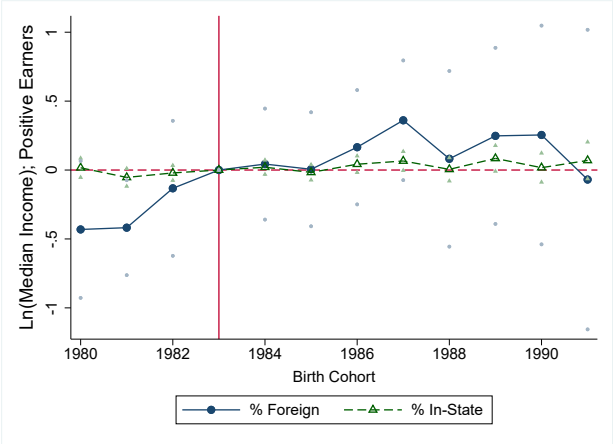
(e) Two-Year Colleges (Public/NFP)

Notes: Plots are analogous to those in Figure A.37, but for females.

Figure A.39: **Recession Effects: Tier 1 Relative to Tier 3-5 (Selective) Universities, Including Interactions with Fraction In-State and Fraction Foreign, Using the Fraction for the 1988 cohort**



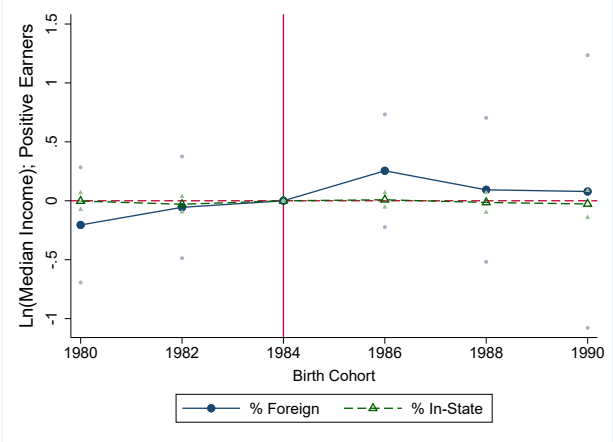
(a) Coefficients on Cohort*Tier 1*Severe Recession



(b) Coefficients on Cohort*Fraction In-State (Foreign)*Severe Recession

Recession Effects: Tier 1 Relative to Tier 3-5 (Selective) Universities, Including Interactions with Fraction In-State and Fraction Foreign, Using the Fractions for Each Cohort

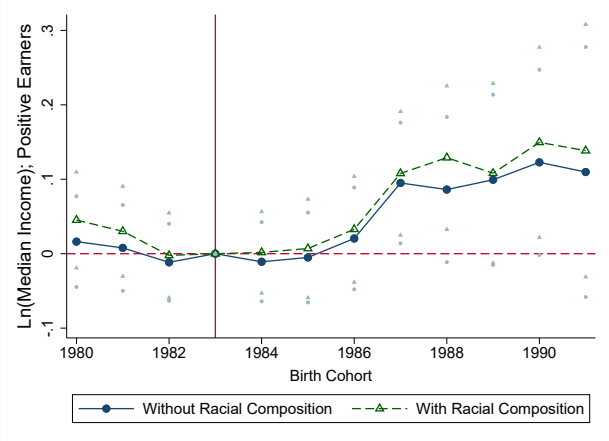
(c) Coefficients on Cohort*Tier 1*Severe Recession



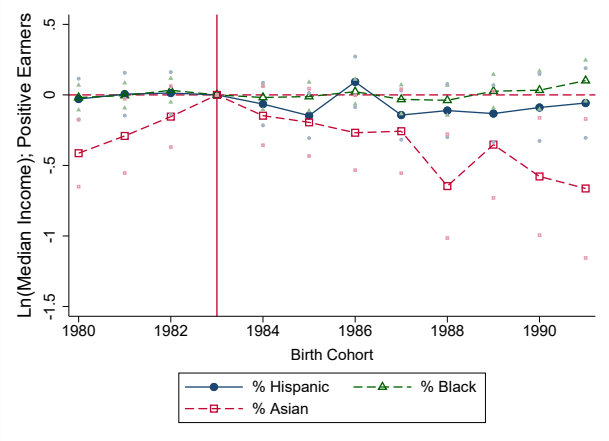
(d) Coefficients on Cohort*Fraction In-State (Foreign)*Severe Recession

Notes: Plots are similar to Figure A.3 but additionally include interactions between fraction in-state, cohort, and severe recession, as well as fraction foreign, cohort, and severe recession, and all lower-level terms. Plots A.39c and A.39d show coefficients only in even years because universities are required to report the data on in-state and foreign students only in even years. We restrict the sample to even cohorts, and to universities that have data for each of these cohorts. See text for details.

Figure A.40: **Recession Effects: Tier 1 Relative to Tier 3-5 (Selective) Universities, Including Interactions with Fraction Black, Hispanic, and Asian Students**



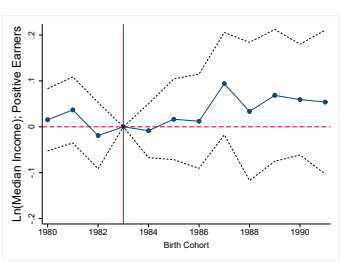
(a) Coefficients on Cohort*Tier 1*Severe Recession



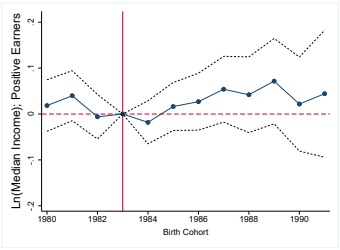
(b) Coefficients on Cohort*Fraction by Race*Severe Recession

Notes: Plots are similar to Figure A.3 but additionally include interactions between fraction Black, Hispanic, and Asian students, cohort, and severe recession, as well as all lower-level terms. See text for details.

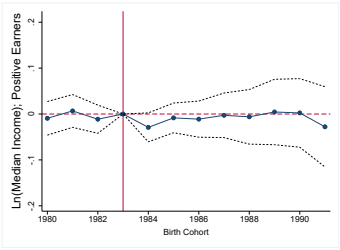
Figure A.41: **Recession Effects by University Selectivity, Relative to Tier 3-5 (Selective) Universities: State-Cohort Fixed Effects**



(a) Ivy Plus Universities

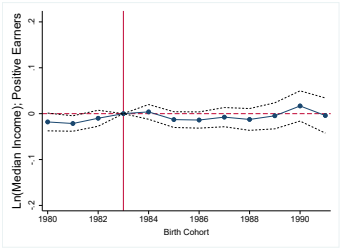


(b) Tier 1 Universities (Elite)



(c) Tier 2 Universities (Highly Selective)

(d) Nonselective Four-Year Univ. (Public/NFP)



(e) Two-Year Colleges (Public/NFP)

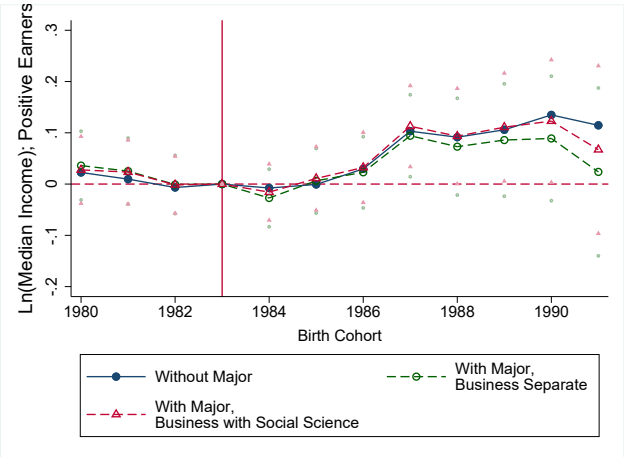
Notes: Plots are analogous to Figure A.3, except these use an indicator for severe recession in the state instead of CZ, and with state-cohort FE not CZ-cohort FE. Plots show coefficients on the interaction between birth cohort fixed effects, university tier, and an indicator for severe recession in the state from 2007 to 2009. Dashed lines show 95% confidence intervals. See text and notes to Figure A.3 for details.

Table A.11: **Additional Specifications, Effects Relative to Tier 3-5 Universities**

	Ln(Median Income, Positive Earners)				Ln(Students)	Share Female
1980*Ivy Plus	-0.002	-0.011	0.011	-0.026	0.049	-0.015
	(0.042)	(0.043)	(0.045)	(0.037)	(0.085)	(0.020)
1980*Elite	0.020	0.012	0.025	0.023	0.088	-0.015
	(0.031)	(0.033)	(0.035)	(0.029)	(0.061)	(0.017)
1981*Ivy Plus	-0.016	0.003	0.009	-0.014	0.034	-0.023
	(0.042)	(0.047)	(0.045)	(0.040)	(0.072)	(0.018)
1981*Elite	0.007	0.016	0.019	0.010	0.036	-0.015
	(0.029)	(0.032)	(0.032)	(0.030)	(0.060)	(0.016)
1982*Ivy Plus	-0.047	-0.066	-0.061	-0.053	0.034	0.002
	(0.041)	(0.043)	(0.044)	(0.041)	(0.063)	(0.021)
1982*Elite	-0.010	-0.025	-0.022	-0.011	0.030	-0.008
	(0.027)	(0.028)	(0.029)	(0.026)	(0.043)	(0.016)
1984*Ivy Plus	0.001	-0.020	-0.013	0.008	0.059	0.012
	(0.033)	(0.036)	(0.036)	(0.036)	(0.051)	(0.015)
1984*Elite	-0.009	-0.024	-0.020	0.002	-0.025	0.004
	(0.027)	(0.027)	(0.028)	(0.029)	(0.040)	(0.014)
1985*Ivy Plus	-0.005	0.014	0.007	0.004	0.033	0.004
	(0.055)	(0.049)	(0.049)	(0.059)	(0.065)	(0.016)
1985*Elite	-0.004	0.005	0.001	0.006	-0.025	-0.009
	(0.031)	(0.031)	(0.031)	(0.031)	(0.048)	(0.014)
1986*Ivy Plus	0.023	0.032	0.039	0.024	-0.025	0.001
	(0.065)	(0.059)	(0.061)	(0.064)	(0.060)	(0.024)
1986*Elite	0.028	0.032	0.038	0.031	-0.052	0.020
	(0.035)	(0.035)	(0.036)	(0.036)	(0.049)	(0.015)
1987*Ivy Plus	0.118*	0.121*	0.123*	0.118*	0.004	-0.004
	(0.067)	(0.064)	(0.064)	(0.068)	(0.071)	(0.021)
1987*Elite	0.098**	0.097**	0.100**	0.103**	-0.068	0.005
	(0.041)	(0.040)	(0.041)	(0.045)	(0.055)	(0.015)
1988*Ivy Plus	0.082	0.089	0.084	0.066	0.005	-0.012
	(0.098)	(0.084)	(0.086)	(0.101)	(0.075)	(0.023)
1988*Elite	0.088*	0.087*	0.086*	0.081	-0.046	-0.002
	(0.050)	(0.047)	(0.049)	(0.052)	(0.062)	(0.016)
1989*Ivy Plus	0.131	0.119	0.123	0.136	0.046	-0.002
	(0.087)	(0.074)	(0.077)	(0.092)	(0.078)	(0.025)
1989*Elite	0.101*	0.087*	0.091	0.111*	-0.035	0.006
	(0.058)	(0.053)	(0.056)	(0.062)	(0.069)	(0.018)
1990*Ivy Plus	0.146**	0.138**	0.133**	0.146**	0.067	-0.012
	(0.066)	(0.058)	(0.061)	(0.072)	(0.078)	(0.023)
1990*Elite	0.132**	0.114*	0.115*	0.140**	-0.059	-0.010
	(0.064)	(0.058)	(0.062)	(0.068)	(0.070)	(0.020)
1991*Ivy Plus	0.092	0.032	0.047	0.129	0.045	-0.022
	(0.081)	(0.075)	(0.078)	(0.092)	(0.093)	(0.027)
1991*Elite	0.112	0.064	0.075	0.139	-0.099	0.005
	(0.085)	(0.078)	(0.082)	(0.090)	(0.084)	(0.020)
N	14,652	14,616	14,616	14,652	14,652	14,652
R-Squared	0.982	0.983	0.982	0.982	0.989	0.960
Interactions with Majors	N	All	Top 3	N	N	N
Interactions with Fract. Parents in Top 5 and Top 1%	N	N	N	Y	N	N

Notes: *** p-value $\leq$ .01, ** p-value $\leq$ .05, * p-value $\leq$ .1. Coefficients are on birth cohort, university tier, *SevereRecession* interactions in equation (2) with different dependent variables. Column 1 presents the results from Figure A.3. Columns 2 and 3 additionally include interactions between birth cohort, indicator for severe recession, and share in major category in 2000 based on the eight classifications of college majors in Chetty et al. (2020), as well as lower level terms. Column 2 includes interactions with all major categories, while column 3 shows interactions with the three categories that have the largest average share at Tier 3-5 universities. Column 4 shows interactions between birth cohort, indicator for severe recession, and fraction with parents in the top 5% of incomes and separately with fraction in top 1% of incomes. I do not show interactions with all tiers for space constraints. See Figure A.3 and text for details.

Figure A.42: **Recession Effects by University Selectivity, Tier 1 Relative to Tier 3-5 (Selective) Universities: Including Interactions with Major Composition**



Notes: Plots are each from a separate estimation of equation (2), and show coefficients on the interaction between birth cohort fixed effects, university tier, and an indicator for severe recession in the CZ from 2007 to 2009. Solid circles show coefficients without including interactions between major composition, birth cohort, and *Severe*. Open circles show coefficients when including in the regression interactions with share in each major category (using the five broad groupings from the ACS), keeping business as its own category, as in the ACS categories. Open triangles show coefficients when including in the regression interactions with share in each major category, grouping business and social science together, rather than grouping social science with science and engineering. This specification is included as roughly 50% of the Tier 1 universities do not offer business degrees. I also show 95% confidence intervals associated with the latter two plots. See text for details.

Table A.12: **Differential 2001-2013 Change in Average SAT scores in Severely Affected CZs, by University Selectivity, Relative to Tier 3-5 Universities**

Y = Change in Average SAT 2001-2013		
Ivy Plus*Severe Recession	51.421*	52.399***
	(31.049)	(20.180)
Tier 1* Severe Recession	-12.266	-5.735
	(18.043)	(17.630)
Tier 2*Severe Recession	-14.899	-30.152
	(23.926)	(24.088)
Interactions between Tier and Change in Parental Income	N	Y
Number of Observations	401	401
R-squared	0.383	0.514

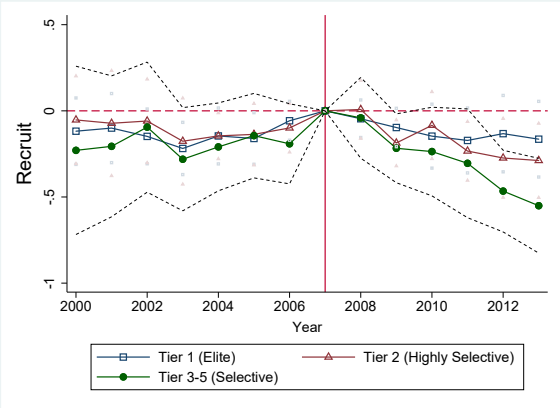
Notes: *** p-value $\leq$ .01, ** p-value $\leq$ .05, * p-value $\leq$ .1. There is one observation per university in the regression. Robust standard errors in parentheses. The regression also includes CZ fixed effects, and university tier fixed effects. The omitted interaction is between Tier 3-5 and Severe Recession. Data on average SAT scores are from the mobility report cards, for 2001 and 2013. These data are not available for universities that do not require SAT scores. We have data for 10 of the 12 Ivy Plus universities, 50 of the 59 Tier 1 universities, 51 of the 73 Tier 2 universities, 368 of the 611 Tier 3-5 universities, 12 of the 79 nonselective four-year not-for-profit and public universities, and zero of the 387 two-year public and not-for-profit colleges. While I include interactions between the nonselective tier and Severe Recession, I do not show the coefficients given the small number of these universities for which we have the data. The second column includes interactions between university selectivity tier fixed effects and the following variables: change in the fraction of students with parents in the second income quintile, the third, fourth, and fifth, and change in the fraction of students with parents in the top 10% of incomes. These changes are measured between the 1983 birth cohort and 1991 birth cohort, to approximate as best as possible given the data constraints, the period over which we are measuring the change in SAT scores.

Table A.13: **Changes in Recruiting Over Time within Firm-University Pairs, by University Tier, Relative to Ivy Plus Universities**

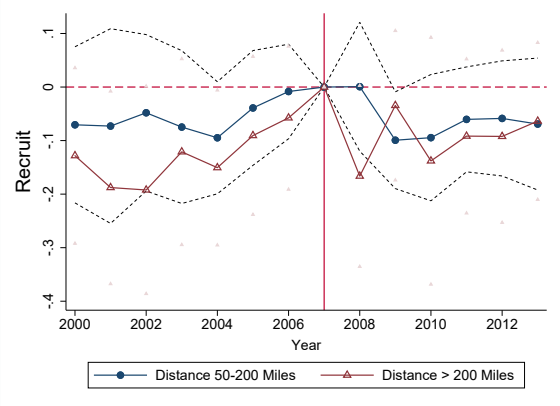
Y = Recruit	Main version			*Recruit*=0 instead of missing		
2000	-0.113*	-0.052	-0.174	-0.061	-0.029	-0.088
	(0.061)	(0.066)	(0.107)	(0.046)	(0.040)	(0.057)
2001	-0.102	-0.070	-0.114	-0.050	-0.040	-0.064
	(0.075)	(0.067)	(0.092)	(0.046)	(0.042)	(0.047)
2002	-0.114	-0.088	-0.076	-0.071	-0.057	-0.060
	(0.077)	(0.067)	(0.075)	(0.054)	(0.044)	(0.054)
2003	-0.183***	-0.100	-0.198**	-0.136**	-0.083	-0.144**
	(0.065)	(0.071)	(0.094)	(0.056)	(0.055)	(0.061)
2004	-0.100	-0.070	-0.134	-0.058	-0.022	-0.088
	(0.071)	(0.059)	(0.082)	(0.053)	(0.047)	(0.061)
2005	-0.170***	-0.118**	-0.201***	-0.140***	-0.098**	-0.191***
	(0.053)	(0.045)	(0.070)	(0.045)	(0.038)	(0.062)
2006	-0.073	-0.062	-0.131	-0.070*	-0.060	-0.134*
	(0.048)	(0.057)	(0.082)	(0.036)	(0.043)	(0.068)
2008	-0.072	-0.009	-0.098	-0.064*	-0.010	-0.094*
	(0.048)	(0.050)	(0.072)	(0.035)	(0.038)	(0.054)
2009	-0.115*	-0.176**	-0.318***	-0.109**	-0.137**	-0.219***
	(0.064)	(0.076)	(0.084)	(0.054)	(0.061)	(0.065)
2010	-0.140*	-0.076	-0.180***	-0.120*	-0.047	-0.121**
	(0.078)	(0.068)	(0.064)	(0.065)	(0.058)	(0.058)
2011	-0.167**	-0.155***	-0.203**	-0.120*	-0.080	-0.110*
	(0.078)	(0.055)	(0.083)	(0.071)	(0.056)	(0.059)
2012	-0.128	-0.115	-0.317***	-0.089	-0.116	-0.242***
	(0.102)	(0.098)	(0.065)	(0.081)	(0.074)	(0.054)
2013	-0.118	-0.159*	-0.410***	-0.113	-0.122	-0.364***
	(0.097)	(0.089)	(0.083)	(0.083)	(0.076)	(0.069)
Tier	Elite	Highly Selective	Selective	Elite	Highly Selective	Selective
N	6,341			9,264		
R-squared	0.723			.726		

Notes: The first three columns are estimated coefficients from the same regression (equation (3)), and correspond to the plots in Figure 4a. Estimates are relative to Ivy Plus universities. Columns four to six are estimated coefficients from the same regression (equation (3)), but use a version of Recruit set to zero instead of missing if the recruiting page is nonarchived for reasons other than being blocked to robots or nonworking links. See text and Figure 4a for details.

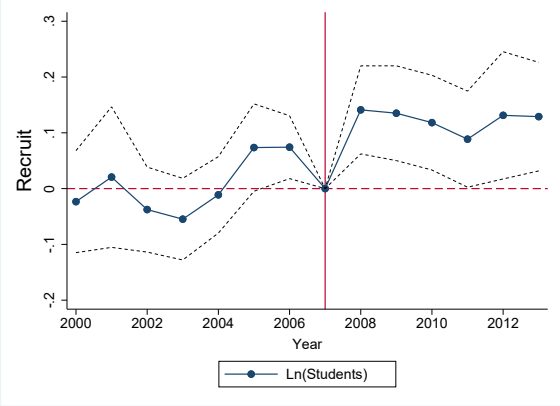
Figure A.43: **Changes in Recruiting Over Time within Firm-University Pairs, by University Characteristics based on the 1985 Birth Cohort, Including Firm-Year Fixed Effects**



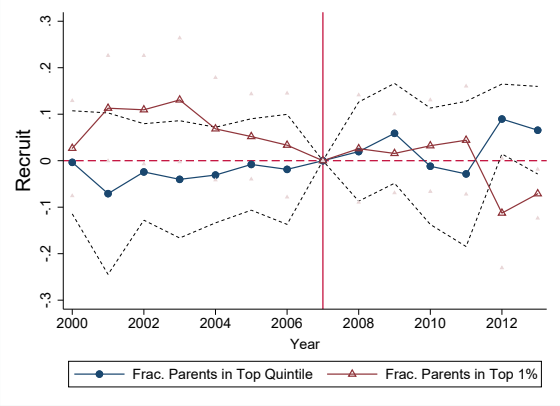
(a) By Tier, Relative to Ivy Plus



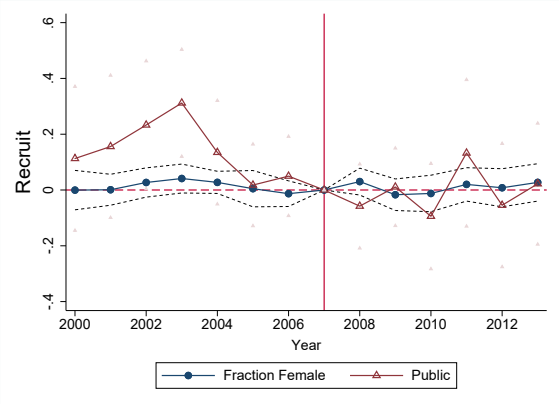
(b) By Firm-Univ. Distance in 2007, Relative to $\leq$ 50 Miles



(c) By ln(Students in 1985 Cohort)



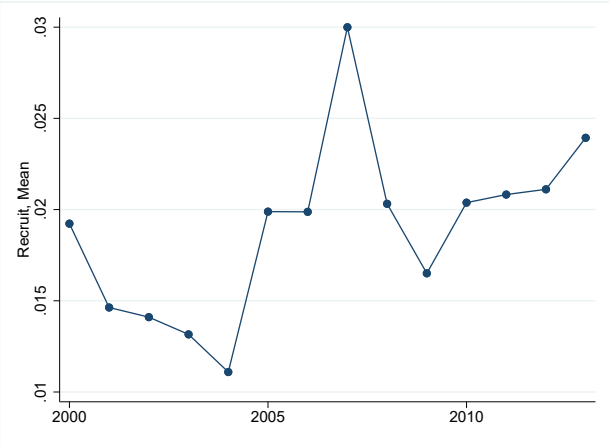
(d) By Parental Income, 1985 Cohort



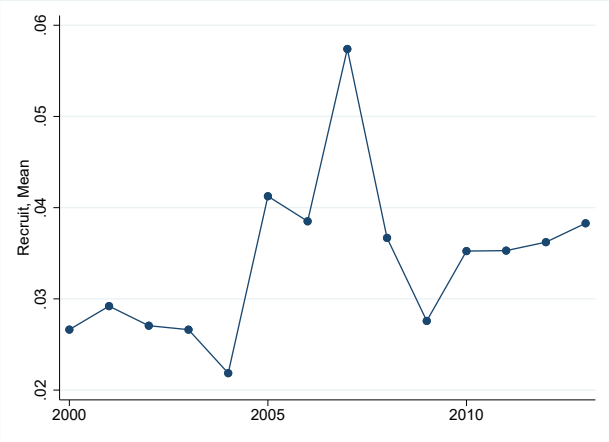
(e) By Public Univ. and Fraction Female, 1985 Cohort

Notes: All coefficients in plots A.43a through A.43e are from one regression, equation (3), and additionally including interactions between these university characteristics and year fixed effects. Dashed lines show 95% confidence intervals for Tier 3-5 universities in A.43a, and for the first plot of all the other subfigures. Lightly-colored markers are upper- and lower-bounds for 95% confidence intervals for the remaining plots. I include only universities not reporting as a system in these regressions, and pairs for which the firm-university distance is not missing. These restrictions were not implemented in Figure 4. Parental income and fraction female are standardized so they are mean zero and standard deviation one in the sample. See text and Appendix A.3 for details.

Figure A.44: **Mean Likelihood of Recruiting Over Time**



(a) All Firms and Universities

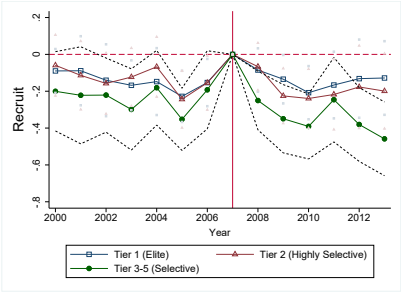


(b) Firm-Univ. Pairs with Non-Missing Recruiting Data in 2007, and Firms that Recruit at least once and universities that attract at least one firm from 2000-2013

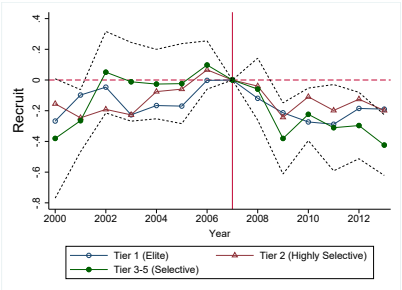
Notes: Figure A.44a shows the mean value of *Recruit* for all firm-university pairs, which includes data for 105 firms and 362 universities. Figure A.44b shows the mean value of *Recruit* for firm-university pairs with non-missing recruiting data in 2007, and firms that recruit at least once from 2000-2013, and universities that attract at least one firm from 2000-2013. This includes data for 65 firms at 236 universities.

Figure A.45: **Changes in Recruiting Over Time by University Tier, Relative to Ivy Plus Universities**

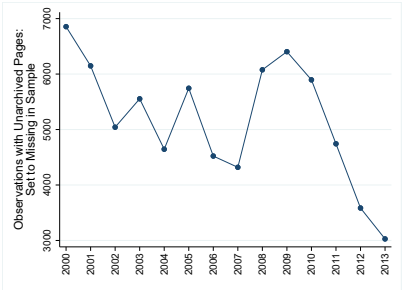
(a) **With Year Fixed Effects**



(b) **Balance in 2007, 2009, 2013**



(c) **Observations with Unarchived Pages**



Notes: Figure A.45a is the same as Figure 4a, but including year fixed effects instead of firm-year fixed effects. Figure A.45b is the same as Figure 4a, but requires that for each firm-university pair in the sample, the pair is in the regression sample in 2007, 2009, and 2013. See notes to Figure 4a for details. Figure A.45c shows the number of firm-university pairs with *Recruit* equal to missing, for reasons other than the website being blocked to robots or having nonworking links. I include in the sum in this figure only firm-university pairs for which the firm recruited at least once during the sample, and the university attracted at least one firm during the sample, and the firm-university pair had data based on this alternative measure in 2007. In Table A.13 columns four through six these are set to zero as this may reflect lack of recruiting.

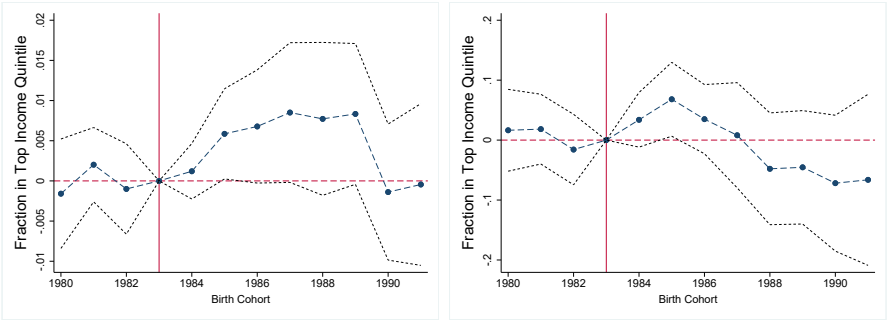
Table A.14: **Firms with Recruiting Data in 2007**

Firm	**Years with Data**	**Sample: Equation** (3)
Banks		
ABN AMRO	2000-2007	N
Bank of America	2005-2007, 2012-2013	Y
BNP Paribas	2001-2002, 2006-2007, 2013	Y
Citi	2000-2009	Y
Gleacher & Company	2000-2013	N
Houlihan Lokey	2000-2004, 2007, 2009-2013	Y
HSBC	2004-2013	N
Jefferies & Company	2000-2013	Y
JP Morgan Chase & Co.	2000, 2003, 2006-2007	N
Lazard	2000-2010	Y
Macquarie Group	2000-2004, 2006-2009	Y
Morgan Stanley	2001-2002, 2005-2009, 2011-2013	Y
Perella Weinberg Partners	2006-2009, 2012-2013	N
Piper Jaffray Companies	2000-2005, 2007, 2010, 2012-2013	Y
Raymond James Financial	2000-2002, 2004-2010, 2012-2013	Y
Robert W. Baird & Co.	2007-2011	Y
Rothschild	2002-2003, 2005-2008, 2011-2013	N
Thomas Wiesel Partners Group	2000, 2007-2009	Y
U.S. Bancorp	2002-2004, 2006-2013	N
Wachovia	2000-2008	Y
Consulting Firms		
A. T. Kearney	2004-2013	N
Analysis Group	2006-2013	Y
Arthur D. Little	2003-2008, 2010, 2012-2013	N
Bain & Company	2000-2007, 2011-2012	Y
BearingPoint	2007-2008	Y
Booz Allen Hamilton	2000, 2006-2009, 2011-2013	Y
Corporate Executive Board	2000-2008, 2010	Y
Dean & Company	2000-2011	Y
First Manhattan Consulting Group	2000-2008, 2010-2012	Y
FTI Consulting	2000, 2004-2007, 2009, 2012-2013	Y
Gallup	2000-2003, 2005, 2007-2013	N
Hewitt Associates	2000-2013	N
Huron Consulting Group	2002-2013	Y

Table A.14 – continued from previous page

Firm	**Years in Sample**	**Sample: Equation** (3)
Kurt Salmon	2000, 2005-2011	Y
Marakon	2000-2001, 2003-2013	N
McKinsey & Company	2007-2013	Y
Mercer	2004, 2006-2011, 2013	Y
Mitchell Madison Group	2003-2013	Y
Navigant	2005-2010, 2012-2013	Y
NERA Economic Consulting	2000, 2003, 2005-2013	Y
OC&C Strategy Consultants	2004-2007, 2011-2013	Y
Oliver Wyman	2001-2013	Y
PA Consulting Group	2003-2005, 2007, 2009-2013	Y
PRTM	2000-2010	Y
Putnam Associates	2000-2009, 2011-2012	Y
Roland Berger	2001-2002, 2006-2009, 2011-2013	N
The Boston Consulting Group	2001-2007, 2009-2013	Y
ZS Associates	2000-2005, 2007-2012	Y
Fortune 250 Firms		
ConAgra Foods	2002-2004, 2006-2008, 2010-2013	Y
ConocoPhillips	2000-2002, 2004-2013	Y
Eli Lilly	2001-2003, 2005-2013	N
General Electric	2000-2013	N
General Mills	2002-2010, 2012-2013	Y
Goodyear Tire & Rubber	2001-2013	N
Halliburton	2004-2005, 2007-2013	N
Honeywell International	2000-2004, 2007-2008, 2010-2013	N
KBR	2004, 2007-2013	Y
Kohl's	2002-2007, 2009-2012	N
Lowe's	2002-2008, 2010-2011	Y
McKesson	2000-2002, 2006-2013	Y
Monsanto	2000, 2002-2003, 2006-2010	Y
National Oilwell Varco	2005-2013	N
Occidental Petroleum	2000-2001, 2004, 2006-2007, 2013	N
PPG Industries	2000-2001, 2006-2009, 2011-2013	N
Progressive	2000-2002, 2006-2008, 2011-2013	N

Figure A.46: **Likelihood of Top Quintile Earnings, Coefficients on Cohort Fixed Effects Interacted with *SevereRecession* and Recruiting Variables**



(a) Number of Recruiting Firms in 2007

(b) Fraction of 2007 Recruiting Firms Dropping the Campus

Notes: Figures A.46a and A.46b show the coefficients on the interactions with the number of recruiting firms in 2007 and the fraction of firms recruiting in 2007 that paused their recruiting at some point between 2008 and 2013, respectively. These are from the same regression as the dashed line in Figure 4c. See text for details on all covariates included in the regression. Dashed lines in Figures A.46a and A.46b show 95% confidence intervals.

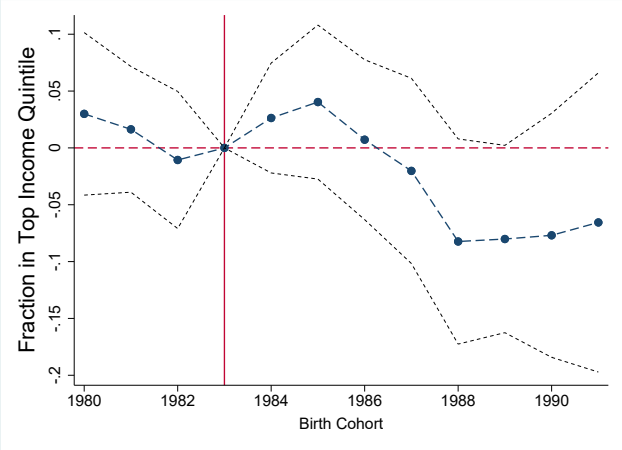
Table A.15: Likelihood of Top Quintile Earnings, Coefficients on Cohort Fixed Effects Interacted with *SevereRecession* and Recruiting Variables

Y = Fraction in Top Quintile Earnings	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Recession*Ivy Plus*Severe	0.028	0.020	0.037	-0.055	0.030	-0.052	-0.022	-0.121
	(0.021)	(0.025)	(0.044)	(0.059)	(0.037)	(0.055)	(0.059)	(0.080)
Recession*Tier 1*Severe	0.024	0.019	0.035	0.006	0.033	0.004	-0.026	-0.070
	(0.017)	(0.017)	(0.034)	(0.034)	(0.027)	(0.029)	(0.050)	(0.060)
Recession*Tier 2*Severe	-0.029	-0.030*	-0.011	-0.026	-0.021	-0.037	-0.056	-0.078*
	(0.018)	(0.018)	(0.038)	(0.035)	(0.031)	(0.029)	(0.038)	(0.040)
Recession*Fraction Firms Leaving*Severe		0.024		-0.047		-0.057*		-0.062*
		(0.031)		(0.033)		(0.030)		(0.032)
Recession*2007 Firms*Severe		0.002		0.005		0.004		0.004
		(0.001)		(0.003)		(0.003)		(0.003)
Recession-CZ Fixed Effects	N	N	Y	Y	Y	Y	Y	Y
Birth Cohort-CZ Fixed Effects	N	N	Y	Y	Y	Y	Y	Y
University Controls	N	N	N	N	Y	Y	Y	Y
Parental Income*Recession*Severe	N	N	N	N	N	N	Y	Y
Observations	1,548	1,548	840	840	840	840	840	840
R-Squared	0.837	0.838	0.925	0.927	0.930	0.932	0.932	0.934

Notes: This table is similar to Table A.2, but additionally including *Recession*FractionFirmsLeaving2008-2013*Severe* interactions as well as *Recession**2007*Firms*Severe* interactions, and on the sample of universities that attracted at least one recruiting firm in my data in 2007. See Table A.2 and Figure 4c for details.

Figure A.47: **Likelihood of Top Quintile Earnings, Tier 1 (Elite) Relative to Tier 3-5 (Selective) Universities: Role of Losing Access to High-Wage Firms, Controlling for Fraction of Firms Dropping the Campus**

Figure A.48: **Likelihood of Top Quintile Earnings, Coefficients on Cohort Fixed Effects Interacted with *SevereRecession*, and Fraction of 2007 Recruiting Firms Dropping the Campus**



Notes: Plots are similar to those in Figures 4c and A.46b, but including interactions with fraction of firms dropping the campus, and not the number of 2007 recruiting firms.

Table A.16: Number of Universities by Tier in Sample with Recruiting as Control

	Severe Recession			Mild Recession		
	No CZ FE	CZ FE	CZ FE With Tier 3-5 (Tier 1)	No CZ FE	CZ FE	CZ FE With Tier 3-5 (Tier 1)
Ivy Plus	8	7	6	4	3	2
Tier 1 excluding Ivy (Elite)	23	13	12	18	14	8
Tier 2 (Highly Selective)	17	8	6	14	8	5
Tiers 3-5 (Selective)	29	12	10	16	5	5

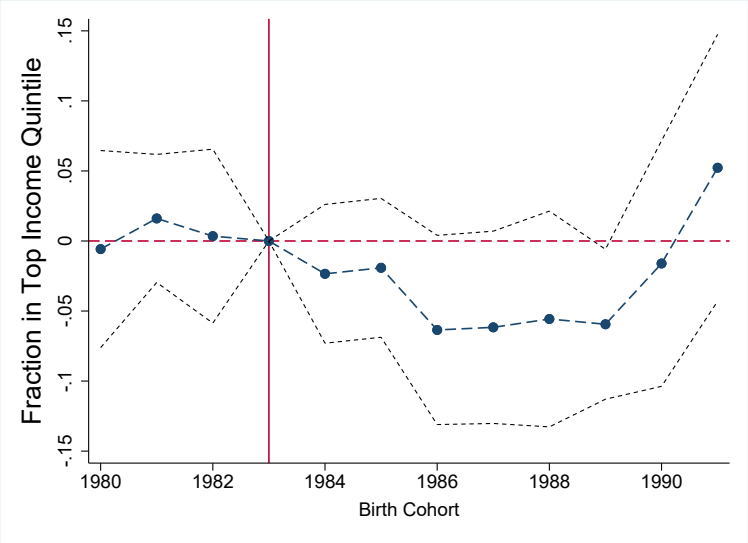
Notes: This table shows the number of universities in the regression samples with recruiting as a control variable (Table (A.15)), by selectivity tier, whether they are located in a severe- or mild-recession CZ, and whether they are in the same CZ as a Tier 3-5 university (denoted in columns 3 and 6). For the Tier 3-5 universities, columns 3 and 6 denote the number of these universities in the same CZ as a Tier 1 university. See text for details.

Table A.17: **Differential Changes in University Characteristics, for Universities Losing Access to Greater Fraction of Prestigious Firms Post-2007**

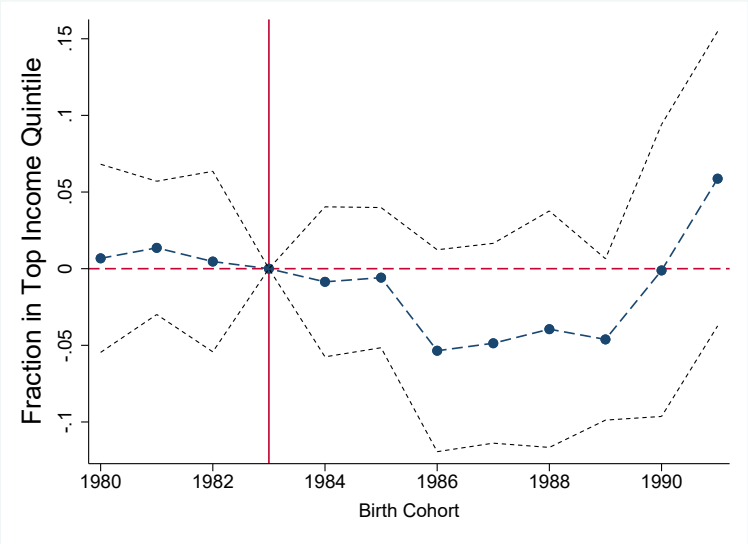
	Share with Parents in Income Quintile					Share with Parent Income in Top					
	1	2	3	4	5	10%	5%	1%	0.10%	Ln(Students)	Share Female
1980**FractionFirmsLeaving2008-2013*	-0.018**	-0.017	0.000	0.024*	0.011	0.033	0.046*	0.020*	-0.000	0.163**	-0.016
	(0.009)	(0.020)	(0.015)	(0.013)	(0.038)	(0.027)	(0.024)	(0.011)	(0.005)	(0.060)	(0.022)
1981**FractionFirmsLeaving2008-2013*	0.002	-0.011	-0.013	0.005	0.016	-0.007	0.021	0.005	-0.001	0.152***	0.011
	(0.010)	(0.015)	(0.013)	(0.020)	(0.029)	(0.027)	(0.024)	(0.010)	(0.005)	(0.051)	(0.026)
1982**FractionFirmsLeaving2008-2013*	-0.011	0.005	-0.010	0.014	0.001	0.015	0.030	0.004	0.000	0.030	0.002
	(0.008)	(0.012)	(0.013)	(0.016)	(0.020)	(0.017)	(0.019)	(0.010)	(0.005)	(0.061)	(0.023)
1984**FractionFirmsLeaving2008-2013*	-0.013	-0.011	0.015	0.048**	-0.038**	-0.011	0.005	-0.003	-0.003	0.022	-0.002
	(0.008)	(0.013)	(0.012)	(0.019)	(0.015)	(0.018)	(0.012)	(0.007)	(0.005)	(0.044)	(0.012)
1985**FractionFirmsLeaving2008-2013*	0.006	0.003	0.018	0.023	-0.051***	-0.018	0.006	-0.000	-0.005	-0.067	-0.031
	(0.012)	(0.017)	(0.015)	(0.024)	(0.018)	(0.016)	(0.020)	(0.006)	(0.005)	(0.074)	(0.021)
1986**FractionFirmsLeaving2008-2013*	0.005	0.025***	0.027***	0.033**	-0.090***	-0.035**	-0.022	0.002	0.004	-0.086	-0.012
	(0.013)	(0.009)	(0.010)	(0.015)	(0.022)	(0.016)	(0.017)	(0.009)	(0.005)	(0.057)	(0.017)
1987**FractionFirmsLeaving2008-2013*	0.013	0.005	0.020*	0.031**	-0.069***	-0.032	-0.030	0.011	0.005	-0.079	-0.021
	(0.015)	(0.012)	(0.010)	(0.013)	(0.018)	(0.022)	(0.023)	(0.009)	(0.005)	(0.084)	(0.018)
1988**FractionFirmsLeaving2008-2013*	0.018	0.016	-0.004	0.028*	-0.057**	-0.023	-0.032	0.000	-0.001	-0.097	-0.032
	(0.011)	(0.013)	(0.012)	(0.014)	(0.027)	(0.025)	(0.025)	(0.008)	(0.005)	(0.070)	(0.021)
1989**FractionFirmsLeaving2008-2013*	0.020	0.014	0.013	0.014	-0.060**	-0.058*	-0.033	-0.003	-0.000	-0.075	-0.021
	(0.013)	(0.015)	(0.017)	(0.016)	(0.030)	(0.031)	(0.024)	(0.011)	(0.005)	(0.079)	(0.038)
1990**FractionFirmsLeaving2008-2013*	0.018	0.013	0.029***	0.038**	-0.099***	-0.061	-0.022	-0.022	-0.004	-0.110	0.007
	(0.011)	(0.014)	(0.010)	(0.016)	(0.026)	(0.037)	(0.030)	(0.017)	(0.005)	(0.084)	(0.026)
1991**FractionFirmsLeaving2008-2013*	0.025**	0.008	0.012	0.041**	-0.086*	-0.076	-0.032	-0.008	-0.000	-0.122	-0.001
	(0.012)	(0.019)	(0.017)	(0.019)	(0.048)	(0.046)	(0.038)	(0.017)	(0.005)	(0.092)	(0.035)
Observations	432	432	432	432	432	432	432	432	432	432	432
R-squared	0.974	0.971	0.946	0.906	0.983	0.986	0.984	0.979	0.908	0.996	0.991
CZ-Cohort-Tier FE	Yes										
University FE	Yes										

Notes: *** p-value $\leq$ .01, ** p-value $\leq$ .05, * p-value $\leq$ .1. This table shows the results from estimating equation (4), but using the characteristics X as dependent variables. All columns include a balanced sample, CZ-birth cohort-university selectivity tier fixed effects, and university fixed effects. See text for details.

Figure A.49: **Earnings Outcomes, for Universities Losing Access to a Greater Fraction of Prestigious Firms Post-2007, CZ-Cohort-Tier Fixed Effects**



(a) Including parent income interactions



(b) Not including parent income interactions

Notes: Dashed lines show 95% confidence intervals. Plots show coefficients, from equation (4), on the interaction between birth cohort fixed effects and the fraction of 2007 recruiting firms who cease recruiting at the university at some point between 2008 and 2013. Plot A.49a shows results when additionally including interactions between birth cohort and fraction of parents in the top income quintile. Plot A.49b does not include those interactions, but includes controls for parental income measures. The sample includes only universities with data for each cohort. See text for details on all covariates included in the regression.