

## Background

In the 2018-2019 academic year, international students in undergraduate and graduate programs in U.S. colleges and universities account for 39.4% and 34.5%, respectively, and those in Optional Practical Training (OPT) account for 20.4% of 1,095,299 international students (Institute of International Education, 2019).

### What is OPT visa?

OPT is a temporary employment program that permits international students with F-1 visas to work up to 12 months in the United States before and/or after completing their degrees, and it provides international students with opportunities to seek employment and apply for an H-1B work visa.

In April 2008, the Department of Homeland Security (DHS) announced a new rule that allows international students with degrees in STEM fields to apply for a 17-month extension following the completion of their OPT. A STEM degree thus increases accessibility to the U.S. job market for international students by allowing them to stay longer in the United States. In May 2012, DHS expanded the list of STEM majors eligible for the OPT extension. Compared to studies on student choices, little is known about supply side responses to the changes in immigration policies.

### Research questions are:

- How did business colleges and departments respond to the STEM OPT extension rule?
- What is the effect of the OPT extension rule on the number of domestic and foreign students' STEM degree attainment?

## Data

I use a sample from the academic years 2006-2007 to 2017-2018 consists of 241 four-year institutions offering business-related CIP code degree programs from the Integrated Postsecondary Education Data System (IPEDS).

### Why use business-related majors?

DHS designated management science and quantitative methods (CIP code: 52.13) as STEM-eligible majors among 21 business-related 4-digit CIP codes. CIP codes determine eligibility for an OPT extension. I exploit the fact that only one 4-digit CIP code out of 21 CIP codes in business-related fields are listed as a STEM major when DHS expanded the STEM-eligible major list.

In most engineering and sciences majors, any CIP code under the broad 2-digit CIP code is eligible for the STEM OPT extension. Hence, engineering and sciences departments could attract international students interested in the STEM education without creating a new STEM program. On the other hand, business departments needed to offer new degree programs in the specific CIP code (CIP code: 52.13) to be qualified for the STEM OPT extension rule.

## Empirical strategy

I estimate a difference-in-differences model (1) and an event-study model (2) using the major code level data at U.S. universities.

$$Y_{ict} = \beta_0 + \beta_1 POST_t \times STEM_c + \beta_2 STEM_c + X_i \gamma + \delta_t + \epsilon_{ict} \quad (1)$$

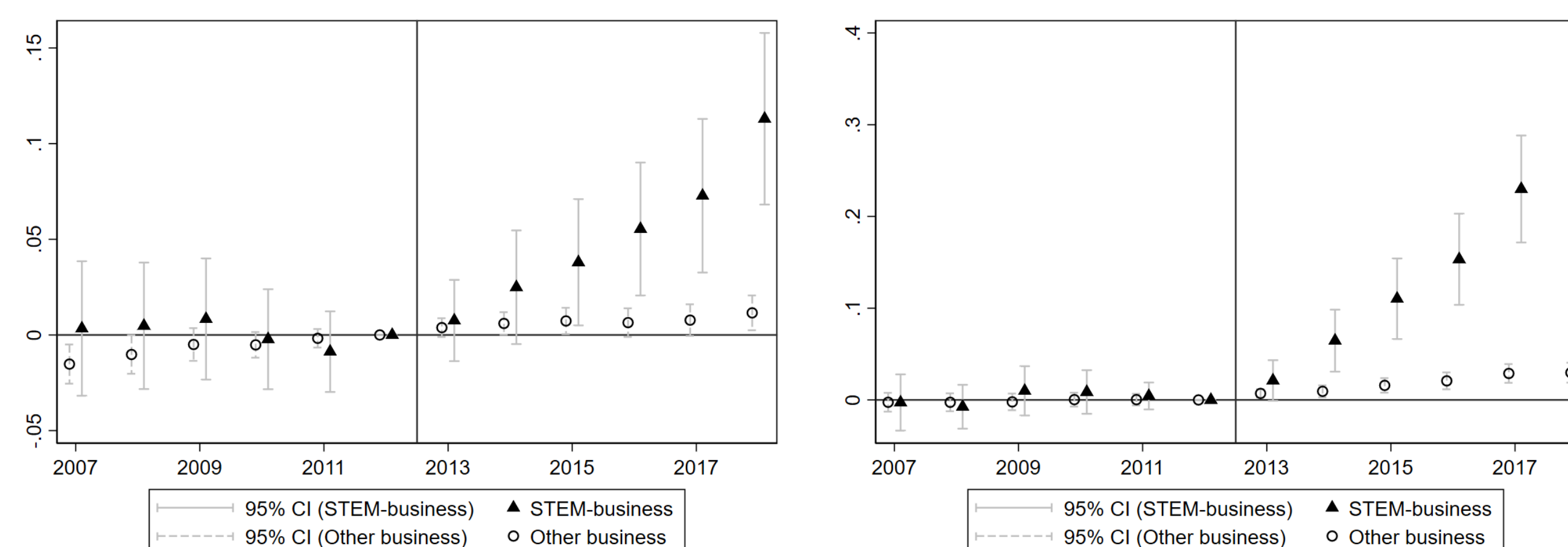
for  $t \in \{2007, \dots, 2018\}$ .  $Y_{ict}$  is a dependent variable of interest at university  $i$ , major CIP code  $c$  at degree level  $l$  at year  $t$ .  $POST_t$  is a binary variable equal to 1 if  $t$  is later than 2012 and 0 otherwise.  $STEM_c$  is a binary variable equal to 1 if the major CIP code  $c$  at university  $i$  is eligible for the STEM extension after the rule change and 0 otherwise.

$$Y_{ict} = \beta_0 + \sum_{y=-6}^5 \alpha_y \mathbf{1}(t - t^* = y) \times STEM_c + \beta_1 STEM_c + X_i \gamma + \delta_t + \epsilon_{ict} \quad (2)$$

for  $t \in \{2007, \dots, 2018\}$  and  $t^* = 2013$ . The coefficients  $\alpha_y$  represent the effect on outcome  $Y_{ict}$  in STEM business programs relative to non-STEM business programs in year  $t$  relative to year 2013.

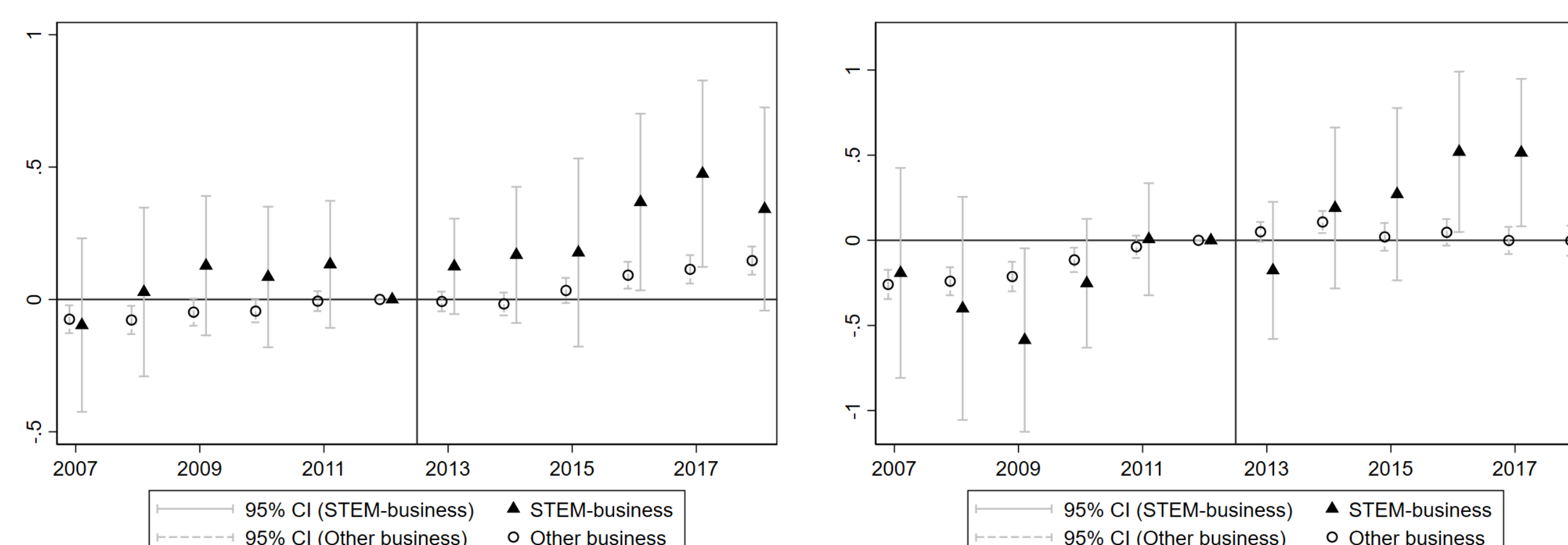
## Results

Figure 1: Effects on degree program offerings: Event-study model  
(a) Bachelor's (b) Master's



Figures 1(a) and 1(b) illustrate that STEM degree program offerings increase after the inclusion of STEM-OPT eligible list. Master's program and bachelor's program show a statistically significant difference between stem-eligible business and non-stem business programs. Event-study estimates show that the probability of offering STEM business programs increases by 1.9 to 10.2 percentage points one to five years after the visa policy change at the bachelor's level and 5.5 to 25.5 percentage points at the master's level.

Figure 2: Effects on degrees awarded: Event-study model  
(a) Bachelor's (b) Master's



Figures 2(a) and 2(b) show that the extension of OPT period increases the number of degrees awarded in STEM business majors compared to degrees awarded in other business majors. The estimate of year 3 (0.498) represents a 64.5% increase in the number of degrees awarded in STEM-degree programs at the master's level.

When STEM-designated business programs are offered, nonresidents and residents may respond differently. I separately estimate the effect of the OPT extension on the number of degrees awarded to nonresident and resident students (model (1)).

Table 1: Effects on degrees awarded by resident status

	All	BA	MA
Panel A: Effects on ln(Degrees awarded to nonresidents)			
STEM Business ×	0.333***	0.185*	0.526***
Post-2013	(0.102)	(0.112)	(0.173)
Panel B: Effects on ln(Degrees awarded to residents)			
STEM Business ×	0.073	0.076	0.264
Post-2013	(0.099)	(0.109)	(0.189)

Table 1 shows that when a department offers a STEM-designated degree program, the number of degrees awarded to international students increases by 39.5% compared to other business majors. The OPT extension has a larger effect on master's programs which include career-oriented programs. I do not find a statistically significant result for domestic students. Resident students may not have enough incentive to major in STEM-business programs compared to the case of international students. Note that three most popular CIP codes in business majors (Business Administration, Management and Operations (52.02), Accounting and Related Services (52.03), Finance and Financial Management Services (52.08)) are not eligible for the STEM OPT extension.

## Discussion

The growing number of international students applying for the OPT visa and their impact on U.S. economy and labor market illustrate the importance of immigrant policies related to U.S. higher education. This paper examines the effects of changes in the visa policy on the responses of university departments and students.

When implementing an immigration policy that applies to foreign students and workers, it is important to understand the effect on the supply of STEM programs and the demand of nonresident students, because the net changes in the number of STEM degree holders is affected by the responses from both the departments and the students. As DHS continues to expand the STEM-designated degree list, the agency could target specific field as this paper shows that there are enough incentives for departments to offer and for international students to major in a STEM-designated degree program.