

# **Global Firms, Local Students: Multinational Presence Shapes College Major Choice**

---

Jose Rojas-Fallas

October 17, 2025

# Why Do We Care?

- Multinationals affect receiving nations ([Harrison and Rodríguez-Clare, 2010](#))
- Economic growth is pushed forward by the accumulation of physical and **human capital**
  - ([Romer, 1990; Caballé and Santos, 1993; Barro, 1996, 2003](#))
- Evidence of FDI and Education being linked
  - ([Atkin, 2016; Blanchard and Olney, 2017](#))
  - ([Mughal and Vechiu, 2011; Kheng et al., 2017; Dey and Mishra, 2018](#))
- Developing economies have increasingly attracted more FDI in recent years 

# Motivation

- FDI affects local labor markets through different channels
- Employment shifts toward the ends ([Blanchard and Willmann, 2016](#); [Goos et al., 2014](#))
- FDI inflows effects vary by region and country ([Alvarado et al., 2017](#))
- Central America has seen a significant increase in FDI inflows, with Costa Rica being a prominent country ▶ Regional ▶ Relative
- Evidence of MNC wage premia ([Alfaro-Ureña et al., 2021](#))

## Context

- Public universities require applicants to list their two preferred majors when applying
  1. Helps construct a demand for major, rather than observing equilibrium enrollment outcomes
  2. Applicants submit relevant demographic information
- Costa Rica provides incentives for FDI inflows through their Free Trade Zone (FTZ) regime
  1. Firms locate within dedicated industrial parks
  2. The FTZ regime has become a significant portion of all FDI inflows entering Costa Rica (>60% of all FDI \$s in the last 5 years)

# Research Question

## Does the Presence of Multinational Corporations Influence Major Choice?

- Leverage industry-district-year variation in MNC presence to look at field-of-study choice effects for individuals

## Empirical Strategy

- Create Gravity Model-inspired MNC Presence Index at industry-district-year level
- Group individual majors creating broad field-of-study categories
- Look at within field-of-study choices for more detailed analysis

## Preview of Results

- An increase in the presence of Manufacturing MNCs increases the probability of choosing a discipline within STEM and Applied Sciences by 0.84 p.p.
  - Decreases probability of choosing Arts by 0.56 p.p. and Social Sciences by 0.29 p.p.
- Synergy between field of study and industry is an important factor in identifying effects
- Heterogeneity effects by sex shows minimal differences
  - Female students increase their probability to choose a STEM discipline by almost 3 times as much as men

# Contribution

- Literature on determinants of college major choice
  - Wages ([Carneiro et al., 2011; Arcidiacono et al., 2012, 2020; Beffy et al., 2012; Carroll et al., 2014; Kirkeboen et al., 2016; Bleemer and Mehta, 2022](#))
  - Non-pecuniary ([Altonji, 1993](#))
  - Ability and preference sorting ([Arcidiacono, 2004; Kinsler and Pavan, 2015](#))
  - Information availability ([Jensen, 2010; Kaufmann, 2014](#))
- Increased Trade/FDI participation effects on local labor markets ([Feenstra and Hanson, 1997; Atkin, 2016; Blanchard and Willmann, 2016; Alfaro-Ureña et al., 2021](#))

## Admissions Process

- Decentralized admissions process
- Universities have an comprehensive exam which produces an entry score
- Each applicant then lists their preferred 2 majors, in order, when applying ▶ Example
- Applicants are then ordered by major-entry score and are admitted until all available seats are full

## FTZ Regime

- Firms are located inside an industrial park
- Exclusive use for firms under the regime and managed by a private administrator
- The acceptance process is managed by the government institution (PROCOMER)
- The FTZ regime has become an important destination (>60% in the last 5 years) 

# Utility

Individuals choose a field-of-study subject to the utility function:

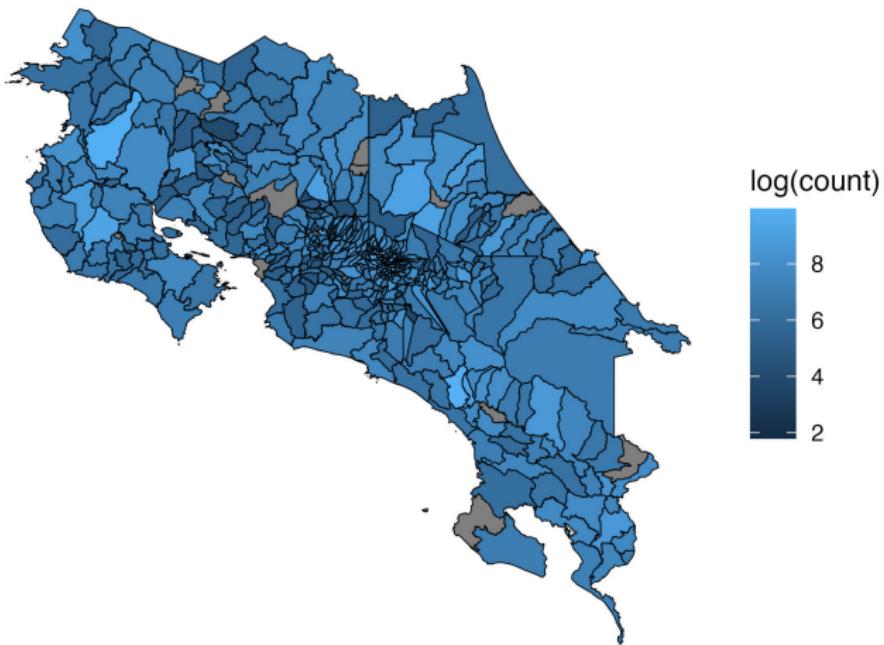
$$U_{idmt} = \beta_m \left( \sum_j p_{mjt} \times \Gamma_{djt} \right) + \gamma_i X'_i + \alpha_c + \alpha_t + \varepsilon_{idmt}, \quad (1)$$

## Subscripts

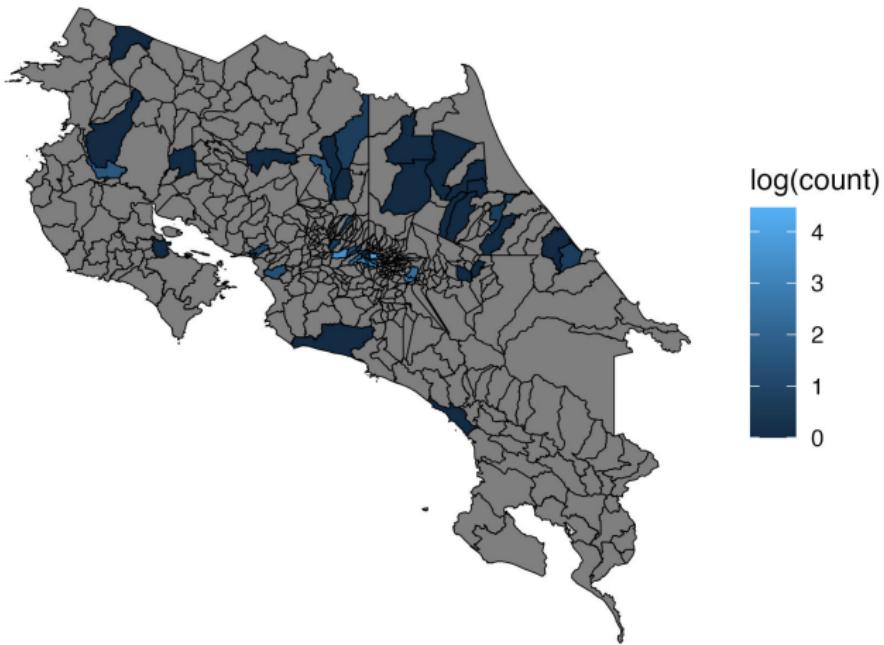
$i$  = individual,  $d$  = district,  $m$  = field-of-study,  
 $j$  = industry,  $c$  = canton,  $t$  = year

- $\Gamma_{djt}$ : MNC Presence Index
- $p_{mjt}$ : Industry Attachment Probabilities
- $X'_i$ : Individual Characteristics Vector
- $\alpha_c$ : Canton Fixed Effect
- $\alpha_t$ : Year Fixed Effect

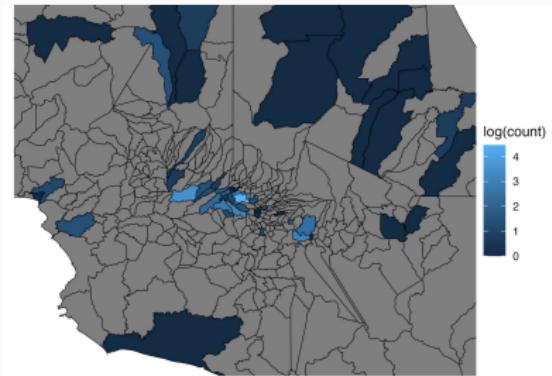
# Student Location



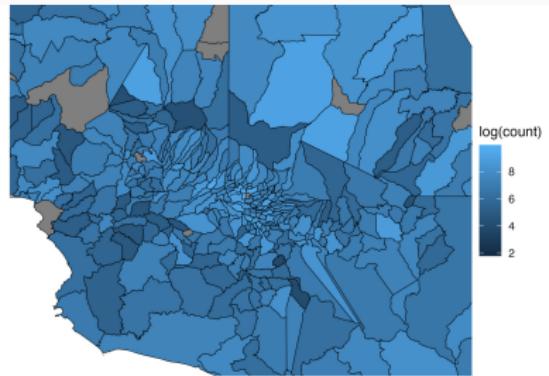
# Firm Location



# Central Valley Concentration



**Figure 1:** Firm Concentration



**Figure 2:** Student Concentration

# MNC Presence Index

$$\Gamma_{djt} = \sum_{d'} \sum_{f \in F_{jd't}} \frac{\tau_{f \in F_{jd't}}}{\exp(\mu^{\rightarrow dd'})}, \quad (2)$$

## Subscripts

- $d$ : district
- $\tau_{f \in F_{jd't}}$ : tenure of firm  $f$  in industry  $j$  in district  $d'$  operating in year  $t$
- $\mu^{\rightarrow dd'}$ : Distance (in km) from district  $d$  (student) to district  $d'$  (firm)

## Estimation Method

- Multinomial Logit (MNL) estimation and then estimate the Average Marginal Effects (AMEs) by industry

$$P(Y_i = m) = \frac{\overbrace{\exp(\beta_m \left( \sum_j p_{mjt} \times \Gamma_{djt} \right) + \gamma_i X'_i + \alpha_c + \alpha_t + \varepsilon_{idmt})}^{\text{Utility of chosen field-of-study}}}{\sum_{m'} \underbrace{\exp(\beta_{m'} \left( \sum_j p_{m'jt} \times \Gamma_{djt} \right) + \gamma_i X'_i + \alpha_c + \alpha_t + \varepsilon_{idm't})}_{\text{Utilities across all possible field-of-study choices}}} \quad (3)$$

### Subscripts

$i$  = individual,  $d$  = district,  $m$  = field-of-study,

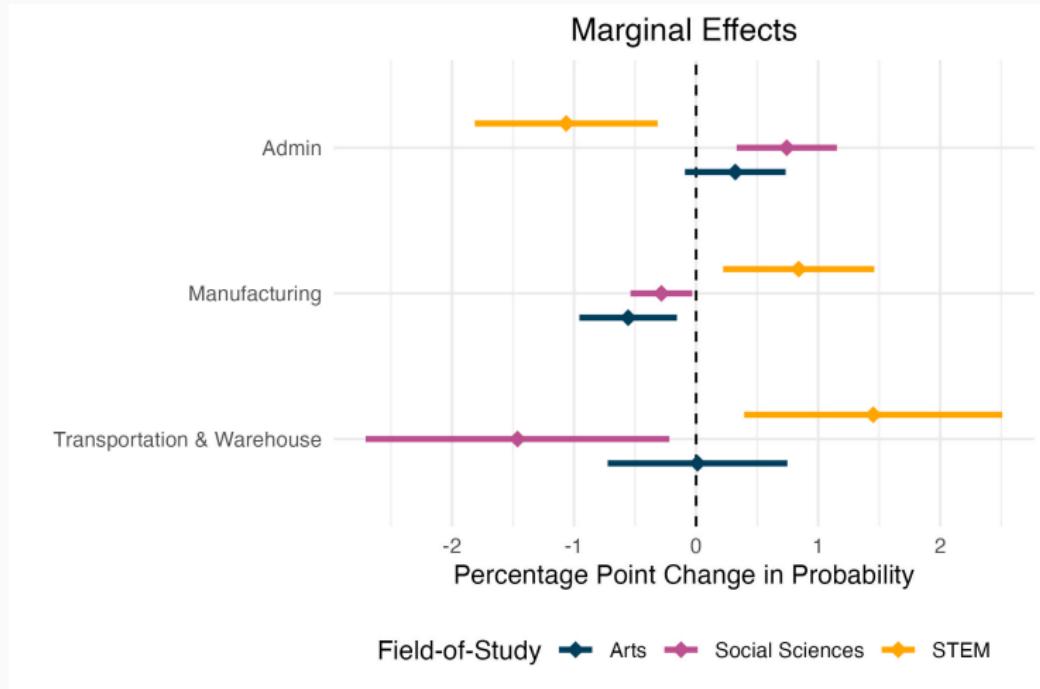
$j$  = industry,  $c$  = canton,  $t$  = year

# Average Marginal Effects by Industry × Field of Study Pairing

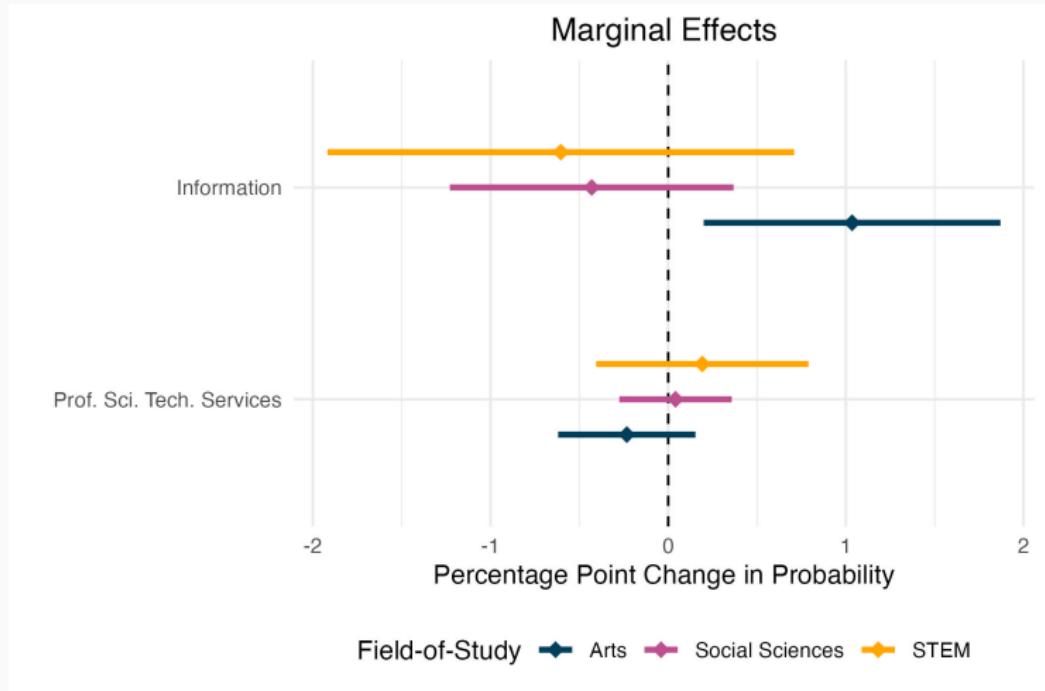
	Field of Study Choice		
	Arts, Writing & Culture	STEM & Applied Sciences	Social Science & Prof. Studies
Administration	0.3212 (0.2104)	-1.064*** (0.382)	0.743*** (0.2096)
Information	1.0349** (0.4261)	-0.6043 (0.6701)	-0.4307 (0.4074)
Manufacturing	-0.5566*** (0.2038)	0.8408*** (0.3158)	-0.2842** (0.1293)
Prof. Science & Tech. Services	-0.2331 (0.1972)	0.1919 (0.3049)	0.0412 (0.1614)
Transportation & Warehouse	0.0118 (0.3755)	1.4516*** (0.5395)	-1.4633** (0.6348)
Wholesale	3.8000* (1.9937)	-7.7612** (3.3693)	3.9612*** (1.5092)
Controls	✓	✓	✓
District FE	✓	✓	✓
Year FE	✓	✓	✓
Applications	20,985	92,273	116,904
Pseudo-R2	0.0436	0.0436	0.0436

Statistical significance is displayed as \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$

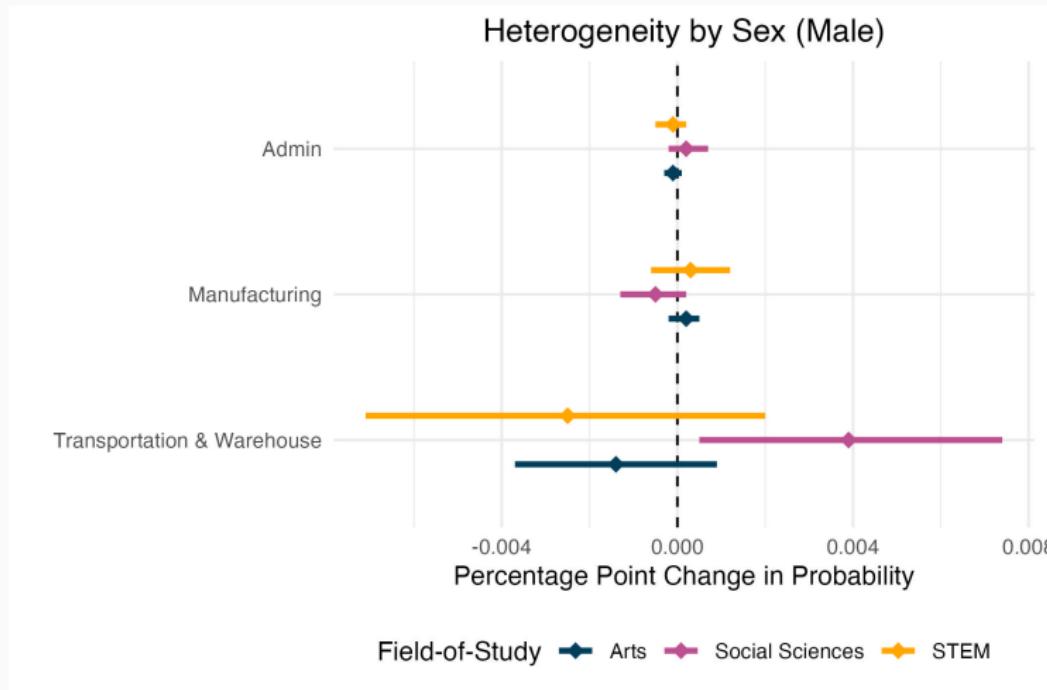
# Results



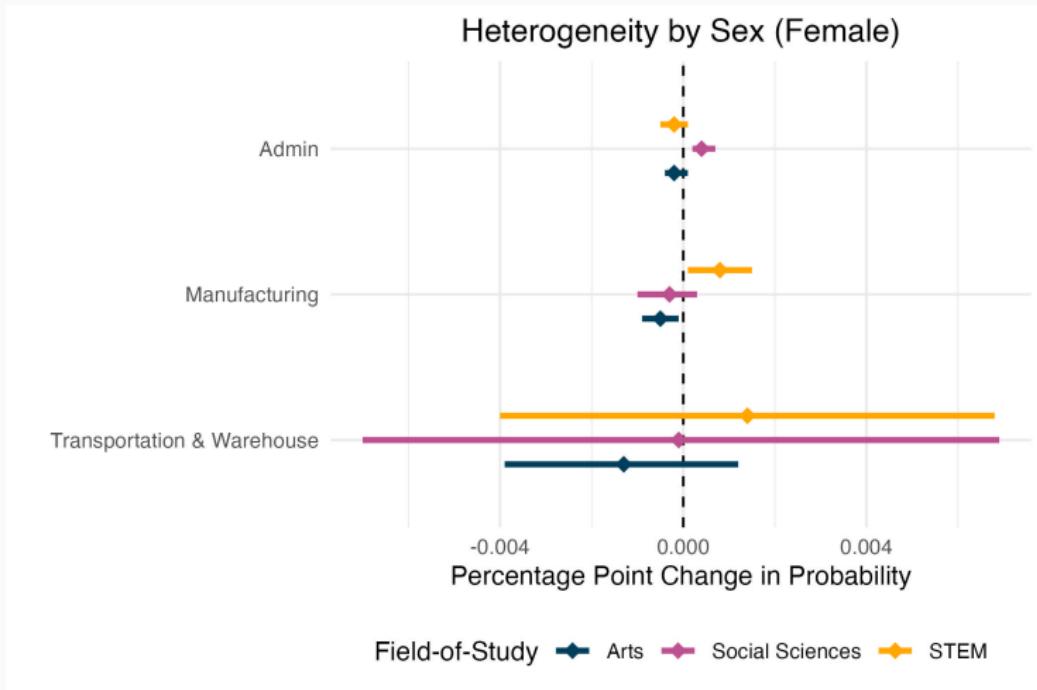
# Results



# Heterogeneity (Male)



# Heterogeneity (Female)



## Conclusion

- Multinationals do more than create jobs, they reshape local incentives to acquire certain skills
- I ask whether this influence impacts students **before** they enter the labor market, affecting their choice of university academic discipline
- By combining administrative university application data with multinational-firm level information on location and industry, I estimate how exposure to MNC activity shapes field-of-study preferences
- Results show that students likely choose majors that better align with those industries' skill needs
- This highlights a new channel through which foreign investment shapes the formation of human capital in developing economies

## References

---

- Alfaro-Ureña, A., Isabela, M., and Vasquez, J. (2021). The Effects of Multinationals on Workers: Evidence from Costa Rican microdata. *Working Paper*, No. 285.
- Altonji, J. G. (1993). The Demand for and Return to Education When Education Outcomes are Uncertain. *Journal of Labor Economics*, 11(1).
- Alvarado, R., Iñiguez, M., and Ponce, P. (2017). Foreign direct investment and economic growth in Latin America. *Economic Analysis and Policy*, 56:176–187.
- Arcidiacono, P. (2004). Ability sorting and the returns to college major. *Journal of Econometrics*, 121(1-2):343–375.
- Arcidiacono, P., Hotz, V. J., and Kang, S. (2012). Modeling college major choices using elicited measures of expectations and counterfactuals. *Journal of Econometrics*, 166(1):3–16.
- Arcidiacono, P., Hotz, V. J., Maurel, A., and Romano, T. (2020). Ex Ante Returns and Occupational Choice. *Journal of Political Economy*, 128(12):4475–4522.

## References ii

- Atkin, D. (2016). Endogenous Skill Acquisition and Export Manufacturing in Mexico. *American Economic Review*, 106(8):2046–2085.
- Barro, R. J. (1996). Determinants of Economic Growth: A Cross-Country Empirical Study. *NBER*, Working Paper 5698.
- Barro, R. J. (2003). Determinants of Economic Growth in a Panel of Countries. *Annals of Economics and Finance*, 4:231–274.
- Beffy, M., Denis, F., and Maurel, A. (2012). Choosing the Field of Study in Postsecondary Education: Do Expected Earnings Matter? *The Review of Economic and Statistics*, 94(1):334–347.
- Blanchard, E. and Willmann, G. (2016). Trade, education, and the shrinking middle class. *Journal of International Economics*, 99:263–278.
- Blanchard, E. J. and Olney, W. W. (2017). Globalization and human capital investment: Export composition drives educational attainment. *Journal of International Economics*, 106:165–183.
- Bleemer, Z. and Mehta, A. (2022). Will Studying Economics Make You Rich? A Regression Discontinuity Analysis of the Returns to College Major. *American Economic Journal: Applied Economics*, 14(2):1–22.

## References iii

- Caballé, J. and Santos, M. S. (1993). On Endogenous Growth with Physical and Human Capital. *Journal of Political Economy*, 101(6):1042–1067.
- Carneiro, P., Heckman, J. J., and Vytlacil, E. J. (2011). Estimating Marginal Returns to Education. *American Economic Review*, 101(6):2754–2781.
- Carroll, T., Assane, D., and Busker, J. (2014). Why it Pays to Major in Economics. *The Journal of Economic Education*, 45(3):251–261.
- Dey, D. and Mishra, A. S. (2018). A Study on FDI in Education Sector and Its Impact on Gross Enrolment Ratio in Higher Education in India: An Econometric Approach. *International Journal of Management Studies*, V(3(6)):44.
- Feenstra, R. and Hanson, G. (1997). Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladors. *Journal of International Economics*, 42:371–393.
- Goos, M., Manning, A., and Salomons, A. (2014). Explaining Job Polarization: Routine-Biased Technological Change and Offshoring. *American Economic Review*, 104(8):2509–2526.

## References iv

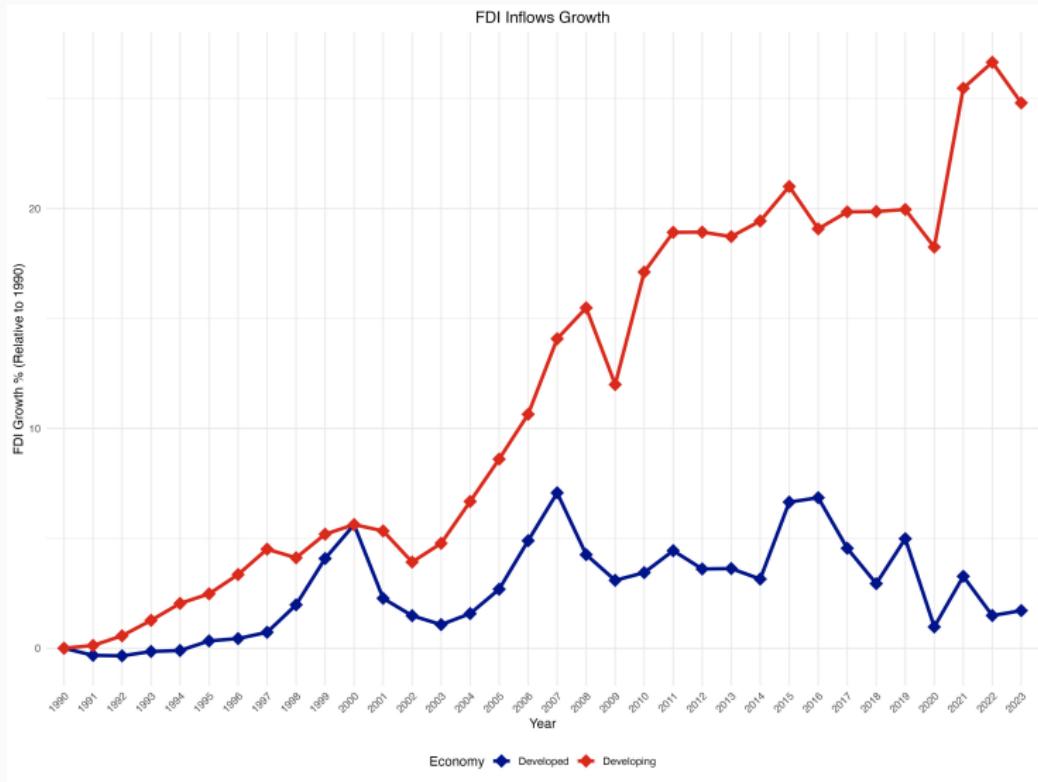
- Harrison, A. and Rodríguez-Clare, A. (2010). Chapter 63 - trade, foreign investment, and industrial policy for developing countries\*. In Rodrik, D. and Rosenzweig, M., editors, *Handbooks in Economics*, volume 5 of *Handbook of Development Economics*, pages 4039–4214. Elsevier.
- Jensen, R. (2010). The (Perceived) Returns to Education and the Demand for Schooling. *The Quarterly Journal of Economics*, 125(2):515–548.
- Kaufmann, K. M. (2014). Understanding the income gradient in college attendance in Mexico: The role of heterogeneity in expected returns: Income gradient in college attendance. *Quantitative Economics*, 5(3):583–630.
- Kheng, V., Sun, S., and Anwar, S. (2017). Foreign direct investment and human capital in developing countries: a panel data approach. *Economic Change and Restructuring*, 50(4):341–365.
- Kinsler, J. and Pavan, R. (2015). The Specificity of General Human Capital: Evidence from College Major Choice. *Journal of Labor Economics*, 33(4):933–972.
- Kirkeboen, L. J., Leuven, E., and Mogstad, M. (2016). Field of Study, Earnings, and Self-Selection\*. *The Quarterly Journal of Economics*, 131(3):1057–1111.

## References v

- Mughal, M. and Vechiu, N. (2011). The role of Foreign Direct Investment in higher education in the developing countries (Does FDI promote education?).
- Romer, P. M. (1990). Endogenous Technological Change. *JPE*, 98(5):71–102.

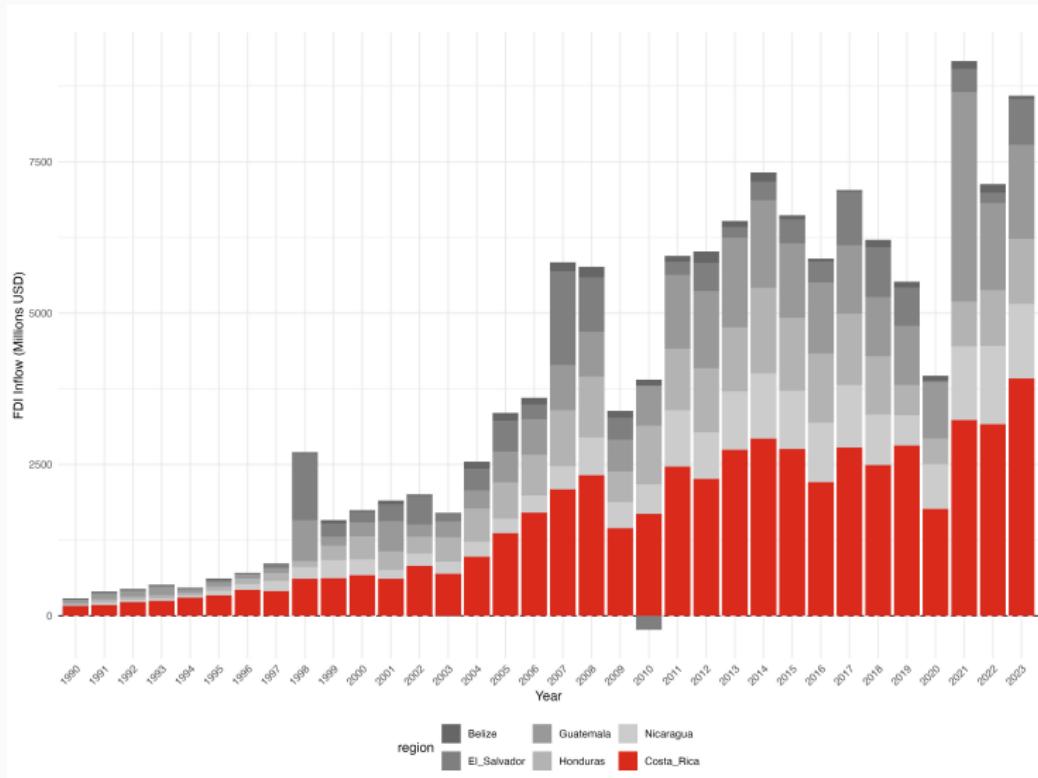
# FDI Growth in Developing Nations

[◀ Return](#)



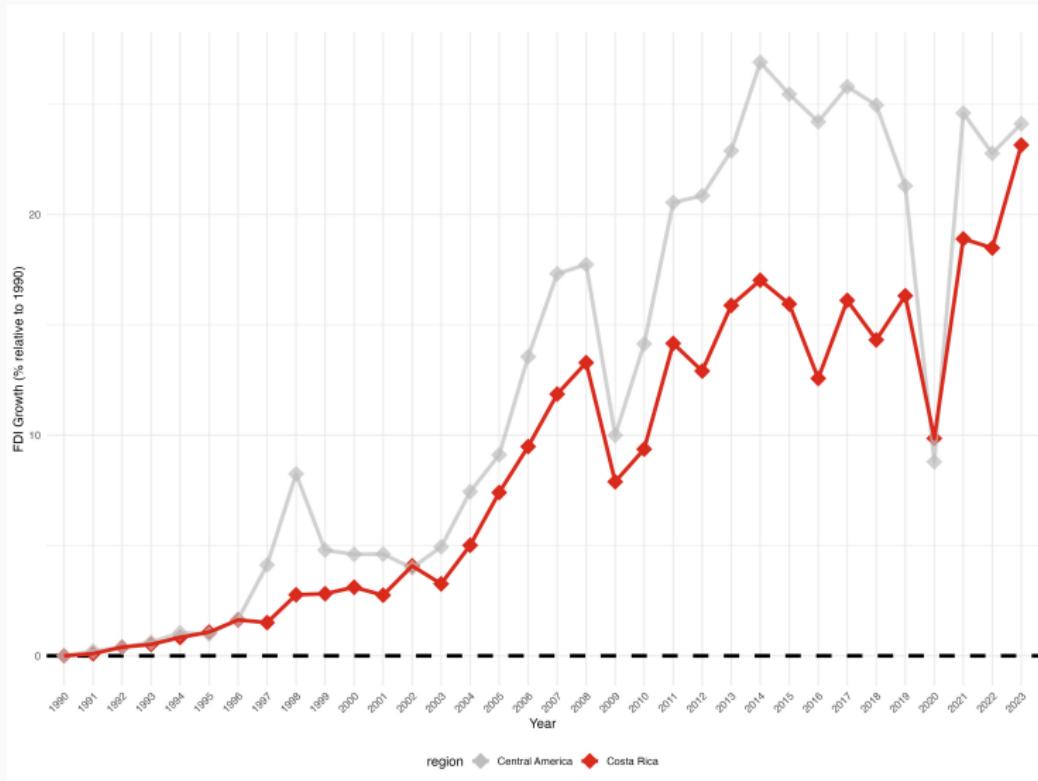
# Costa Rica Share of Central America FDI Inflows

[◀ Return](#)



# Costa Rica FDI Growth Relative to Central America

[◀ Return](#)



# Application Rank-Order Major Preference Example

[◀ Return](#)

6a

Opción 1

3	1	0	1	0	1
---	---	---	---	---	---

Código de carrera

Bachillerato y Licenciatura en Derecho

Nombre de la carrera

1	1
---	---

Código del recinto

--	--

Código del recinto

Sede Rodrigo Facio

Nombre del recinto

Nombre del recinto

Opción 2

2	1	0	1	0	1
---	---	---	---	---	---

Código de carrera

Bachillerato y Licenciatura en Biología

Nombre de la carrera

1	1
---	---

Código del recinto

Sede Rodrigo Facio

Nombre del recinto

# FDI into FTZ Regime

[◀ Return](#)

