

FDI and College Major Choice

Job Market Paper

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Abstract

Multinational firms shape local economies by changing the returns of skill acquisition and through changes in labor demand. In this paper, I study a specific pathway through which they do so, by reorienting college graduates towards fields of specialization in demand by Multinational Corporations (MNCs). Using administrative data from a large public university in Costa Rica, I examine whether the local presence of MNCs affects the field-of-study preference of prospective university students. To capture local exposure to MNC activity, I develop a measure of multinational firm presence by industry and location, incorporating spatial proximity between firms and university applicants. I estimate a multinomial logit model where students choose among broad field-of-study categories, allowing for heterogeneous effects to MNC presence across industry and academic discipline pairings. Results show that MNCs impact students decisions, with effects varying by industry and field-of-study. These findings highlight an important and previously understudied channel through which FDI can shape human capital formation in receiving nations.

1 Introduction

Over the past several decades, Foreign Direct Investment (FDI) has become a driving force in shaping developing economies. In FDI-receiving countries, Multinational Corporations (MNCs) not only influence wages, productivity, and technology adoption, but also alter the composition of local labor markets ([Melitz, 2003](#)). A key, but underexplored question is how FDI may influence the skills that individuals choose to acquire through tertiary education.

This paper provides an answer to whether the presence of MNCs influences prospective university students' decision about which field-of-study to pursue. I study this in Costa Rica, which has experienced significant growth in FDI inflows since 2009. This setting is particularly well-suited because of their Free Trade Zone (FTZ) regime which serves as a dedicated system for attracting FDI investments and the detailed administrative level education data from a large public university, which requires students to list their field-of-study preference prior to being admitted. The combination of this unique administrative education data and identifiable spatial variation in local exposure to MNCs across time allows me to examine how MNC presence shapes demand for specific fields in high-skill individuals.

I use a Multinomial Logit (MNL) model of field-of-study choice where students are differentially exposed to MNCs based off their district of residence and year of application. MNC exposure is captured by a tenure-weighted presence index which is derived from a Gravity model approach using both the firm's and applicant's residence. I then create industry/field-of-study attachment probabilities using the American Community Survey (ACS) for the sample years. This allows for field-of-study choices to have a proportionate and market-relevant response to each industry and allows for heterogeneous responses across field-of-study \times industry.

I find that greater exposure to MNCs does have affect the probability that students choose a specific field-of-study, with effects varying across field-of-study \times industry pairings. Notably, an increase in the presence of MNCs in the Manufacturing industry, the largest exporting

industry in Costa Rica, increases the likelihood of selecting a major in a the STEM field-of-study by 84%, while reducing the probability of choosing a major in the Social Science category by 28% and in the Arts by 55%. These results are consistent across cohorts, suggesting a stickiness of human capital specialization decisions.

The introduction of MNCs into local economies shift employment opportunities toward two possible ends, low-skill or high-skill. Labor supply, now driven by MNC demand, shifts toward new equilibriums ([Blanchard and Willmann, 2016](#)). Employment trends in recent history have carved-out the middle-skill opportunities in industrialized economies ([Goos and Manning, 2007](#); [Goos et al., 2014](#)), while MNCs seemingly follow suit in developing nations. They offer low-skill jobs ([Feenstra and Hanson, 1997](#); [Atkin, 2016](#)) and high-skill jobs.

In the Costa Rica context, there is evidence of a MNC wage premium up to 9% and a higher demand for higher education individuals than seen in domestic private firms ([Alfaro-Ureña et al., 2021](#)). This marks the transitional shift observed in high-income countries, where knowledge-intensive sectors play a dominant role over production-intenstive sectors. Complementary to productivity, educational attainment and skills development are linked to long-run economic performance ([Blanchard and Olney, 2017](#)). This makes human capital investment decisions an important question to address. This decision is shaped by a complex mix of individual incentives, institutional constraints, and policy decisions. Undesrtanding the determinants is essential, not only for explaining microeconomic behavior but also for informing the design of effective policies which target an improvement of human capital in developing nations.

The potential impact of FDI on local labor supply is part of an expansive research area ([Blomström and Kokko, 2003](#)). Effects stemming from FDI inflows are not necessarily uniform across the world, with differing effects by region and country income levels ([Alvarado et al., 2017](#)). It is important to comprehensively understand possible effects, as FDI may have unintended consequences which policymakers should consider when targeting growth.

The primary idea behind the present analysis originates from individuals being differentially exposed to their local labor markets, in a spatial dimension. As FDI project numbers increase, the more relevant these foreign firms, and their industries, become to the individual's decision-making process. Firms that are observed are either domestic or foreign, where MNCs are assumed to be more attractive to high-skill individuals as evidenced in [Alfaro-Ureña et al. \(2021\)](#). The redistribution of labor markets as they adjust to new firm and industry compositions can be thought of as adjustments similar to those experienced from trade shocks ([Artuç et al., 2010](#)). The individuals may consider other factors such as better employment opportunities, possibility for migration, or other non-pecuniary returns derived from being employed by a MNC.

Costa Rica is a promising context to help answer this questions. There are several reasons for this. First, they have a relatively strong economy whose success can be attributed to its education levels, strong democratic institutions, and industry diversity. Importantly, the country uses a dedicated system tasked with attracting FDI inflows name the Free Trade Zone (FTZ) regime. Beyond fiscal incentives, it offers land within industrial parks which are exclusive to FTZ participants. These parks vary in location across the country, providing access to input-output linkages and possible exporting venues.

Second, their public university system offers a compelling case to properly identify demand for field-of-study. Prospective students, when applying into the university, must first apply to a specific major prior to their admittance. This component of the admissions process makes it so observed choices of field-of-study selection are reflective of demand for that field-of-study, rather than equilibrium outcomes. Their acceptance is determined by a weighted average of their performance on a university entrance exam and their high school grades. Admittance into majors is subject to the number of seats made available by the university in that given year. Students come from all across the nation, giving confidence in using a spatial analysis. Additionally, attendance costs in Costa Rica are relatively low, which helps

dispell any selection into schooling due to affordability concerns.

The paper is structured as follows. Section 2 describes the relevant literature. Section 3 describes the institutional details and context of the project in greater detail. Section 4 presents the data. Section 5 introduces a toy behavioral model that explains individuals decision-making process. Section 6 describes the empirical approach. Section 7 presents the empirical results and Section 8 concludes.

2 Literature Review

The present analysis relates to several strands of literature. First, there exists a large literature studying why and how individuals choose which field-of-study to specialize in. This can be split into 4 broad categories of potential determinants of college major choice: Expected earnings of the field and non-pecuniary returns and sorting on individual abilities and ex-post learning.

Although not the exclusive motive for education specialization, a large proportion of existing work has focused on the impact of expected earnings on major choice. Either through observational studies (Altonji, 1993; Carneiro et al., 2011; Beffy et al., 2012; Kirkeboen et al., 2016) or eliciting beliefs of expected earnings in a laboratory setting (Arcidiacono et al., 2012, 2020), results suggest that both expected earnings are an important determinant in college major choices (Altonji et al., 2012; Beffy et al., 2012). There is also evidence of heterogeneity in returns to field-of-study, supply-side selectivity of fields such as work by Hastings et al. (2013) which shows large, positive returns to highly selective degrees in Chile. Likewise, Bleemer and Mehta (2022); Carroll et al. (2014) find that studying Economics comes with a wage premium.

Given that completion of a university degree takes 4-years on average, while the expectation of earnings is important, there may be other immediate effects that are relevant to the

individual. Ex-ante information on returns seems important to educational attainment levels. [Jensen \(2010\)](#) shows that eight-grade boys in the Dominican Republic completed 0.20 - 0.35 more years of school, on average, after receiving information on the higher measured returns to education. In this project, I look to explain the impact of FDI, through MNC presence, on individuals choice of field-of-study specialization.

Individuals may also choose a field-of-study based on their endogenous abilities, also known as ability sorting. [Arcidiacono \(2004\)](#) confirms there are earning premiums for certain majors, but this does not fully explain observed ability sorting across majors. They state that sorting is primarily due to individual preferences for field-of-study. [Kinsler and Pavan \(2015\)](#) derive a structural model which provides evidence that selection into fields plays a role in generating the observed wage gap across fields.

The literature above does a good job at providing evidence on the returns of choosing a major and to a lesser extent how people choose majors based on their abilities. The present analysis expands the current literature on major choice by focusing on how the individuals surrounding economic market may influence their decisions. In particular, I give greater attention to the effects of MNCs on university field-of-study choice in a developing economy setting. This is important effect to consider due to the increasingly substantial role foreign firms play in developing economies as globalization has expanded to all corners of the world.

3 Institutional Details

There are a total of four public universities: Universidad de Costa Rica (UCR), Universidad Nacional (UNA), Instituto Tecnológico Costarricense (TEC), Universidad Estatal a Distancia (UNED), Universidad Técnica Nacional (UTN). Universities offer a wide selection of fields for students to specialize in. These range from social sciences and education to traditional STEM fields, totalling 69 unique majors. Tuition costs are generally low in Costa Rica, with

a university credit costing roughly \$30 in 2025.¹ Obtaining a tertiary degree (I only consider bachelor's degrees in this project) will usually take students 5 years on average. Due to data availability, I only observe applications into UNA.

Admissions Process

The admissions process to a public university in Costa Rica is done through a decentralized process, where individuals apply directly to each university separately. In order to apply to any public institution, the applicant must take an entry exam meant to evaluate verbal and mathematical reasoning skills. When applying, each student is asked to rank their two preferred majors.² The institution has determined, through budgetary and internal processes, how many seats it will award for each major each year but this is unknown to the student at the time of application. Universities generate an entry score for each prospective student through a weighted average of their performance on the entry exam and their performance over the last two years of their high school education.

However, the institutions make public the historic cut-off grades for being admitted into each major. Although this does not guarantee admission simply by having a higher entry score than previous years, it does provide the student with important information as they can better guide themselves when choosing majors. Once the application deadline passes, the university rank-orders each student by major and entry score. The university then admits students into their first choice major going down in order of entry score until there are no more seats available. This constitutes the "cut-off" grade for being admitted into the major, which is essentially the last student to have been accepted. Once this sorting finalizes, students are informed of their application status, and they are allowed to enroll into the institution.

¹This corresponds to nearly \$400 for a full credit load semester. Over 50% of students receive some form of scholarship.

²An example from Universidad de Costa Rica can be seen in figure A1.

Free Trade Zone Requirements & Incentives

The Free Trade Zone regime in Costa Rica is a set of incentives and benefits given to firms that realize new FDI projects that meet all local requirements. It is mandated by Free Trade Zone Law N7210 and all articles therewithin. Firms that are accepted into the regime establish their activities within determined industrial parks which are strictly designated for firms operating under the FTZ regime. It is possible for firms to obtain authorization from the government to establish operations outside the industrial park but these are rare cases. For simplicity, I remove all firms that are reported as operating outside of the industrial parks in the data.³

There is a required minimum investment amount of \$150,000 in fixed assets. This investment requirement is less for firms that locate themselves outside the Greater Metropolitan Area (GAM, for its initials in Spanish), being required to a minimum investment amount of \$100,000. These investments must be completed in the initial 3 years after the firm has been notified of their acceptance into the regime. Beyond the initial financial investment requirement, firms must also abide by both local and international strict environmental policies and must be able to prove they abide by them.

Firms are allowed to carry out all regular business activities, plus other specific ones outlined by the law, without limiting their overall scope. Firms that provide services can serve both firms in the FTZ and foreign clients. Manufacturing and processing firms can perform a broad range of activities on goods for export/re-export, except for activities prohibited by provisions in the law. Outsourcing of services is allowed without limitations if these services are provided to foreign firms or to firms also operating within the FTZ regime. If services are provided to firms outside the FTZs, only a maximum of 50% of total sales may come from these clients. Similarly, local sale of products by processing firms may represent up to 25% of the firm's total sales, except in the case that the firm is labeled as a "Type f processing

³Firms may request special permission to operate outside of the Industrial Park but this is subject to approval by the governing body.

firm”, as indicated in subsection (f) of Article 17 of the FTZ Law. Subsection (f) firms may sell 100% of their output in the local market, meaning that they are not required to export in order to benefit from the FTZ regime.

4 Data

MNCs Operating Within FTZ Regime

Firms under this regime are by definition Multinational Corporations. I begin with the entire universe of firms operating within the FTZ regime as of 2023. The data contains each firm’s name, location at the province-canton-district level, whether they operate inside the industrial park or not, industries they engage in, and a unique corporate identity number. A crucial part of my identification strategy is the time of entry of each firm, which is missing in this data. To remedy this, I use each firm’s unique corporate identity number to identify their earliest date of registry with the Costa Rican government using the Costa Rica National Registry.⁴ From this data I select the earliest date possible and assign it to the respective firm.

These economic activity codes are equivalent to the 4-digit International Standard Industrial Classification (ISIC Rev.4). For simplicity, I use the first reported code in the data. I then concord these codes to their 2-digit categories in order to properly concord it with the industry × field-of-study mapping I detail below. This produces 31 unique 2-digit ISIC Rev. 4 categories, with the largest proportion of firms being in Manufacturing (29.5%). The full list can be found in table A3 of the Appendix.

⁴Access to the registry can be completed online at <http://www.registracion.go.cr>

Education

Data on university applications from the Universidad Nacional (UNA) are sourced directly from the university. Each observation is an anonymized individual application containing the year they applied, their province-canton-district of residence, age, sex, type of high school they attended, entry score grade, their first and second choices for major and the respective International Standard Classification of Education (ISCED) category as determined by UNESCO. For UNA, there are 77 unique majors which are categorized into 10 Broad Categories. Table A1 in the Appendix shows these with examples of majors within each category. The data from UNA goes from 2010 to 2019 and contains 230,162 applications.

To make the possible choice set for each student more tractable, I aggregate the possible majors using the ISCED broad categories into three fields-of-study. These are Arts, Writing and Tourism, STEM and Applied Sciences, and Social Sciences and Professional Studies. These are the possible choices each individual will face when applying.

In Section 6, I detail how I map industries to the fields-of-study in my analysis. They are probability attachment weights which capture how likely a given field-of-study is to have employment in a given industry. To do so, I use the American Community Survey (ACS) for each year of the sample period.⁵ The ACS surveys individuals on their education attainment and which industry they are employed in, if any, amongst many other questions. One question asks respondents which field they have a degree in, which using the same ISCED categorization structure as in the education data above, I sort into the three aggregated fields-of-study.

⁵I am unaware of similar data existing for Costa Rica.

5 Toy Model

6 Methodology

Model

In order to estimate how MNC presence impacts field-of-study choice, I model individuals utility as:

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

where individual i from district d chooses the field-of-study m in year t that maximizes their utility. β_{mj} captures the effect of MNC presence on field-of-study choice. The MNC-industry presence index (Γ_{djt}) is interacted with field-of-study and industry attachment probabilities (p_{mjt}) in order to create industry \times field-of-study direct influences. In this way, fields with a higher likelihood of being employed in a given industry receive a higher influence, and vice-versa. Each individual also has demographic characteristics X'_i , like their age, sex, entry score, and local unemployment rate. They are also subject canton and year fixed effects that absorb unobserved factors that will influence all individuals in the same canton or year. While they shift the overall level of utility, they do not affect choice probabilities directly in the multinomial logit regressoin because choice depends on differences on utility across alternatives. Individuals are also subject to an indiosyncratic shock ε_{idmt} . The possible field-of-study choices are those noted in table A2.

The individual choice is estimated using a Multinomial Logit (MNL) model where individuals choose the field-of-study which gives them the highest utility:

$$P(Y_i = m) = \frac{\overbrace{\exp(\beta_{mj}(p_{mjt} \times \Gamma_{djt}) + \gamma_i X'_i + \alpha_c + \alpha_t + \varepsilon_{idmt})}^{\text{Utility of chosen field-of-study}}}{\sum_{m'} \underbrace{\exp(\beta_{m'j}(p_{m'jt} \times \Gamma_{djt}) + \gamma_i X'_i + \alpha_c + \alpha_t + \varepsilon_{idm't})}_{\text{Utilities across all possible field-of-study choices}}} \quad (2)$$

This gives the probabilities of choosing field-of-study m as determined by the utility function above. The coefficients of interest are β_{mj} , which capture the effects of MNEs through their industry to choose a field-of-study m . Specifically, Γ_{djt} is an index of the presence of an economic activity j in year t weighted by the distance between firms and individual i weighted by the attachment probabilities of field-of-study m to industry j . By allowing β_{mj} to vary across field-of-study m and economic activity j , the model tests whether industries affect education choices differently. These coefficients quantify the extent to which students' field-of-study choices respond to influences of MNCs in the local labor market.

Average Marginal Effects

To better interpret the effects of MNCs on prospective students' field-of-study choices, I compute the average marginal effects (AMEs) from the above model. While the multinomial logit model coefficients β_{mj} describe how industry-specific presence Γ_{djt} affects the latent utility of choosing a specific field-of-study m , they are not directly interpretable in terms of choice probabilities due to the non-linear form of the logit model.

AMEs allow for a direct interpretation by transforming the estimated logit utilities into changes in predicted probabilities. Specifically, the marginal effect of an industry presence variable Γ_{djt} on the probability that individual i chooses field-of-study m is given by:

$$\frac{\partial P_{im}}{\partial \Gamma_{djt}} = P_{im} \left(\beta_{mj} - \sum_{m'} P_{im'} \beta_{m'j} \right), \quad (3)$$

where P_{im} is the predicted probability of individual i chooses field-of-study m , and the summation term reflects the average effect of Γ_{djt} across all possible field-of-study choices. This captures the reallocation of probability mass across competing alternatives from a change in local MNC-industry conditions.

I compute the average marginal effects, which essentially computes this for each individual

and averages over the sample:

$$\text{AME}_{mj} = \frac{1}{N} \sum_{i=1}^N \frac{\partial P_{im}}{\partial \Gamma_{djt}}. \quad (4)$$

These AMEs represent the expected change in the probability of choosing field-of-study m with a one-unit increase the presence index of industry j , holding all else equal. Because these are direct predictions on changes in probability, there is no reference category and all probabilities should sum to zero. The coefficients shown in table 1 are in percentage points.

MNC Presence Index

In order to create an index that captures how individuals experience the presence of MNCs, I use the following gravity model structure:

$$\Gamma_{djt} = \sum_{d'} \sum_{f \in F_{jd't}} \frac{\tau_{f \in F_{jd't}}}{\exp(\mu^{\vec{dd'}})}, \quad (5)$$

where the numerator $\tau_{f \in F_{jd't}}$ is the tenure of firm f in industry j in district d' operating in year t . A firm's tenure is used to capture the "size" of the presence an individual may capture from any firm, where an older firm is thought to factor increasingly in an individual's decision-making as they have been aware of their presence for more years. Each year applicants are exposed to a different stock of firms, and thus different industry compositions, as new firms are likely to enter in a given year. The denominator $\exp(\mu^{\vec{dd'}})$ serves as the distance weight, where it measures the distance (in kilometers) from district d (residence of applicant) to district d' (residence of firm). Distance is exponentiated to account for circumstances where the applicant and firms share the same district and distance is measured as zero.⁶ This index is non-negative, and summary statistics are reported in **INDEX MEASURES HERE**.

Given how the MNC presence index is constructed, an increase of one unit in the index can

⁶ $\exp(0) = 1$, which then gives full weight to immediately located firm-industries

potentially come from two possibilities: (1) Individuals relocate closer to the firms or (2) New firms enter the economy. Because the data are repeated cross-sections, there is no possibility of migration. Without migration as a mechanism of change leaves new firms entering as the only possibility of an increase. Given that the index is also weighed by spatial distance, one new firm does not necessarily equal one unit increase in the index.

Education to Industry Mapping

A crucial detail for this project is the ability to map individual industry effects to possible fields-of-study. Given that any given degree could theoretically lead to employment across multiple industries, it is necessary to address how I can differentiate across education \times industry pairings. Because each employed individual is asked assigned an industry of employment, I am able to create a probabilistic attachment weight from each field-of-study to observed industries. Reported industries are given using the North American Industry Classification System (NAICS) and the amount of detail varies by individual. To remedy this, I concord them to their 2-digit categories. Firms ISIC Rev.4 industry codes are then concorded with their 2-digit NAICS counterparts, creating a harmonized dataset.

These attachment weights allow me to assign probabilistic importance of each field-of-study to each existing industry. This reflects the fact that, although any given industry, for example, may hire an individual with a degree in chemical engineering they may also find employment with a financial firm although that is less likely. It creates differential effects across the education by industry pairings choice set. The mapping can be found on the **Appendix**.

7 Estimation Results

Results show the Average Marginal Effects (AMEs) of MNC presence, measured at the district level for all 6 2-digit NAICS industries in the sample period, on the probability of

choosing one of the three field-of-study possible choices: *Arts, Writing and Tourism, STEM & Applied Sciences*, and *Social Sciences & Professional Studies*. Each column reflects how an increased presence of that given industry shifts the likelihood of applicants choosing a field-of-study, conditional on individual characteristics (age, sex, entry score) and the unemployment rate they observe in their local labor market. There are also fixed effects for canton and year that control for unobserved characteristics at a wider geographical region, and the year that students apply into university.

Table 1: MNC Industry Presence Effects on Field of Study Choice

	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 * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Field of Study Fields grouped up as shown in table [A2](#).

Standard errors are clustered at the District level

By definition of AMEs, each row (industry) coefficients should sum to zero

Results in table 1 show that the presence of Multinational firms in their respective industries shifts educational investments in intuitive directions.

Manufacturing is a significant industry in Costa Rica as it relates to FDI inflows. Over the sample period (2009 to 2019), it represents the majority share of all FDI inflows (36.8%), and ranges from 0.67% to 3.05% of GDP. Being the largest industry (as measured in inflow dollars), observed effects of this industry are of economic interest.

An increase in the presence of manufacturing MNCs leads to a significant rise in the probability of choosing a major in STEM and Applied Sciences, which are accompanied by declines in the Arts and Social Science programs. To be more precise, an increase of one unit in the manufacturing MNC presence index increases the probability of choosing a discipline in STEM & Applied Sciences by 0.84 percentage points. This is accompanied by a decrease in the probability of choosing a discipline in the Arts and in Social Sciences by 0.56 and 0.29 percentage points, respectively. This pattern may indicate that the presence of production and technology intensive firms raises the perceived returns from more technical human capital fields, steering students toward science and engineering disciplines.

The Transportation & Warehouse industry produces similar results. An increase in the presence of MNCs in this industry leads to a greater probability of choosing a discipline in STEM while reducing the probability of choosing a discipline in Social Sciences. This industry likely expands local demand for quantitative and logistical skills, creating a stronger incentives to choosing technical education found in STEM and Applied Sciences disciplines.

By contrast, an increase in the presence of MNCs in the Administration industry is associated with a shift away from STEM and Applied Science (a probability decrease of 1.06 percentage points) toward Social Sciences and Professional Studies (a probability increase of 0.74 percentage points). This suggests that firms more likely to engage in managerial or organizational services encourage human capital investment in business-related or professional skills over technical ones. In a similar way, the Wholesale industry shows a similar

pattern. Social Sciences and Professional Studies and Arts see a probability increase of 3.96 percentage points and 3.8 percentage points, respectively. This industry is also associated with a sharp decrease in disciplines in STEM and Applied Sciences. This is consistent with these industries rewarding interpersonal and communication-based skills.

Overall, the estimation results show that multinational corporations industry presence through regional proximity impacts educational choices at the intensive margin and in predictable ways. Exposure to technologically intensive or primarily production based MNCs pushes students toward the STEM and Applied Science field-of-study. At the same time, increased exposure to administrative, wholesale, or information-focused MNCs shifts students toward social and communication oriented disciplines. These results provide evidence that MNC participation in local-labor markets influences human capital formation at a field-of-study level.

Robustness Tests

No Attachment Probabilities

To evaluate the role of the attachment probability weights in shaping the estimated effects, I re-estimate the model without applying them to the industry index. This removes the direct link between industry and field-of-study pairings. Results are shown in table 2. The resulting coefficients remain broadly consistent with the baseline estimates, suggesting that the main findings are not driven by the weighting scheme. There are changes in the statistical significance across industry and field-of-study pairings, with many coefficient estimates no longer being significant. More noticeable, there are significant reductions in the magnitude of the coefficients. The smaller underweighted coefficient likely reflects the loss of the direct link between individual field-of-study attachment probabilities and the respective industry. Without the weights, the model assigns equal exposure between industry and field-of-study, diluting the observed connections between specific industries and disciplines.

Table 2: Unweighted MNC Industry Presence Effects on Field of Study Choice

	Field of Study Choice		
	Arts, Writing & Culture	STEM & Applied Sciences	Social Science & Prof. Studies
Administration	-0.00014 (0.0001)	-0.0002 (0.0001)	0.0003** (0.0001)
Information	0.00012 (0.0002)	-0.0005 (0.0004)	0.0003 (0.0003)
Manufacturing	-0.0002 (0.2038)	0.0007** (0.0003)	-0.0005** (0.0002)
Prof. Science & Tech. Services	-0.0005** (0.0004)	-0.0014 (0.0005)	0.0020*** (0.0005)
Transportation & Warehouse	-0.0014 (0.3755)	-0.0004 (0.0012)	0.0017 (0.6348)
Wholesale	0.0015 (0.0010)	-0.0007 (0.0014)	0.0008 (1.5092)
Controls	✓	✓	✓
District FE	✓	✓	✓
Year FE	✓	✓	✓
Applications	20,985	92,273	116,904
Pseudo-R2	0.0347	0.0347	0.0347

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

Field of Study Fields grouped up as shown in table [A2](#).

Standard errors are clustered at the District level

By definition of AMEs, each row (industry) coefficients should sum to zero

8 Conclusion

Human capital attainment is an important aspect of economic growth and FDI has become a popular choice for developing economies as a growth strategy. As a consequence, greater FDI inflows into developing nations has an influence on the local labor market composition, and through human capital investment adaptation, on educational attainment. The intensive margin of educational attainment, as observed through field-of-study choices, is an important consequence of increased FDI inflows. Educational attainment decisions are influenced by many factors, such as expected wages or endogenous ability sorting. Local labor market composition may also directly influence educational attainment decisions. Specifically, local market composition as influenced by higher MNC participation directly affects field-of-study decisions.

In this analysis, I directly measure how the presence of MNCs influence the field-of-study chosen by university applicants. Using data of applicants from a large Costa Rican public university and MNCs operating under the Free Trade Zone regime in the country, I estimate a Multinomial Logit model in where individuals choose among possible field-of-study in their application process. Results show that industries have differing effects across industry and field-of-study pairings. When looking at the 6 largest MNC industries in the country, results suggest that industries intuitively impact educational decision

Overall, these results suggest that higher levels of FDI does influence human capital specialization decisions. Given the heterogeneity in both magnitude and sign of response to increasing MNC presence by industry and field-of-study pairing, it is suggestive of individuals adapting differently to different levels of exposure. Because there is large heterogeneity in the industry/field-of-study effects, its suggestive of how some fields may be better insulated from MNC presence. It also may be that industry concentration may be of particular interest as compositions are likely to vary across economies due to historic and comparative advantages. The results underscore the need for education and industrial policy coordination

to ensure that specialization patterns evolve in step with economic transformation.

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A Appendix

Table A1: Classification of Broad Fields Using ISCED-2013 with Examples

Education: Pedagogy, Specific Topics in Primary and Secondary Teaching ^a
Arts & Humanities: Music, Literature, History, Dance, Languages
Social Sciences: International Relations, Economics, Psychology, Sociology
Business Administration: Business Administration, International Commerce
Natural Sciences, Math & Statistics: Industrial Chemistry, Biology, Geography
Information Technologies: Information Systems
Engineering: Topography, Forestry Sciences, Industrial Bioprocesses
Agriculture & Veterinary: Agronomy, Veterinary Medicine, Aquaculture
Health: Social Work, Medicine, Counseling
Services: Tourist Recreation, Sustainable Tourism Business Management

^a Topics include Social Studies, Mathematics, English, etc.

Table A2: Aggregation of ISCED Broad Categories

STEM & Applied Sciences: Natural Sciences, Engineering, Information Tech., Agriculture, Health
Social Sciences & Professional Studies: Business Admin., Social Sciences, Education
Arts, Writing, & Culture: Arts & Humanities, Tourism ^a

^a Tourism is not the official category, but rather "Services". It is renamed due to the only majors in this category are some related to tourism activities.

Table A3: Firm Quantity & ISIC4 (2 Digit) Codes

2-Digit Code	ISIC4 Description	Count
Manufacturing (103 firms)		
10	Manufacture of food products	20
11	Manufacture of beverages	2
13	Manufacture of textiles	2
16	Manufacture of wood and of products of wood and cork, except furniture	2
18	Printing and reproduction of recorded media	1
20	Manufacture of chemicals and chemical products	10
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	2
22	Manufacture of rubber and plastics products	8
23	Manufacture of other non-metallic mineral products	2
24	Manufacture of basic metals	2
25	Manufacture of fabricated metal products, except machinery and equipment	7
26	Manufacture of computer, electronic and optical products	5
27	Manufacture of electrical equipment	2
32	Other manufacturing	33
33	Repair and installation of machinery and equipment	5
Electricity, Gas, Steam and Air Conditioning (14 firms)		
38	Waste collection, treatment and disposal activities; materials recovery	14
Wholesale and Retail Trade (13 firms)		
46	Wholesale trade, except of motor vehicles and motorcycles	13
Transportation and Storage (15 firms)		
52	Warehousing and support activities for transportation	14
56	Food and beverage service activities	1
Information and Communication (78 firms)		
61	Telecommunications	1
62	Computer programming, consultancy and related activities	64
63	Information service activities	13
Real Estate Activities (47 firms)		
68	Real estate activities	1
70	Activities of head offices; management consultancy activities	7
71	Architectural and engineering activities; technical testing and analysis	24
72	Scientific research and development	5
73	Advertising and market research	4
74	Other professional, scientific and technical activities	6
Administrative and Support Service Activities (77 firms)		
78	Employment activities	1
82	Office administrative, office support and other business support activities	76
Education (1 firm)		
85	Education	1

Table A4: Demographic Summary Statistics

Demographic Information		
	Mean	Std. Dev.
Age	19.49	(2.65)
Application Score	568.74	(110.87)
Female	0.57	
STEM ^a	0.36	
GAM ^b	0.55	
Public High School	0.77	

Geographical Information			
Province	(%) of Applications	No. of Cantons	No. of Districts
San José	30.67	20	108
Alajuela	19.82	16	94
Heredia	16.64	10	41
Cartago	8.45	8	48
Puntarenas	8.24	11	57
Guanacaste	10.02	11	58
Limón	6.17	6	28
Observations	230,162		

^a First choice was a STEM major.

^b Applicant lives within the Greater Metropolitan Area.

6a

Opción 1

3	1	0	1	0	1
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Código de carrera

Bachillerato y Licenciatura en Derecho

Nombre de la carrera

1	1
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Código del recinto

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Código del recinto

Sede Rodrigo Facio

Nombre del recinto

Opción 2

2	1	0	1	0	1
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Código de carrera

Bachillerato y Licenciatura en Biología

Nombre de la carrera

1	1
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Código del recinto

Sede Rodrigo Facio

Nombre del recinto

Figure A1: Example of Rank Order of Majors Application

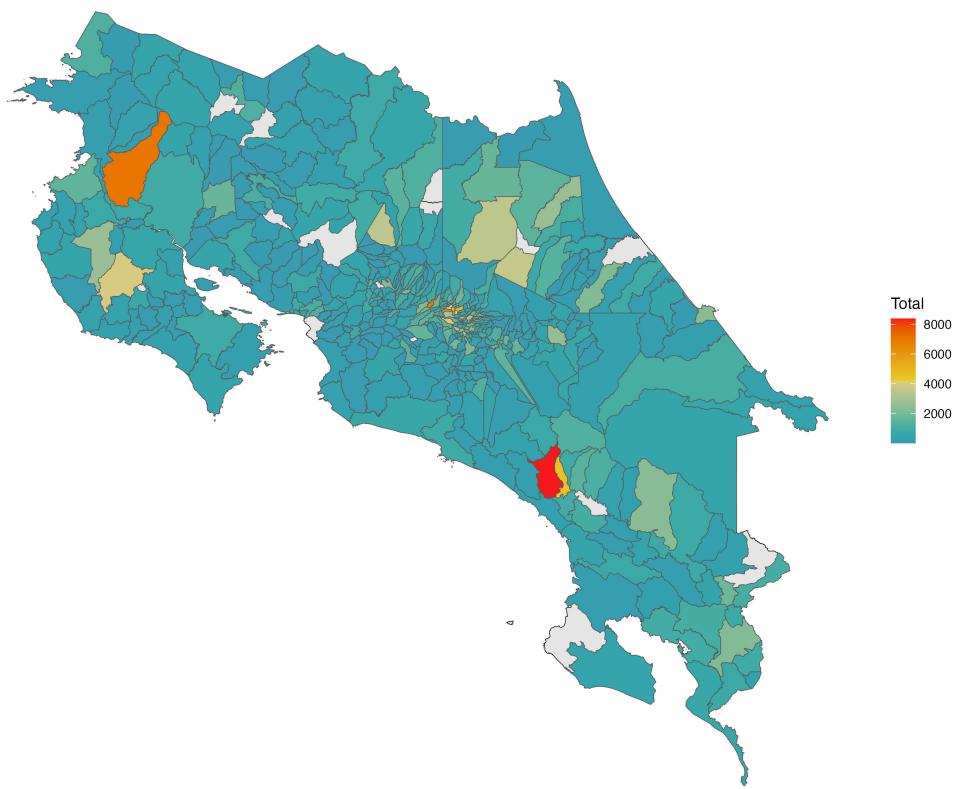


Figure A2: Applications Heatmap (All Years)

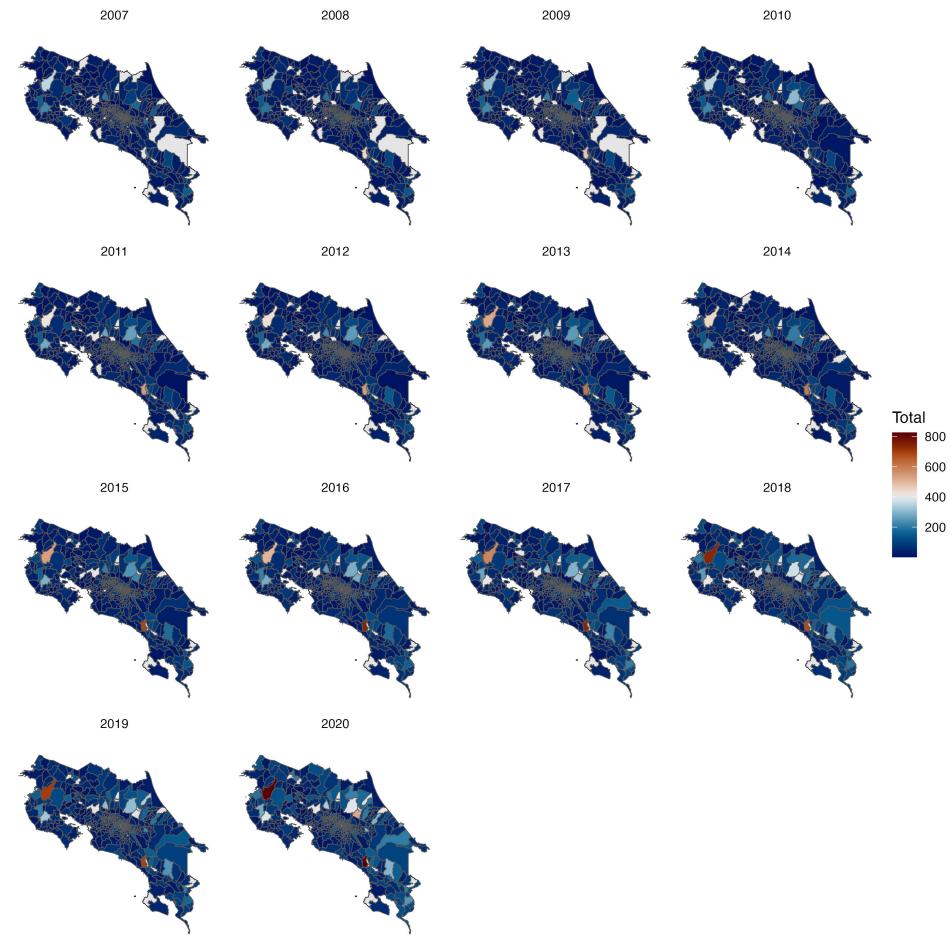


Figure A3: Applications Heatmap (By Year)

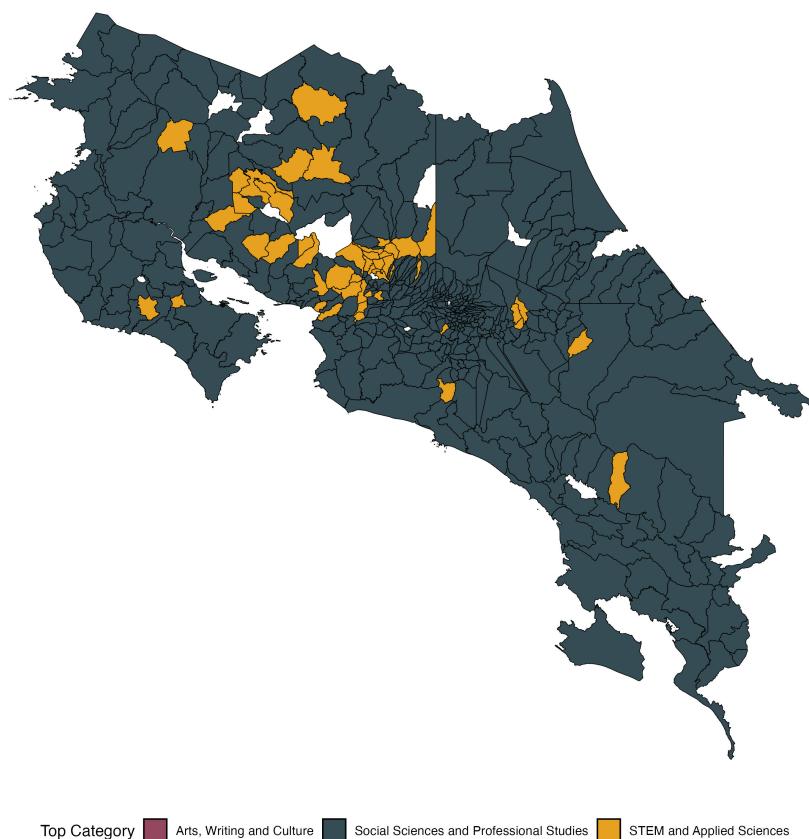


Figure A4: Field-of-Study Majority Applications by District (All Years)

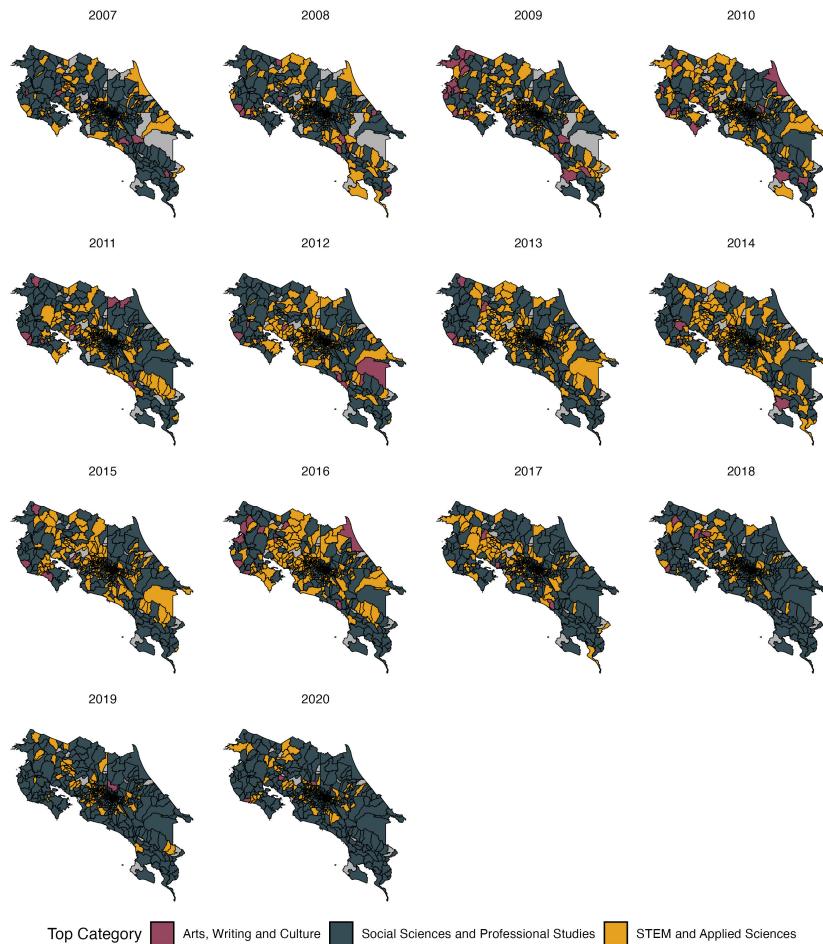


Figure A5: Field-of-Study Majority Applications by District (By Year)

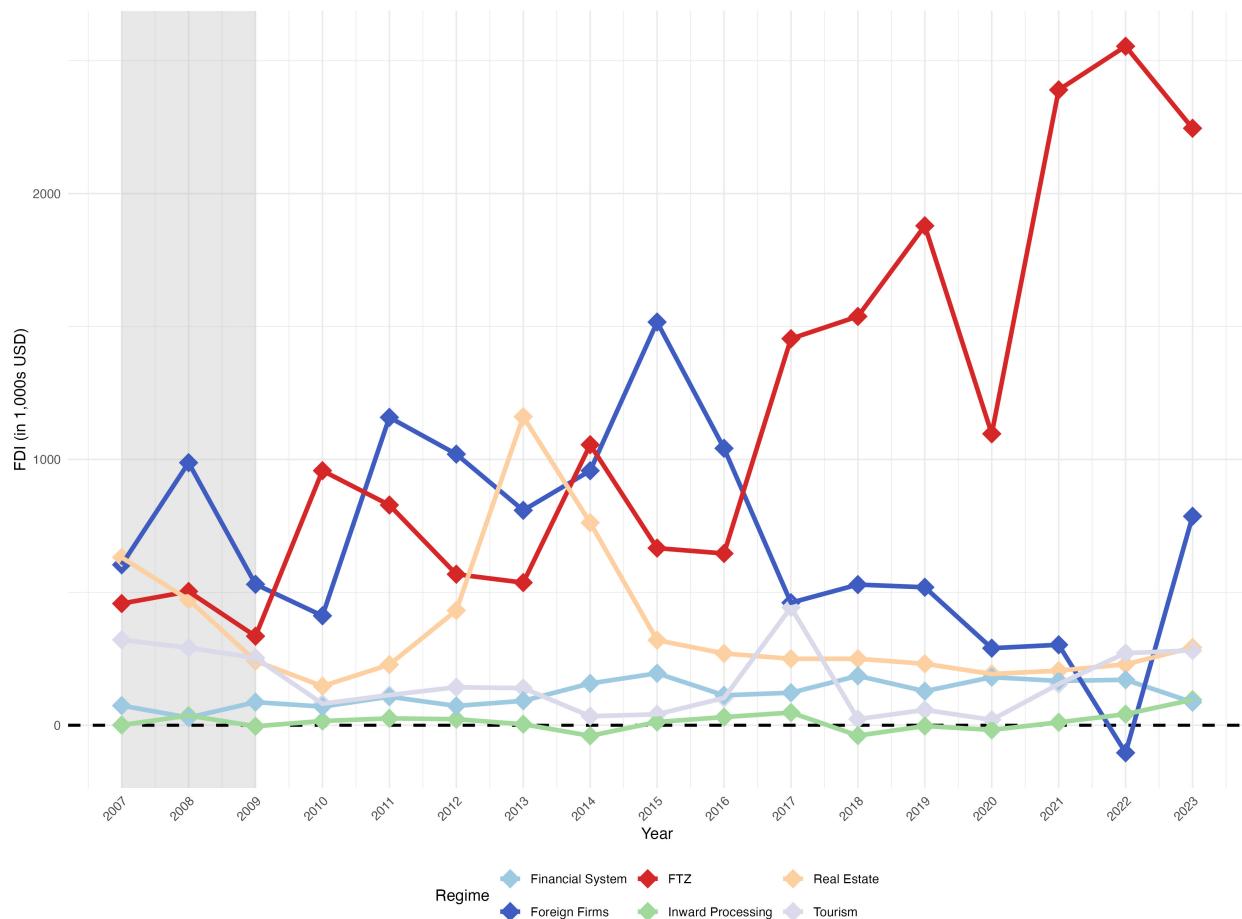


Figure A6: FDI Flows by Regime into Costa Rica

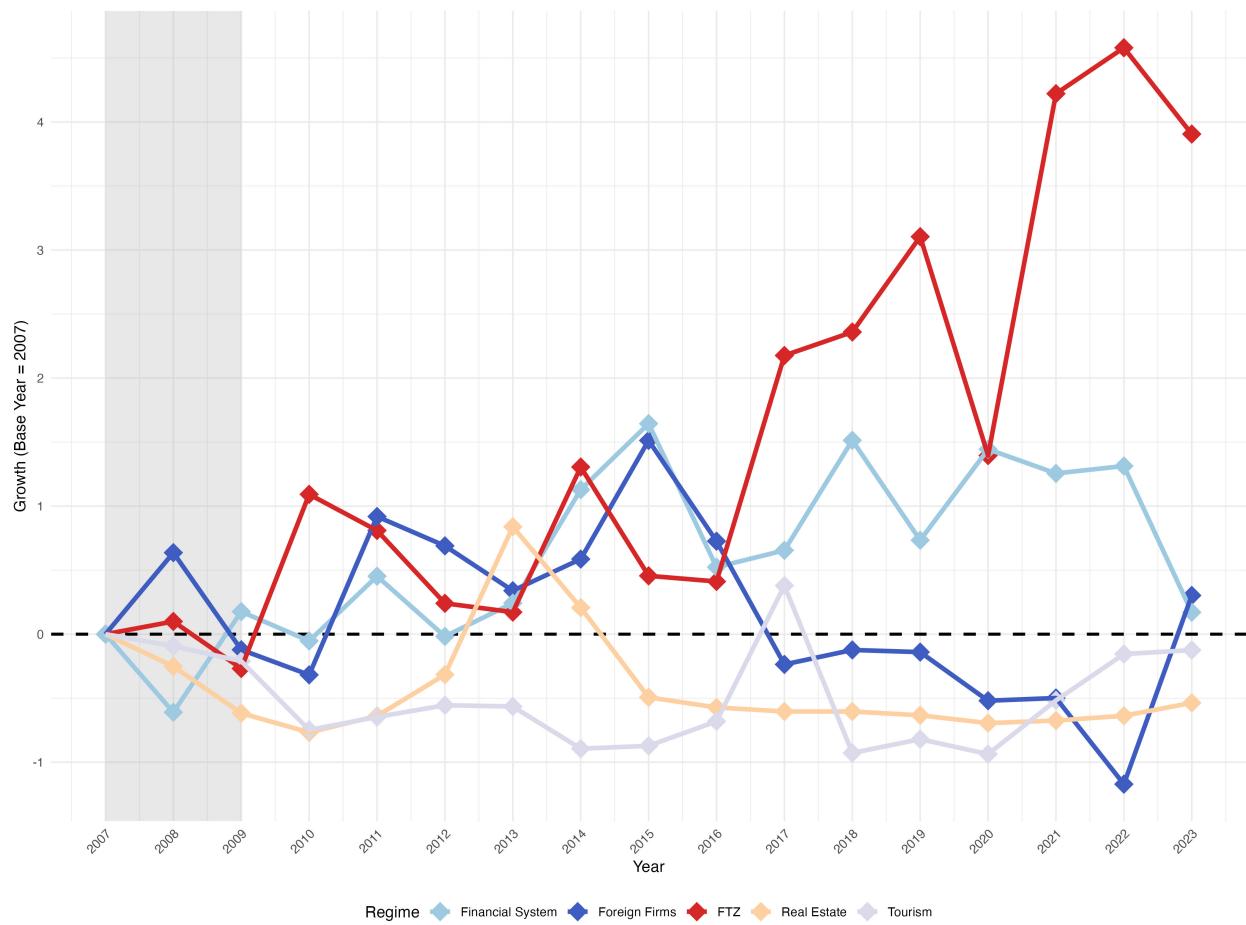


Figure A7: FDI Growth (Base Year = 2007)

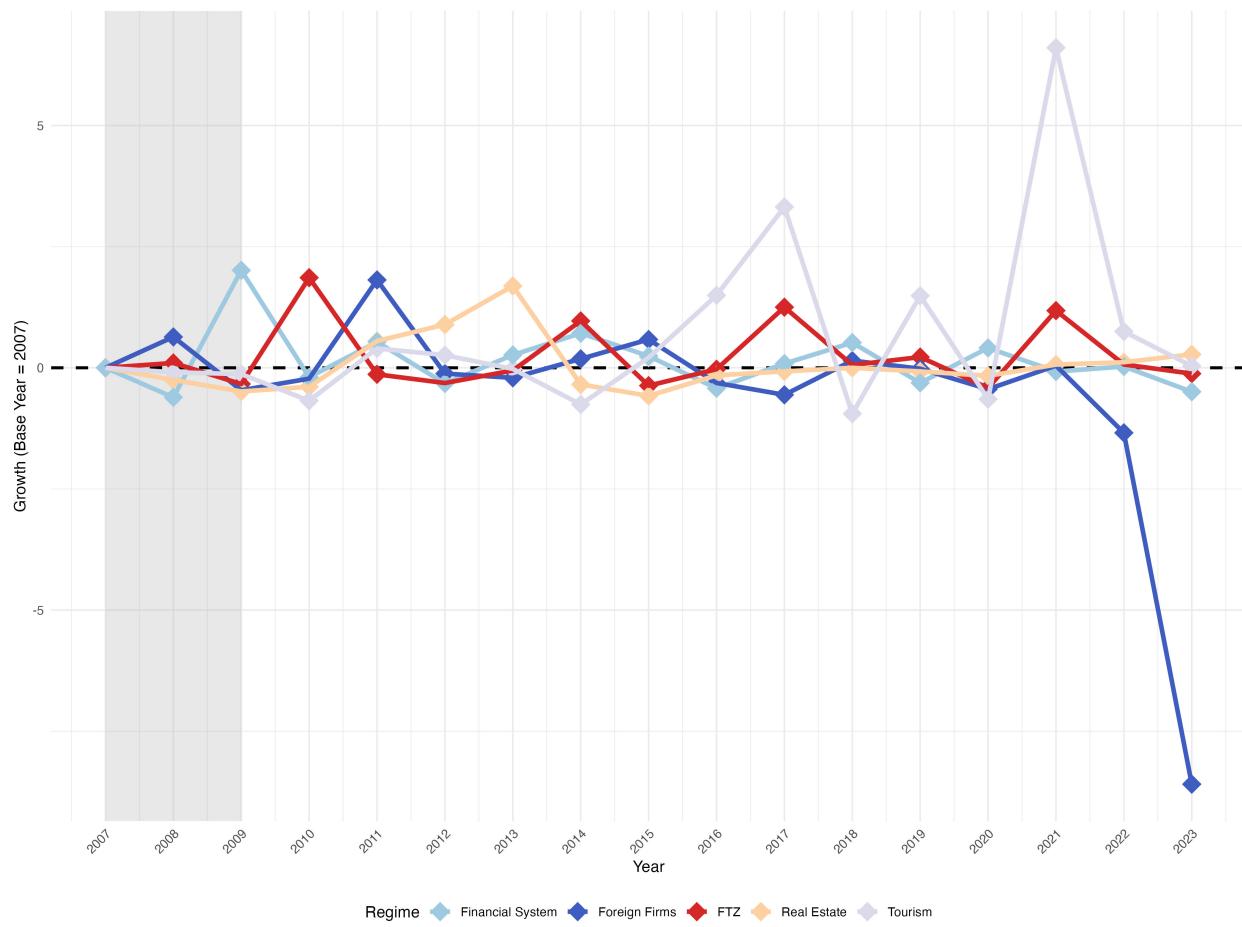


Figure A8: FDI Growth (By Year)

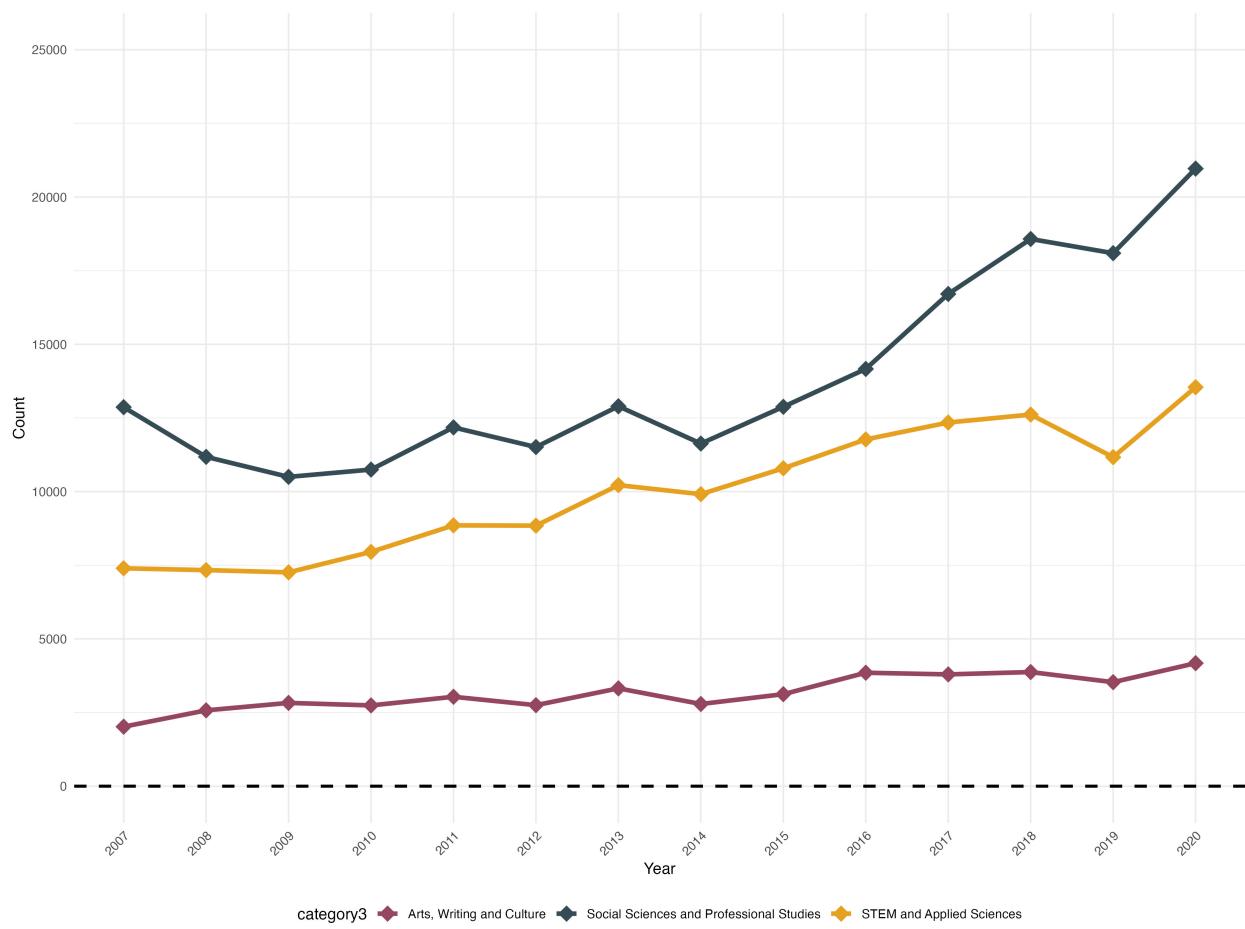


Figure A9: Applications by Field-of-Study by Year

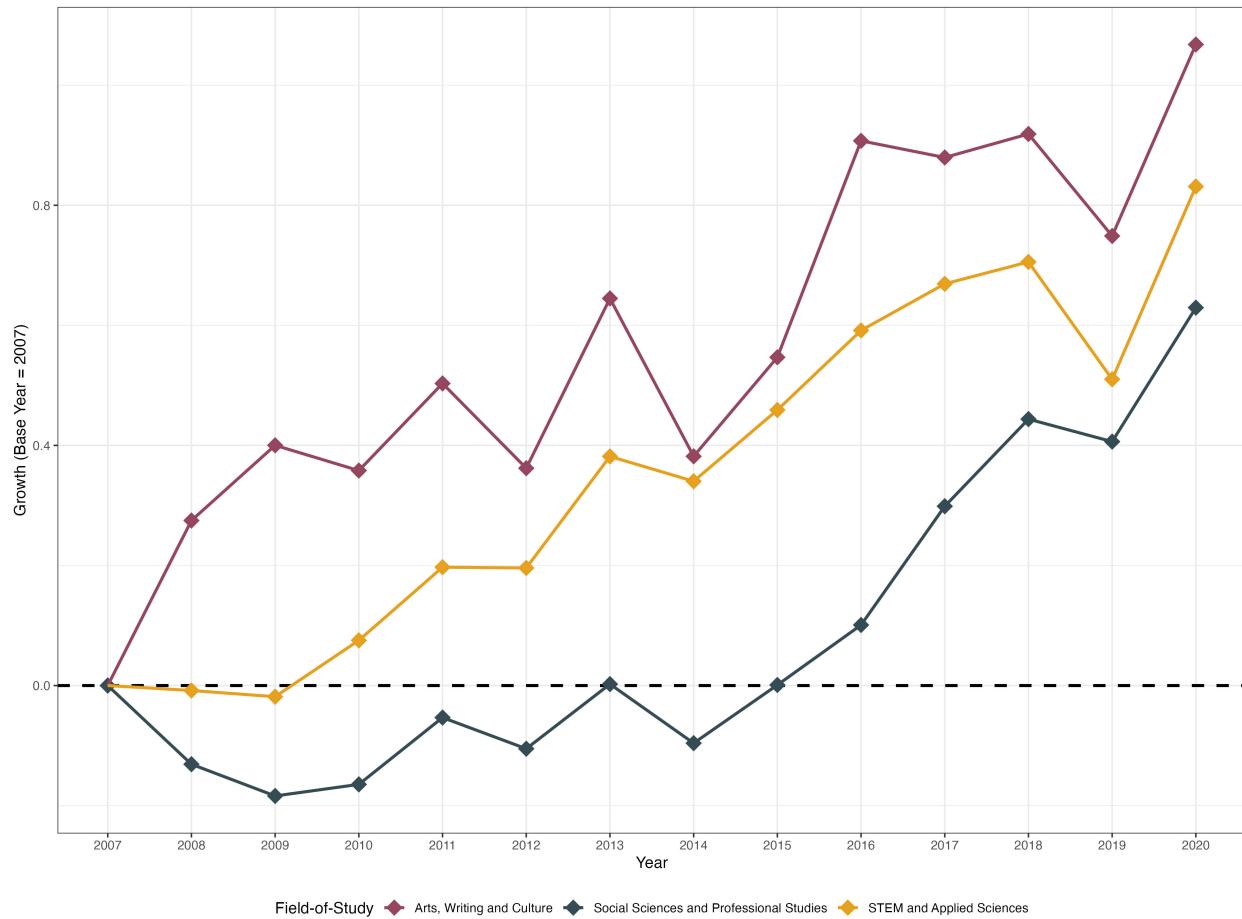


Figure A10: Growth in Applications by Field-of-Study (Base Year = 2007)

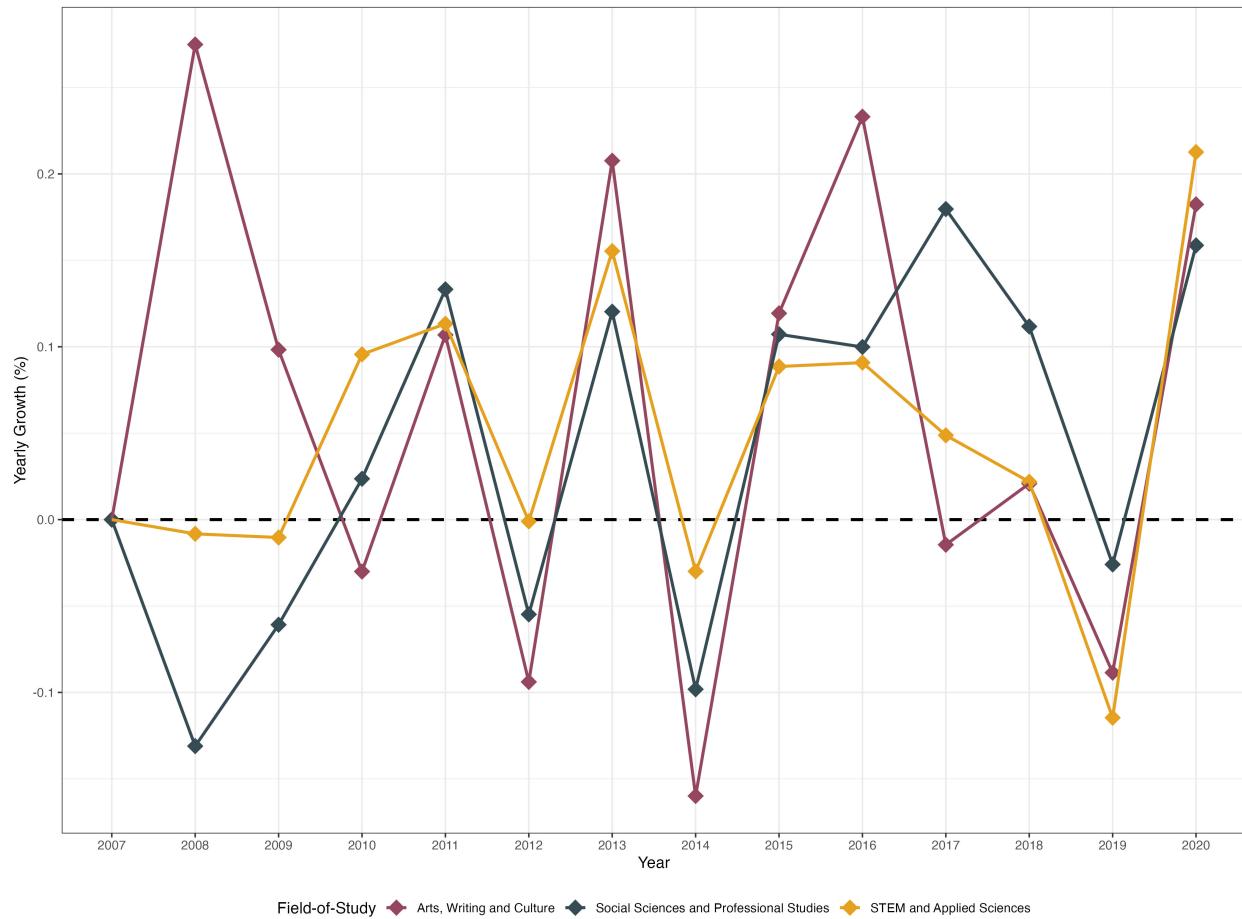


Figure A11: Growth in Applications by Field-of-Study by Year

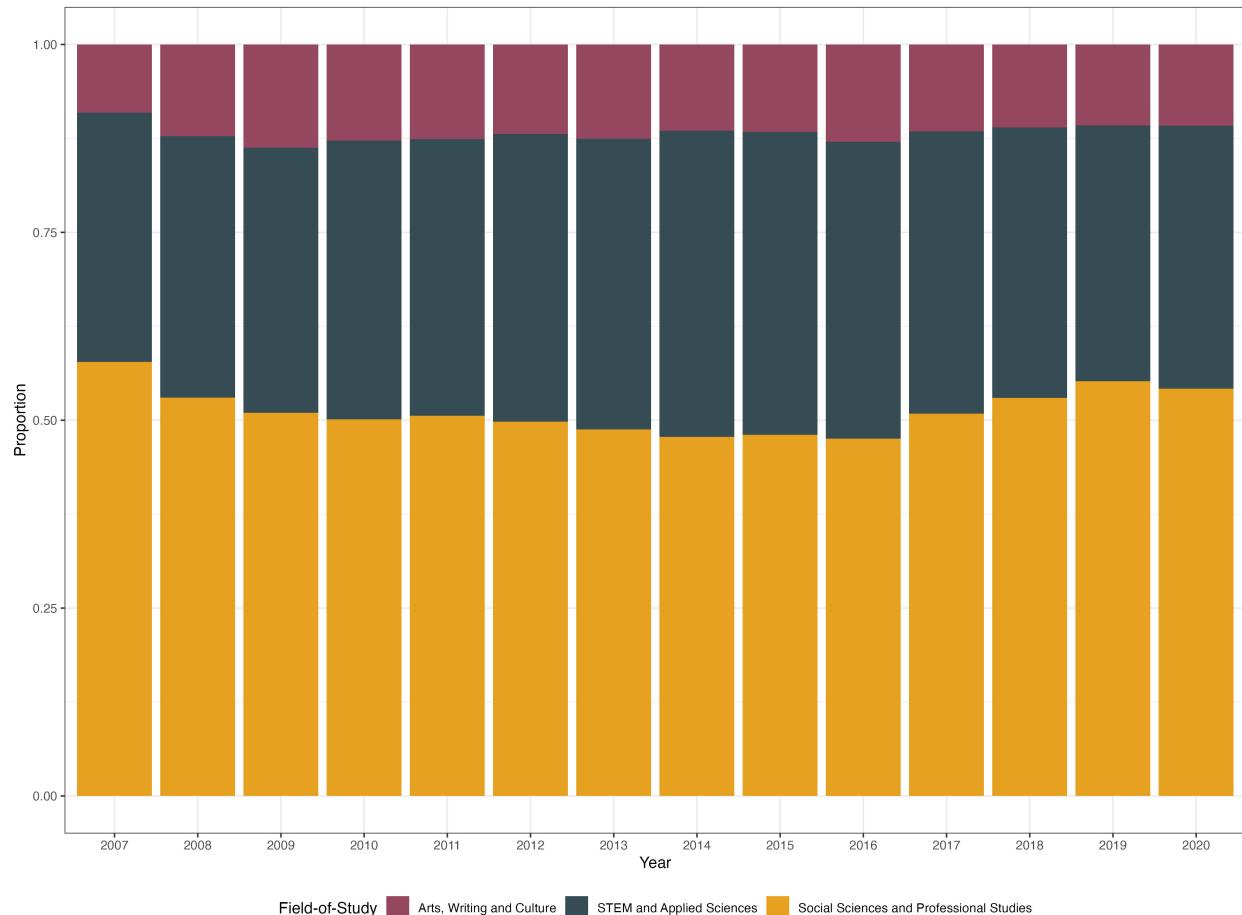
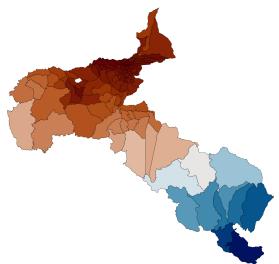
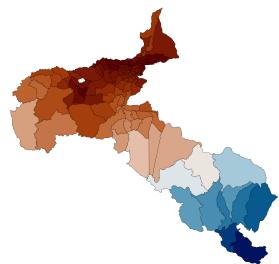


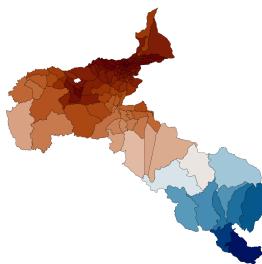
Figure A12: Field-of-Study Categories Proportions



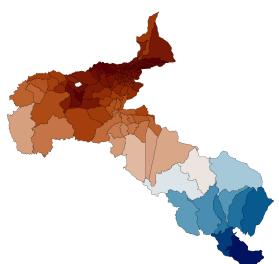
(a) Admin. Services



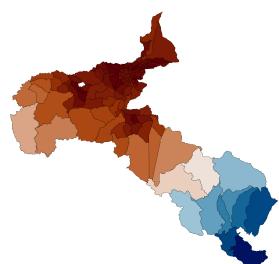
(b) Comp. Programming



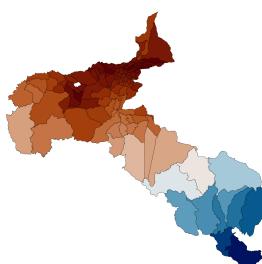
(c) Call Centers



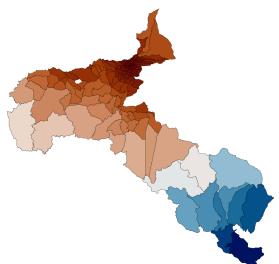
(d) Comp. Consultancy & Mgmt.



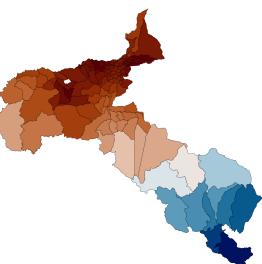
(e) Manu. of Medical Instruments



(f) Architectural & Engineering

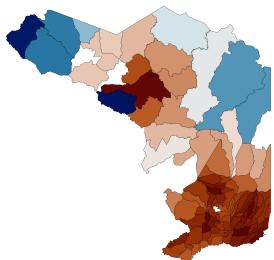


(g) Materials Recovery

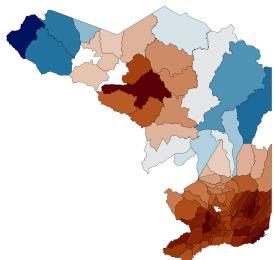


(h) Data Processing

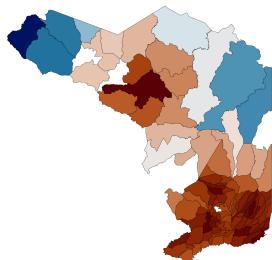
Figure A13: MNC Presence Index (San Jose)



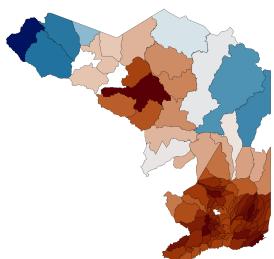
(a) Admin. Services



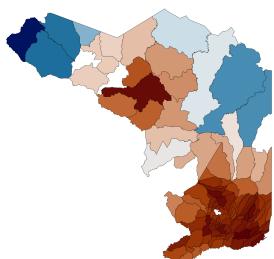
(b) Comp. Programming



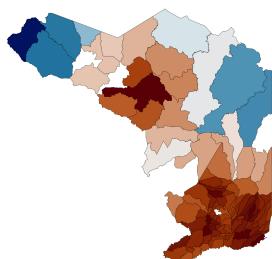
(c) Call Centers



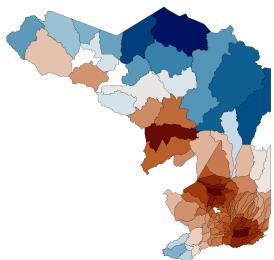
(d) Comp. Consultancy & Mgmt.



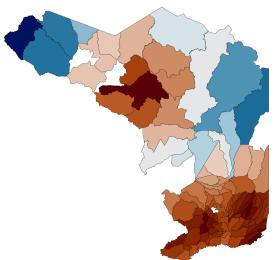
(e) Manu. of Medical Instruments



(f) Architectural & Engineering



(g) Materials Recovery



(h) Data Processing

Figure A14: MNC Presence Index (Alajuela)

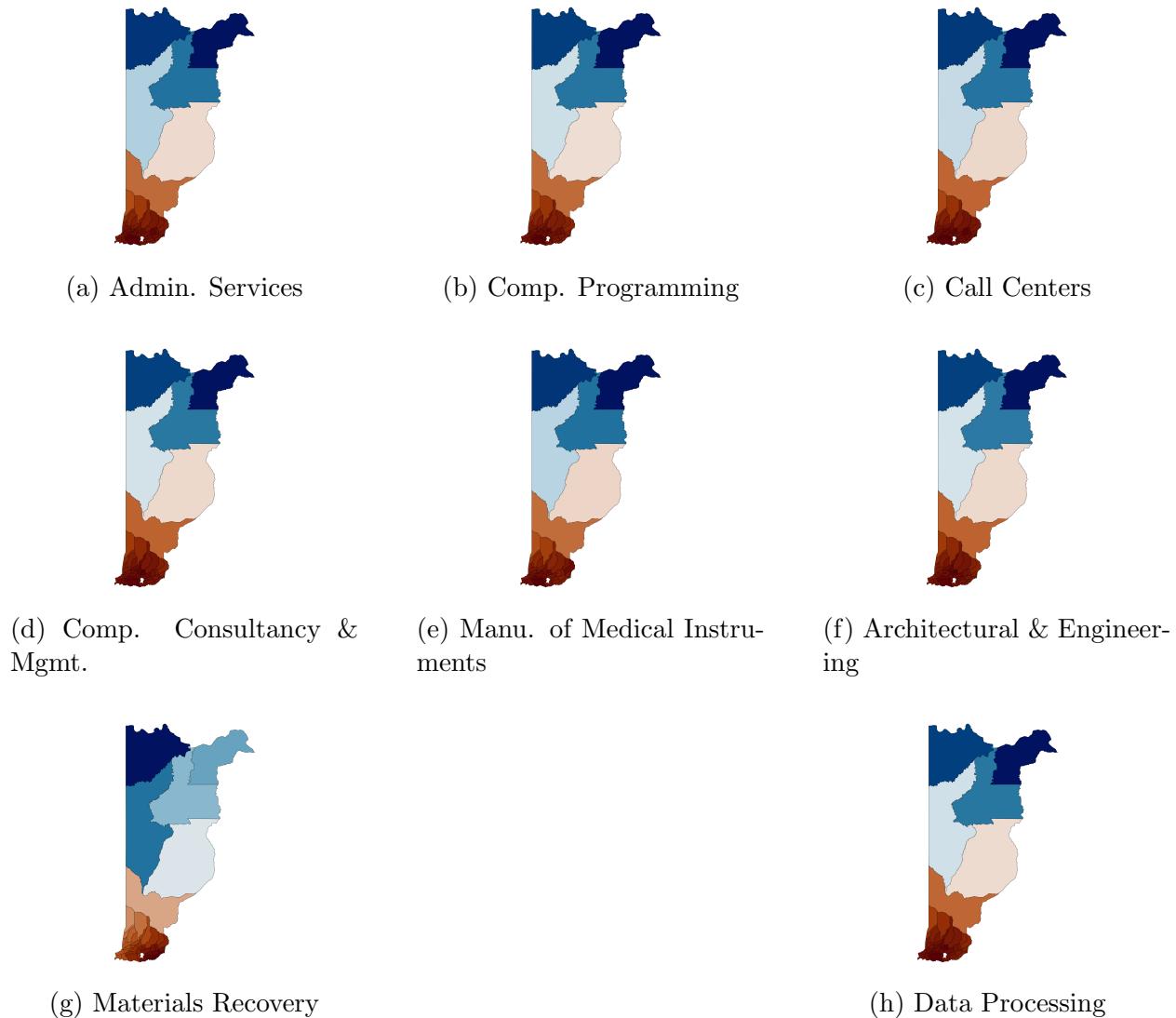


Figure A15: MNC Presence Index (Heredia)

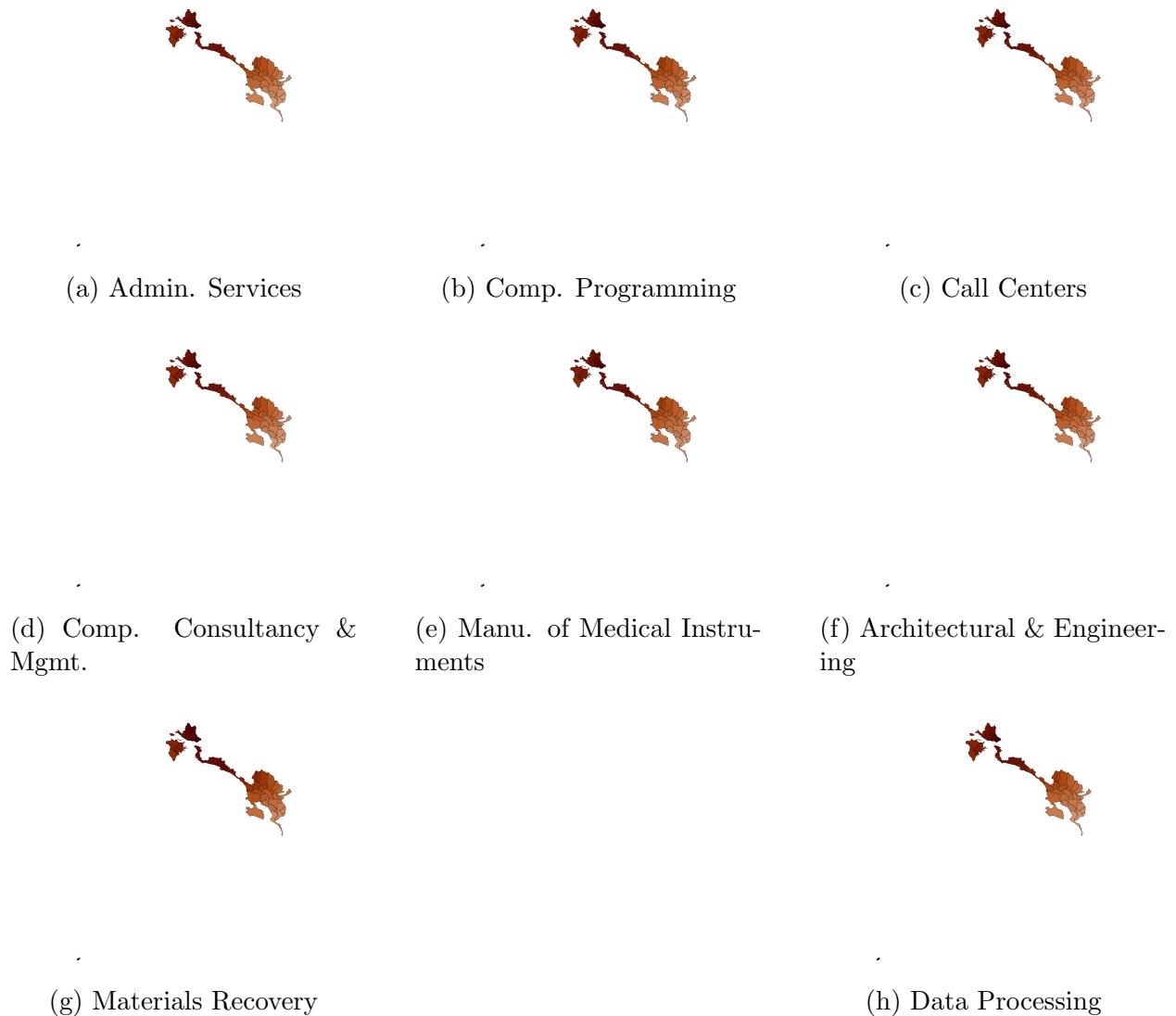
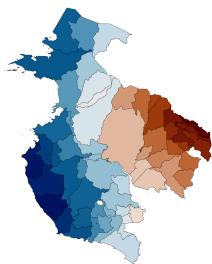
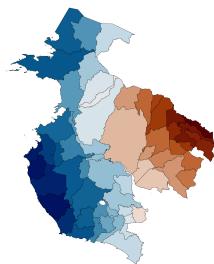


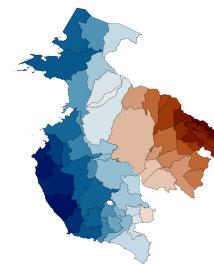
Figure A16: MNC Presence Index (Puntarenas)



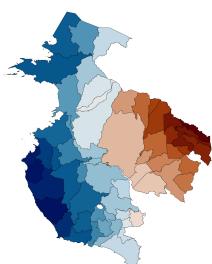
(a) Admin. Services



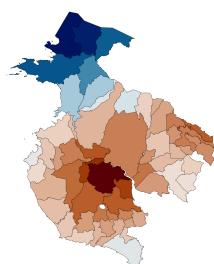
(b) Comp. Programming



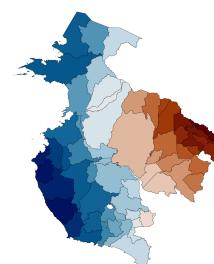
(c) Call Centers



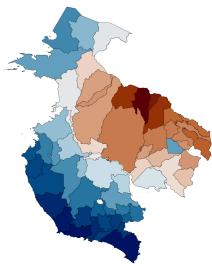
(d) Comp. Consultancy & Mgmt.



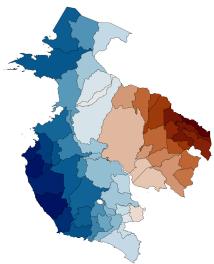
(e) Manu. of Medical Instruments



(f) Architectural & Engineering



(g) Materials Recovery



(h) Data Processing

Figure A17: MNC Presence Index (Guanacaste)

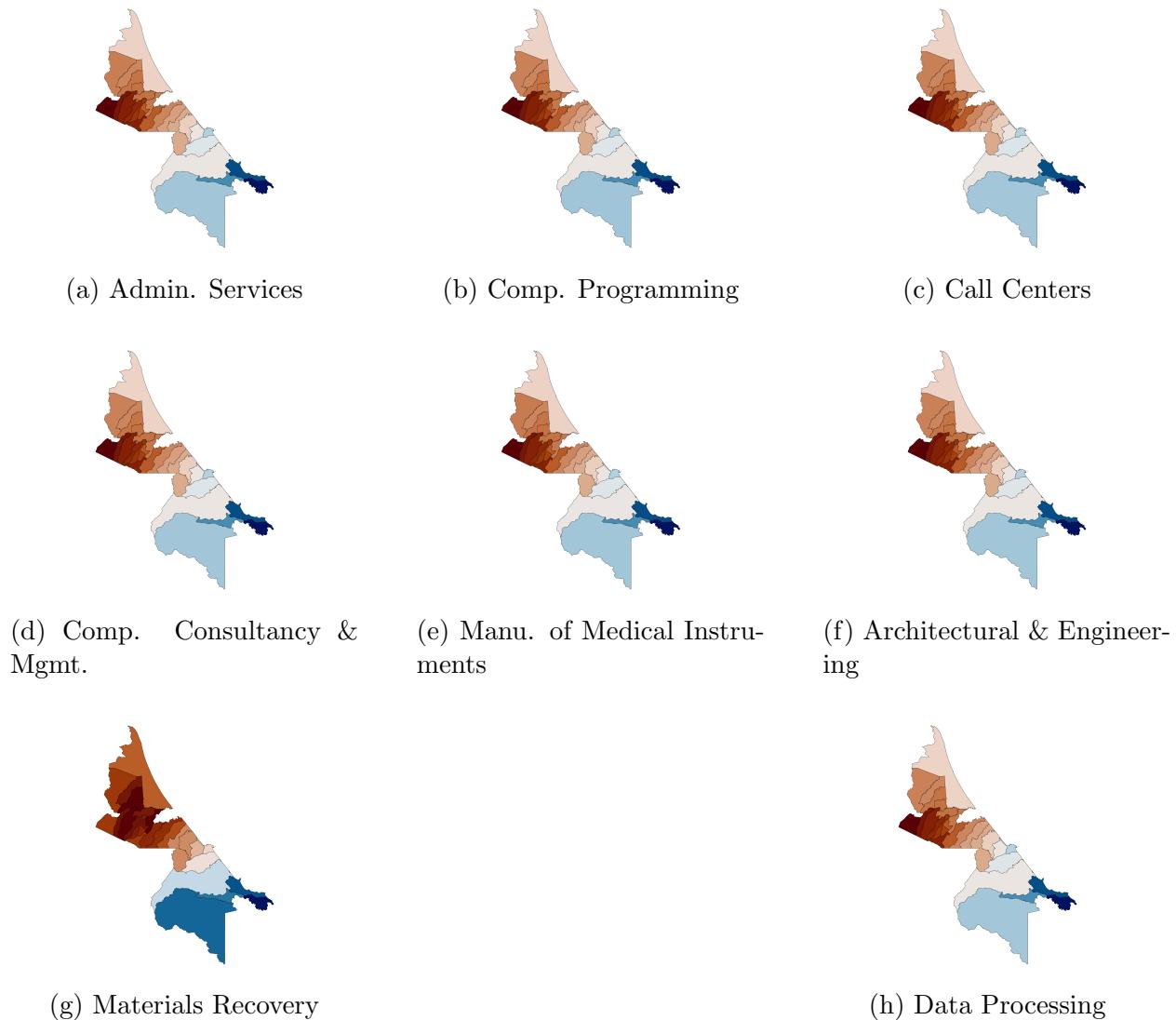


Figure A18: MNC Presence Index (Limon)

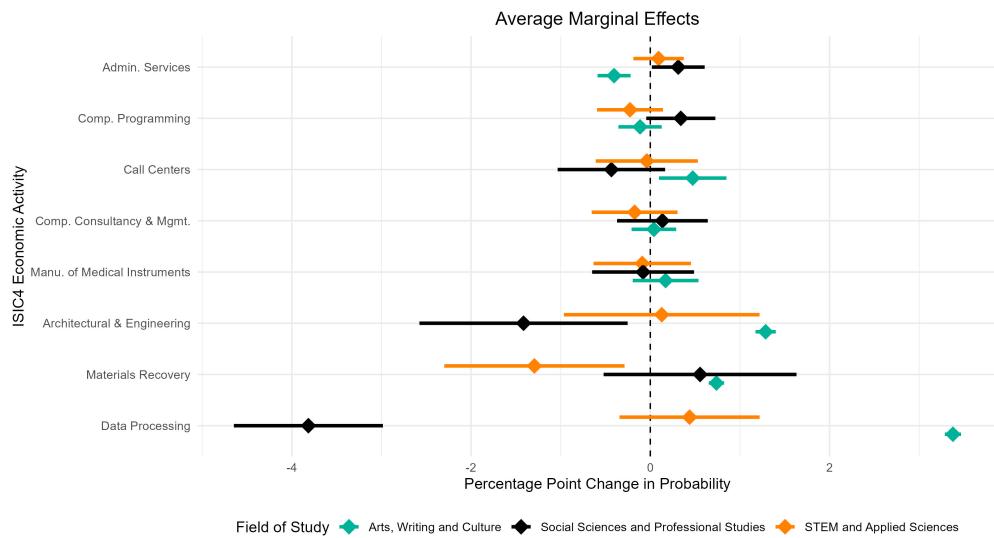


Figure A19: Marginal Effects by Each ISIC4 Economic Activity

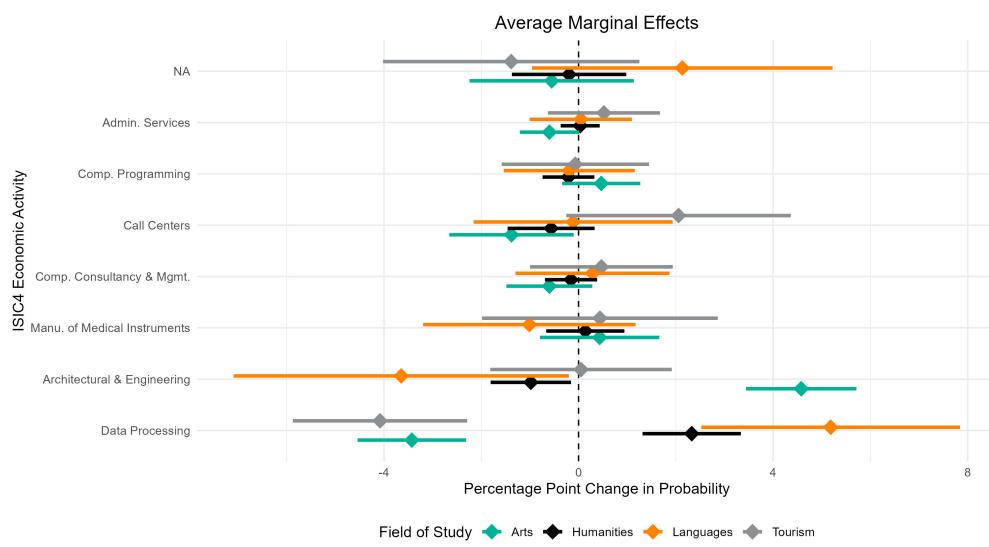


Figure A20: Arts, Writing and Tourism AMEs

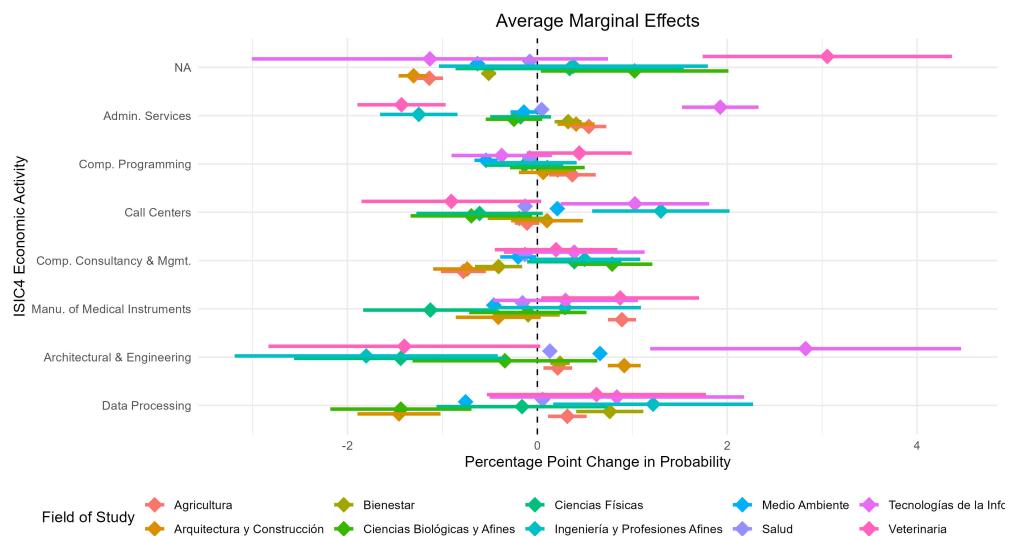


Figure A21: STEM and Applied Sciences AMEs

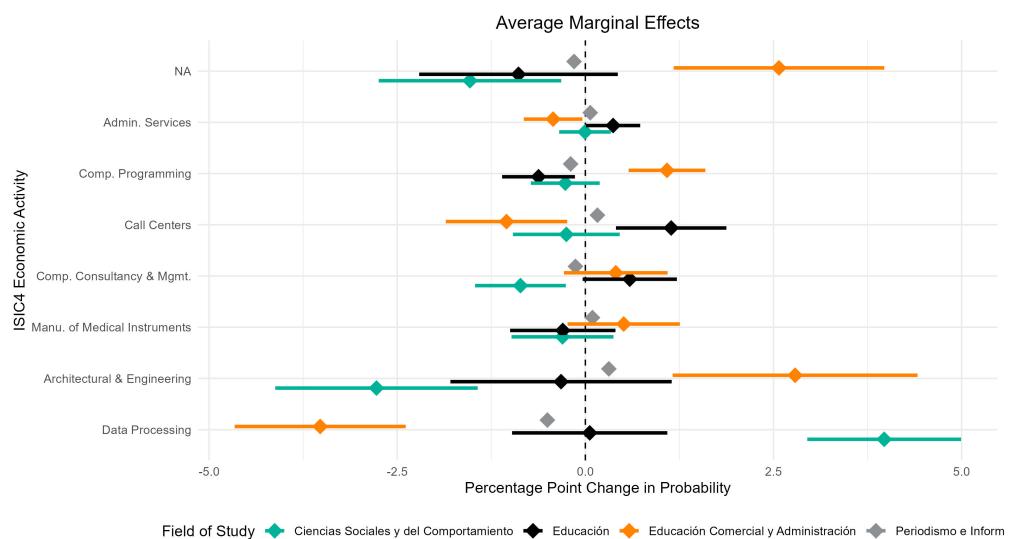


Figure A22: Social Sciences and Professional Studies