

Skilled Immigration and Firm-Level Upgrading as Exports Boosters in Developing Countries

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STEG Annual Conference, Theme 4: Trade and Spatial Frictions

Strathmore University Business School, Nairobi, Kenya, 2026

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- Large **migration events could bridge this gap** by supplying a more balanced skill mix

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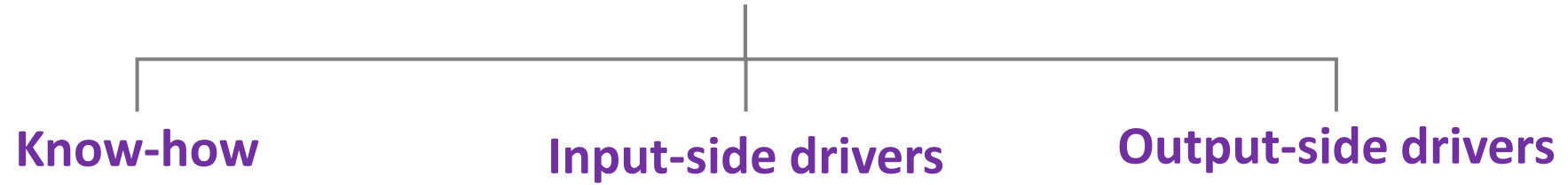
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 - But upgrading hinges on the **availability of labor at all skill levels**
- Large **migration events could bridge this gap** by supplying a more balanced skill mix
 - The **Venezuelan exodus**, the fourth most important migratory crisis in the world, offers such a shock

Research Question

How can low-productivity firms in developing countries catch-up?

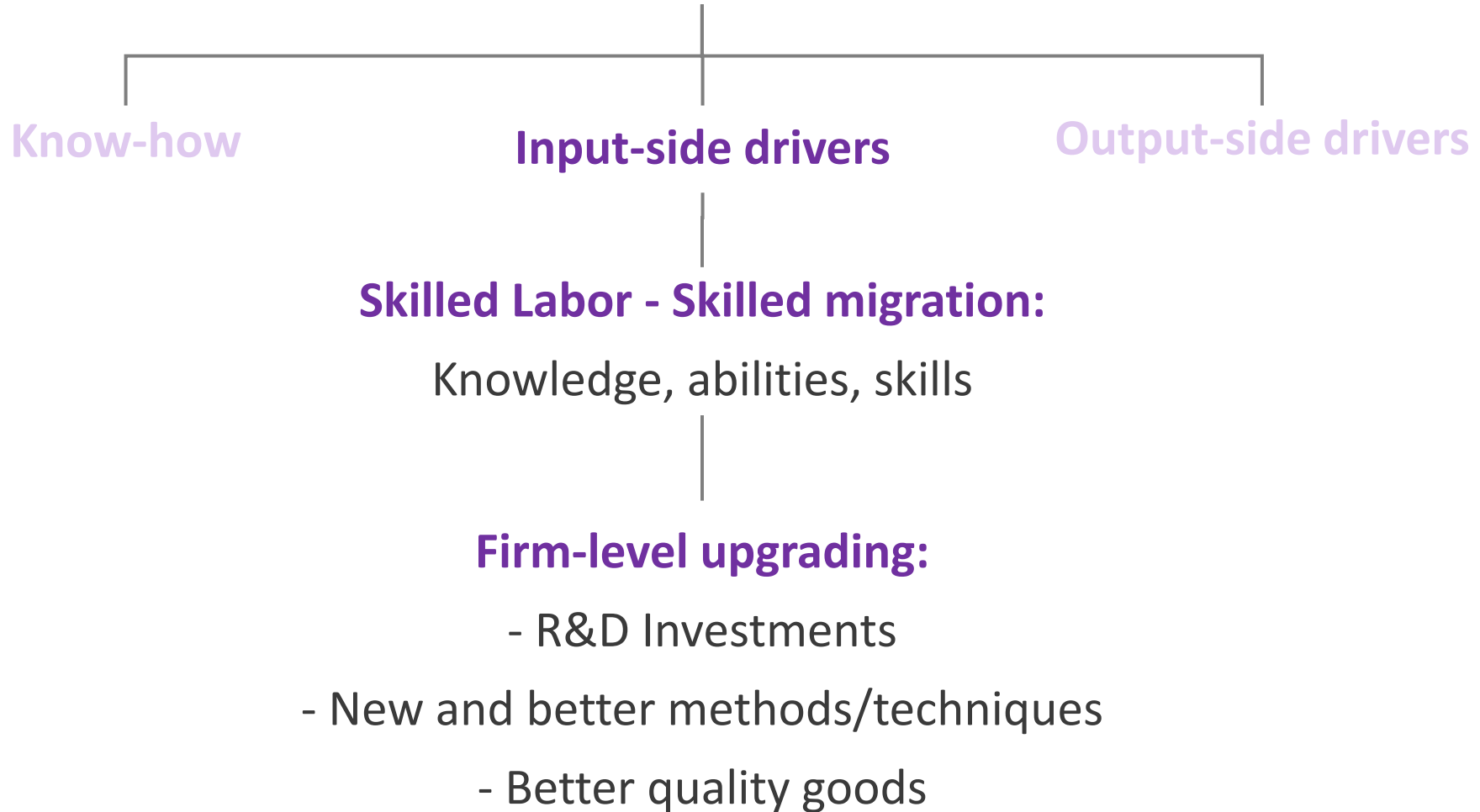
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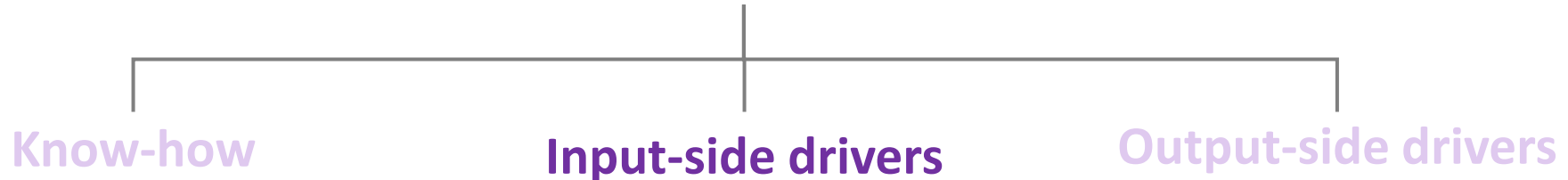
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Skilled Labor - Skilled migration:

Knowledge, abilities, skills

Firm-level upgrading:

- R&D Investments
- New and better methods/techniques
- Better quality goods

Trade / Structural Change / Development

In one slide

- The effect of a slightly **high-skilled supply shock** on **firm-upgrading** and **trade** (2013-2019)
 - We exploit cross-municipality variation in the migration share
 - We **instrument** the share of immigrants with a **distance instrument**

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- Firm-level upgrading boosted **exports: diversification, new markets, more differentiated**
- Model to capture **key empirical findings** and **formalize mechanisms**

Outline

- Data and Descriptives
- Empirical Strategy
- Main Results
- Theory
- Final Remarks

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- 3,017 firms. Data on wages, employment, investment in technology, etc...
- Immigration data: Colombian household survey – municipality data
 - Venezuelan migrants: people born in Venezuela
 - Working-age people (15-64 years)

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We exploit changes in the immigrant share by municipality over time

$$Y_{ijmrt} = \alpha + \beta S_{mrt} + \theta_i + \delta_{rt} + \omega_{jt} + [\Gamma_{mr} \times \gamma_t] + \epsilon_{ijmrt}$$

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Y_{ijmrt} Outcomes of firm i , in industry j , municipality m , region r , year t

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S_{mrt} Share of immigrants in municipality m , region r , year t

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θ_i Firm i fixed effects

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ω_{jt} 4-digit Industry Trend

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Γ_{mr}

Pre-shock municipality characteristics Per capita GDP (in logs), homicide rate, hectares of coca crops (in logs), subsidized health system coverage, and Gini coefficient

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ϵ_{ijmrt} Error term of firm i , in industry j , municipality m , region r , year t

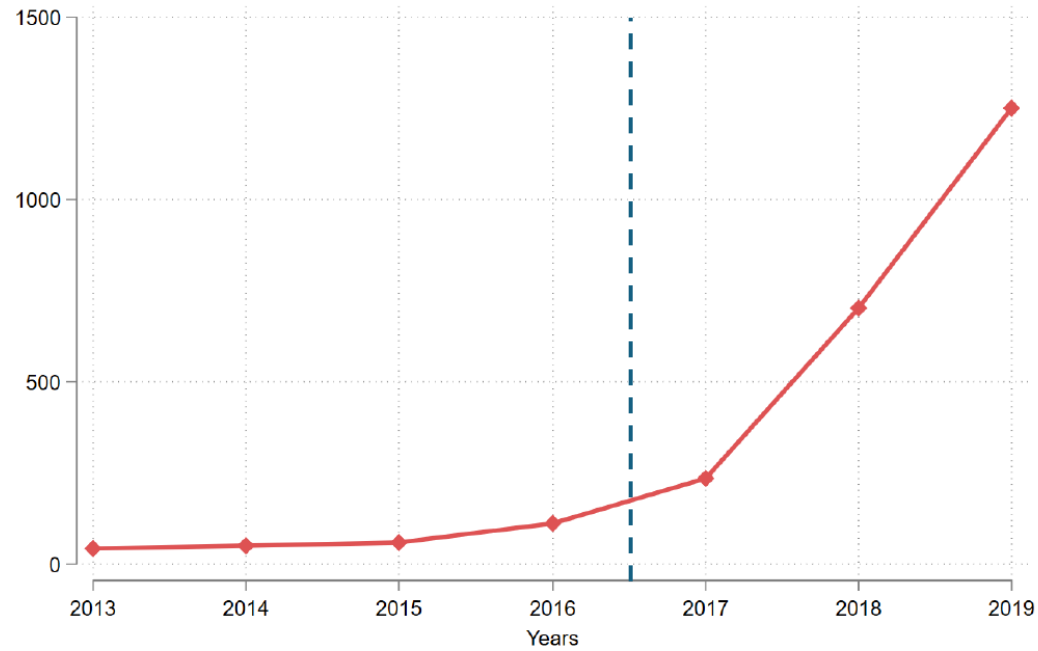
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- We compare an average firm in counties that are more exposed to average firms in counties that are less exposed

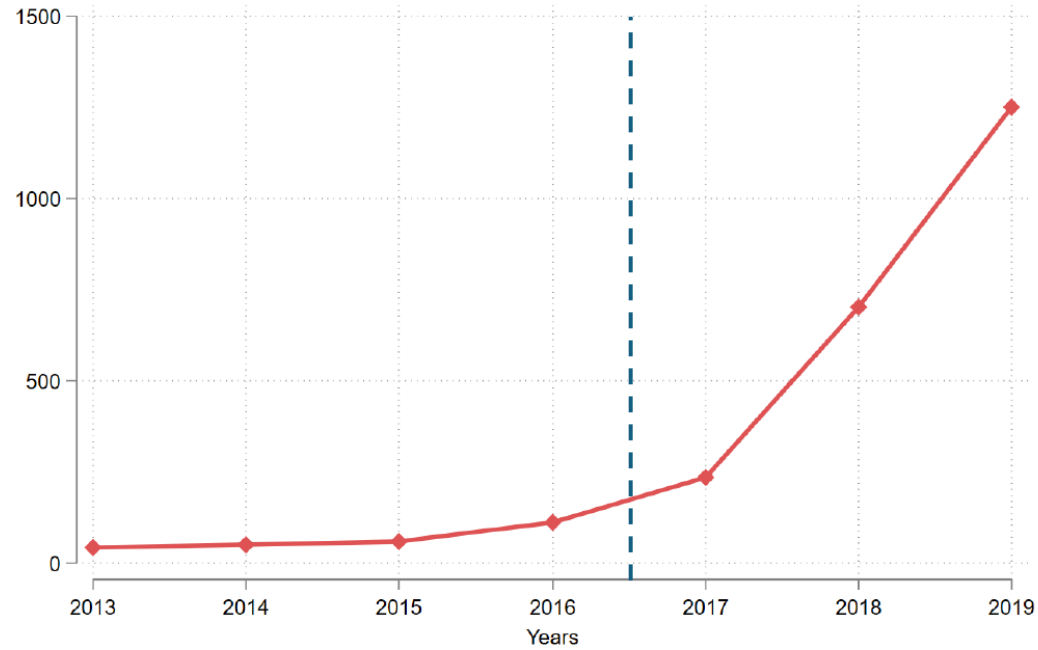
Since 2016, Venezuelan immigration in Colombia skyrocketed

Stock of Venezuelans in Colombia (1000s)

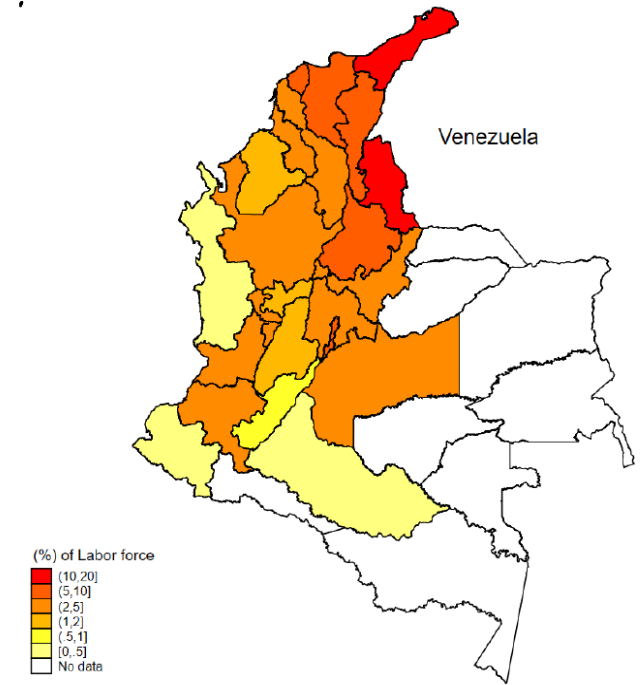


With an enclave settlement pattern

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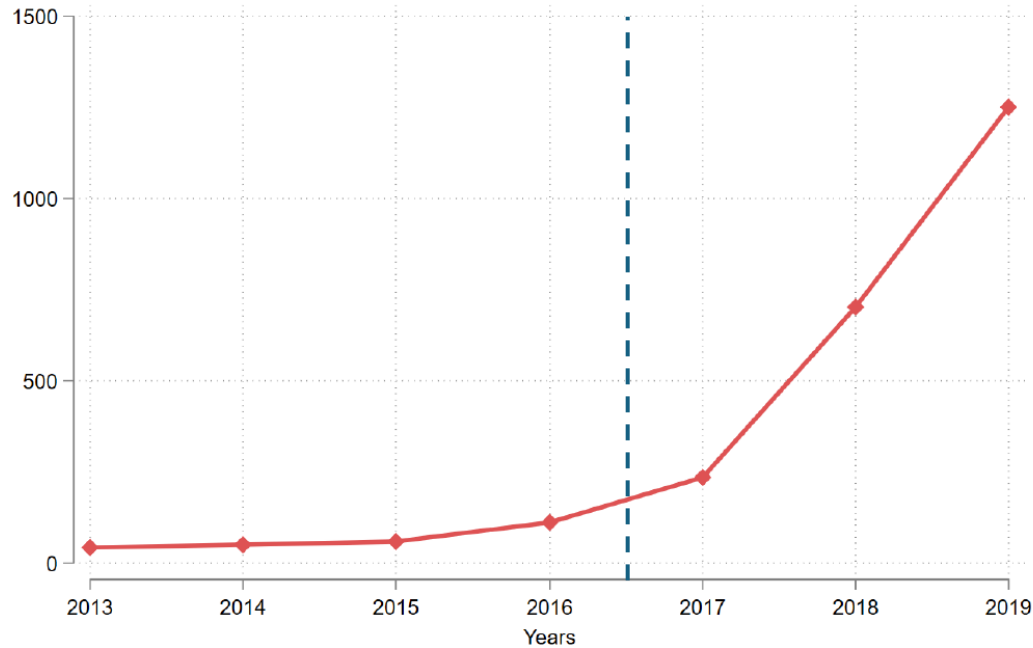


Share of Venezuelans 2019 (% LF)

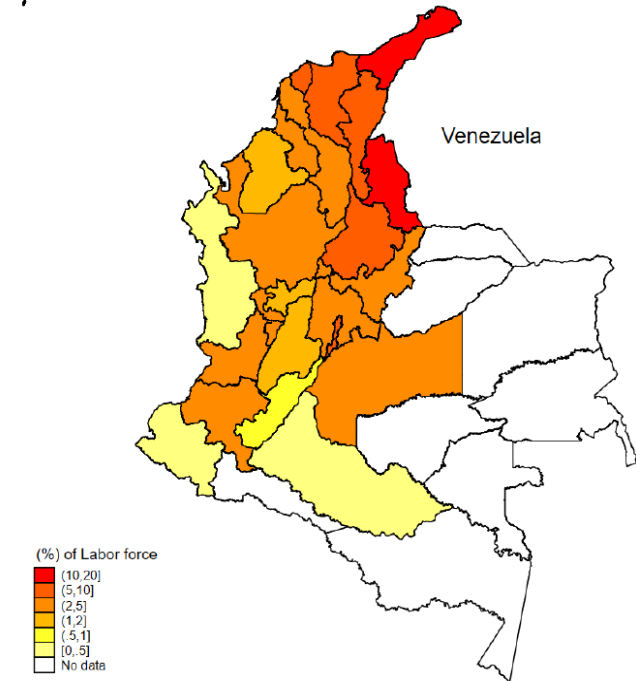


We instrument share of immigrants with a distance IV

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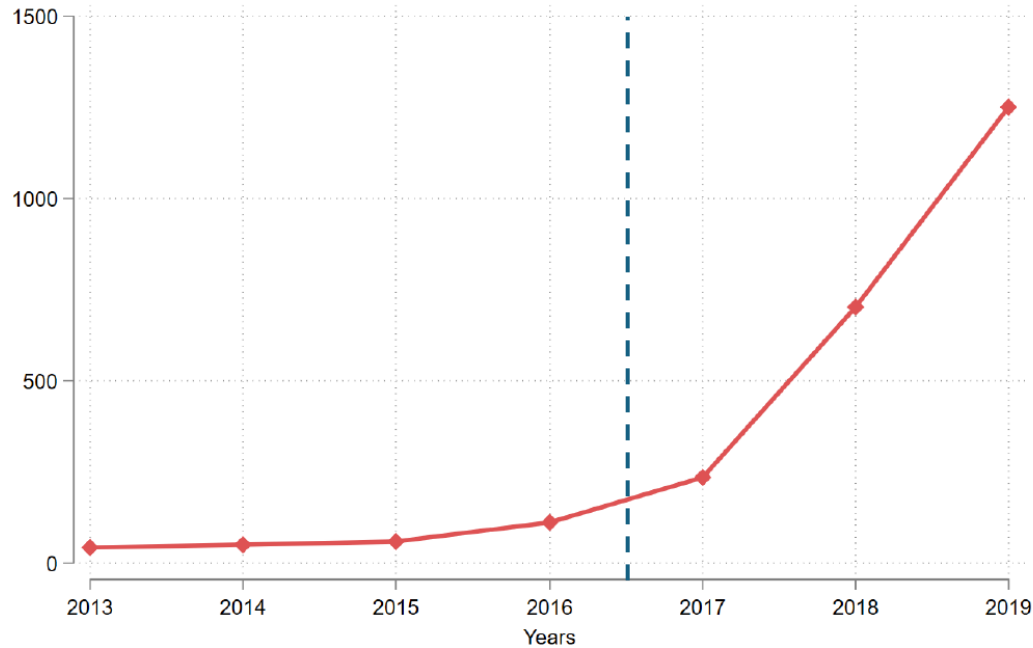
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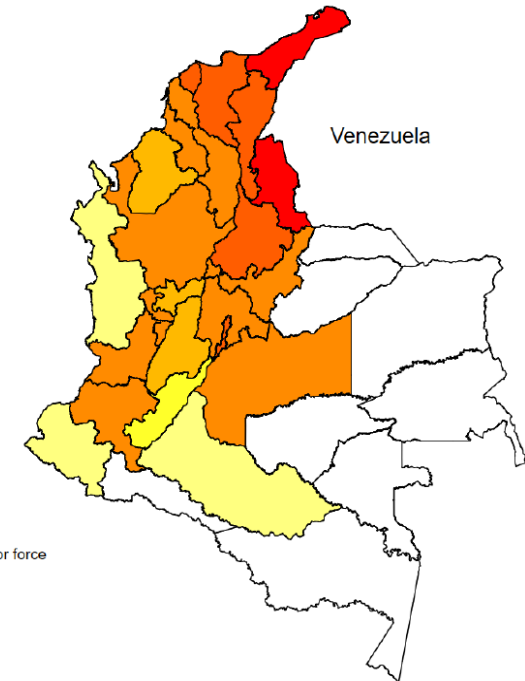
$$IV_{mrt} = V_t \left[\frac{1}{\bar{K}} \sum_K \frac{1}{D_{mrk}} \right] \rightarrow S_{mrt}$$

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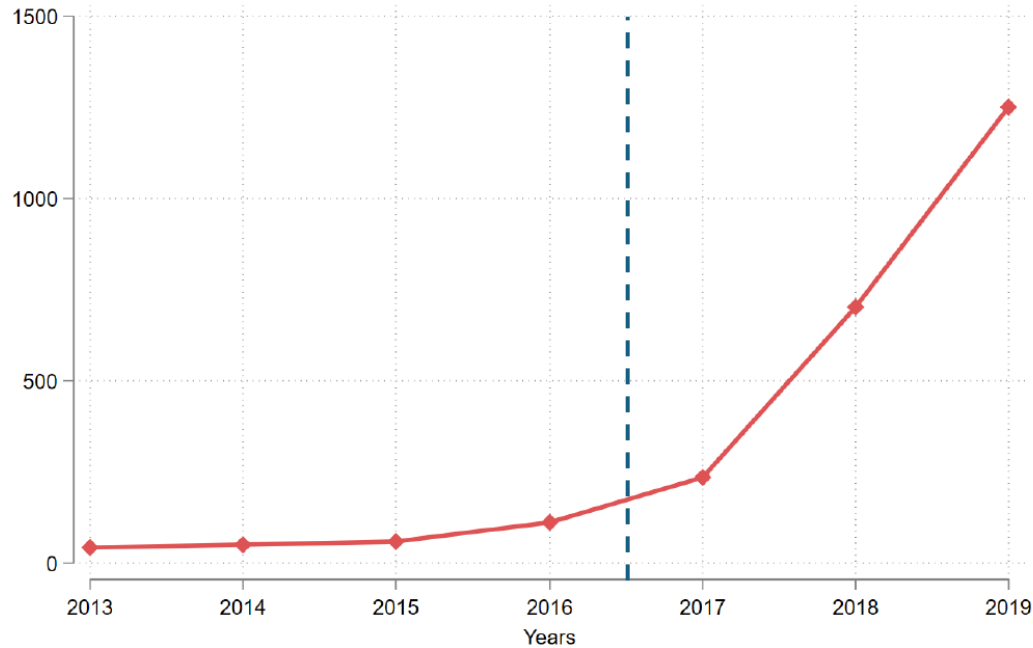


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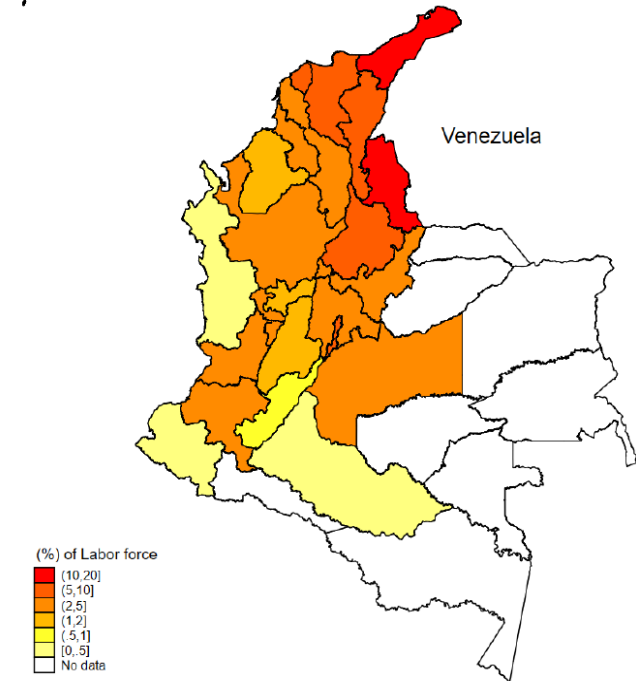
V_t : Stock of Venezuelans living in Colombia in year t

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Stock of Venezuelans in Colombia (1000s)



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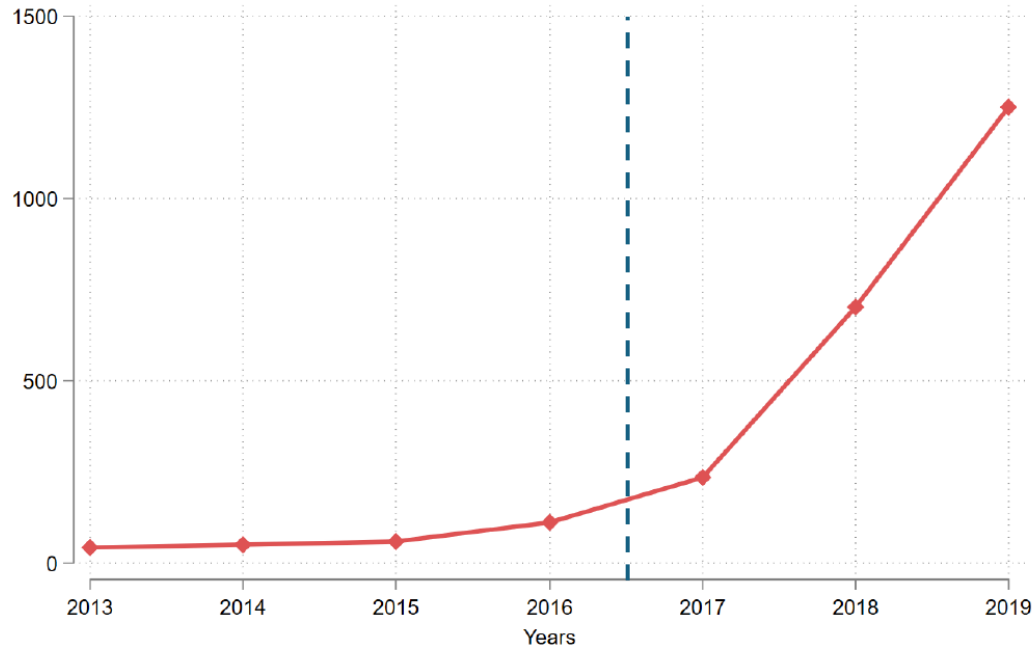


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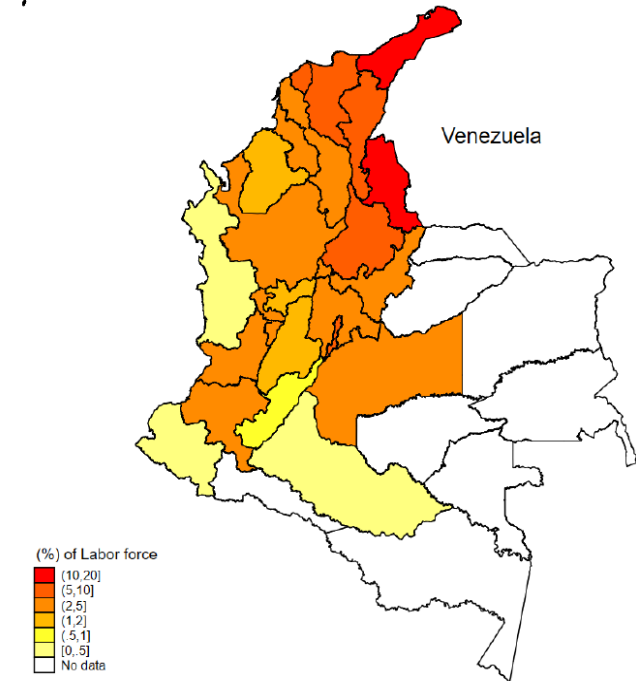
K : Number of States in Venezuela

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Share of Venezuelans 2019 (% LF)



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D_{mrk} : Driving distance between Colombian municipality m and Venezuelan state k

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**How did migration impact
firm-level upgrading?**

Immigration increased high-skilled employment



90% Confidence Intervals

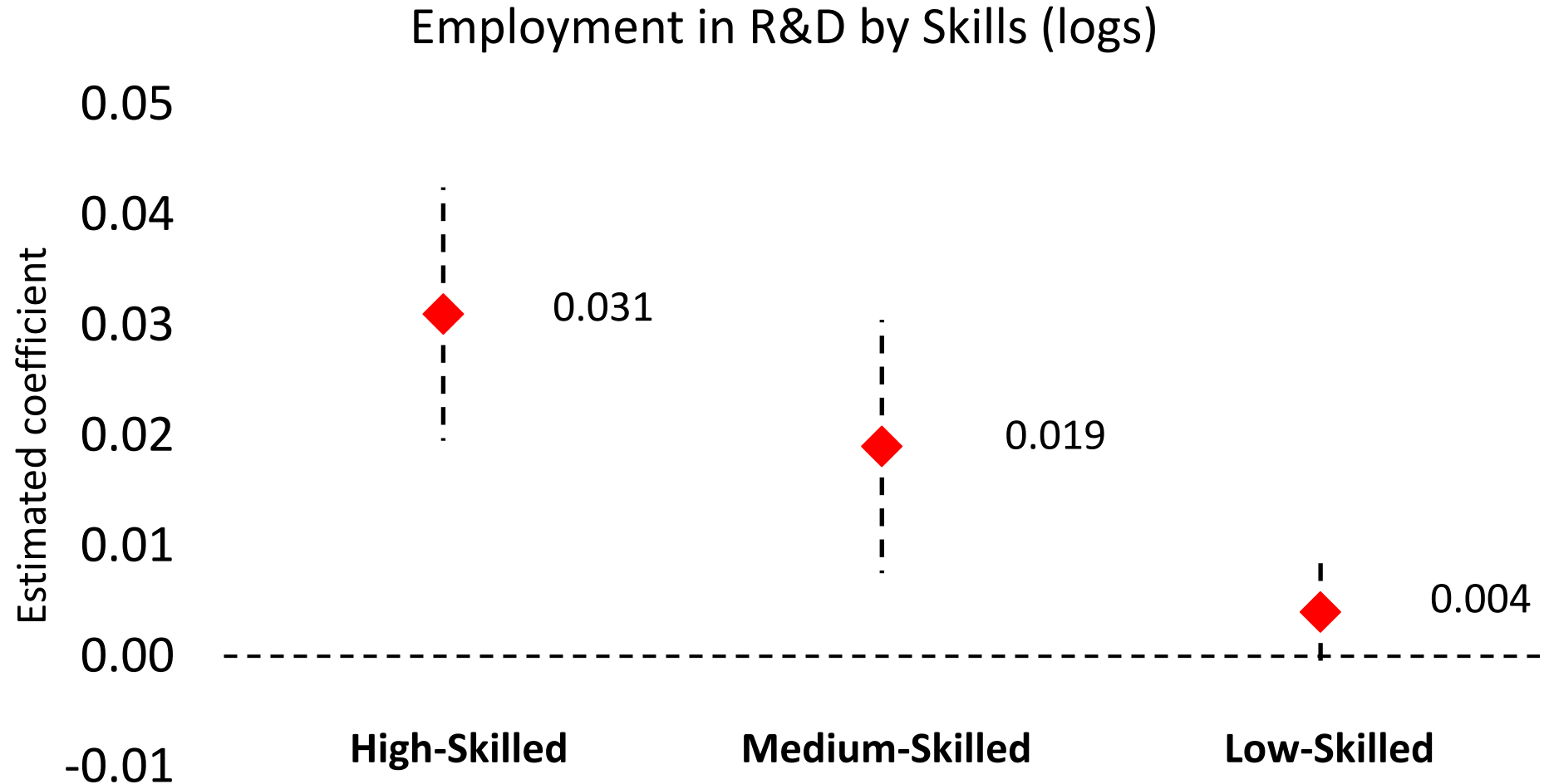
Observations: 21,119
Municipality FE: Yes

Firms: 3,017
Region×Time FE: Yes

Clusters: 79
Industry Trend: Yes

F-statistic: 65.39
Past Controls×Time FE: Yes

Immigration strengthened high-skilled hires in R&D divisions



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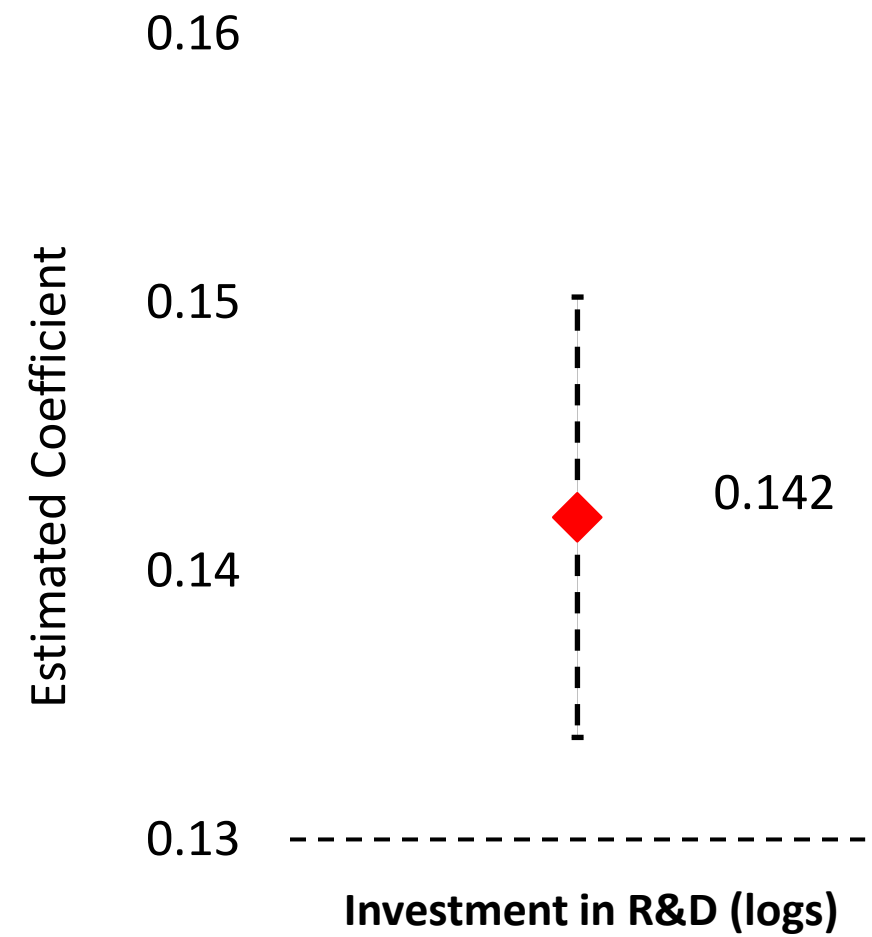
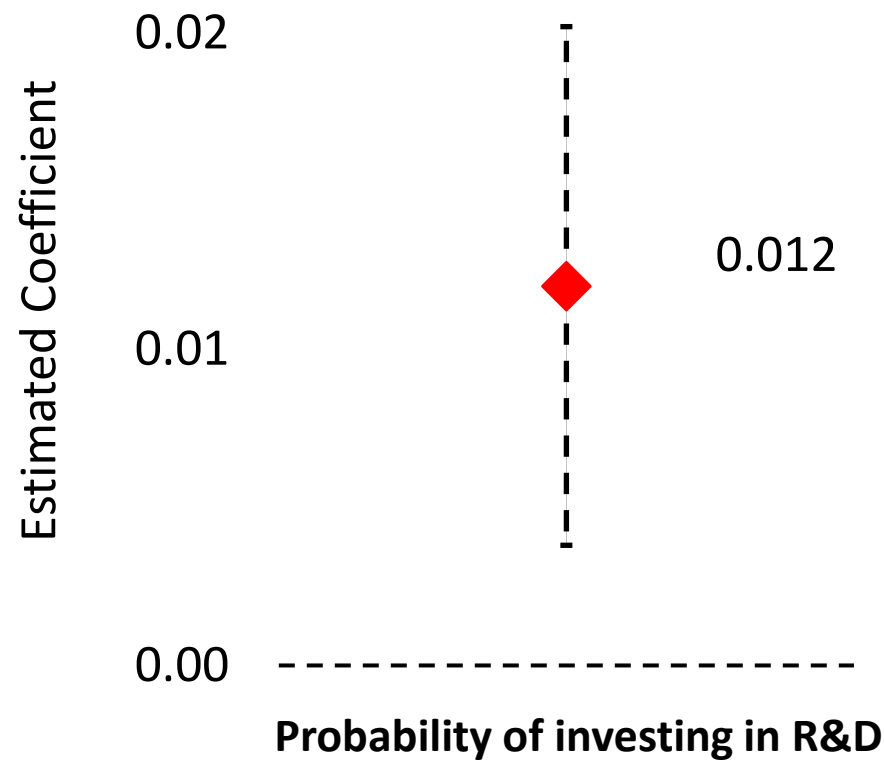
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Immigration increased investment in R&D



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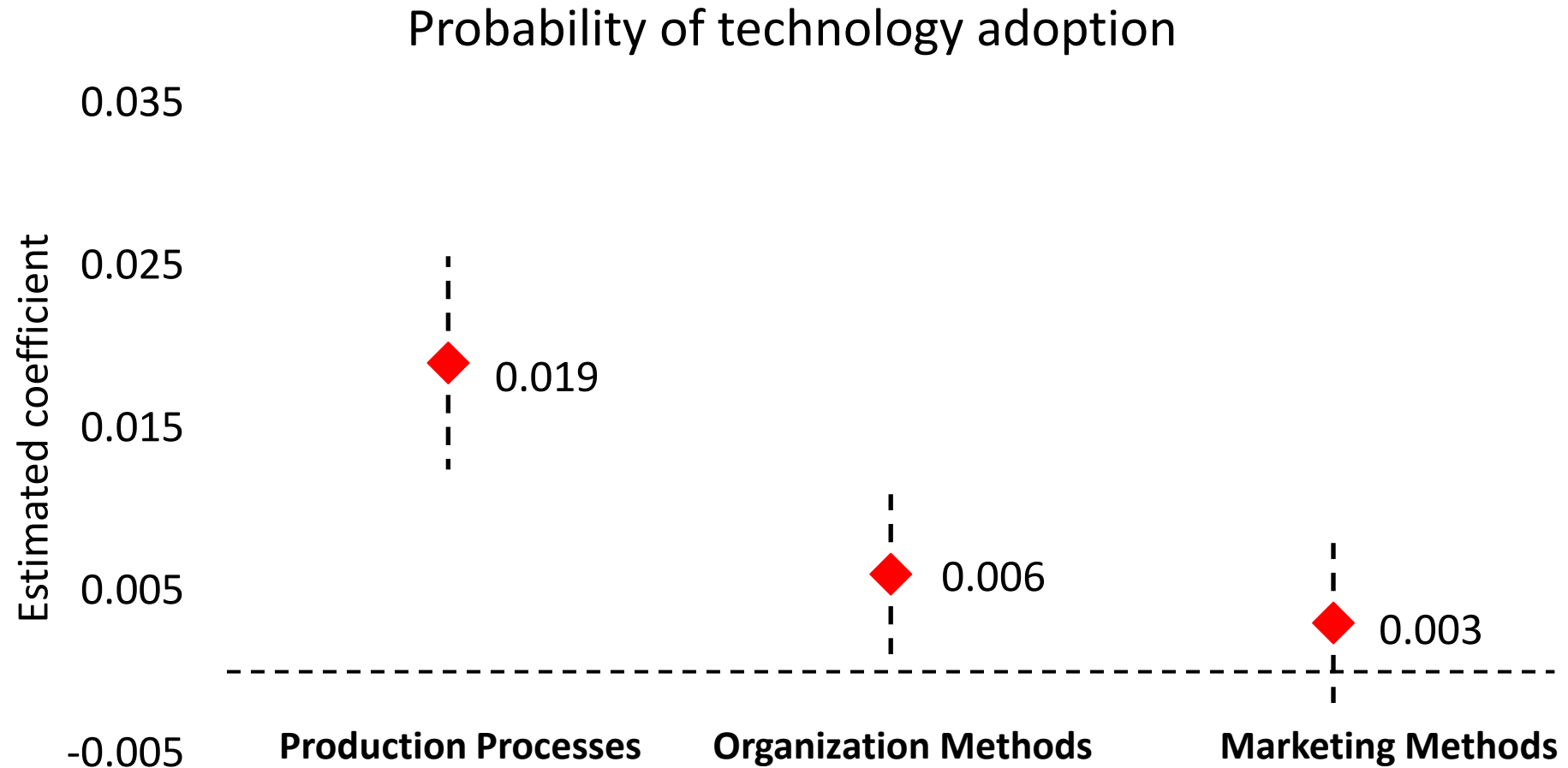
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Immigration helped firms adopt new technologies



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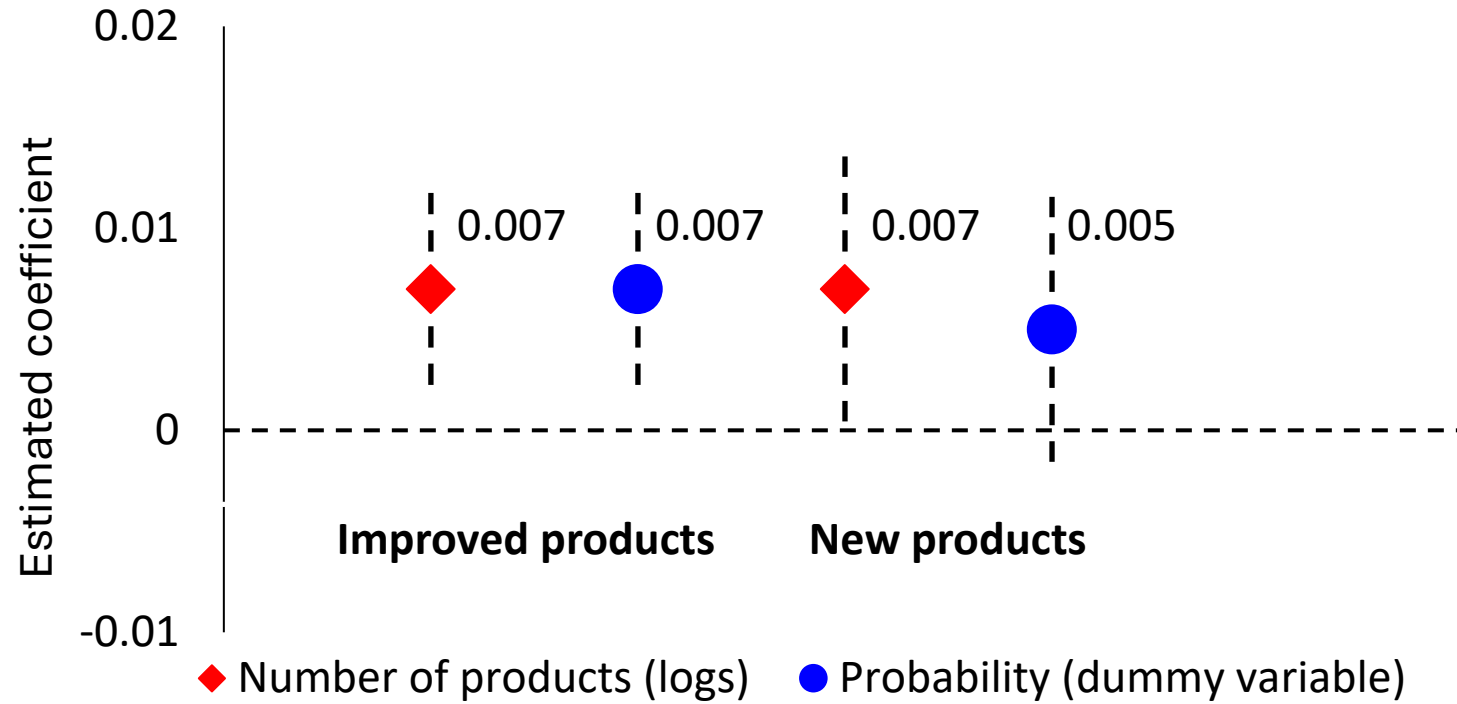
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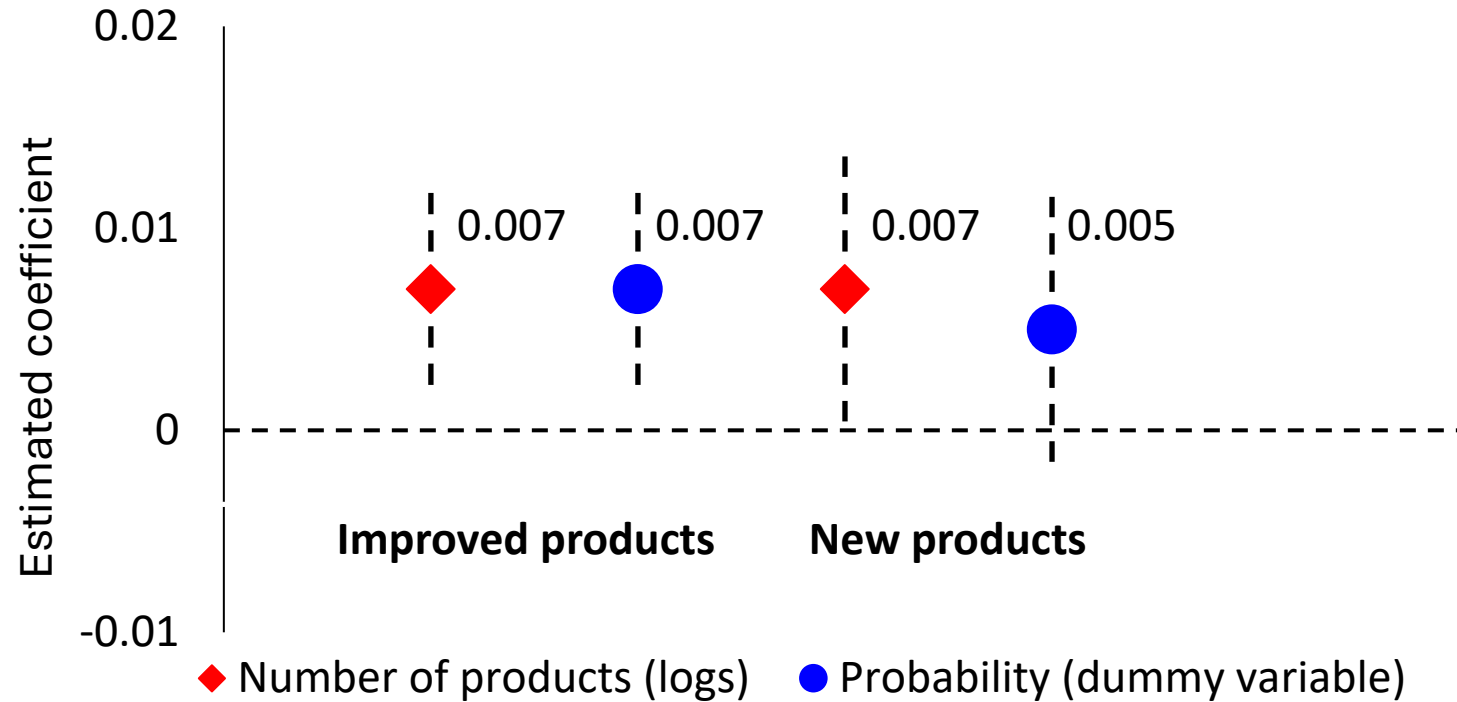
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Immigration helped firms to improve their product portfolio



- Firms import more inputs and changed their main product towards more skill- and R&D intensive one

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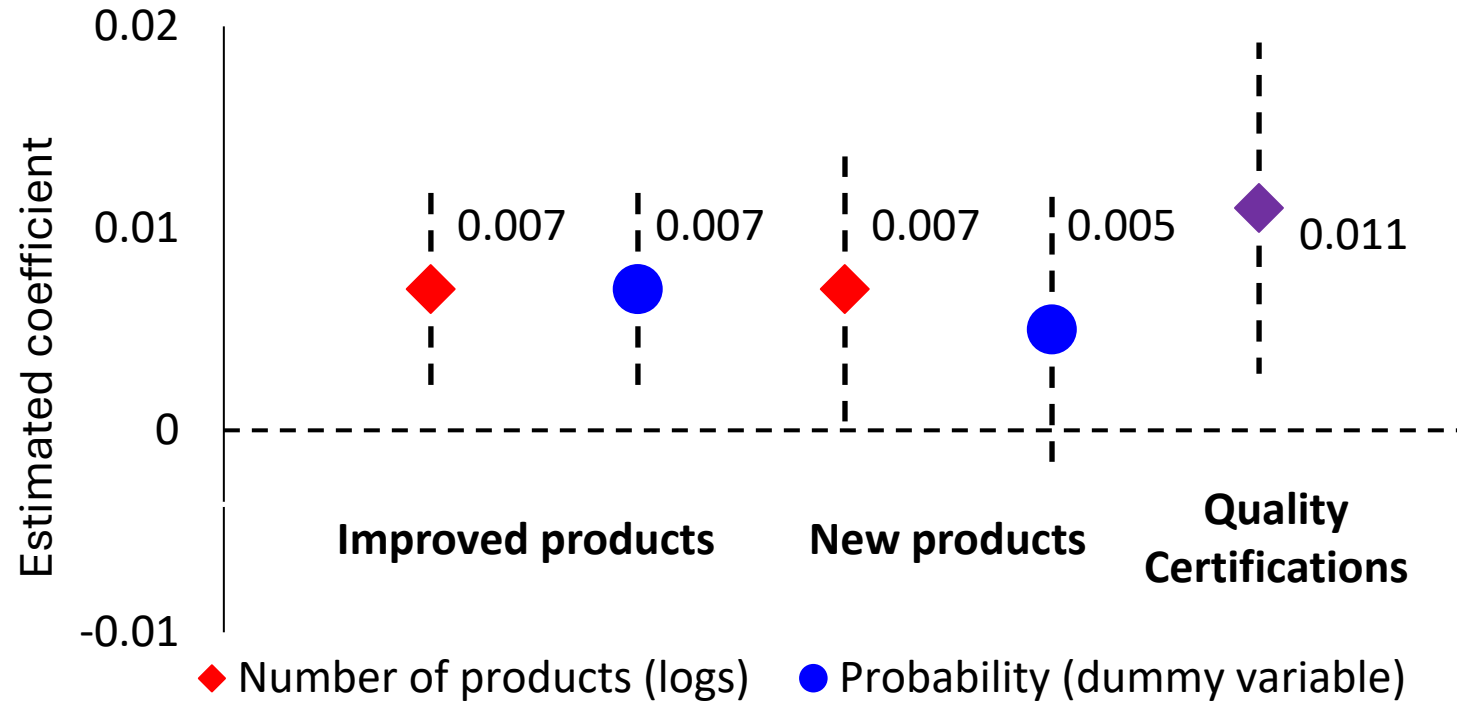
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11/25

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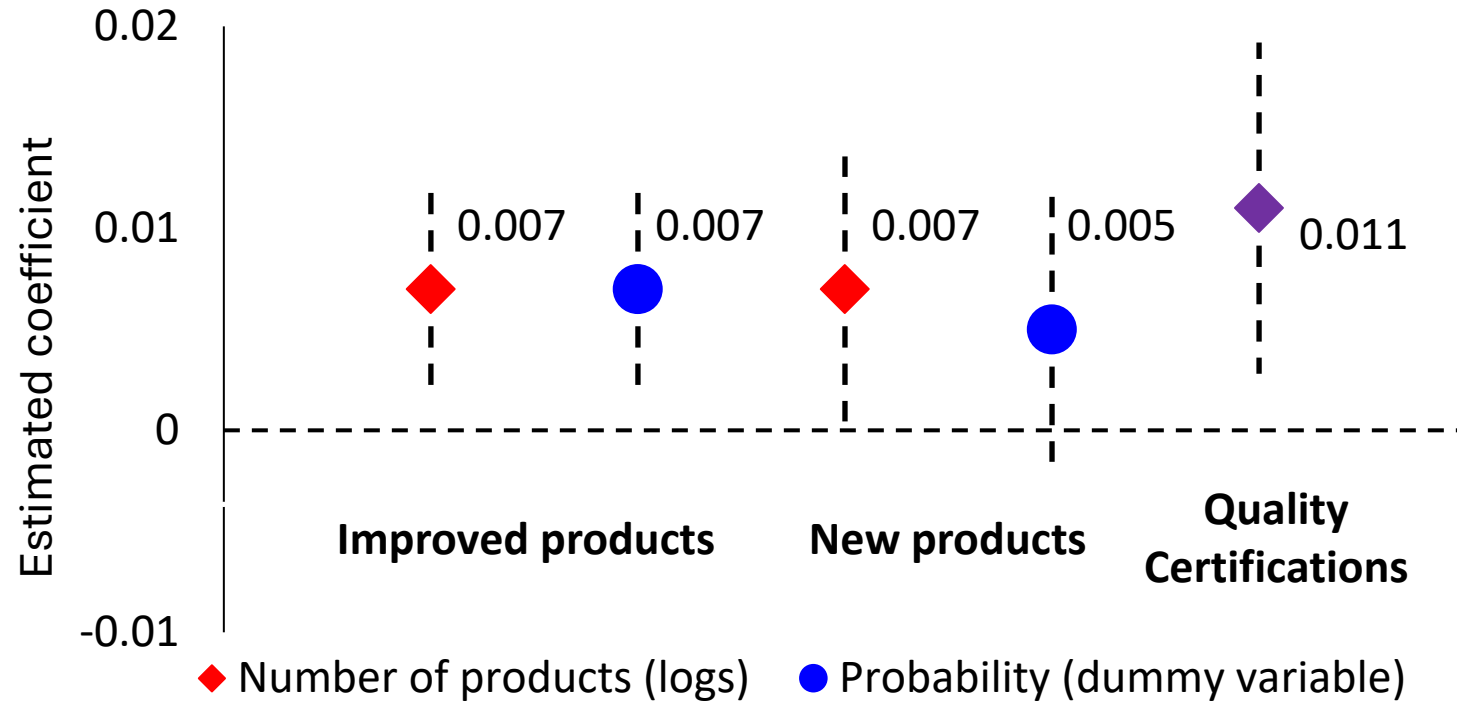
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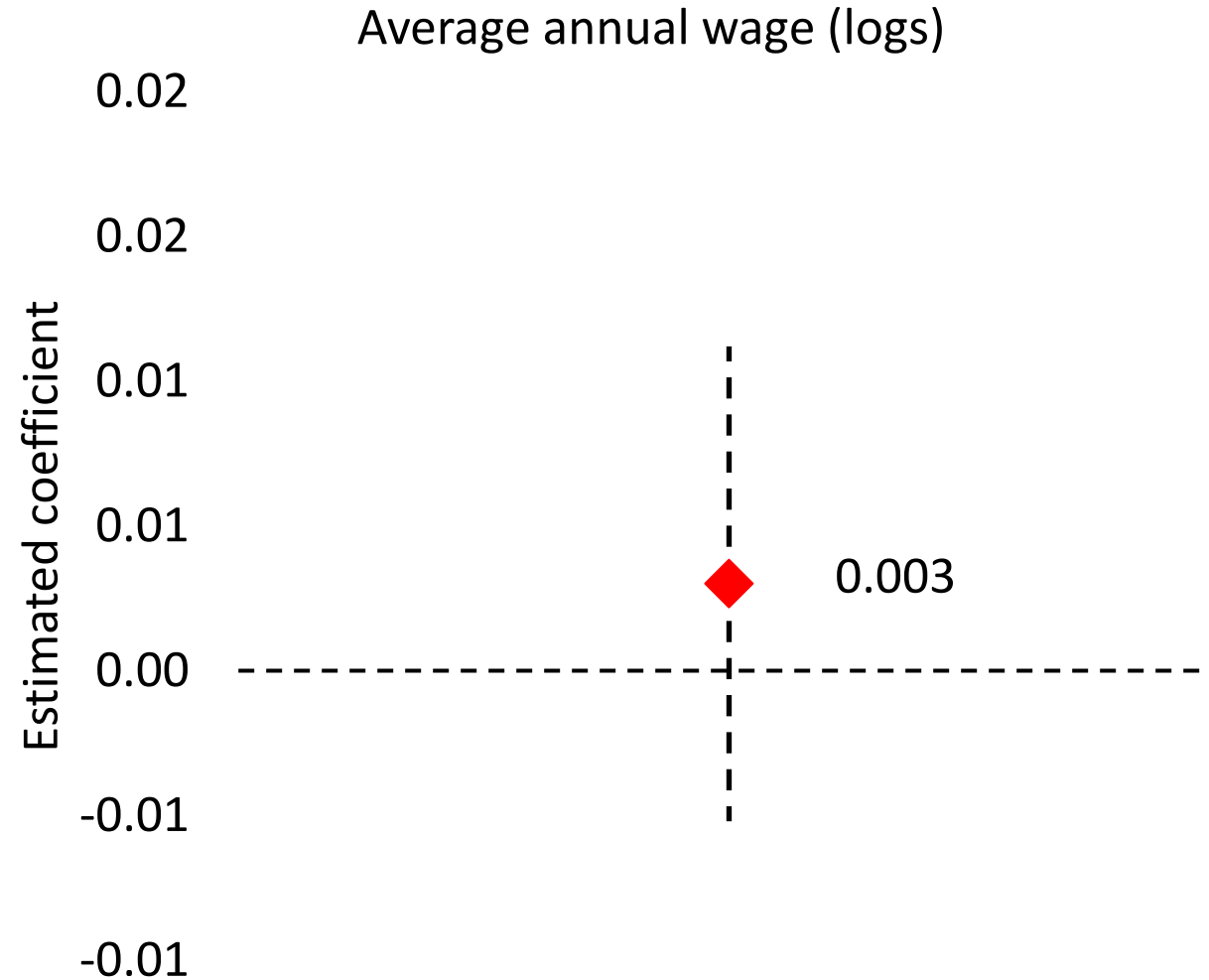
Municipality FE: Yes

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We find no impact on the wage per worker



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Municipality FE: Yes

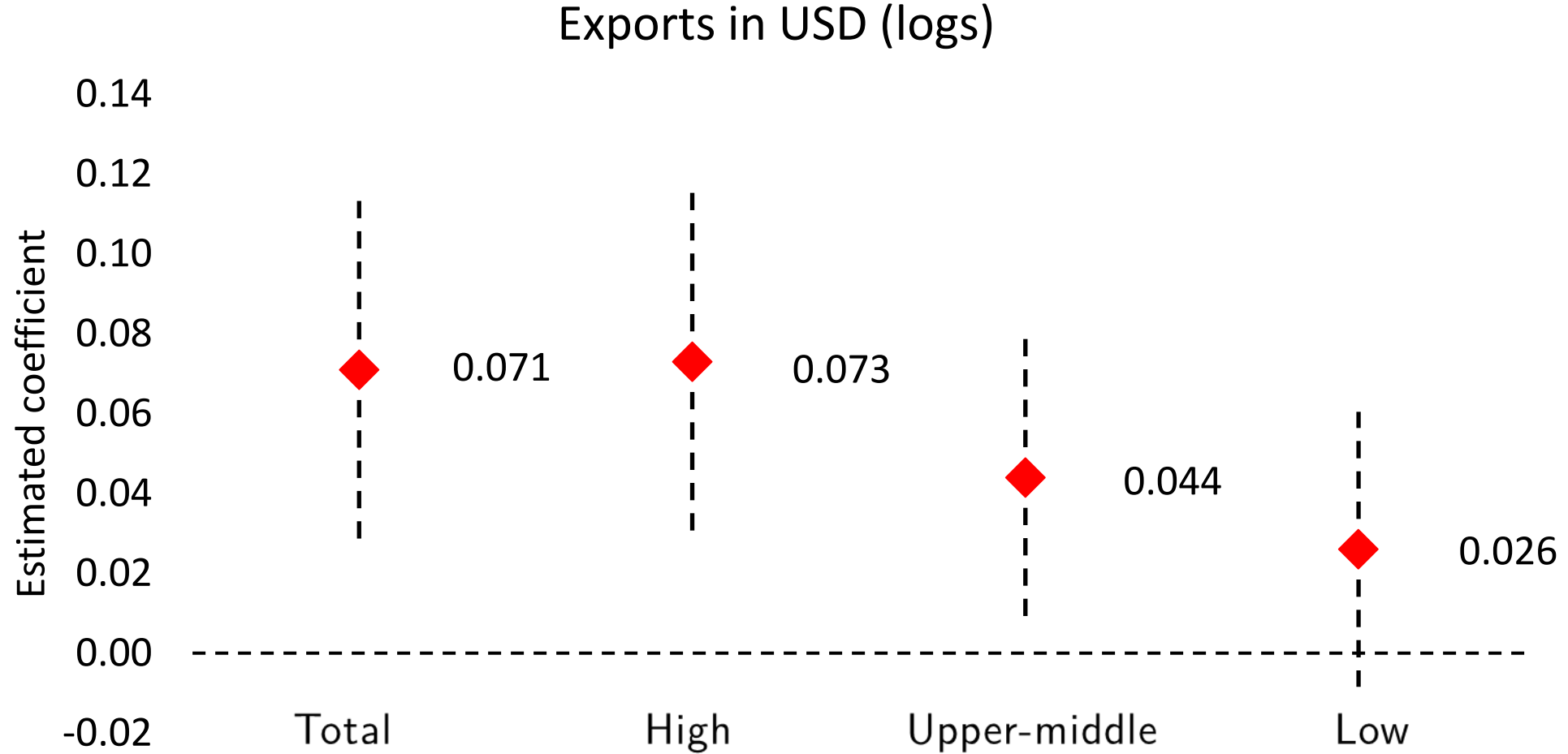
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**Did the firm-level upgrade lead to
an increase in exports?**

Immigration increased amount exported to high-income countries



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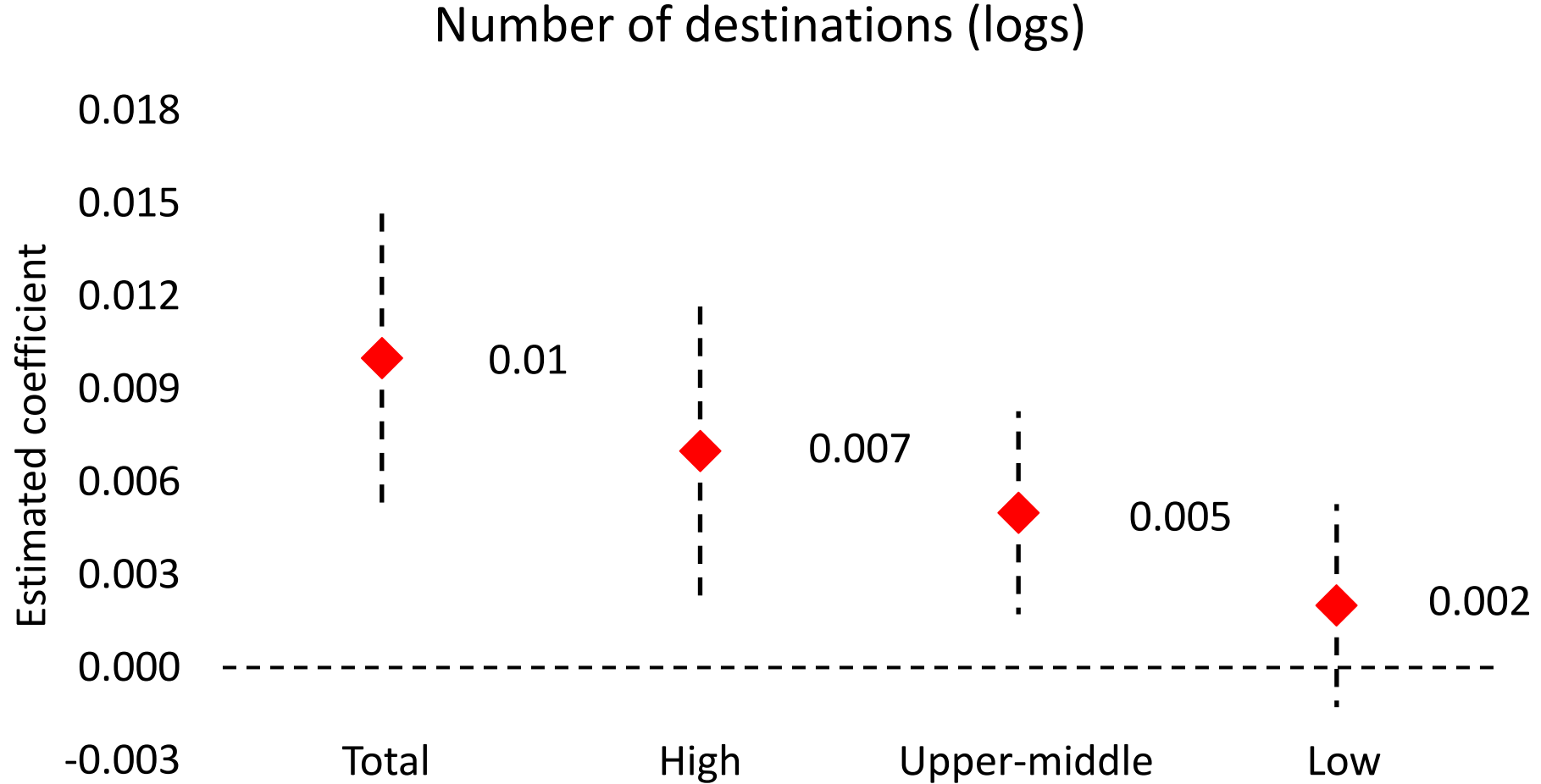
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Immigration helped firms to open new markets



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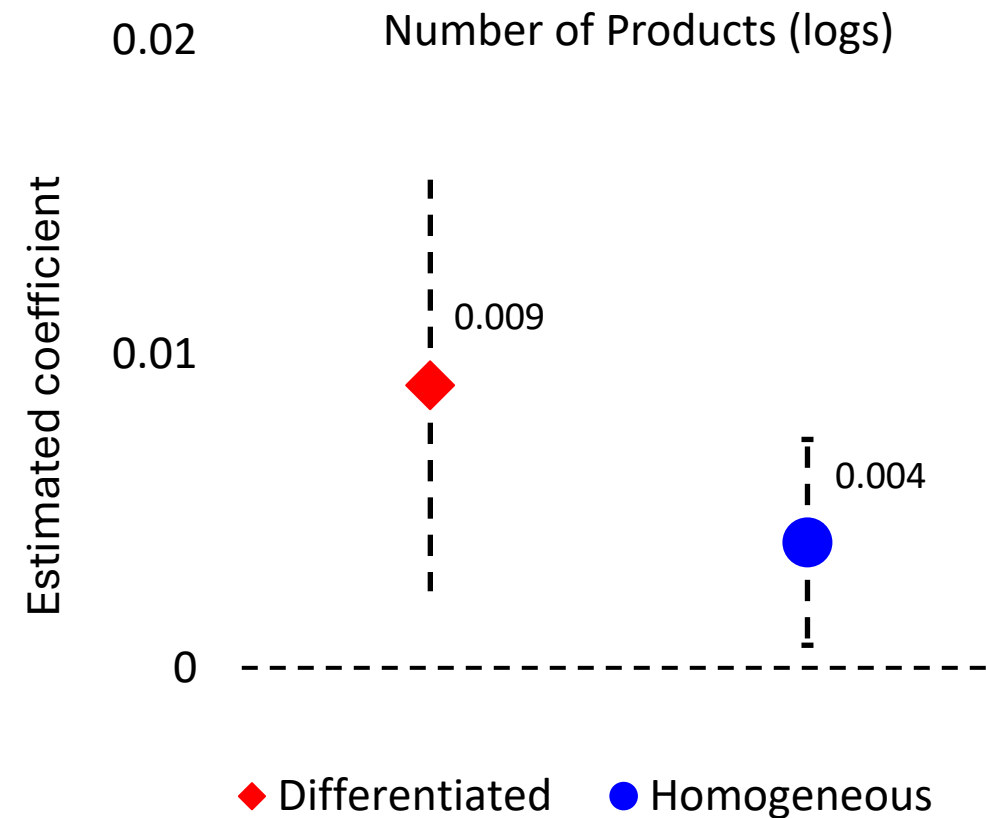
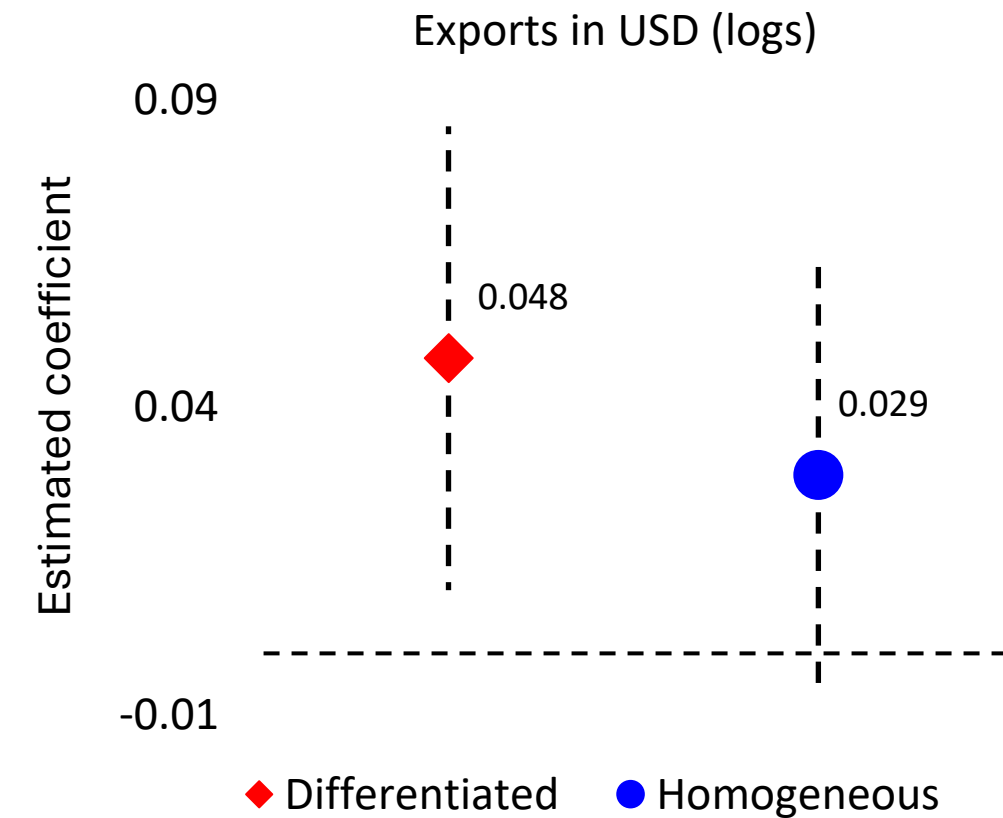
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Immigration increased amount exported of differentiated goods



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 - Trade-off: neoclassical negative effect on wages vs wage increase due to upgrading

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- 3. Better quality increases trade to higher-income destinations

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- Cheaper R&D labor increases revenue, thus increasing wages

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 - Firm heterogeneity + fixed export costs that delivers selection of upgraded firms into high-income destinations
 - Non-homothetic demand makes richer countries pay more for quality

Set up: demand

- Continuum of varieties $\omega \in \Omega$

$$Y = \left[\int_{\omega \in \Omega} u(\omega)^\beta d\omega \right]^{1/\beta}$$

$$u(\omega) = \left[(y(\omega)Q(\omega))^\rho + q(\omega)^\rho \right]^{1/\rho}$$

- In the variety-specific benefit q substitutes effective quantities, yielding a non-homothetic demand
 - Scale quality: durability and warmth of jacket
 - Substitute quality: style and texture of jacket

Set up: production

- Technology has constant returns to scale
- Two divisions within the firm: **production** and **R&D**

$$y(\omega) = z(\omega)q(\omega)^{-\gamma}L_x(\omega)^{1-\alpha}L_y(\omega)^{\alpha}$$

$$Q(\omega) = z(\omega)^{\eta}L_x(\omega)^{\nu}$$

- Production tasks combine **high-, medium-, and low-skilled labor**

$$L_y(\omega) = \ell_{y,s}(\omega)^{\kappa}\ell_{y,m}(\omega)^{\iota}\ell_{y,u}(\omega)^{1-\kappa-\iota}$$

- R&D occupations use **high- and medium-skilled research labor**

$$L_x(\omega) = \ell_{x,s}(\omega)^{\xi}\ell_{x,m}(\omega)^{1-\xi}$$

Closed economy: revenue and complementary quality

- Revenue:

$$x(\omega) = \left(\frac{v(\omega)}{V} \right)^{\frac{1}{\psi-1}} X$$

- A firm with inverse quality-adjusted cost of variety ω , $v(\omega) = Q(\omega)/c(\omega)$, selling to a buyer with budget x provides substitute quality:

$$q(\omega) = \left(\frac{\Gamma_1^{1/\rho}}{\psi} \right)^{\frac{1}{1+\gamma}} \left(\frac{v(\omega)}{V} \right)^{\frac{1}{1+\gamma-\beta}} (xV)^{\frac{1}{1+\gamma}}$$

- Substitute quality increases with
 - The firm's share in the budget, $v(\omega)/V$
 - The buyer's real spending xV

Closed economy: cost and substitutable quality

- Inverse quality-adjusted cost:

$$v(z, \mathbf{w}) = \frac{z^{\frac{1+\eta}{1+\nu}}}{\tilde{c}}$$

- Scale quality:

$$Q = z^{\frac{\eta-\nu}{1+\nu}} \left(\frac{W_x}{W_y} \frac{\tilde{\alpha}}{1 - \tilde{\alpha}} \right)^{-\nu\tilde{\alpha}}$$

- A firm facing lower relative R&D wages
 - Produces higher scale quality
 - Increases revenue, that pushes wages up

Open economy: setup

- N countries indexed by n as destinations and by i as sources
 - Focus on Colombia, h
- Measure of potential producers with efficiency at least z given by Pareto measure $T_i z^{-\theta}$
- Consider producer in h with efficiency z selling to buyers in country n
- Inverse of firm's quality-adjusted cost in the destination

$$v(z, \mathbf{w}_h) = \frac{z^{\frac{1+\eta}{1+\nu}}}{d_{nh} \tilde{c}_h}$$

Open economy: entry and selection

- Cutoff

$$\underline{v}_n = \Gamma_4 \left(\frac{f_n}{X_n} \right)^{\psi-1} V_n$$

- Share of country h 's sales in country n 's spending is

$$\pi_{nh} = \frac{T_h (d_{nh} \tilde{c}_h)^{-\tilde{\theta}}}{\sum_{i=1}^N T_i (d_{ni} \tilde{c}_i)^{-\tilde{\theta}}}$$

Open economy: bilateral price equation

- Define firm ω 's relative efficiency in market n , $\epsilon_{nh}(\omega) = v_{nh}(z(\omega))/\underline{v}_n$, the bilateral price is

$$p_{nh}(\boldsymbol{\epsilon}, \boldsymbol{x}) = \Gamma_6(d_{nh} W_{h,y}^{\tilde{\alpha}} W_{h,x}^{1-\tilde{\alpha}})^{\tilde{\eta}} \left(\frac{W_{h,x}}{W_{h,y}} \right)^{-v\tilde{\alpha}} \left[\left(\frac{f_n}{X_n} \right)^{\psi-1} V_n \right]^{\tilde{\eta}-1} \left(\frac{f_n}{X_n} \right)^{\tilde{\gamma}\psi} (xV_n)^{\tilde{\gamma}} \epsilon_{nh}^{\tilde{\eta}-1+\tilde{\gamma}\frac{\psi}{\psi-1}}$$

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- $\eta = \nu = 0$ and $\gamma = 0 \Rightarrow$ standard Melitz selection

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- $\eta - \nu > 0$ more efficient firms have higher scale quality Q
 - Firms overcoming entry barriers mitigate selection
- $\nu > 0$ composition of labor matters for Q
- $\gamma > 0$ selling more per buyer associated with \uparrow substitute quality q and $\uparrow p_{nh}$
 - Sales per buyer greater in markets with larger entry cost or richer buyers

Outline

- Data and Descriptives
- Empirical Strategy
- Main Results
- Theory
- Final Remarks

Final Remarks

- The Venezuelan exodus was a labor supply shock, relatively larger among high-skilled workers
- Firms took advantage of this shock and improved their production and organizational processes, as well as their products
- By improving quality of products and processes firms could improve their export performance
- Relative wages across firms' divisions shape quality and thereby influence gains from trade
 - Selection of more productive, higher-quality firms into trade with bigger markets
- Migration-driven upgrading offers a substitute for education or training (much faster!), positioning migration as an alternative to traditional industrial policy for development

Questions or suggestions?

Thank you!

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Robustness checks and additional results

Robustness

- We show that there are **no pre-exodus trends** explained by “share” of IV
- We control for **FTA signed up by Colombia** with other countries

Substitution of Colombians by Venezuelans?

- Using municipality-level data we show that **manufacturing employment of Venezuelans increased** (proportionally more for high-skilled workers)
- There was **no negative impact** on the employment of Colombian workers

Relation to the literature

Firm Upgrading Literature

- Usually trade → upgrading (Verhoogen, 2008)

→ Migration as a driver of upgrading

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Migration & Trade Literature

- Beyond network effects (Gould, 1994; Head & Ries, 1998)
- Skills and knowledge channel (Bahar *et al.*, 2022)

→ Direct evidence on upgrading mechanisms

Relation to the literature

Firm Upgrading Literature

- Usually trade → upgrading (Verhoogen, 2008)

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Key Innovations

- Go into more detail about the measurement and mechanisms
- Chain of Effects: Input quality (skilled workers) → Process improvement → Output quality → Export sophistication

Migration & Trade Literature

- Beyond network effects (Gould, 1994; Head & Ries, 1998)

- Skills and knowledge channel (Bahar *et al.*, 2022)

→ Direct evidence on upgrading mechanisms

Relation to the literature: Why this matters?

Moving beyond TFP residuals to observable upgrading

- More credible than residual-based measures
- No strong functional form assumptions
- Direct link to export market requirements

→ Particularly valuable for developing country context where such data is rare

Exporter firms have more skills, R&D, and quality certifications

	All firms	Exporters	Non-Exporters
High-skilled workers	51.26	84.53	15.55
Medium-skilled workers	84.41	128.62	36.94
Low-skilled workers	14.17	17.13	11.08
High-skilled workers in R&D	2.19	3.64	0.63
Medium-skilled workers in R&D	1.03	1.59	0.43
Low-skilled workers in R&D	0.06	0.09	0.02
Average annual wage in USD	13,021	15,459	10,404
Annual sales in 1,000 USD	1,347	2,160	473
R&D in USD in 1,000 USD	28.66	51.96	4.06
Adopted a new technique	0.23	0.29	0.16
Has a quality certification	0.14	0.20	0.08
Observations	3,017	1,562	1,455

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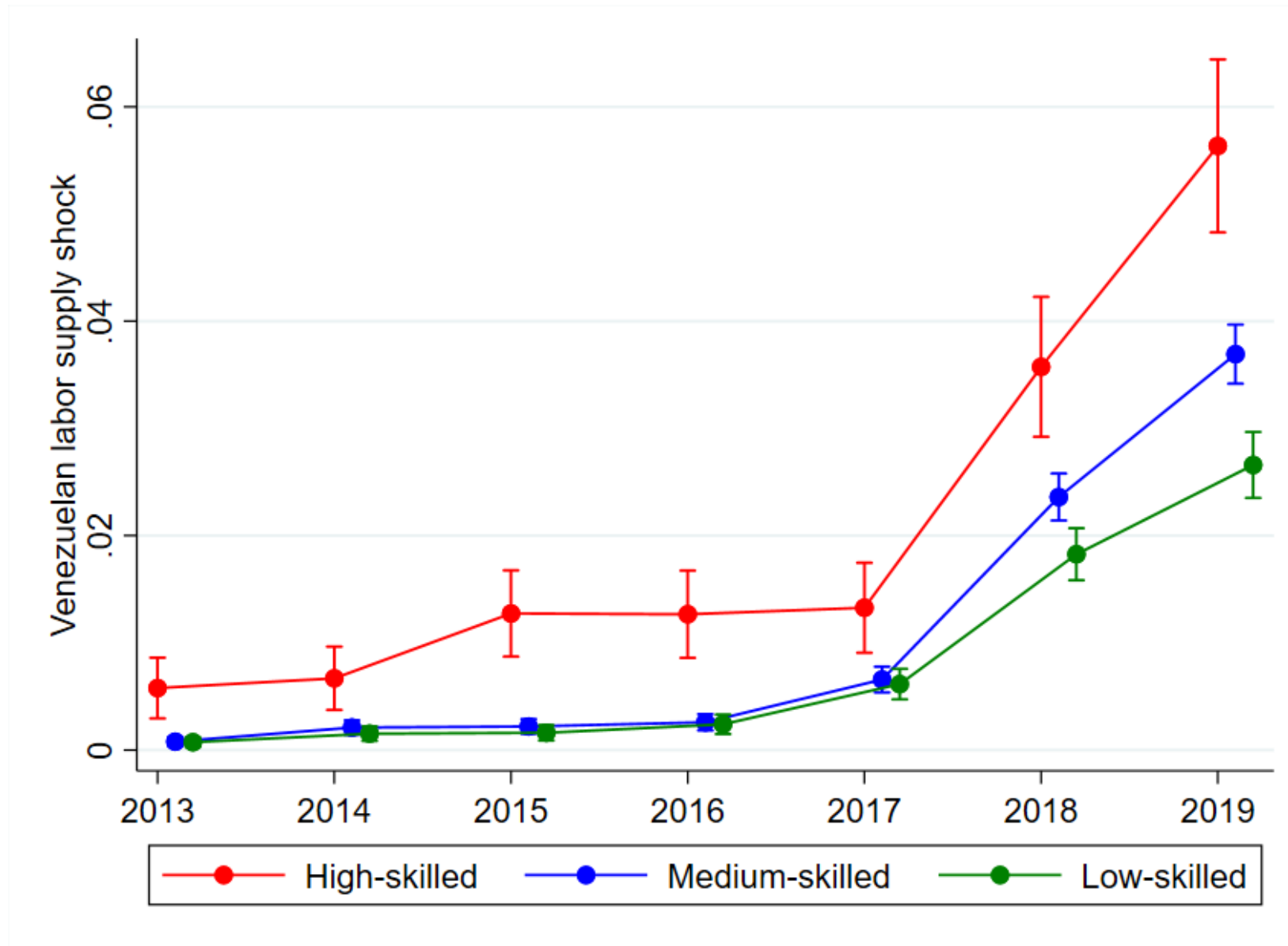
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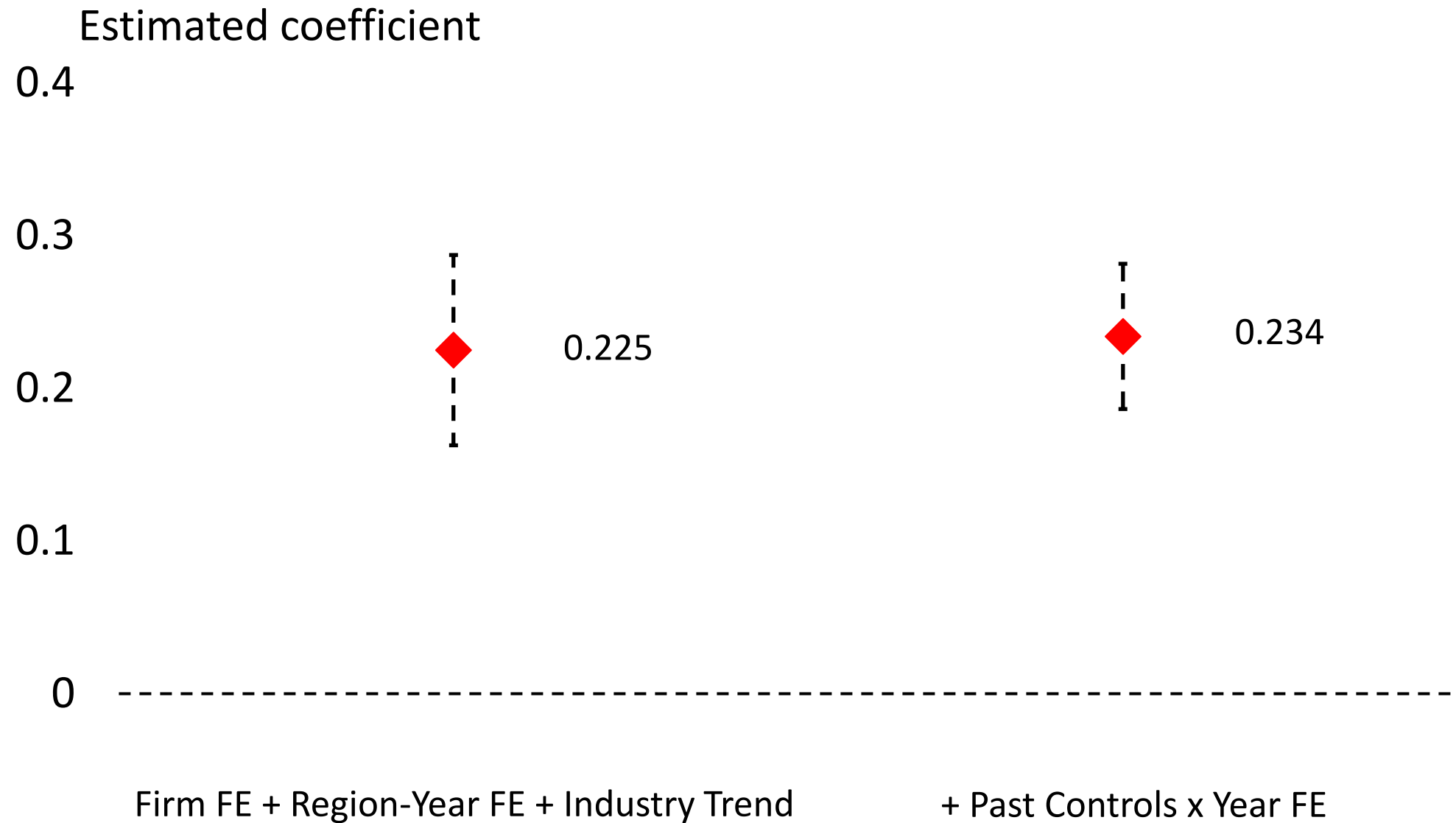
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Venezuelan exodus: slightly high-skill biased supply shock in manufacturing



We have a strong first-stage (F – statistic = 65.39)



Summary: Changes in Firm Behavior

Migration

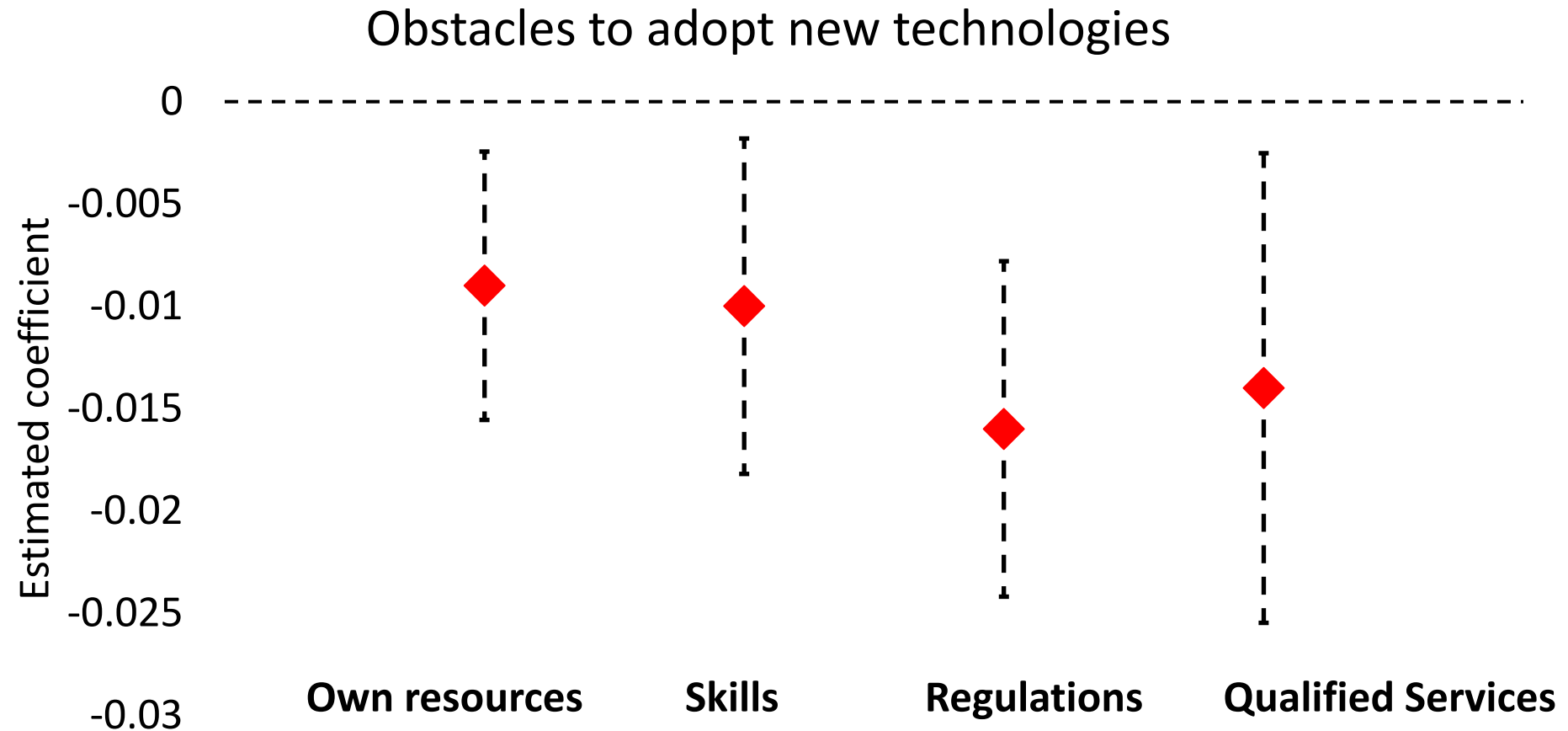
- Increased high-skilled hires and high- and medium-skilled employment in R&D divisions
- Increased investment and the probability of investing in R&D
- Enhanced technology adoption:
 - Increased probability of adopting new/better production process
 - Increased probability of adopting new/better organization methods
- Improved product quality and expanded product portfolio
- Had no impact on the average annual wage per worker

Summary: Changes in Exporting Behavior

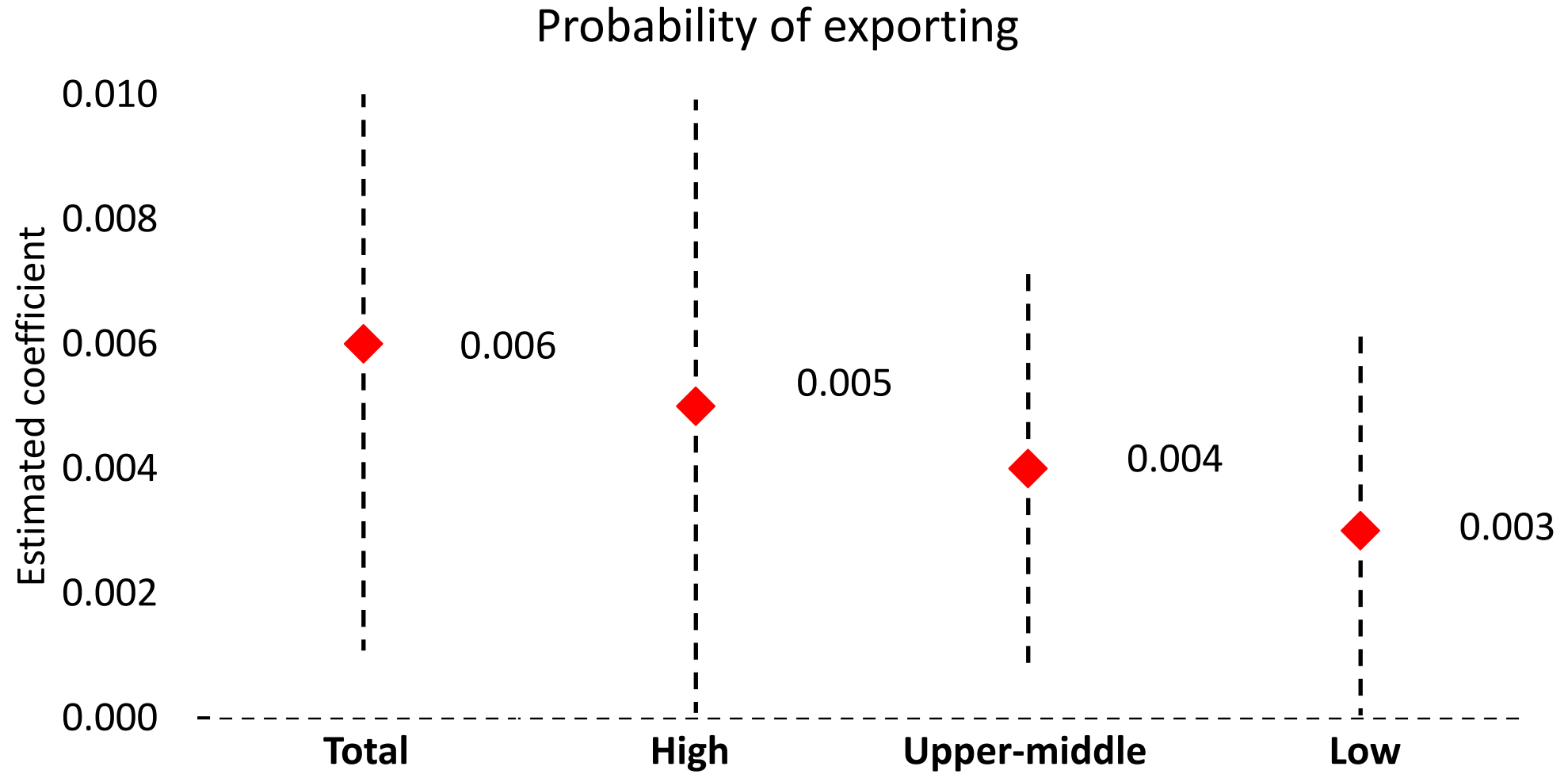
Migration

- ↑ exports, particularly to high- and upper middle-income countries (intensive and extensive)
- ↑ number of destinations and opened markets in high- and upper middle-income countries
- ↑ amount exported of differentiated goods

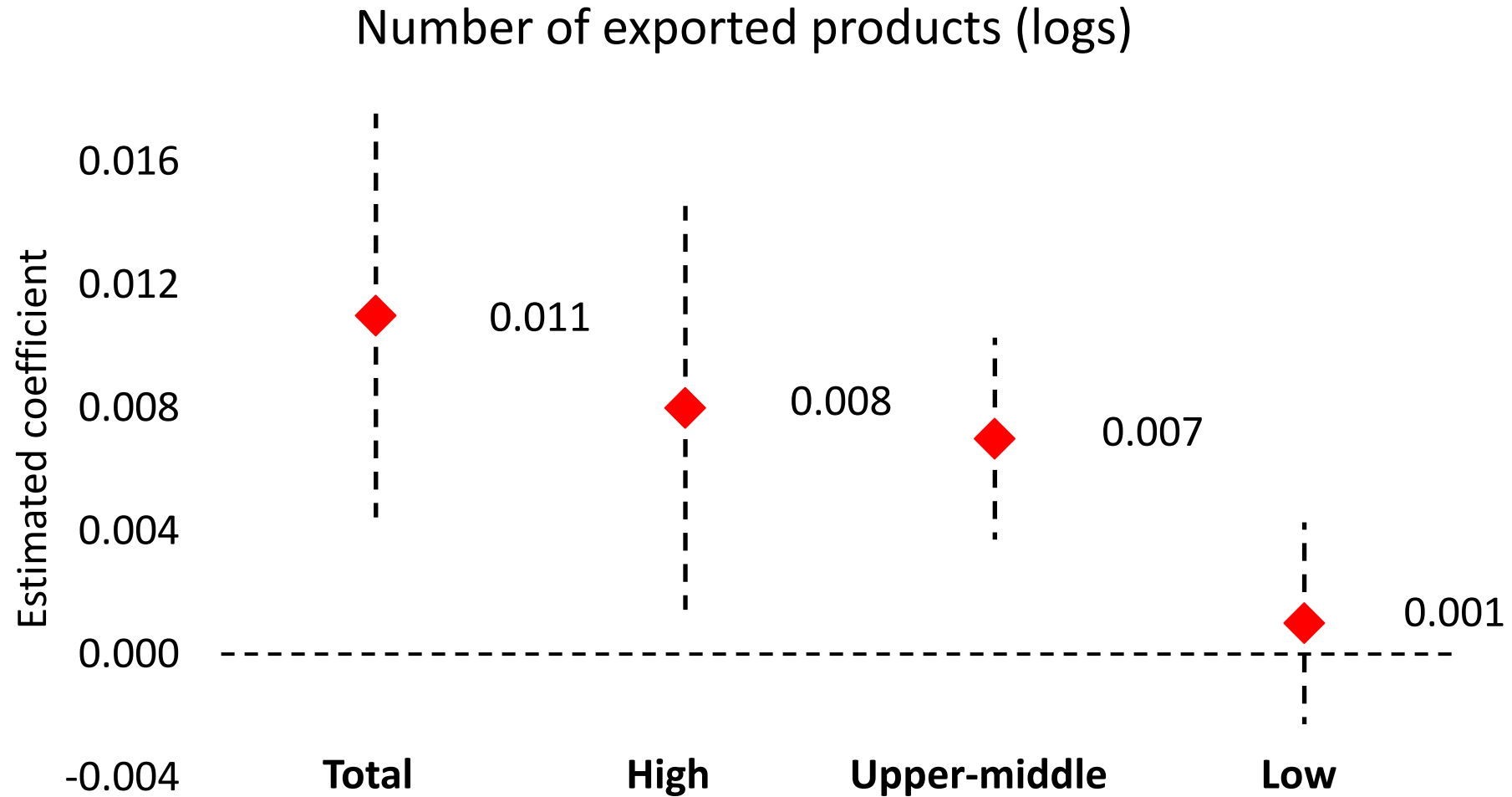
Immigration reduced obstacles to adopt new technologies



Immigration increased probability to export to high-income countries



Immigration increased number of products exported



Summary of the model

- Quality enters consumption and production
- Non-homothetic preferences
 - Two dimensions of quality: substitute and complement with quantity
 - Richer countries pay more for the same product
- Heterogeneous firms with monopolistic competition
 - Substitutable quality increases with efficiency and R&D labor
- Quality plays a big role in the gains from trade
 - Selection of more productive, higher-quality firms into trade with bigger markets