

# Stay Longer, Fill the Vacancy: Evidence from South Korea's New Visa System

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# Introduction

# Motivation

- Several advanced economies have experienced large **shortage** of low-skilled workers.
  - In sectors such as **agriculture**, **construction**, and **low-skilled manufacturing**
  - Due to the increase in **education** and the **aging** of the native population
- The **shortage** in these sectors was **exacerbated** after the Covid-19 pandemic (Lowrey 2021).
- **Immigrants** fill those **bottlenecks** in many countries.
  - They are specialized in **manual** and **physically-intensive** jobs (Peri and Sparber 2009)

# Motivation

- **South Korea** is an extreme example of a highly **educated** and **aging** society.
  - Also experiencing a significant labor **shortage**
- To relieve the labor **shortage**, South Korea runs a **foreign guest** worker program.
  - Employment Permit System (EPS)
- However, EPS workers are **temporary** workers.
  - They can work up to 4 years and 10 months.
  - It hinders immigrant workers' **assimilation** into Korean society and results in the **loss of firm-specific human capital**.
- In 2017, Korean government introduced a **new visa** for **stable** stay of the **guest** workers.

# This Paper

- Examines the impact of the **new visa** system (E-7-4) on outcomes of **local firms**.
  - Job vacancy, value added (manufacturing), employment
- By exploiting the **pre-period exposure** to the new visa system across **227** cities in Korea
  - Population share of **foreigners** that were **eligible** for (E9, E10, and H2) the **new visa**
- **Contributions:**
  - 1** **Unique** setting (South Korea): highly educated + fastest aging → labor shortage
  - 2** A policy that extends the **length of stay** for immigrants (**not** an **inflow** of them)
  - 3** **Heterogeneous** job vacancy and productivity effect across regions.

# Preview of Findings

- 1 The introduction of the E-7-4 system **lowered job vacancies** in certain industries. (e.g. manufacturing, agriculture).
- 2 The new visa enhanced labor **productivity**, measured by the **value added** per worker.
- 3 **Heterogeneity**: the job vacancy (productivity) effect pronounced in non-Seoul (Seoul).
- 4 The policy did **not** lead to an increase in local **employment**.

# Related Literature

## Low-skilled Immigration and Local Labor Market

- US: (Peri, 2011; Monras, 2020; Lee, Peri, and Yasenov, 2022)
- Europe: (see Edo, 2019; Dustmann, Schönberg, and Stuhler 2017)
- Korea: (Kim, 2021; Kim and Lee, 2023; Kim, Lee, and Peri 2024)

## The Status of Immigrants

- Pan (2012), Chassamboulli and Peri (2015), Borjas (2017), Albert (2021),

## Immigration and Labor Shortage

- Anastasopoulos, Borjas, Cook, and Lachanski (2021)
  - Immigrant supply shocks (Mariel boatlift) → job vacancies ↓ in Miami.
- Fogel, Kreuder, and Peri (2022)
  - Examines a policy that matched refugees to occupations with local labor shortages.

## Institutional Background



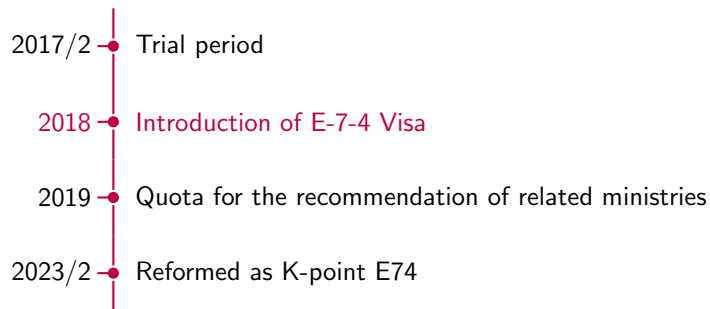
# EPS (Employment Permit System)

- EPS was introduced in 2004, to address the labor shortages in certain sectors.
  - Government to government arrangement with 16 Asian countries
- 1 E-9 visa (non-professional): mainly in manufacturing, agriculture, and fishery
- 2 H-2 visa (work and visit): above sectors + some service sectors
- Restrictions on Immigrants' Stay
  - Foreigners must return to their home countries after 3 years (max. 4 years and 10 months).
  - Family invitation is not allowed (E-9) or allowed with restrictions (H-2).
- This temporary stay is unwelcomed by both foreign workers and employers.
  - Hinders the assimilation of immigrants.
  - May result in the loss of firm-specific human capital and increased cost

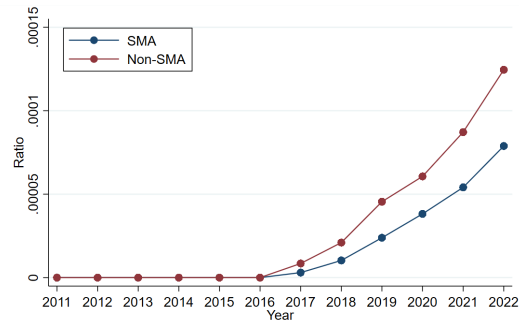
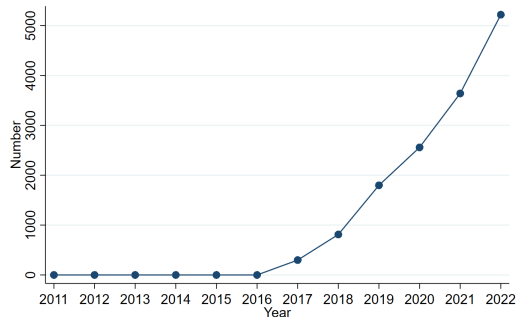
# Skilled Worker Points System Visa (E-7-4 visa)

- For foreign workers (with **E-9**, **E-10** (maritime crew), **and H-2 visa**) who worked more than 4 years
- Eligibilities are evaluated by
  - Industrial contribution (annual earnings)
  - Future value (e.g. skillfulness, Korean fluency, age) based on the points system.
  - Additional points for long-term work or rural areas
- Firms in manufacturing, construction, agriculture and fisheries can hire E-7-4 workers
  - Depending on the firm size.

# Timeline of E-7-4



# Trends of E-7-4



Source: Registered Foreigners by Districts Data, Korea Immigration Service

# Advantages of E-7-4

- E-7-4 visa guarantees the stable stay of foreign guest workers.
  - Continuous stay in Korea without the process of returning to home countries.
  - Family invitation with F-3 visa
    - the same stay period as E-7-4 worker and economic activities (though restrictive).
- Channels to relieve the labor shortage / enhance productivity
  - 1 No loss of firm-specific human capital
  - 2 Stability to firms in sectors experiencing labor shortages.
  - 3 May induce a positive behavioral change to eligible workers (E-9, E-10, and H-2)
  - 4 Supply of family workers (F-3)

## Data

# Data

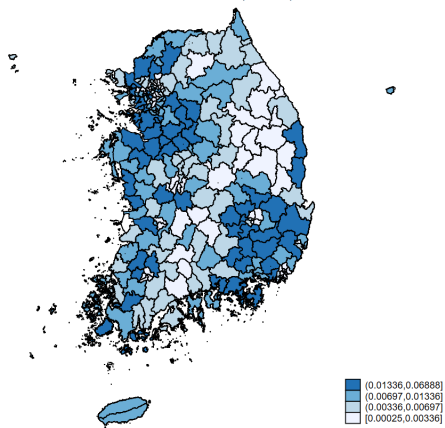
The district–year level panel dataset (227 districts for 2012–2022).

## 1 Whole immigrant population

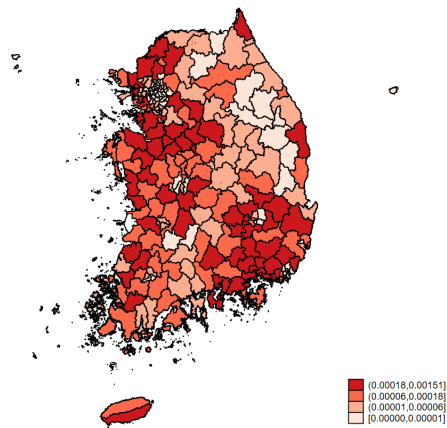
- Provided by Korea Immigration Service
- We can identify immigrants' visas and registered districts.
- # of E-9, E-10, H-2, and E-7-4 foreigners and standardize it by 2016 district population.

# Distribution E-9+E-10+H-2 and E-7-4

Panel A. Share of E-9, E-10, H-2 in 2016



Panel B. Normalized Increase in E-7-4



Source: Registered Foreigners by Districts Data, Korea Immigration Service



# Data (ctd.)

## 2 Job vacancy

- Provided by Korean Employment Information Services
- We can identify job vacancies at the end of each month by districts and industries.

## 3 Value added

- Provided from Mine and Manufacturing Survey
- Value added per employee is defined as

$$\frac{\text{output value} - \text{intermediate input costs}}{\text{number of employees}}$$

## 4 Employment

- Provided by Local Area Labor Force Survey (October version for each year)
- Collapse the individual-level into 162 city-level

# Industry Classification

- Regulations on E-9, E-10, and H-2 specify the list of industries where the employment of those workers is permitted or prohibited.
- We classify industries by the exposure to E-7-4 system.

Classification	Industries
Direct Exposure	Manufacturing, Agriculture, Forestry, Fisheries, Construction
Partial Exposure	Industries not specified in other groups (e.g. Mining, Wholesale and Retail Trade)
No Exposure	Financial and Insurance Activities, Real Estate Activities, Education, Electricity, Gas, Steam and Air Conditioning Supply

# Summary Statistics

	Mean	SD	Min	Max	N
<b>Panel A: Key Outcomes</b>					
Job Vacancy (Normalized)	0.00445	0.00383	0.00020	0.04419	2,497
Value Added Per Employee (in 1 million won)					
Manufacturing	138.5448	102.9386	-186.5468	1419.957	2,491
Root Industries	142.9168	89.22931	-211.5015	730.0222	2,280
Employment (Normalized)					
Low-Skilled Local Service	0.17966	0.03180	0.05954	0.35131	2,492
High-Skilled Local Service	0.14282	0.05061	0.03695	0.43622	2,492
Manufacturing	0.07323	0.04780	0.00674	0.33242	2,492
<b>Panel B: Treatment Intensity</b>					
2016 E-9+E-10+H-2 share	0.01090	0.01227	0.00025	0.06888	2,497
<b>Panel C: District Characteristics</b>					
2016 Population	227343	219093.2	10001	1194041	2,497
2016 Working Age Population	166198.4	166357.5	7112	913312	2,497
2016 Rural Population Share	0.44867	0.44143	0.00000	1.00000	2,497
2016 Senior Population Share	0.18600	0.07825	0.06649	0.37490	2,497
2015 University Graduates Share	0.16764	0.07502	0.07073	0.49492	2,497
2016 Manufacturers Share	0.13649	0.09795	0.02001	0.52414	2,497
2016 Other Foreigners Share	0.01076	0.00857	0.00271	0.05974	2,497

## Empirical Framework

# Empirical Framework

$$y_{i,t}^j = \Sigma_t \beta_t^j (EEH_{i,2016} \times D_t) + \Sigma_t \gamma_t^j (X_{i,2016} \times D_t) + \theta_i + \lambda_t + \epsilon_{i,t} \quad (1)$$

- $y_{i,t}^j$  : Outcome  $y$  for industry group  $j$  in district  $i$  at year  $t$
- $EEH_{i,2016}$  : Share of (E-9+E-10+H-2) out of 2016 population in district  $i$
- $D_t$  : Year dummy variable (2012-2022)
- $X_{i,2016}$  : District characteristics fixed at the pre-period
  - Living zones, the share of rural/senior population, the share of university graduates (2015), log of population, the share of manufacturing businesses, value added per employee in manufacturing, and the share of foreigners other than E-9, E-10, H-2, E-7-4, and F-3
- $\theta_i$  : District fixed effect /  $\lambda_t$  : Year fixed effect

→ Standard errors are clustered at the district level.

→ Weighted by 2016 district's working-age population.

# Key Outcomes

## 1 Job vacancy (Labor shortage)

$$\frac{jobvac_{i,t}^j}{pop_{i,2016}}, \quad j = \{overall, direct, partial, no\}$$

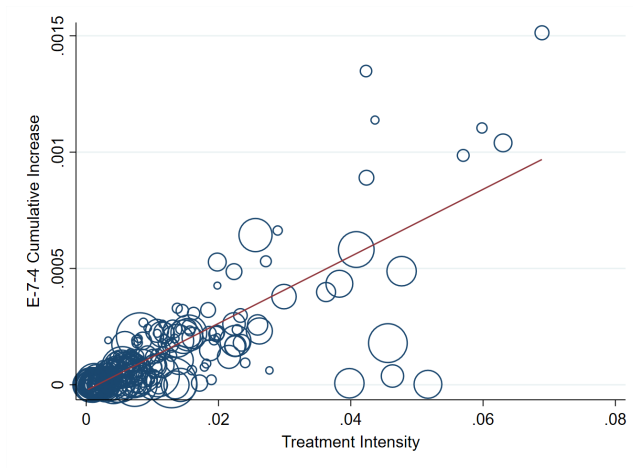
## 2 Value Added Per Employee (Labor productivity growth)

$$\log\left(\frac{valueadd_{i,t}^j}{emp_{i,t}^j}\right), \quad j = \{manufacturing\}$$

## 3 Employment (Employment multiplier effects)

$$\frac{emp_{i,t}^j}{pop_{i,2016}}, \quad j = \{manu, low, high\}$$

# Treatment Intensity and E-7-4 Increase



Source: Registered Foreigners by Districts Data, Korea Immigration Service

# Treatment Intensity and E-7-4 Increase (ctd.)

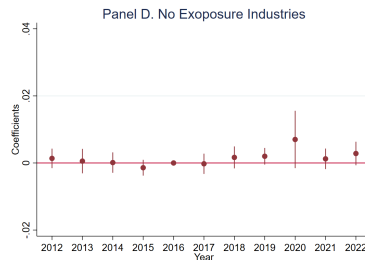
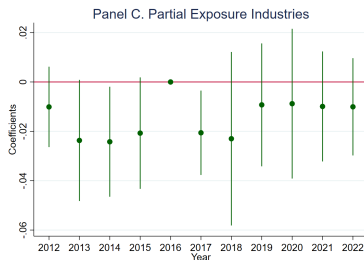
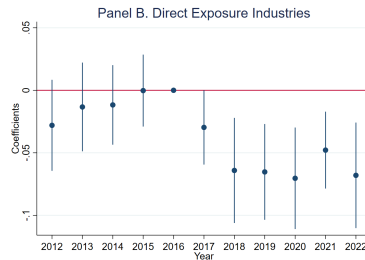
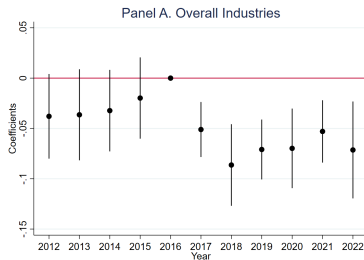
	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta 2016-2017$	$\Delta 2016-2018$	$\Delta 2016-2019$	$\Delta 2016-2020$	$\Delta 2016-2021$	$\Delta 2016-2022$
Treatment intensity	0.000362** (0.000132)	0.000953** (0.000327)	0.00227** (0.000745)	0.00350** (0.00106)	0.00486*** (0.00140)	0.00656*** (0.00188)
Observations	227	227	227	227	227	227
$R^2$	0.63	0.73	0.73	0.76	0.79	0.82

Validity of Treatment Intensity



## Results

# Impacts on Job Vacancy



# Impacts on Job Vacancy (ctd.)

	(1)	(2)	(3)	(4)
	Overall	Direct Exposure	Partial Exposure	No Exposure
Treatment Intensity $\times D_{2017}$	-0.051*** (0.014)	-0.030 (0.015)	-0.021* (0.009)	-0.000 (0.002)
Treatment Intensity $\times D_{2018}$	-0.086*** (0.021)	-0.064** (0.021)	-0.023 (0.018)	0.002 (0.002)
Treatment Intensity $\times D_{2019}$	-0.071*** (0.015)	-0.065*** (0.019)	-0.009 (0.013)	0.002 (0.001)
Treatment Intensity $\times D_{2020}$	-0.070*** (0.020)	-0.070*** (0.021)	-0.009 (0.015)	0.007 (0.004)
Treatment Intensity $\times D_{2021}$	-0.053*** (0.016)	-0.048** (0.016)	-0.010 (0.011)	0.001 (0.002)
Treatment Intensity $\times D_{2022}$	-0.071** (0.024)	-0.068** (0.021)	-0.010 (0.010)	0.003 (0.002)
2016 Mean of Dependent Variable	0.006	0.004	0.002	0.0002
N	2,497	2,497	2,497	2,497
$R^2$	0.92	0.94	0.83	0.65

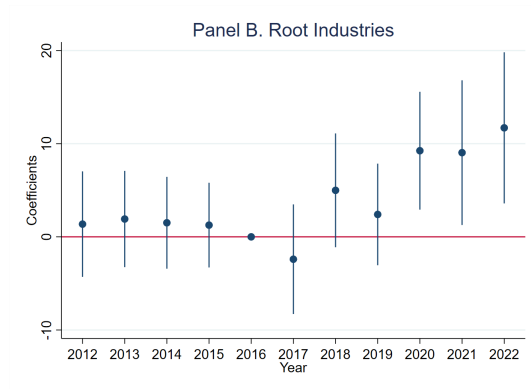
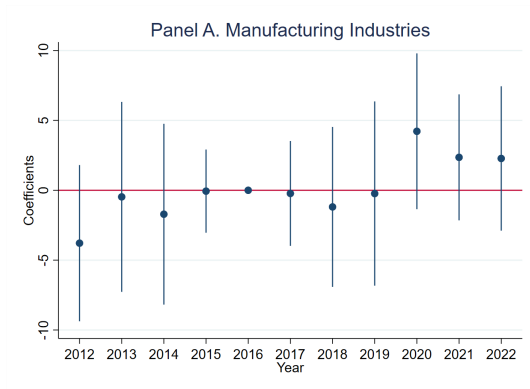
- In 2019, 1 p.p larger treatment (91.7%  $\uparrow$ )  $\rightarrow$  Job vacancy 0.065 p.p  $\downarrow$  (14.6%  $\downarrow$ )
- 1% larger shock  $\rightarrow$  0.16%  $\downarrow$

By Firm Size

# Possible Mechanism Behind Job Vacancy Effect

- The expectation about the visa change of current E-9, E-10, and H-2 workers would reduce the turnover rates.
  - The anticipatory behavioral changes for E-7-4 visa will restrain immigrants from shirking and quitting.
- The long-term stay of immigrant workers who acquire E-7-4 visa prevents the creation of job vacancies.
  - Since immigrants need not return to their home countries, the vacancies that once resulted from their absence are no longer created.
- Invited families with F-3 visa can participate in economic activities.
  - Their extended stay period and the expanded range of permitted economic activities would lead them to join the labor force.

# Impacts on Value Added



# Impacts on Value Added (ctd.)

	(1)	(2)
	Manufacturing	Root Industries
Treatment Intensity $\times D_{2017}$	-0.226 (1.904)	-2.401 (2.985)
Treatment Intensity $\times D_{2018}$	-1.192 (2.905)	4.994 (3.099)
Treatment Intensity $\times D_{2019}$	-0.234 (3.346)	2.405 (2.767)
Treatment Intensity $\times D_{2020}$	4.222 (2.829)	9.246** (3.209)
Treatment Intensity $\times D_{2021}$	2.356 (2.288)	9.038* (3.940)
Treatment Intensity $\times D_{2022}$	2.277 (2.622)	11.702** (4.116)
2016 Mean of Dependent Variable	4.750	4.838
N	2,490	2,274
$R^2$	0.94	0.90

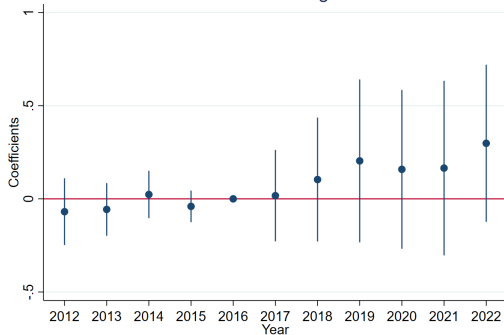
- In 2020, 1 p.p larger treatment (91.7%  $\uparrow$ )  $\rightarrow$  Value Added 9.246%  $\uparrow$  (elasticity = 0.101)

# Employment Effects

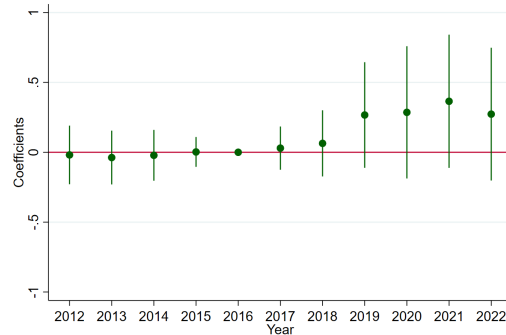
- Moretti (2010): Productivity increase in the tradable sector (manufacturing) may increase employment in non-tradable sector (local services).
- Note that E-7-4 visa does not explicitly increase in employment of eligible sectors.
  - We do find positive productivity effect though.
- Thus, we look at employment in manufacturing and service sectors.

# Impacts on Employment

Panel A. Manufacturing Industries



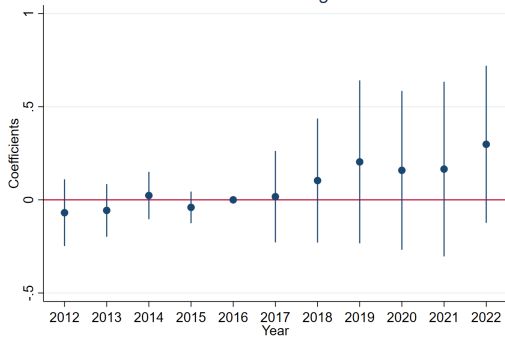
Panel B. Low-Skilled Local Service Industries



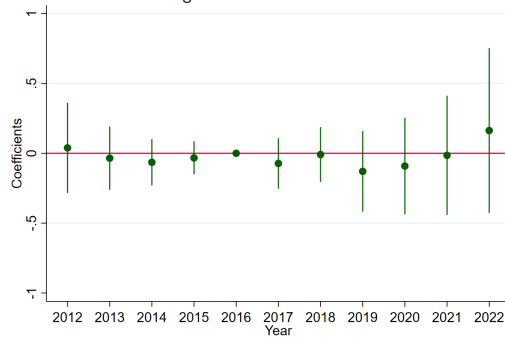


# Impacts on Employment (Ctd.)

Panel A. Manufacturing Industries

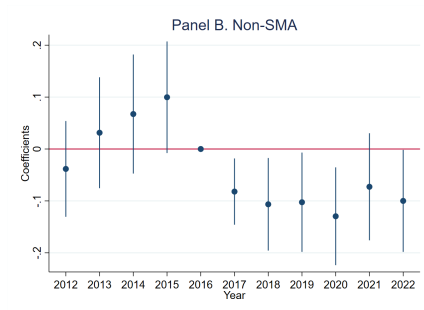
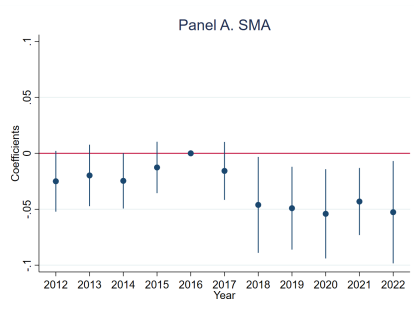


Panel B. High-Skilled Local Service Industries



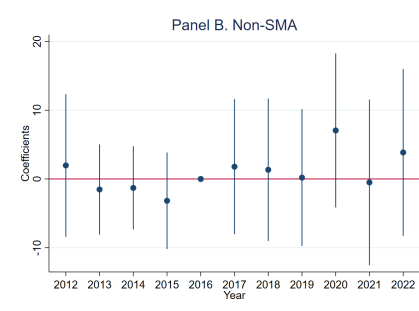
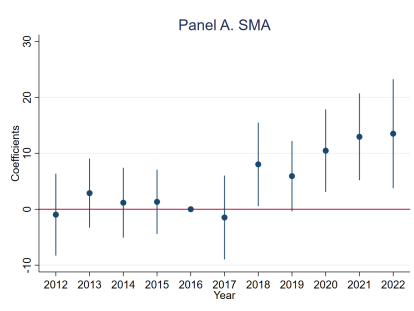
## Heterogeneity

# Heterogeneity (Job Vacancy)



- Larger effect in Non-SMA which suffered from labor shortage
- In non-SMA, the increasing pre-trends in job vacancy reversed after the policy change.

# Heterogeneity (Productivity)



- Larger productivity effect in SMA
- Perhaps agglomeration of highly educated workers in SMA drives the productivity increase.

## Conclusion

# Conclusion

- In 2018, the new visa system (E-7-4) was introduced in Korea, which changes immigrants' stay from temporary to stable and prolonged.
- We examine the impacts of the new visa system on three local outcomes; (1) labor shortage, (2) productivity growth, and (3) employment expansion.
- Labor shortage significantly alleviated
- Positive productivity effect in targeted sectors (with limited local multiplier effect)
- Heterogeneity:
  - Relieving shortage in regions with labor shortage (no productivity increase)
  - Positive productivity effect in agglomeration economies (with smaller effect on job vacancy)

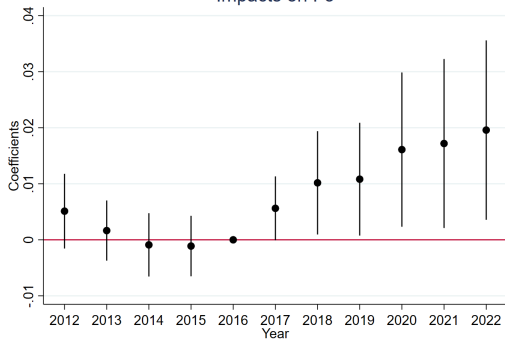
Thank you!

# Appendix

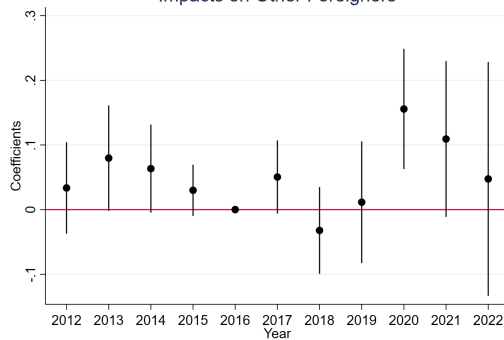


# Validity

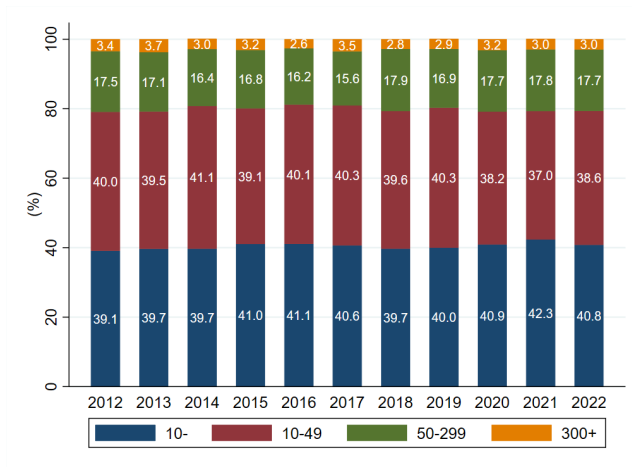
### Impacts on F3



### Impacts on Other Foreigners

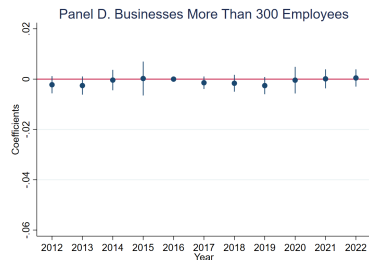
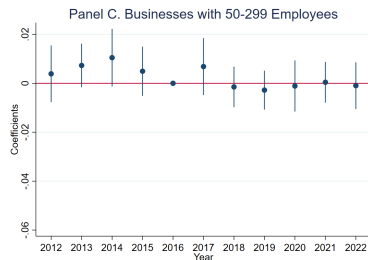
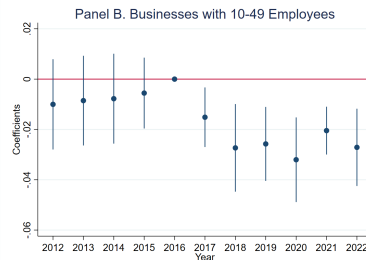
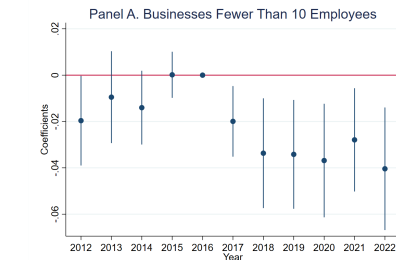
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# Foreign Employment by Firm Size



Source: Survey on Immigrant's Living Conditions and Labour Force, Statistics Korea

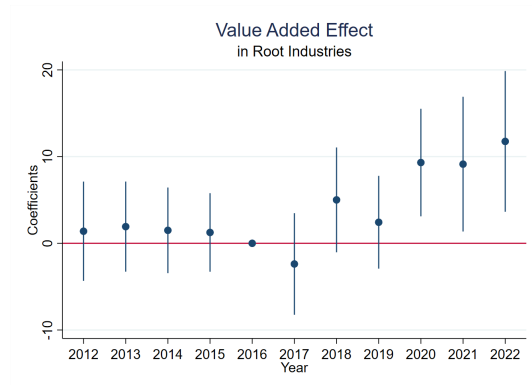
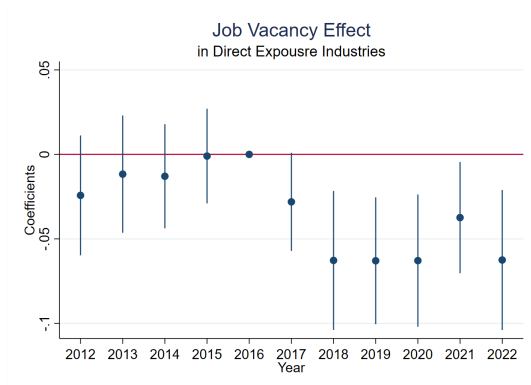
# Impacts on Job Vacancy by Firm Size


[Back](#)

# Impacts on Job Vacancy by Firm Size (ctd.)

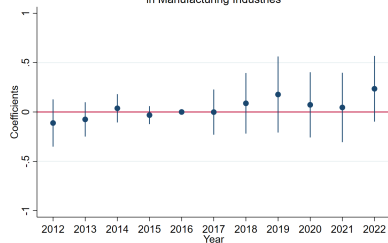
	Direct Exposure Industries (by Firm Size)				
	(1) Total	(2) 10- Employees	(3) 10-49 Employees	(4) 50-299 Employees	(5) 300+ Employees
Treatment Intensity $\times D_{2017}$	-0.030 (0.015)	-0.020* (0.008)	-0.015* (0.006)	0.007 (0.006)	-0.001 (0.001)
Treatment Intensity $\times D_{2018}$	-0.064** (0.021)	-0.034** (0.012)	-0.027** (0.009)	-0.001 (0.004)	-0.002 (0.002)
Treatment Intensity $\times D_{2019}$	-0.065*** (0.019)	-0.034** (0.012)	-0.026*** (0.007)	-0.003 (0.004)	-0.003 (0.002)
Treatment Intensity $\times D_{2020}$	-0.070*** (0.021)	-0.037** (0.012)	-0.032*** (0.009)	-0.001 (0.005)	-0.000 (0.003)
Treatment Intensity $\times D_{2021}$	-0.048** (0.016)	-0.028* (0.011)	-0.020*** (0.005)	0.000 (0.004)	0.000 (0.002)
Treatment Intensity $\times D_{2022}$	-0.068** (0.021)	-0.040** (0.013)	-0.027*** (0.008)	-0.001 (0.005)	0.000 (0.002)
2016 Mean of Dependent Variable	0.004	0.002	0.001	0.0006	0.00006
N	2,497	2,497	2,497	2,497	2,497
$R^2$	0.94	0.87	0.96	0.87	0.58

# Robustness: Controlling for change in E-9 workers

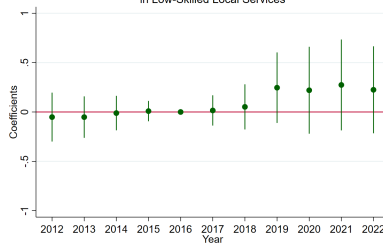


# Robustness: Controlling for change in E-9 workers (employment)

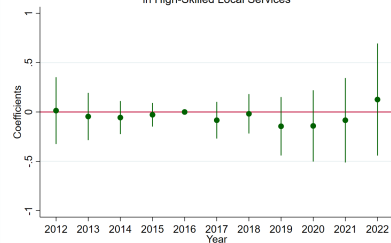
Employment Effect  
in Manufacturing Industries



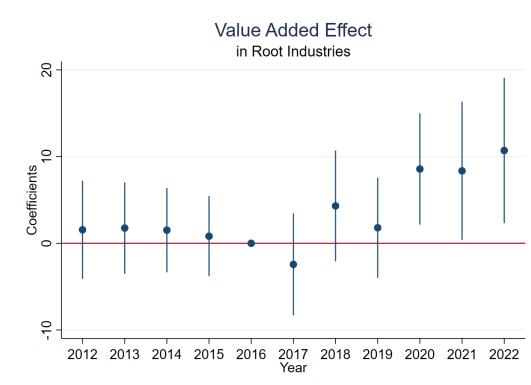
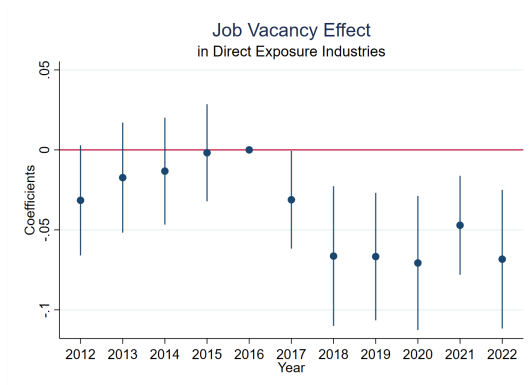
Employment Effect  
in Low-Skilled Local Services



Employment Effect  
in High-Skilled Local Services

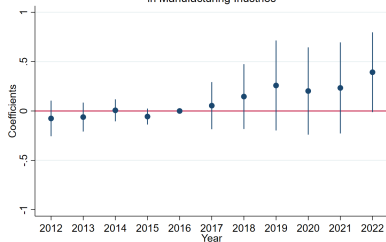


# Robustness: Controlling for the Retirement Age Extension

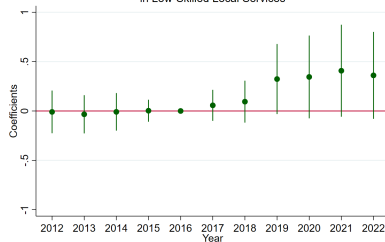


# Robustness: Controlling for the Retirement Age Extension (employment)

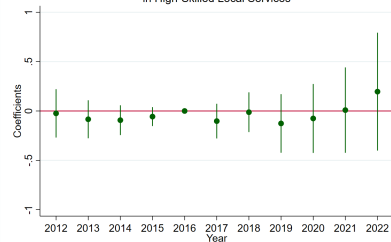
Employment Effect  
in Manufacturing Industries



Employment Effect  
in Low-Skilled Local Services

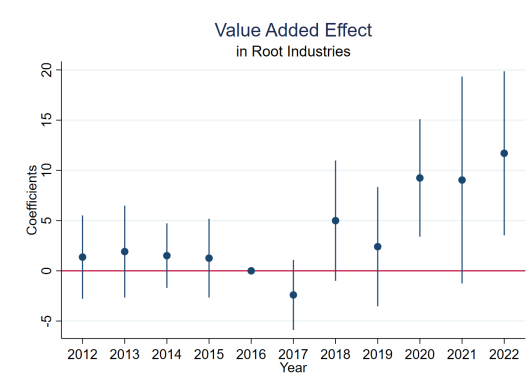
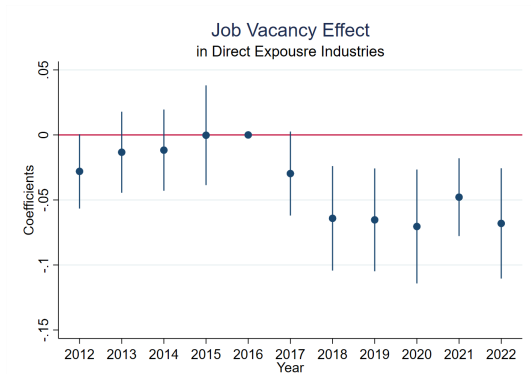


Employment Effect  
in High-Skilled Local Services



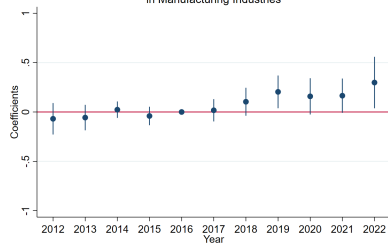


# Robustness: S.E. Clustered at LZ Level

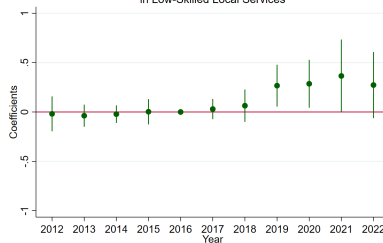


# Robustness: S.E. Clustered at LZ Level (employment)

Employment Effect  
in Manufacturing Industries



Employment Effect  
in Low-Skilled Local Services



Employment Effect  
in High-Skilled Local Services

