

Immigration Enforcement and Gender Gap in Inventor Productivity

Fangfang Du¹; Yinghua Li²; Jessie Jiayu Wang³

¹California State University Fullerton, ²Arizona State University, ³Federal Reserve Board

What drives the gender gap in innovation?

We study the impact of domestic help availability on the gender gap in innovation.

Exploiting an immigration enforcement change—the staggered rollout of the Security Communities (SC) program—as a negative shock to the supply of undocumented immigrants in household services, we examine whether reduced availability of domestic help widens the productivity gap between male and female inventors.

Inventor-level data show that, female inventors experienced more significant declines than male inventors in patenting outcomes after the SC rollout, measured by the quantity, quality, and market value of patents. We find that the differential impact on female inventors is more pronounced for those who likely have young children and those employed in less female-friendly firms, consistent with reduced availability of domestic help disproportionately increasing female inventors' cost of outsourcing household production.

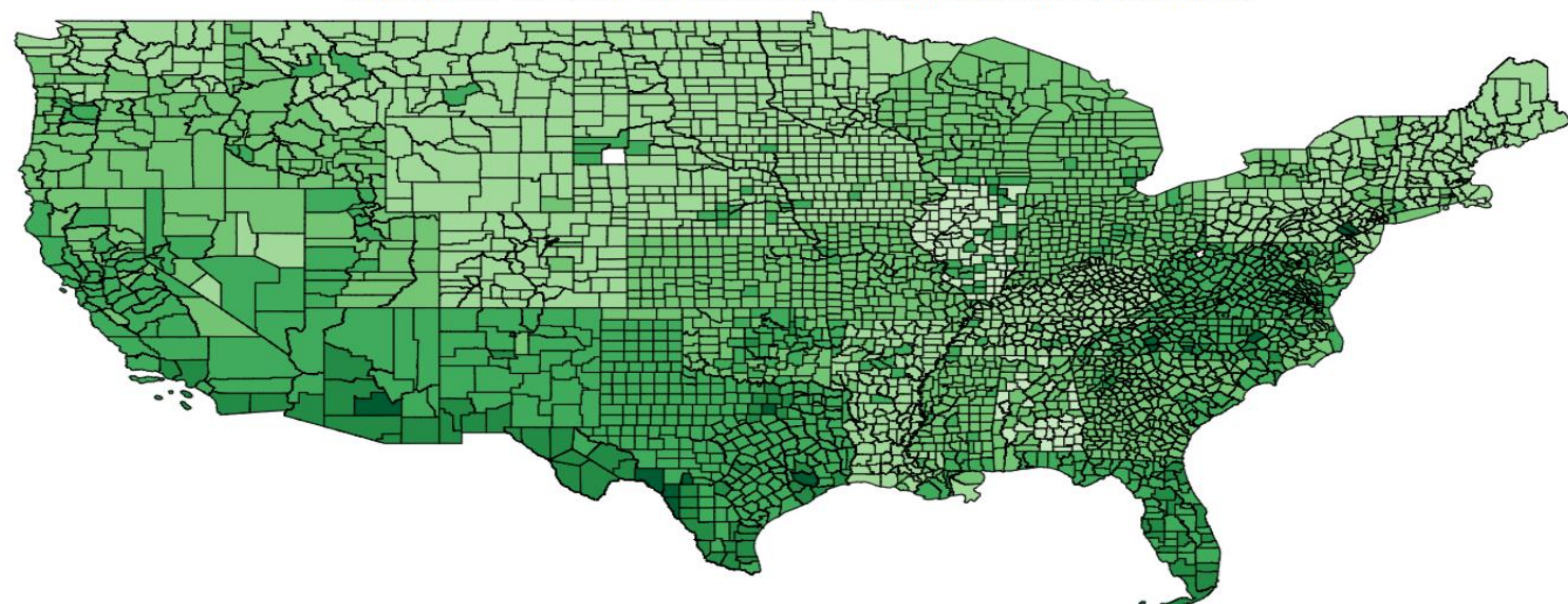
Overall, our results underscore the significant effect of domestic support provided by low-skilled immigrants on the time allocation and productivity of highly skilled female inventors.

The Secure Communities Program

The Secure Communities Program is a federal policy that increased information sharing between local law enforcement agencies and the federal government in an attempt to facilitate the detection and removal of undocumented immigrants. The policy was carried out between 2008 and 2013, with most of the rollout concentrated in 2010–2012 (see Figure 1). More than 454,000 individuals were removed under SC during 2008–2014. The SC program may have further reduced the supply of immigrant workers who remain in the U.S. through “chilling effects”—fear of interacting with local police or having to present forms of identification likely increased the cost of working outside the home and the cost of job searching.

To validate the effect of the SC program on the availability of domestic help, we show that the rollout of the SC program leads to a significant decline in the labor supply of low-skill workers in household services and an increase in the wage of these workers (see Table 1).

FIGURE 1
THE ROLL-OUT OF THE SECURE COMMUNITIES PROGRAM



Year of SC program roll-out	2008	2009	2010	2011	2012	2013

Notes: The SC program was rolled out on a county-by-county basis between October 27, 2008 and January 22, 2013. The counties in darker shades activated the SC program earlier than counties in lighter shades.
Data source: Mockus and Jung (2022)

TABLE 1: Effects of Secure Communities on the Employment Share and Wages of Workers in Household Service

	(Employment of Workers in Household Service/ Total County Population)*100		Average Wage of Workers in Household Service/ Average Population Wage	
SC	-0.036***	(0.011)	0.002**	(0.001)
Year (-1)	-0.027	(0.026)	0.009	(0.006)
Year (-2)	-0.009	(0.026)	0.011	(0.007)
Year (0)	-0.057**	(0.025)	0.009*	(0.005)
Year (+1)	-0.059**	(0.023)	0.008*	(0.004)
Year (+2)	-0.070***	(0.021)	0.007**	(0.003)
Year (+3)	-0.053***	(0.017)	0.006**	(0.002)
Year (+4)	-0.048***	(0.012)	0.003**	(0.001)
Observations	9,194	6,551	9,193	6,551
R-squared	0.759	0.787	0.762	0.804
County level controls	Yes	Yes	Yes	Yes
County + Year FE	Yes	Yes	Yes	Yes

Empirical Methods

The analysis utilizes inventor-level data on patenting outcomes and the rollout dates of the SC program. Our sample spans from 2006 to 2015.

We estimate a Poisson model, regressing various measures of patenting outcomes on the gender indicator of the inventor, interacting with a dummy variable for the rollout of the SC program:

$$Y_{i,t} = \alpha + \beta_1 \times Female_i + \beta_2 \times Female_i \times SC_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t}$$

$Y_{i,t}$ is a measure of innovation outcomes for inventor i in year t . $SC_{i,t}$ is a dummy variable for the exposure to SC at the county that the inventor resides in.

Findings

- **Table 2** shows that the Secure Communities Program reduced patenting productivity, with the effect on female inventors significantly more negative than that on male inventors.
- **Figure 2** shows that the differential effect on female inventors' productivity relative to male inventors emerges after the rollout of the SC program, but not before. This differential effect also persists.
- **Table 3** shows that the differential effect on female inventors is more pronounced for those who likely have young children, and those who are employed in less female-friendly firms.

TABLE 2: Security Communities Program and Inventor Productivity

	Quantity	Quality	Exploitative	High impact	Market Value
	Number of Patents	Number of Citations Per Patent	Number of Backward citations per patent	Number of Top 10% Cited Patents	Average Market Value per patent
SC	-0.303*** (0.020)	-0.457*** (0.021)	-0.338*** (0.016)	-0.224*** (0.020)	-0.361*** (0.040)
Female * SC	-0.088*** (0.013)	-0.069*** (0.018)	-0.107*** (0.018)	-0.065*** (0.020)	-0.084*** (0.024)
Observations	3,190,870	2,863,950	3,136,750	1,140,200	1,640,320
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Inventor fixed effects	Yes	Yes	Yes	Yes	Yes

FIGURE 2: Dynamic Effect of SC on Inventor Productivity

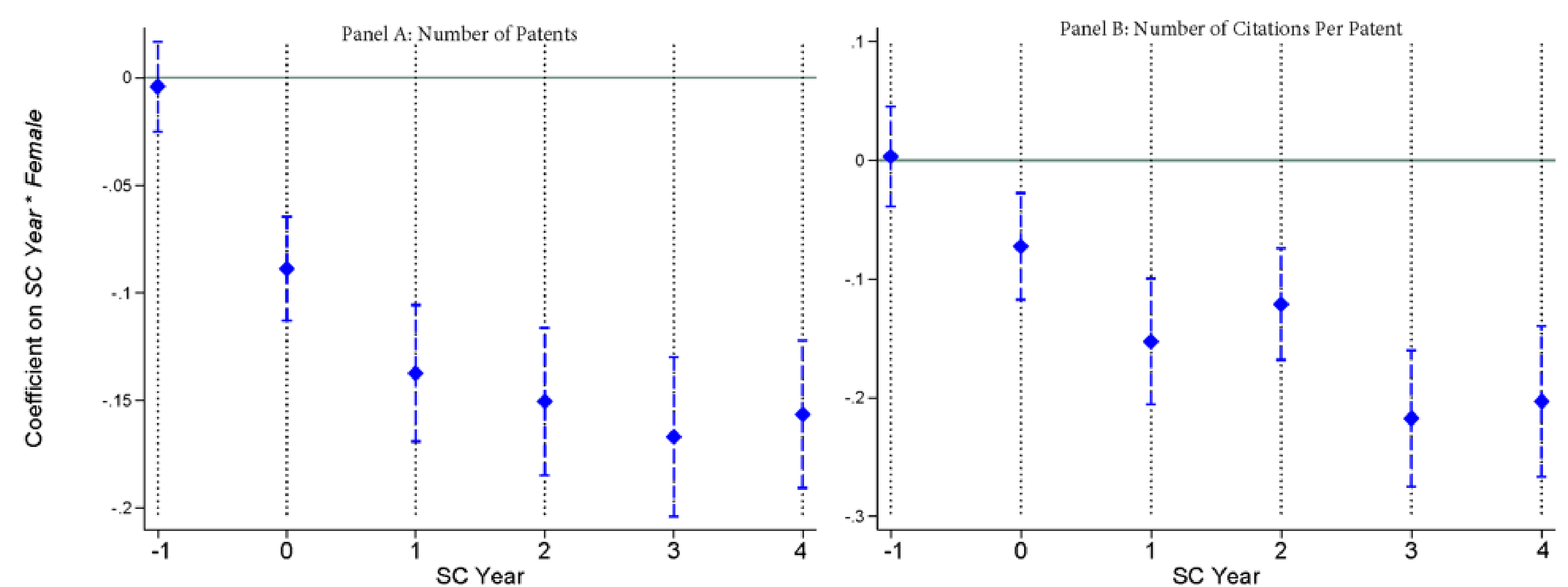


TABLE 3: SC and Inventor Productivity: cross-inventor heterogeneity

	Quantity	Quality	Exploitative	High impact
	Number of Patents	Number of Citations Per Patent	Number of Backward citations per patent	Number of Top 10% Cited Patents
Panel A				
SC * Female * Parenthood	-0.101*** (0.021)	-0.129*** (0.034)	-0.118*** (0.028)	-0.147*** (0.044)
Observations	2,645,220	2,366,640	2,598,430	882,300
Panel B:				
SC * Female * Female Friendly Firm	0.063* (0.038)	0.117* (0.069)	0.140*** (0.050)	0.129* (0.076)
Observations	696,340	630,210	682,520	282,500
Year fixed effects	Yes	Yes	Yes	Yes
Inventor fixed effects	Yes	Yes	Yes	Yes

Conclusions

This paper studies factors that drive the gender gap in productivity. Specifically, we examine the extent to which the availability of low-skilled labor in domestic roles affects high-skilled female inventors' productivity. Our results have important implications for the search of measures for narrowing the gender gap in inventive activities.

Contact: Fangfang Du, California State University Fullerton

Fangfangdu@Fullerton.edu

<https://sites.google.com/view/fangfangdu>