Workplace Flexibility and Entrepreneurship

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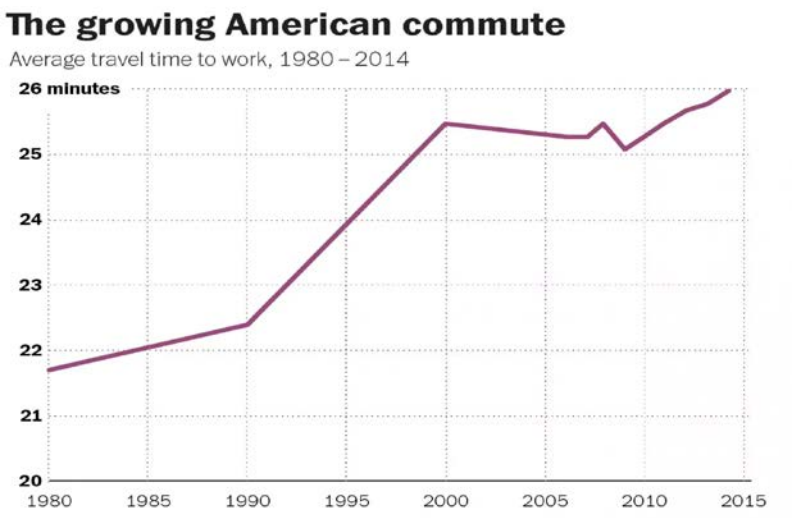
Motivation 1: The road home

- The time workers spend commuting is becoming longer and longer
  - US experience – the Census:
    - average American commute crept up to 26.4 minutes in 2015
    - 2.62 percent of US workforce or 3.5 million workers travel more than 90 minutes to work each way
  - Common around the world

- Cost of long commute:
  - Time-consuming:
  - Adversely affect one's physical and mental well-being (i.e. Ommeren and Puigarnau,2011; Sandow, Westerlund and Lindgren,2014)



WAPO.ST/WONKBLOG Source: US Census

Motivation 1: The road home

- **Solution:** the rising popularity of telecommuting or “work-at-home”
  - For employer - increase productivity, reduce costs, and gain access to a much larger talent pool
  - For employees - bright spot in an otherwise gloomy landscape and saves them the commuting cost

- Practical Examples:
  - On May 24, 2010, the Senate passed the Telework Enhancement Act (S. 707)
  - Companies that offer such positions include Amazon, Apple, Xerox, Aetna, Kaplan, Dell…

- Academic evidence on workplace flexibility:
  - Higher productivity(Bloom et al., 2015) and better work-home balance (Kelley et al., 2014)
  - Reduce the community activity and lower emissions (Bento, Cropper, and Mushfiq Mobarak, 2005)

Motivation 2: Promoting entrepreneurship

- Entrepreneurship has long been recognized as a key mechanism for enhancing economic development
  - Designing and evaluating policies to foster entrepreneurship intrigues both policy makers and academics

- Barriers to entrepreneurship
  - Limited access to finance
    - a top factor that dissuades business creation and growth (i.e. Evans and Leighton, 1989;Holtz-Eakin et al., 1994;Hurst and Lusardi, 2004; Kerr, Lerner, and Schoar, 2011; Schmalz, Sraer, and Thesmar 2017)
  - Entry regulation barriers
    - Mullainathan and Schnabl(2010), Bruhn(2011), Branstetter et al.(2014)
  - Downside career concern
    - Gottlieb et al.(2017); Hombert et al.(2017)
  - Costs of experimentation
    - Kerr, Nanda, and Rhodes-Kropf(2014), Manso(2016), Dillon and Stanton(2017)

Question

- In this paper, we evaluate a large-scale reform in Singapore that introduces workplace flexibility for potential entrepreneurs
  - The scheme allow the possibility of business creation at one's residential property
  - The scheme stipulated a negative list of industry type that are prohibited from home-based operation

- Does allowing home-based entrepreneurship lead to high business creation?

- What type of entrepreneurs benefit the most?

- Does allowing home-based entrepreneurship have any benefits to the entrepreneurs in the long run?

Main results

- Identification: Difference-in-differences
- The home office scheme leads to a significantly higher level of business creation.
  - Firm creation grows by 23 percentage points more following the reform for the treated industries than the control group.
  - The effect is more pronounced for low-income individuals, implying that financial constraint is a barrier for firm creation.
- Additional new firms in response to the reform have a higher survival rate, choose industries with higher productivity and lower risk.
- The reform encourages entrepreneurs to become serial entrepreneurs, and they open a larger business with similar survival rate for their second firm.
- Implication: the scheme attract more entry into self-employment without significantly lowering the average quality of the pool.

Home-based Entrepreneurship Scheme

- **Before November 2001:** business registration was forbidden under residential address prior to the scheme.

- **November 2001:** Urban Redevelopment Authority (URA) launched a pilot Home-Based scheme allow small-scale businesses to operate from homes located in selected mixed zone areas

- **June 2003:** Housing & Development Board (HDB) and Urban Redevelopment Authority (URA) introduced the new Home Office Scheme that apply to all residential units.

- The scheme:
  - Allow the possibility of business creation at one's residential property
  - Stipulated a negative list of industry type that are prohibited from home-based operation

Type of Businesses/Uses that are not allowed

Businesses/uses
a) Maid Agency/Employment Agency
b) Contractors Business
c) Car Trading Business
d) Commercial School
e) Sales/marketing office involving conducting seminars/talks for large number of customers
f) Courier Business
g) Manufacture/Preparation/Processing of products and goods.
h) Ophthalmic dispensing/Pharmacy/Medical or dental clinics/Veterinary medicine
i) Card reading/Palm reading or fortune telling in any form
j) Funeral chapels or homes
k) Mausoleums
l) Shop use and any form of retail activity including pet shop.
m) Food catering/Restaurants
n) Conducting of dress making/embroidery lessons
o) Repair of household appliances, electrical products, footwear, etc.
p) Beauty/Hair-Dressing/Massage therapy services

Data

- Data is obtained from the Accounting and Corporate Regulatory Authority (ACRA)
  - Contains the universe of firm that are created from 1990 to 2015 in Singapore
  - Include firm name, the industry that the firm operates in, the registry date as well as firm's legal status
- Personal database containing demographic information of individuals in Singapore
  - More than 2 million individuals, constituting nearly 60% of Singaporean residents as of 2012
  - Include gender, date of birth, race, marital status, housing address (public or private), and postal code

Empirical Strategy

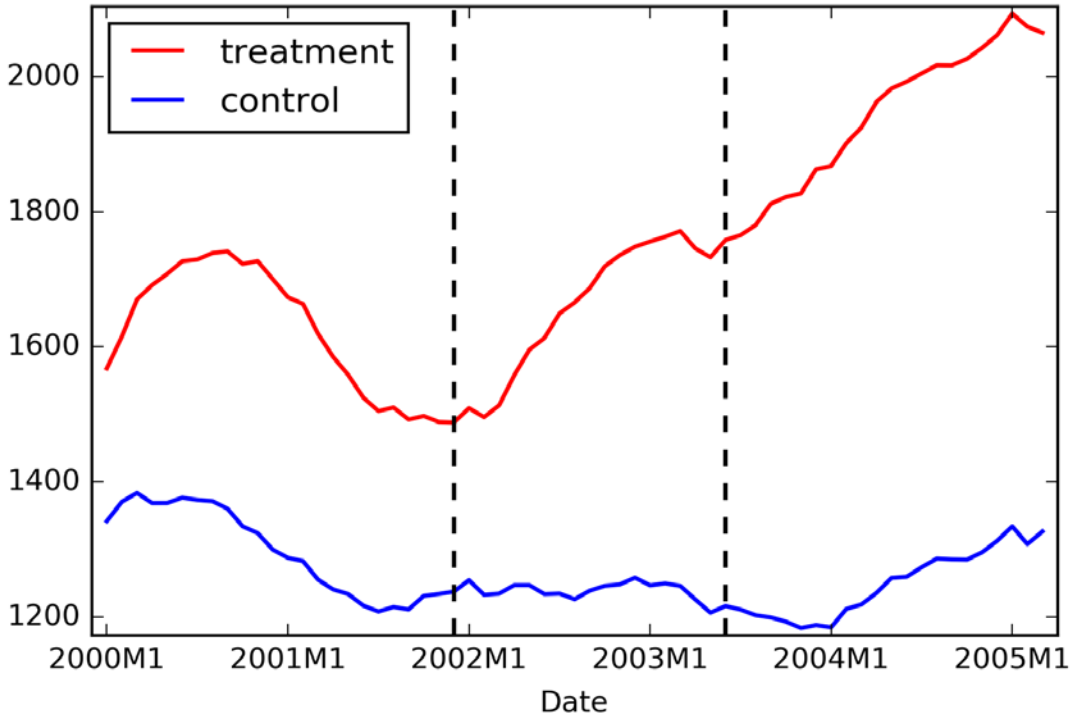
- Difference-in-difference specification:

$$\boldsymbol{Y_{j,t} = \alpha_0 + \alpha_1 \times T_j \times I(Post)_{j,t} + \alpha_2 \times X_{j,t} + \alpha_3 \times T_j \times Macro_t + \delta_t + \theta_j + \varepsilon_{j,t}}$$

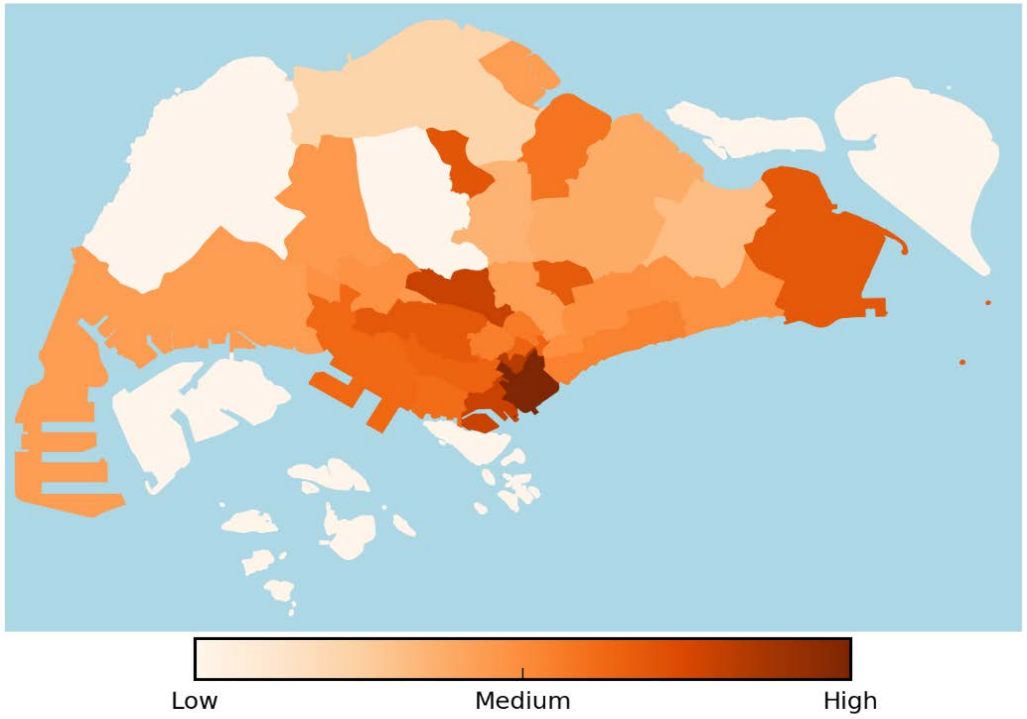
  - $Y_{j,t}$ is represent industry-level outcomes like log number of newly created firms for industry j in month t.
  - T_j takes a value of 1 for industries in the treatment group, those falling out of the forbidden list in the Home Office Scheme, and 0 for the control group
  - $I(Post)_{j,t}$takes the value of 1 for the month after December of 2001 (the program period) and zero otherwise.
  - $X_{j,t}$ contains time-varying industry-level controls
  - $Macro_t$ denotes variables to account for the macroeconomic environment

Identification Validity

Business Creation: Treated vs Control



Distribution of Firm Creation in Treated vs Control Industries



Summary Statistics

	N	mean	sd	p25	p50	p75
Panel A Industry-level						
Number of firms created (monthly)	6075	37.23868	90.12133	1	9	35
Panel B Firm Characteristics: Full Sample						
Employment at creation	124204	3.302	3.762	1	2	4
Survive during the first year	124204	0.954	0.21	1	1	1
Survive during first two years	124204	0.926	0.262	1	1	1
Survive during first three years	124204	0.882	0.322	1	1	1
Survive during first four years	124204	0.833	0.373	1	1	1
Survive during first five years	124204	0.782	0.412	1	1	1
Panel C Entrepreneur Demographics: Singaporean Sample						
Age	85770	39.535	8.714	33	39	45
Ratio of Young/Old	85770	0.224	0.373	0	0	0.5
Male	85770	0.666	0.401	0.5	1	1
Married	85770	0.585	0.439	0	0.667	1
Chinese	85770	0.898	0.289	1	1	1
Malay	85770	0.048	0.204	0	0	0
India	85770	0.039	0.184	0	0	0
Others	85770	0.014	0.106	0	0	0
Non-Chinese	85770	0.102	0.289	0	0	0

Baseline Estimation

Home Office Scheme and Business Creation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Log (1+number of new firms created in an industry at a month)						
Treated*Pre	-0.018						
	(0.052)						
Treated*Post	0.230***	0.236***	0.237***	0.220***			
	(0.083)	(0.074)	(0.073)	(0.072)			
Treated*Post_1_Stage					0.117**	0.117**	0.118**
					(0.060)	(0.058)	(0.057)
Treated*Post_2_Stage					0.344***	0.344***	0.343***
					(0.093)	(0.093)	(0.099)
Constant	2.203***	2.203***	2.204***	1.148***	2.203***	2.204***	2.202***
	(0.050)	(0.050)	(0.051)	(0.327)	(0.050)	(0.051)	(0.054)
Control for industry productivity	No	No	Yes	Yes	No	Yes	Yes
Treated*GDP Growth	No	No	No	Yes	No	No	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,075	6,075	6,075	6,075	6,075	6,075	6,075
R-squared	0.94	0.94	0.94	0.94	0.94	0.94	0.94

Falsification Test

We conduct falsification test by examining the impact of the home office scheme by randomly assigning 81 industries into treatment and control group.

	(1)	(2)	(3)
Dependent Var. = Log (1+number of new firms created in an industry at a month)			
Treated*Post	-0.070	-0.070	-0.067
	(0.071)	(0.071)	(0.070)
Constant	2.203***	2.194***	0.667*
	(0.051)	(0.053)	(0.377)
Control for industry productivity	N	Y	Y
Treated*GDP Growth	N	N	Y
Month FE	Y	Y	Y
Industry FE	Y	Y	Y
Observations	6,075	6,075	6,075
R-squared	0.94	0.94	0.94

Heterogeneity Test (Firm Size)

	(1)	(2)	(3)	(4)
Dependent Var. = Log (1+number of new firms created in an industry at a month)				
	>3 employees at creation		<=3 employees at creation	
Treated*Post	0.013	-0.002	0.247***	0.230***
	(0.032)	(0.034)	(0.073)	(0.072)
Constant	0.235***	-0.377	2.182***	1.271***
	(0.045)	(0.329)	(0.049)	(0.323)
Control for industry productivity	No	Yes	No	Yes
Treated*GDP Growth	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	6,075	6,075	6,075	6,075
R-squared	0.67	0.67	0.94	0.94

Heterogeneity Test (Experience of Entrepreneurs)

	(1)	(2)	(3)	(4)	(5)	(6)
	Novice		Experienced			
			Failures		Non-Failures	
Treated*Post	0.235***	0.219***	0.050*	0.054**	0.149**	0.131**
	(0.069)	(0.067)	(0.025)	(0.027)	(0.061)	(0.062)
Constant	1.722***	-0.253	0.234***	0.457*	1.030***	-0.616
	(0.053)	(0.350)	(0.031)	(0.231)	(0.050)	(0.384)
Control for industry productivity	No	Yes	No	Yes	No	Yes
Treated*GDP Growth	No	Yes	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,075	6,075	5,850	5,850	6,075	6,075
R-squared	0.93	0.93	0.58	0.58	0.89	0.89

Possible Explanations

1. Home office scheme reduces the entry cost that entrepreneurs used to face
2. Option of workplace flexibility further enhances the non-pecuniary benefits of being an entrepreneur and allows for engagement in joint market and household production
3. Social status of entrepreneurs and possible shame from a business failure is an important driving force for the interest in entrepreneurship

Possible Explanations (Financial Constraints)

	(1)	(2)	(3)	(4)
Dependent Var. = Log (1+number of new firms created in an industry at a month)				
	Rich Community		Poor Community	
Treated*Post	0.175***	0.151**	0.242***	0.233***
	(0.060)	(0.058)	(0.069)	(0.069)
Constant	0.657***	-0.837**	1.308***	0.240
	(0.048)	(0.367)	(0.041)	(0.323)
Control for industry productivity	No	Yes	No	Yes
Treated*GDP Growth	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	6,075	6,075	6,075	6,075
R-squared	0.86	0.86	0.91	0.91

Possible Explanations (Entrepreneur Characteristics)

	(1)	(2)
	Ratio of HDB	Ratio of Married
Treated*Post	0.022*	-0.008
	(0.012)	(0.007)
Constant	0.684***	1.247***
	(0.142)	(0.164)
Industry productivity control	Yes	Yes
Treated*GDP Growth	Yes	Yes
Region FE	Yes	Yes
Month FE	Yes	Yes
Industry FE	Yes	Yes
Observations	85,770	85,770
R-squared	0.12	0.02

Possible Explanations (Future Entrepreneurial Activities)

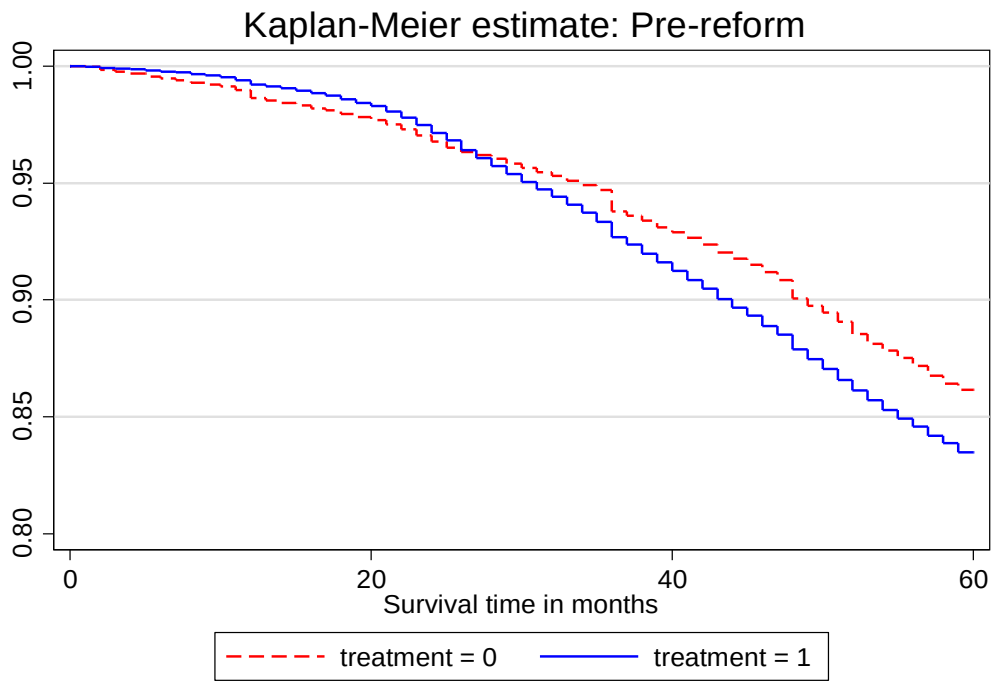
	(1)	(2)	(3)
Dependent Var. = D (Second Business Created)			
D(FirstBusi_Post)	0.029***		
	(0.009)		
D(FirstBusi_Post) *D(FirstBusi_Treated Industries)	0.013	0.012	0.010
	(0.013)	(0.014)	(0.014)
Constant	0.511***	0.590***	0.063**
	(0.002)	(0.024)	(0.028)
First Business Region FE	No	No	Yes
First Business Creation Month FE	No	Yes	Yes
First Business Industry FE	Yes	Yes	Yes
Observations	40,367	40,367	40,367
R-squared	0.01	0.01	0.01

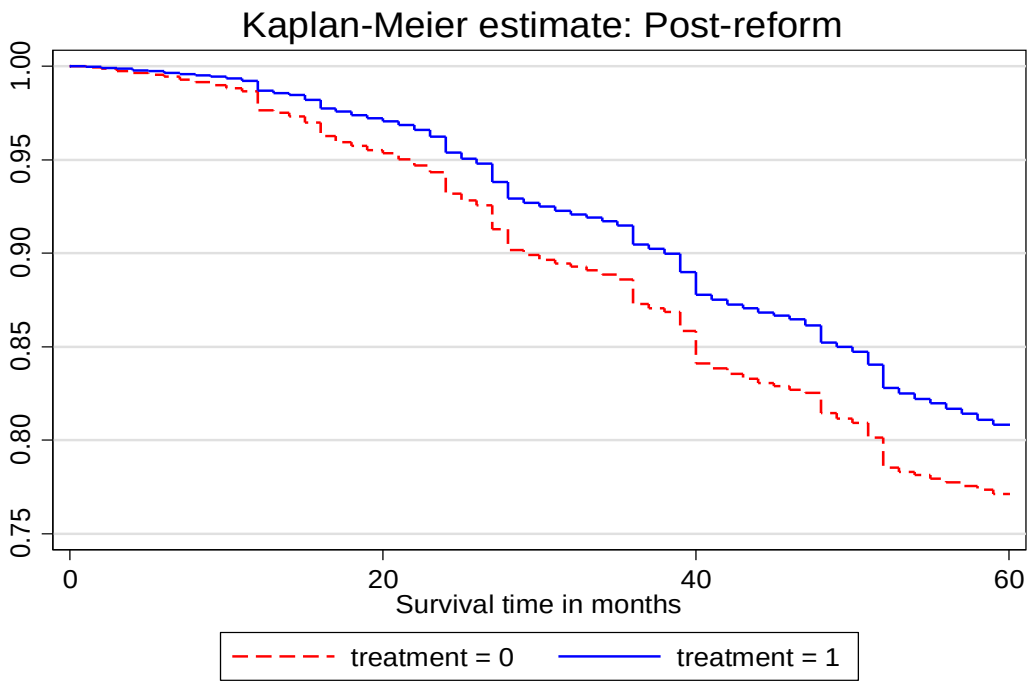
Quality of Start-ups

We now explore whether the home office scheme led to a significant change in the quality of newly built firms

1. Survival rate for the first firm
    - Test hypothesis for increase in survival rate whereby the scheme might encourage individuals to choose industries with high productivity and low risk
2. Characteristics of the next firm

Survivor Analysis





Survivor Analysis (Hazard)

	(1)	(2)	(3)	(4)	(5)
Panel A Hazard regression					
		Full Sample		Pre-reform	Post-reform
Treated				1.088***	0.769***
				(0.028)	(0.013)
Treated*Post	0.704***	0.713***	0.664***		
	(0.021)	(0.021)	(0.022)		
Control for industry productivity	No	No	Yes	Yes	Yes
Treated*GDP Growth	No	No	Yes	Yes	Yes
Region FE	No	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	124,204	124,204	124,204	46,526	77,678

Survivor Analysis (OLS)

Panel B OLS regression					
	D(Survival)				
	1 year	2 years	3 years	4 years	5 years
Treated*Post	-0.004	0.007	0.032***	0.049***	0.054***
	(0.004)	(0.006)	(0.010)	(0.016)	(0.018)
Constant	0.923***	1.041***	1.430***	1.512***	1.539***
	(0.072)	(0.088)	(0.110)	(0.181)	(0.210)
Control for industry productivity	Yes	Yes	Yes	Yes	Yes
Treated*GDP Growth	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	124,204	124,204	124,204	124,204	124,204
R-squared	0.01	0.02	0.04	0.04	0.05

Robustness: firm's failure which comes with lawsuit cases or personal bankruptcy

	D(Failure)*100				
	1 year	2 years	3 years	4 years	5 years
Treated*Post	0.009	-0.062	-0.267***	-0.366***	-0.250*
	(0.034)	(0.064)	(0.087)	(0.114)	(0.137)
Constant	10.032	9.636	9.368	8.601	8.091
	(9.075)	(9.169)	(9.264)	(9.309)	(9.408)
Control for industry productivity	Yes	Yes	Yes	Yes	Yes
Treated*GDP Growth	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	123,520	123,520	123,520	123,520	123,520
R-squared	0.003	0.004	0.006	0.008	0.009

Heterogeneity Test Across Industries (Productivity)

	(1)	(2)	(3)	(4)
Dependent Var. = Log (1+number of new firms created in an industry at a month)				
Panel A Industry-level Productivity				
	Low Productivity		High Productivity	
Treated*Post	0.167	0.169	0.223**	0.201**
	(0.101)	(0.105)	(0.097)	(0.095)
Constant	2.447***	0.538	1.965***	1.351***
	(0.071)	(0.455)	(0.068)	(0.476)
Control for industry productivity	No	Yes	No	Yes
Treated*GDP Growth	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	3,000	3,000	3,075	3,075
R-squared	0.94	0.94	0.94	0.94

Heterogeneity Test Across Industries (Risk)

	(1)	(2)	(3)	(4)
Dependent Var. = Log (1+number of new firms created in an industry at a month)				
Panel B Industry-level Risk				
	Low Risk		High Risk	
Treated*Post	0.323***	0.305***	0.145	0.131
	(0.114)	(0.108)	(0.088)	(0.092)
Constant	1.846***	1.397***	2.551***	0.899*
	(0.060)	(0.382)	(0.078)	(0.508)
Control for industry productivity	No	Yes	No	Yes
Treated*GDP Growth	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	3,000	3,000	3,075	3,075
R-squared	0.91	0.91	0.95	0.95

Learning by Venturing (Character of next firm)

Panel A Extensive Margin Analysis: Probability of Second Business Creation		
	(1)	(2)
Dependent Var. = D (Second Business Created)		
D(FirstBusi_Post) *D(FirstBusi_Treated)	0.023***	0.022***
	(0.007)	(0.007)
Constant	0.530***	0.425***
	(0.012)	(0.049)
First Business Region FE	No	Yes
First Business Creation Month FE	Yes	Yes
First Business Industry FE	Yes	Yes
Observations	136,154	136,146
R-squared	0.01	0.01

Learning by Venturing (Character of next firm)

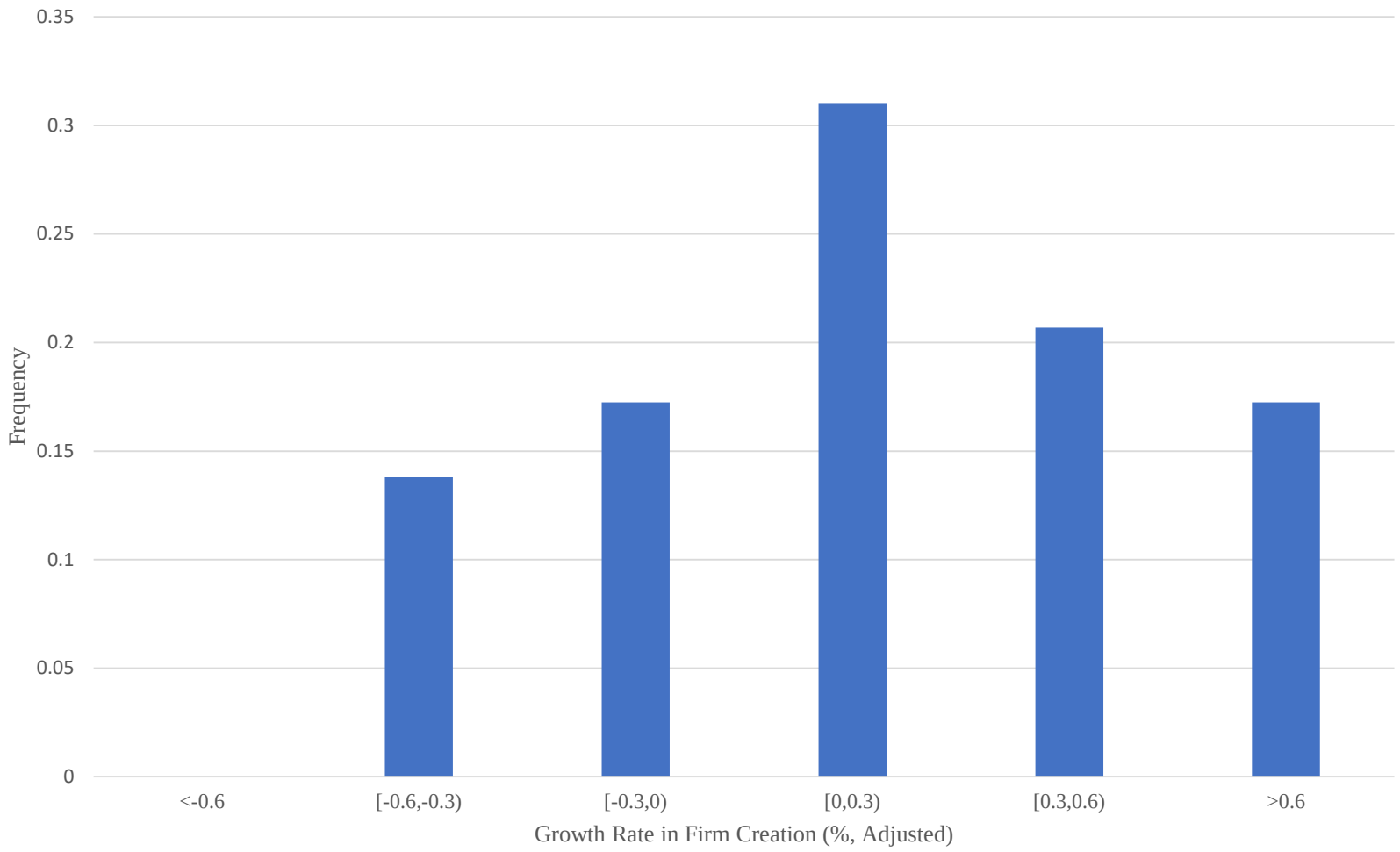
Panel B Intensive Margin Analysis				
	(1)	(2)	(3)	(4)
Dependent Var.	Number of employees		D(survival within 2 years)	
D(FirstBusi_Post) *D(FirstBusi_Treated)	0.291***	0.261***	-0.001	-0.002
	(0.103)	(0.091)	(0.009)	(0.008)
Constant	3.704***	6.872***	0.880***	-0.320***
	(0.880)	(2.098)	(0.107)	(0.078)
Control for industry productivity	No	Yes	No	Yes
Second Business Region FE	No	Yes	No	Yes
Second Business Month FE	Yes	Yes	Yes	Yes
Second Business Industry FE	Yes	Yes	Yes	Yes
First Business Creation Month and Industry FE	Yes	Yes	Yes	Yes
Observations	52,165	52,165	52,165	52,165
R-squared	0.11	0.15	0.26	0.27

Conclusion

- The home office scheme leads to a significantly higher level of business creation.
  - Firm creation grows by 23 percentage points more following the reform for the treated industries than the control group.
  - The effect is more pronounced for low-income individuals, implying that financial constraint is a barrier for firm creation.
- Additional new firms in response to the reform have a higher survival rate, choose industries with higher productivity and lower risk.
- The reform encourages entrepreneurs to become serial entrepreneurs, and they open a larger business with similar survival rate for their second firm.
- Implication: the scheme attract more entry into self-employment without significantly lowering the average quality of the pool.

Thank you

Infra-marginality Concern



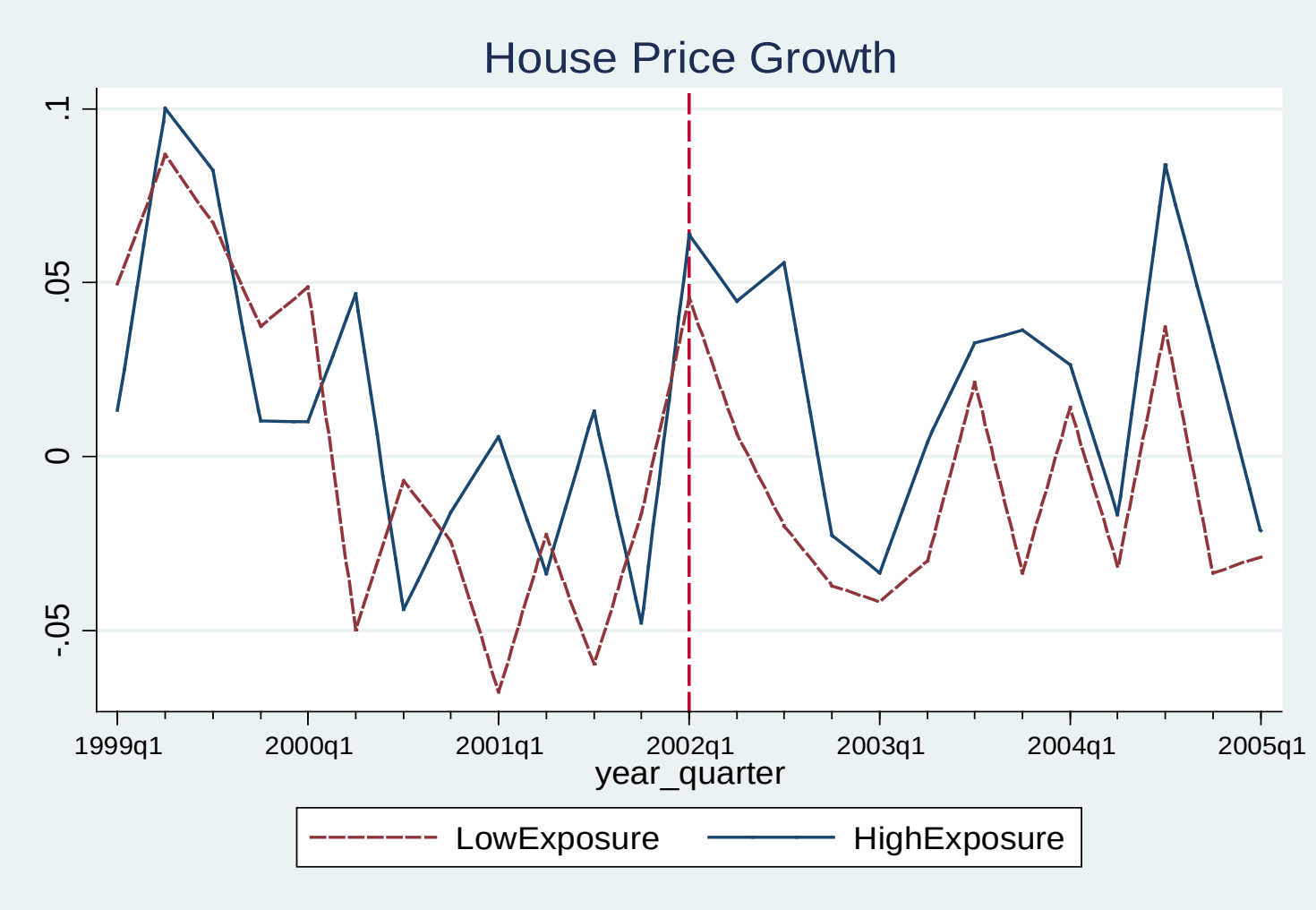
House Price

To estimate the effect of the home office scheme on house price during the implementation period, we adopt the following region-level specification:

$$Ln(Y_{post,s}) - Ln(Y_{pre,s}) = \alpha_0 + \alpha_1 \times Exposure_s + X_s + \varepsilon_s$$

- Left-hand side variable is the growth rate of house price in region s from the pre-reform to post-reform period
- $Exposure_s$ denotes our measures of the program exposure in region *s*
- X_s represents region-level controls

House Price


House Price Growth
.1
.05
0
-.05
1999q1
2000q1
2001q1
2002q1
2003q1
2004q1
2005q1
year_quarter
LowExposure
HighExposure

House Price

	(1)	(2)	(3)	(4)
Dependent Variable =	House Price Growth			
Residential Land Density	0.433**	0.493*		
	(0.205)	(0.252)		
D(High Residential Land Density)			0.132*	0.141**
			(0.065)	(0.060)
Constant	-0.274***	-0.796*	-0.169***	-0.655
	(0.059)	(0.406)	(0.011)	(0.382)
Regional Controls	N	Y	N	Y
Observations	23	23	23	23
R-squared	0.06	0.23	0.15	0.32