



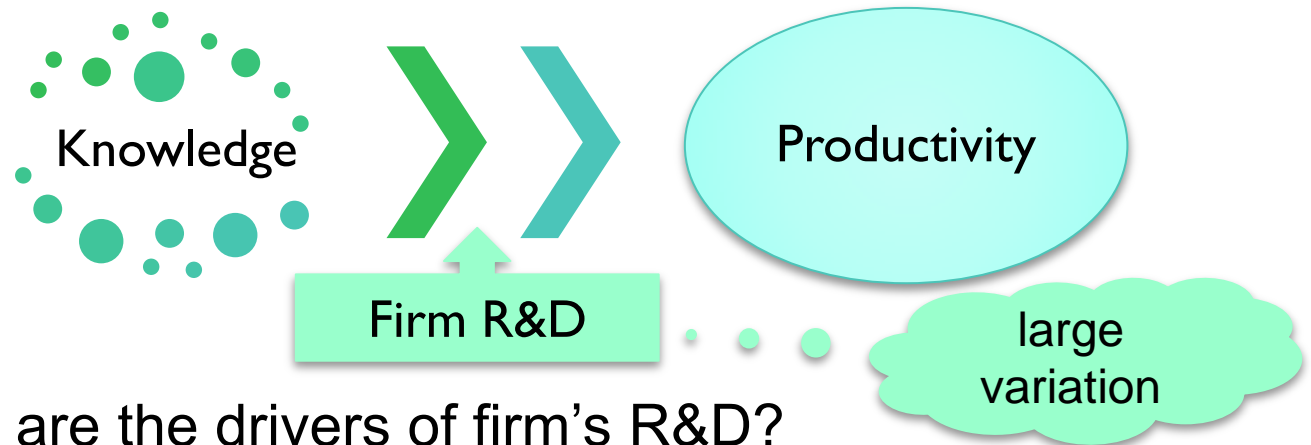
# **Firm-Level R&D Activity, Employee Turnover and HRM Practices – Evidence from China**

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# 1. Motivation



- What are the drivers of firm's R&D?
- Here, two drivers:
  - Employee turnover in firms
  - HRM practices
- Little evidence; esp. from firm-level data for China.

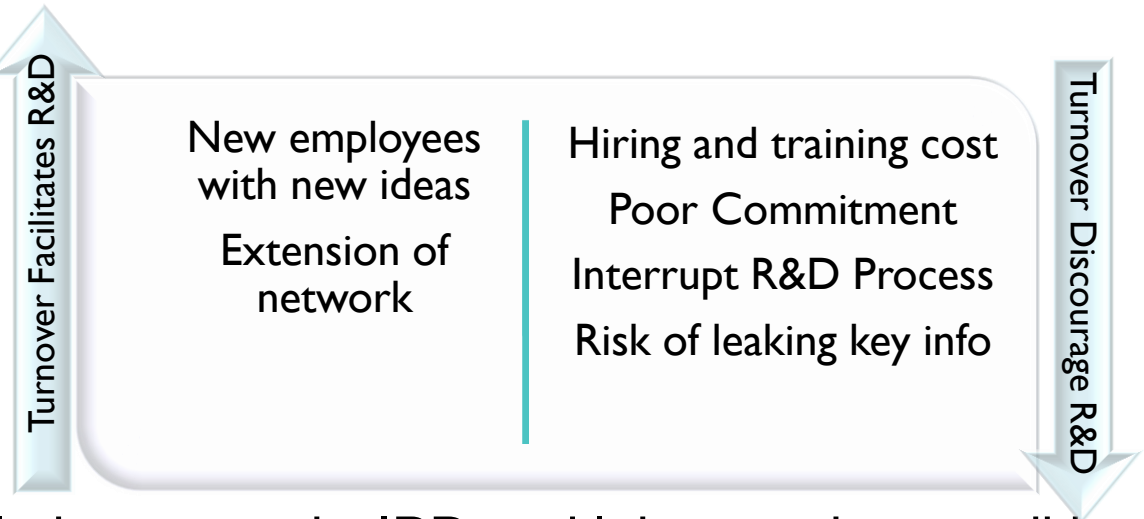
Results from advanced industrialized countries may not apply to China (weak IPR, less developed labor market)

Question: How do employee turnover and HRM practices influence firm's R&D in China?

## 2. Hypothesis

- Impacts of employee turnover on R&D activity:

Two directions:



Overall effect: relative strength- IPR and labor market condition

- in China, *negative* effect dominates: higher turnover → lower R&D.
- Impacts of different HRM practices on R&D activity:
  - High Performance HRM Practices → *higher* R&D return/intensity
- Interaction between employee turnover and HRM:
  - High Performance HRM Practices → *larger effect* of turnover

# 3. Data and Variables

## Data

- 582 Chinese firms across five high-tech industry, 2011

## Variables

- Dependent variable

Number of R&D projects during 2010

- Independent variables

HRM practices (cross functional team, job rotation, training expense, base salary, etc.)

Voluntary turnover rate of technical employee

= number of voluntary resign/ total number tech employee

- Control variables

Number of R&D employee, firm size (output, employee number), industry, ownership, etc.

# 3. Data and Variables

## Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Number of R&D Projects	73.15	432.08	0	10,000
Number of Patents	40.92	228.20	0	5,000
Channel for Suggestion	0.16	0.36	0	1
Cross-Functional Teams	0.77	0.42	0	1
Proportion: Base Salary	0.68	0.16	0.1	1
Job Rotation	0.53	0.50	0	1
Training Expenses	8.79	32.67	0	499.17
Employee Turnover Rate	1.27	3.81	0	63.83
Investment on Technical Development	11,53	41,181.65	0	420,000
Ratio of R&D Employee	0.12	0.1013	0.0015	0.87
New Cooperators	40.95	130.23	1	2,000

## 4. Empirical Strategy

### Two-Part Model: Hurdle Logit Negative Binomial

It allows the process that determines whether carrying out indoor R&D activity or not to differ from the process that determines the level of R&D activity.

$$E(Y|X) = P(Y=0|Z)*0+(1-P(Y=0|Z))E(Y=y_i|Y>0)*y_i$$

### Probability functions

$$\begin{aligned} P(Y_i = 0|Z_i) &= \frac{1}{1 + \exp(Z_i' \gamma)} & P(Y_i = y_i|X_i, Y_i > 0) \\ & &= \frac{\exp(z_i' \gamma) \Gamma(\theta + y_i)}{[1 + \exp(z_i' \gamma)] \Gamma(y_i + 1) \Gamma(\theta) [1 - (1 + \theta^{-1} \lambda_i)^{-\theta}]} \left(\frac{\theta}{\theta + \lambda_i}\right)^\theta \left(\frac{\lambda_i}{\theta + \lambda_i}\right)^{y_i} \end{aligned}$$

### Marginal Effects

$$\frac{\partial P(Y_i = 1|Z_i)}{\partial z_{ik}} = \frac{\gamma_k \exp(z_i' \gamma)}{[1 + \exp(z_i' \gamma)]^2} \qquad \frac{\partial E(Y_i|Y_i > 0, X_i)}{\partial x_{ij}}$$

# 5. Results

Table: Average Marginal Effects of Three Models with Different Regressors

Regressors	Turnover Rate				HRM Practices				Turnover Rate +HRM Practices			
	Logit		ZTNB		Logit		ZTNB		Logit		ZTNB	
	AME	z	AME	z	AME	z	AME	z	AME	z	AME	z
Employee Turnover Rate	0.091***	3.07	-3.133***	-2.83	---	---	---	---	0.105** *	2.74	-3.205***	-2.78
Channel for Suggestion = 1	---	---	---	---	0.002	0.04	-2.513	-0.2	-0.002	-0.06	4.795	0.35
Cross Functional Team = 1	---	---	---	---	-0.081	-1.21	18.801*	1.95	-0.088	-1.4	17.564*	1.81
Proportion of Base Salary	---	---	---	---	-0.014	-0.14	14.417	0.43	-0.034	-0.34	5.592	0.17
Job Rotation = 1	---	---	---	---	-0.109**	-1.97	-2.419	-0.2	- 0.113**	-2.01	0.190	0.02
Training Expense	---	---	---	---	0.002	1.37	0.1996*	1.81	0.002	1.22	0.213*	1.9
Log # of New Cooperators	0.017	0.71	24.946***	4.64	0.030	1.23	24.977***	4.52	0.024	0.92	25.595***	4.6

- R&D active firms have a higher employee turnover rate than R&D inactive firms
- A negative relation between employee turnover and the intensity of R&D activities among R&D active firms
- Estimates for the employee turnover rate are robust to inclusion of the HRM practices
- Cross-functional teams and employee training -> more R&D projects
- HRM and employee turnover seem to influence R&D through different channels

# 5. Results

Table 5. Comparison of Marginal Effects Conditional on Different HRM Practices

Variable	(1)		(2)		(3)	
	Logit	ZTNB	Logit	ZTNB	Logit	ZTNB
Employee Turnover	0.0180	-.897**	0.158**	-1.162**	0.160*	-1.281**

Control/Column	(1)	(2)	(3)
channels for employee suggestions	N	N	Y
cross-functional teams	N	Y	Y
job rotation	N	Y	Y

R&D activity in firms with more innovative HRM practices is more “sensitive” to technical employee turnover



## 6. Further Issues

- **Robustness Check**

Proxy variable: turnover rate of non-technical employees -> to control other unobserved factors, such as management quality.

Previous estimates are robust to inclusion of proxy

- **Policy Implication**

Possibility of encouraging indoor R&D activity by anchoring labor mobility at a suitable level

Considering that firms may not have full control of employee turnover (at least not through the examined HRM practices), the government who is interested in facilitating R&D activity should deal with this by using policy to adjust general labor mobility.



**Thank You  
Very Much for Your  
Attention!**