Paper 2: Product Market Competition, Platform Business Model and, Firm Performance

airbnb

amazon

Alibaba.com

Evolving Product Market Competition : Product Market Fluidity

- Market competition is a dynamic process. (Schumpeter 1950)
- Firms constantly worry about it, especially in high technology sector.

(Heltzel 2019, Gaspar and Stürmer 2016)

- Traditional competition measurement methods have a problem – NAICS code.

518210: Data Processing, Hosting, and Related Services.

32819: Hotels (except Casino Hotels) and Motels

How to Measure Product Market Competition?

- No direct way of measuring increase and decrease of market competition at firm level.
- Product Market Fluidity : The change in a firm’s product space due to moves made by competitors in the firm’s product markets. (Hoberg et al. 2014)
- Compared product description from 10-K reports (Annual Reports) and measured the cosine similarity between firms' products and products of competing firms.

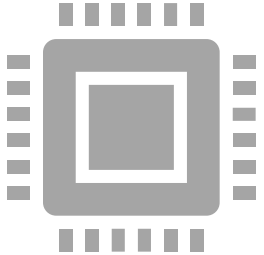
How Product Market Fluidity Increases?

Innovation

Technological discontinuities and new product lifecycle.

Entrance of new players in the product category.

(Utterback & Suarez, 1993, Tushman & Anderson 1990)



Imitation

Quite prevalent in high technology industry.

It can happen at multiple levels (Industry, firm, popularity, service lines etc)

Inherent modularity in products help imitation.

Standardization of core technologies promote imitation.

(Ruckman *et al.* 2015, Ethiraj *et al.* 2008, Bapna *et al.* 2010)

How Product Market Fluidity Effects a Firms Performance

Destructing “Economies of Scale”

Shorter product lifecycles : less opportunities for value appropriation.

Reduction in value proposition due to entrants.

Increase uncertainty leads to consumer reluctance.

(Anderson and Tushman 1990, Acs and Audretsch 1987, Cusumano *et al.* 2007)

Destructing “Economies of Learning”

Context based accrued learning is less useful in value generation.

Difficult to unlearn and relearn in dynamic environment.

Imitation destroys the value proposition of the focal product.

(Tushman and Romanelli 1985 ,Gavetti and Tripsas 2000, Nickerson and Silverman 2003, Argote 2012)

Pipeline vs Platform Business Models

Pipeline Business Model

Resource based view of competition.(Resource control)

Internal optimization of value chain.

Focus on customer value.

Walmart

AMD

Platform Business Model

Network based view of competition. (Resource orchestration)

Maximization of external interactions.

Focus on ecosystem value.

Booking

(Van Alstyne *et. al.* 2016)

How Platform Business Model Effect Firm Performance ?

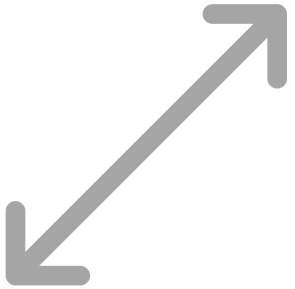
Creating “Economies of Network”

Shift of variable production cost to suppliers of platform.

Fluidity in consumer-producer relationship.

Network size (scale) becomes threat for new entrant and pipeline businesses.

(Van Alstyne & Parker 2019, Eisenmann et al. 2011)



Creating “Economies of Scope”

Expanding scope by adding new features.

Platform envelopment by enveloping related services and products.

Learning accrued on platform can be used to expand scope and platform envelopment. It is not context dependent.

(Zhao *et al.* 2019, Eisenmann et al. 2011)

My Research Questions

What is the effect of product market fluidity on a firm's performance?

What is the effect of platform business model on a firm's performance?

Does platform business model moderate the effect of product market fluidity on a firm's performance ?

Research Setting and Data

1199 firms identified from 16 NAICS-5 high technology sectors.

Identified firms matched with Hoberg *et al.* 2014 product market fluidity dataset . 654 firms matched – 6456 firm-years.

934 firm-years identified for hand labelling as platform or non-platform firms.

Labeled firm-years then further divided in subsample: 700 (training set), 234 (testing set) for platform model classification algorithm.

Financial data for the firms was captured from COMPUSTAT.

Estimation Strategy

Cobb-Douglas Production Function

$$\mathrm{Ln}(Y)_{it} = \alpha \mathrm{Ln}(K)_{it} + \beta \mathrm{Ln}(L)_{it} + \delta(Z)_{it} + \xi_{it}$$

Dynamic Panel Data Fixed Effect Model

$$ln(\text{Value-added})_{it} = \beta_0 + \beta_1 ln(\text{Value-added})_{it-1} + \beta_2 (\text{product market fluidity})_{it} + \beta_3(\text{platform})_{it} + \beta_4(\text{product market fluidity}_{it} * \text{platform}_{it}) + \beta_5 ln(\text{capital})_{it} + \beta_6 ln(\text{emp})_{it} + \beta_7 ln(\text{r\&d expenses}) + \beta_8 ln(\text{advertising expenses}) + \beta_9 ln(\text{leverage}) + \beta_{10}(\text{firm\_size}) + (\text{firm fixed effect})_i + (\text{year fixed effect})_t + \varepsilon_{it}$$

How Platform Business Model is Measured?

- 10-K reports
  - Downloaded for all firms for last 20 years.
  - Parsed and preprocessed.
  - Extracted item 1. Business Description Section
  - Labelled a sub sample of firms as platform and non-platform.
  - Submitted this sub sample to Naïve Bayes Algorithm.
  - Used output model of the Algorithm to predict business model for rest of the firms.

Naïve-Bayes Classification Algorithm

$$P\,(Platform/x_1, x_2 \ldots\ldots, x_n) = (\prod_{j=1}^{n} P(\frac{xj}{Platform})).(\frac{P(Platform)}{P(x1,x2,\ldots.xn)})$$

Where P (Platform)= The prior probability of a firm to be platform business model

$\prod_{j=1}^{n} P(\frac{xj}{Platform})$ = The conditional probability defined as the likelihood of observing a feature(x_1, x_2,…,x_n) value given the firm is a platform (non-platform) business. P(x_1, x2,…..,x_n) is predictor features.

10-K Text - Platform Business Model

"We are a global commerce platform and payments leader. We enable commerce through three reportable segments: Marketplaces, Payments and GSI. These segments provide online platform, services and tools to help individuals and small, medium and large merchants around the globe establish online and mobile commerce and payments. As of December 31, 2011, we had more than 100 million active users transacting on our sites, millions of merchants using one or more of our platforms, and a developer community with more than 800,000 members using our APIs. We operate a vibrant global marketplace designed to bridge online, mobile and offline shopping and enable consumers to find what they want, when they want it."

10-K Text - Non-platform Business Model

"We are a global semiconductor company with facilities around the world. Within the global semiconductor industry, we offer primarily:

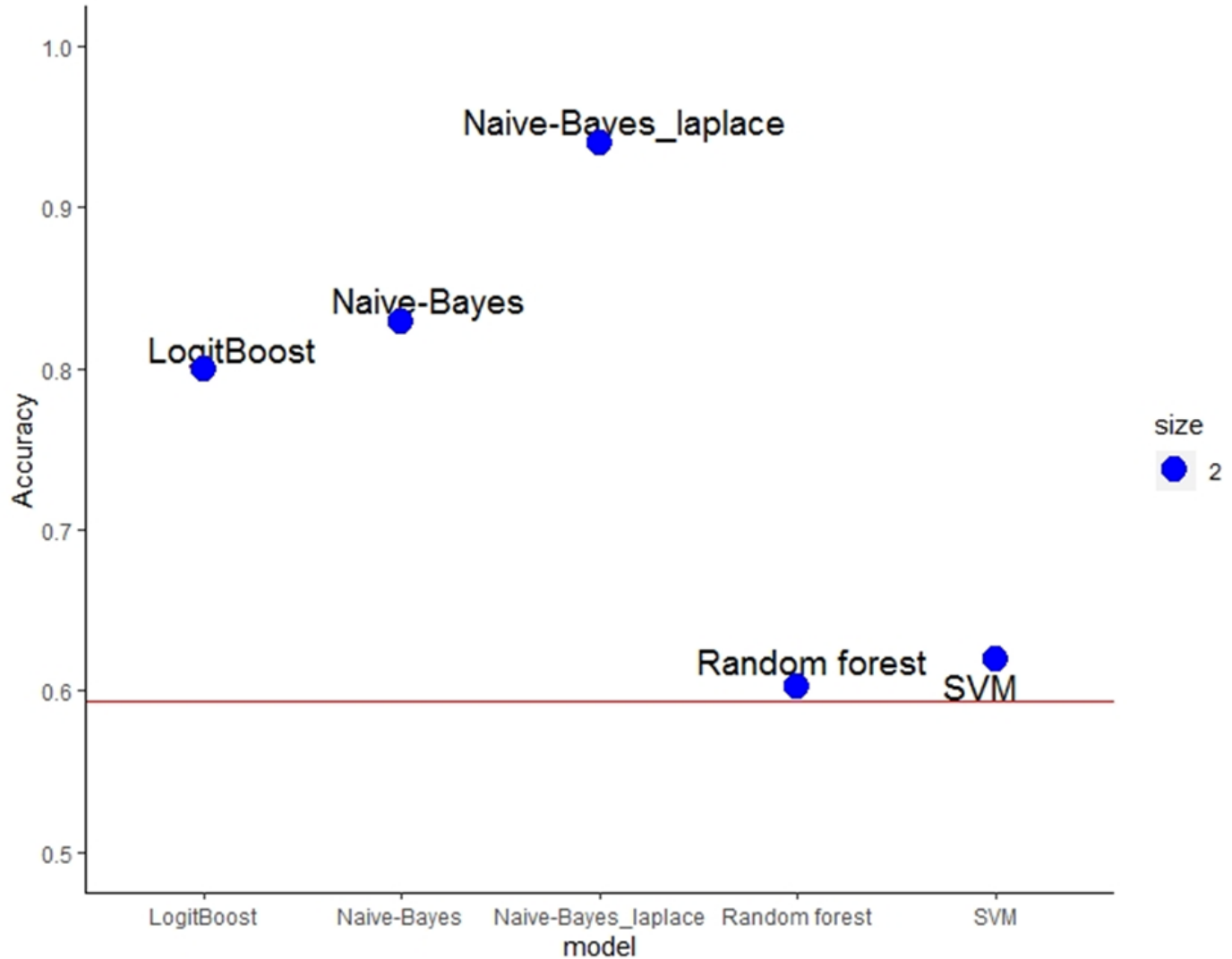
a.x86 microprocessors, for the commercial and consumer markets, embedded microprocessors for commercial, commercial client and consumer markets and chipsets for desktop and notebook PCs, professional workstations and servers; and

b. graphics, video and multimedia products for desktop and notebook computers, including home media PCs, professional workstations and servers and technology for game consoles."

Our Classification Model is 94% Accurate

	Naïve-Bayes Classification Actual		Naïve-Bayes Classification (with Laplace smoothing) Actual	
Prediction	Platform	Non-platform	Platform	Non-platform
Platform	59	4	93	12
Non-platform	36	135	2	127
Sensitivity	0.62		0.98	
Specificity	0.97		0.92	
Kappa	0.63		0.88	
Accuracy	0.83[0.77 – 0.88]		0.94 [0.91 - 0.97]	
No information rate	0.60**		0.60**	
Positive Prediction Accuracy	0.94		0.98	
Negative Prediction Accuracy	0.79		0.89	
Balanced Accuracy	0.80		0.94	
McNemar's Chi-squared test			7.14**	

Comparison Between Classification Algorithms



Other Variable Measurements

Product market fluidity

Adopted from Hoberg *et. al.* 2014 (ranging from 1 to 22)

Value-added productivity

Total Sales – Total Expenses

Capital Stock

Depreciated Capital Stock (t-1) + Capital Investment (t)

Labor

Number of employees in the firm.

R & D Stock

Depreciated R & D Stock (t-1) + R & D Investment (t)

Advertising Stock

Advertising Stock (t-1) + Advertising Expenditure (t)

Leverage

Total company debt/ shareholder equity.

Firm Size

Firm in 75 %tile and above of total sales in a year – large firm, else small firm.

Market Fluidity Hurts, Platform Business Model Moderates Its Effect on Firm Performance

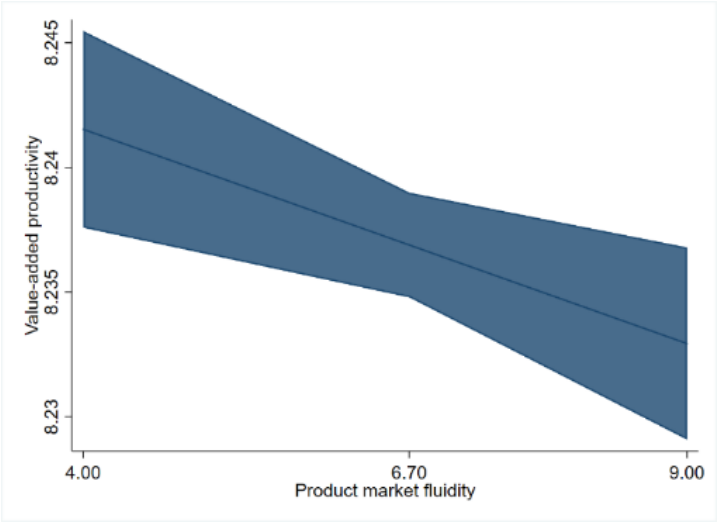
	(1)	(2)	(3)	(4)	(5)
Product market fluidity		**-0.002****		**-0.001****	**-0.002*****
		(0.001)		**(0.001)**	**(0.001)**
Platform			**0.118*****	**0.117*****	**0.061*****
			(0.012)	**(0.012)**	**(0.019)**
Product market fluidity X Platform					**0.008*****
					(0.002)
Capital stock	0.110***	0.108***	0.106***	0.105***	0.105***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Employees	0.193***	0.193***	0.194***	0.194***	0.193***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
R & D stock	0.001	0.001	0.002	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Advertising Expense	0.333***	0.332***	0.321***	0.320***	0.327***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Leverage	-0.004	-0.006	-0.009	-0.010	-0.011
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Firm size	-0.053***	-0.053***	-0.053***	-0.053***	-0.052***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Observations	5536	5536	5536	5536	5536
R-squared	0.830	0.861	0.889	0.898	0.898

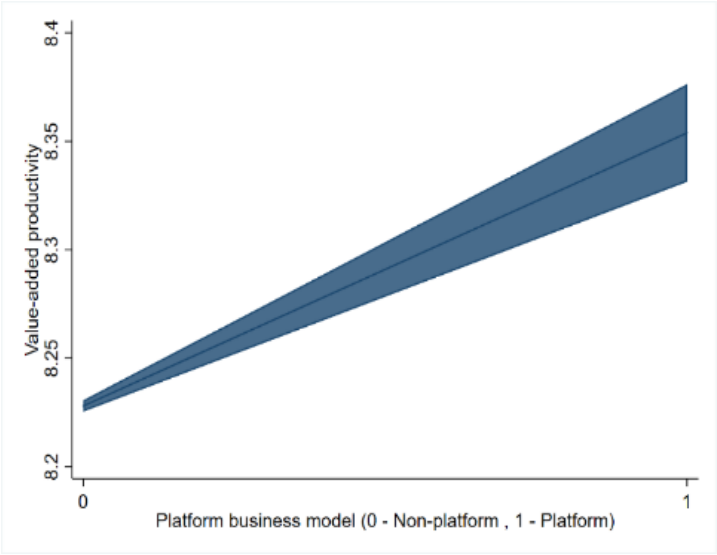
Product market fluidity hurts

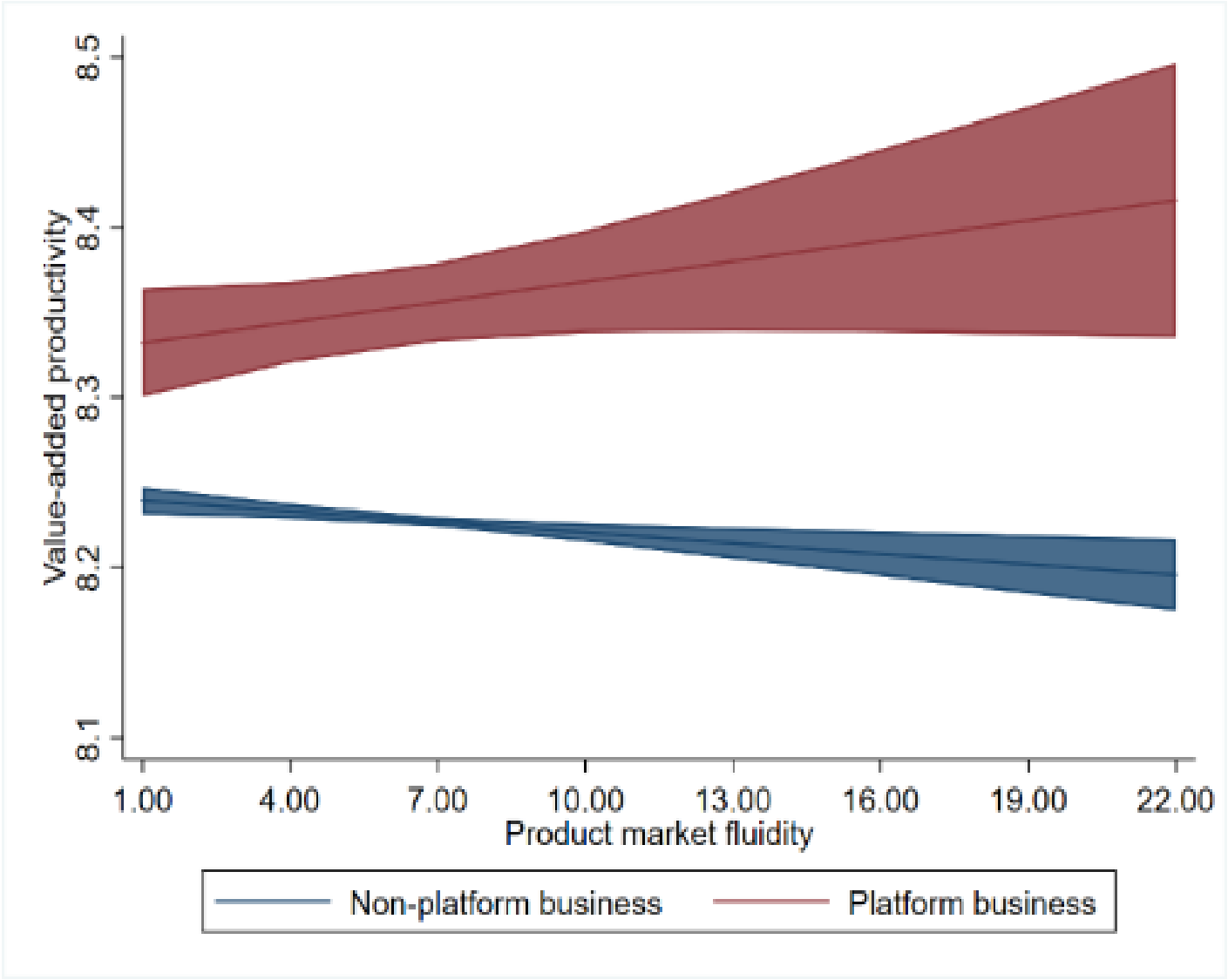
Platform business model helps

Platform business model negates effect of product market fluidity

Marginal Effects







Why Firm Size May Moderate the Relationship Three-Way?

Leveraging the organizational competency for faster adaption.

Development of complement and services.

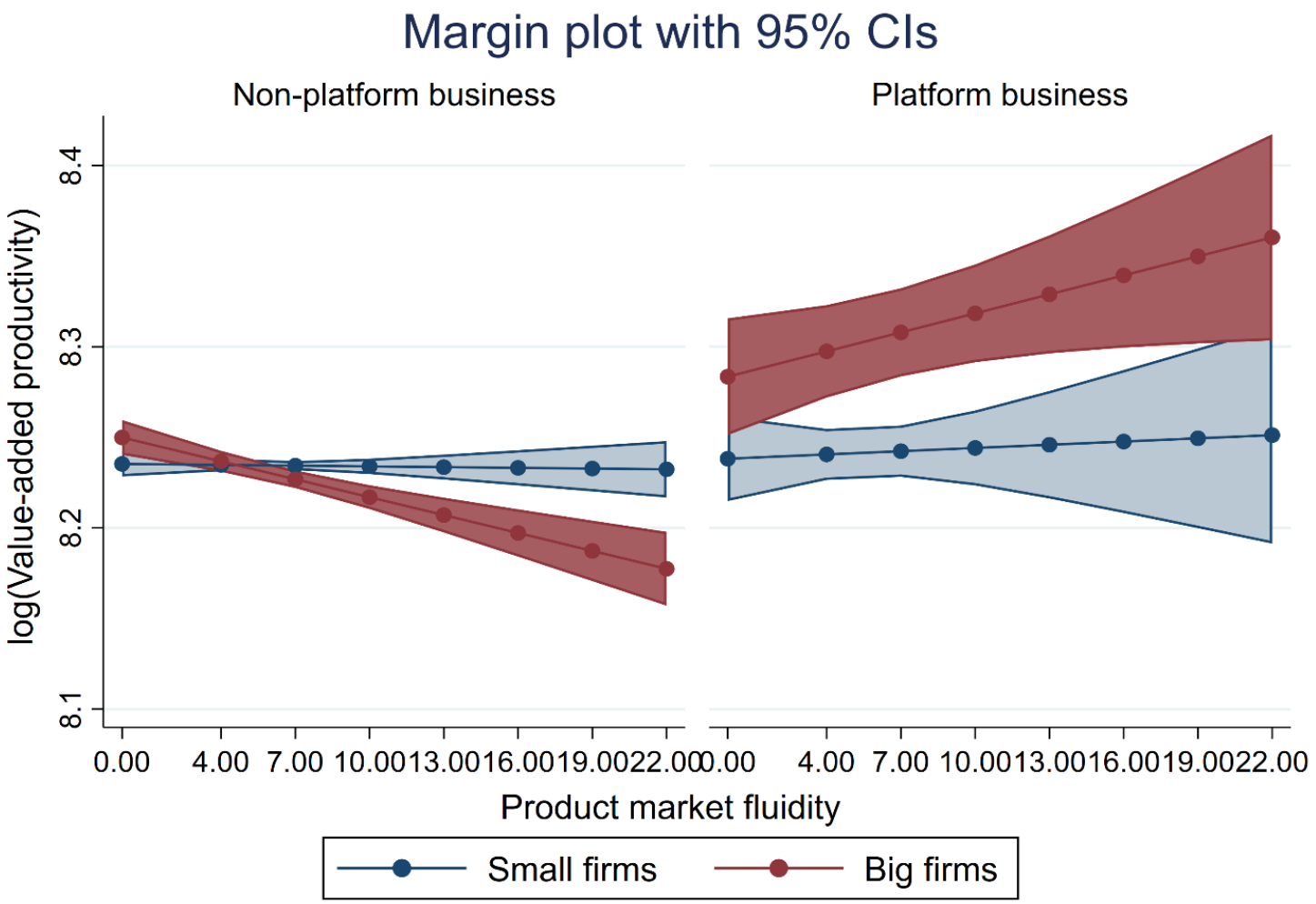
Transition of large customers and suppliers base as parties of the Platform.

Firm Size Moderates the Product Market Fluidity, Platform Business, and Firm Performance Relationship

Y = **Value-added productivity**	(1)	(2)
Platform	0.003	0.004
Product market fluidity	-0.001	-0.000
Product market fluidity X Platform	0.001	0.001
Firm size(sales)	**0.015****	
Product market fluidity x Firm size(sales)	**-0.003*****	
Platform x Firm size(sales)	**0.026**	
Product market fluidity x Platform x Firm size(sales)	**0.006****	
Firm size(employees)		**0.026*****
Product market fluidity x Firm size(emp)		**-0.005*****
Platform x Firm size(emp)		**0.012**
Product market fluidity x Platform x Firm size(emp)		**0.011*****
Observation	5536	5536
No of Firms	654	654
R-squared	0.876	0.877

Firm Size : Large Firms (75 %tile and above in terms of sales)

Firm Size : Large Firms (75 %tile and above in terms of no. of employees)


Margin plot with 95% CIs
Non-platform business
Platform business
log(Value-added productivity)
8.1
8.2
8.3
8.4
0.00
4.00
7.00
10.00
13.00
16.00
19.00
22.00
Product market fluidity
Small firms
Big firms

Paper 2 : Result Summary

- High product market fluidity leads to lower value productivity for a firm due to limited value capture from economies of scale and learning.
- Platform business models deliver superior value compared to non-platform businesses. They also deliver better performance under high market threats compared to non-platform businesses
- While bigger firms benefit more from including platform business model as part of their business strategy compared to smaller firms, the gains are still to be made by smaller firms.

Questions and Answers

THANK YOU