## Matching Frictions in Firm-to-Firm Trade: A Proposed Field Experiment Design

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#### Motivation

- Are there matching frictions in firm-to-firm trade?
  - Perhaps not all surplus-generating trade are realized
- What is the aggregate loss as a result of these frictions?
- Are there policy interventions that could guide firms to form efficient matches?

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- A multi-layered experiment design, in which we:
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    - Potential customers: firms which ever had a supplier reporting the same product of the given supplier firm as its main product
  - 2. Vary the information content: (a) identity of potential customers; (b) information about potential customers

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- Does providing information lead to higher probability of trade?
- Broader policy implications in light of increasingly available VAT data across countries

- Partnership with Tokyo Shoko Research (TSR), Inc.
  - One of the two largest credit reporting companies in Japan
  - Collect firm information based on face-to-face / phone interviews and sell this information
    - Cover about 70% of firms in Japan, from 2007 till present
    - Main suppliers and buyers
    - Detailed firm characteristics and financial statements

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- Where we stand now:
  - Conducted exploratory interviews to assess feasibility
  - Discussed concrete implementation plans with TSR
  - Refining and finalizing the research design and questionnaires

Introduction

Conceptual Framework

Experiment Design

Timeline and Data Collection

#### Outline

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**Conceptual Framework** 

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#### **Conceptual Framework**

- Two players: Supplier (s) and Buyer (b)
- Joint surplus:  $\Pi(X_{sb})$ 
  - $X_{sb}$  are characteristics of S and B: e.g., size, distance, etc
- Denote the information set of s and b by  $I_s$  and  $I_b$ 
  - *I<sub>s</sub>*: knowledge about potential demand
  - *I<sub>b</sub>*: knowledge about available suppliers
- Either side can choose to initiate trade and make a take-it-or-leave-it offer

#### **Conceptual Framework**

- Surplus-generating trade:  $\Pi(X_{sb}) > 0$
- Inefficiency arises when  $b \notin I_s$  and  $s \notin I_b$ 
  - Need both conditions to hold
- The social welfare loss:

 $Pr(b \notin I_s) \times Pr(s \notin I_b | b \notin I_s) \times Pr(\Pi(X_{sb}) > 0) \times \Pi(X_{sb})$ 

- ▶  $Pr(b \notin I_s | X_{sb})$ , X = {size, distance, location, sector}
- ▶  $Pr(s \notin I_b | b \notin I_s, X_{sb})$ , X = {size, distance, location, sector}

#### Testable Hypotheses

Information provision: shocks to  $I_s$  so that  $b \in \Delta I_s$ 

- Positive impact on trade  $\rightarrow$  presence of matching frictions
- Quantitative implication: loss in joint surplus  $\Pi(X_{sb})$

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- Heterogeneity across size and distance
  - ▶ Which types of firms (e.g. small vs large) are affected more?
  - ► For which types of potential customers (e.g. near vs distant)?
  - $\rightarrow$  stratified randomization and matching procedure

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- Scopes of the information frictions: identity of potential trading partners or beyond

 $\rightarrow$  vary the content of the information provided

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  - ► Targeted sample size: 500 firms
  - Cover multiple sectors and locations
  - Recruit firms via email and phone calls: interested in receiving information about industry growth and market demand

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- Sampling and recruitment:
  - Targeted sample size: 500 firms
  - Cover multiple sectors and locations
  - Recruit firms via email and phone calls: interested in receiving information about industry growth and market demand
- A multi-layered experiment of information provision:
  - Vary the types of potential customers:
    - close customers: own prefecture
    - distant customers: other/neighboring prefectures
  - Vary the types information:
    - information about the potential customers
    - information about potential customers' existing suppliers

#### Multi-Layered Experiment Design ( example: general information



### Multi-Layered Experiment Design



#### Multi-Layered Experiment Design ( example: potential customer information



#### Multi-Layered Experiment Design



- Step 1: Stratify suppliers into product-location-size strata
  - Location: prefecture
  - Size: below and above median in each product-prefecture cell
- Step 2: For each supplier product-prefecture group, identify the pool of potential customers:
  - Start with the 2017 KJ sample
  - Select firms which have ever had a supplier reporting the same product of given supplier strata as its main product
  - Restrict to firms located in the same area (total 8 big areas)
  - Exclude outliers:
    - Publicly listed firms
    - ▶ Firms with missing information on sales, location, industry
    - ▶ Top and bottom 10% in sales for each 4-digit industry

- Step 3: Stratify potential customers into location-size strata
  - ▶ Location: same prefecture (as suppliers) vs other prefecture
  - Below and above median in sales revenue within prefecture
- Step 4: Randomly assign and match supplier and buyer firms in each strata into control & treatment arms
  - Ensure balance in treatment and control arms for suppliers
  - Ensure balance in control and assigned supplier characteristics for each buyers strata
  - Match suppliers with different types of customers according to treatment arm (e.g, Near-Large)





Near-Large	Near-Small	Distant-Large	Distant-Small		
• XX	• XX	• XX	• XX		
• XX	• XX	• XX	• XX		
•	•	•	•		
• XX	• XX	• XX	• XX		
• XX	• XX	• XX	• XX		
•	•	•	•		



	Near-Large		Near-Small		Distant-Large		Distant-Small	
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#### Timeline and Data Collection



#### Timeline and Data Collection

- Baseline survey:
  - Knowledge about potential customers
  - List of companies contacted for the past two weeks/one month/six months (up to 10)
  - Among contacted, list of customers agreed to follow up in some form (e.g. future meetings, quote, sample requests)
  - List of newly acquired customers for the past six months and sales amount for the first transaction
- Followup surveys:
  - For control group: repeat the baseline questions
  - For treatment group: repeat the baseline questions separately for those firms provided on the list versus those that were not
  - Other firm-level outcomes, such as supplier search behavior

#### Discussions

Reduced form impact of treatment on joint surplus (profits)

 $Pr(b \notin I_s) \times Pr(s \notin I_b | b \notin I_s) \times Pr(\Pi(X_{sb}) > 0) \times E[\Pi(X_{sb}) | \Pi(X_{sb}) > 0]$ 

IV estimate of trade on profits, instrumented by the treatment:

 $E[\Pi(X_{sb})|\Pi(X_{sb})>0]$ 

- ► Separately identify  $Pr(b \notin I_s)$ ,  $Pr(s \notin I_b)$  &  $Pr(\Pi(X_{sb}) > 0)$ ?
  - Survey supplier knowledge:  $Pr(b \notin I_s)$
  - Supplier contacting:  $Pr(\Pi(X_{sb}) > 0)$

Appendix

# Appendix

#### Appendix

### Example: General Customer Information • Example:

【プロファイルの読み方】

業歴	社数 (ターゲット)	社数割合(%) (ターゲット)	社数 (比較対象)	割合(%) (比較対象)	浸透率 (%)	インデックス	ZZJP
50年以上	8,134	42.08%	195,322	12.89%	4.16%	326.55	121.14
40~49年	3,212	16.62%	175,441	11.58%	1.83%	143.56	21.91
30~39年	2,463	12.74%	205,652	13.57%	1.20%	93.91	-3.35
20~29年	2,159	11.17%	266,428	17.58%	0.81%	63.54	-23.41
10~19年	2,075	10.74%	254,978	16.82%	0.81%	63.81	-22.63
5~9年	763	3.95%	129,484	8.54%	0.59%	46.21	-22.86
5年未満	326	1.69%	84,344	5.57%	0.39%	30.31	-23.52
N/A	196	1.01%	203,928	13.46%	0.10%	7.54	-50.69
合計	19,328	100.00%	1,515,577	100.00%	1.28%		
			1				
	分析対象企業	(例: 既存顧	比較対象企業	能(例:日本全	1	1.1	1.1
	客)の度数およ	び割合	国の企業)の	度数および割合	↓		
			度数(ターゲット	、)÷度数(比朝	皎対象)×100	. ↓	
			割合(%)(	ターゲット)÷割 100以上の場合	合(%)(比東 、セル背景色を2	妓対象)×100 ↓レンジで表示。	Ļ

+3以上の場合、セル背景色をオレンジで表示。 -3以下の場合、セル背景色をブルーで表示。



#### Example: Potential Customer Information • 100 back

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