Border Processing, Trade Costs and New

Introduction

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- Roberto Azevedo - Director-General of the WTO:
  - *\WTO Trade Facilitation Agreement has come into force! This is the biggest global trade deal of this century"*
  - *\The impact of the Trade Facilitation Agreement could be greater than the elimination of all existing tari s around the world"*
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Don't know how firms manage these processes $\Rightarrow$ Don't know how this affects trade, trade theory, or, trade facilitation

Why is this challenging and interesting?

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- A stew of provisions to streamline document, information and shipment processing.
- How can we measure this in a coher2(w)s 0.92111ay?

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Our starting point

Literature shows that slow supply chains are costly (Djankov et al., 2010; Hummels and Schaur, 2013; Carballo et al. 2014; Volpe Martincus et al., 2015; Fernandes et al., 2015; Evans and Harrigan, 2005; Harrigan 2010)

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How to measure time?

- Enterprise Survey and Doing Business: Aggregate de facto versus de jure measures (Hallward-Driemeier and Prichett, 2015)
- Total border time versus time in inspections, unloading, etc
- Time to import versus time to export versus time in ocean transit (Djankov et al., 2010; Hummels and Schaur, 2013; Volpe Martincus et al., 2015; Fernandes et al., 2015)

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- Inform cost rankings based on di erent time meaures.

Empirics: Detailed import data for Peru.

- Merge detailed processing of shipments with rm level import data.
- Estimate the costs elasticities employing xed e ect and IV techniques.

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Related Literature

Related Literature

A set of papers identify trade costs with respect to frictions related to crossing borders (McCallum, 1995; Helliwell, 1996; and Anderson and van Wincoop, 2003).

- Instead of estimating a catch all border e ect, we quantify the impact of detailed border procedures.

Empirical Facts

Import Processing Data

Detailed data taken from import declarations and load manifests at the transaction level data, 2007-2013.

Source: Peru's National Tax Agency (SUNAT).

For each shipment clearing through the sea-port of Callao we observe:

1. Date when the ship arrived.
2. Date the shipment (container) was unloaded.
3. Date the customs import declaration was created and registered.
4. The customs channel.
5. Date the shipment was released by customs.

Transaction Level: importing rm-by-export country-by-HS10 product-by-shipment

Fact 1- Processing Time and Storage Time

Stage	Channel	Mean	5th	50th	95th
Total Border	All	16.5	4.0	12.0	44.0
	Green	11.6	4.0	8.0	29.5
	Red	23.2	7.0	19.0	55.0
Storage	All	11.0	2.0	7.0	32.0
	Green	9.7	2.0	7.0	27.0
	Red	12.5	2.0	8.0	37.0
Port and Custom	All	6.4	1.0	4.0	19.0
(\Processing")	Green	3.8	1.0	2.0	6.0
	Red	12.1	4.0	9.0	26.0

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Total Border : duration from arrival to customs clearance.
Processing: time spend in actual processing stages: Port and Custom.
Firms face atime distribution where the storage and channels matter.

Fact 2- Exporters manage storage time

	Storage			
Port Time	-0.152***	-0.169***	-0.111***	-0.132***
	(0.011)	(0.013)	(0.011)	(0.012)
	Customs Time			
Storage Time	-0.001	-0.009	-0.005	-0.016
	(0.007)	(0.008)	(0.006)	(0.011)
Firm FE	Yes	No	Yes	No
Product-Origin FE	Yes	No	Yes	No
Firm-Product-Origin FE	No	Yes	No	Yes
Day FE	No	No	Yes	Yes

Firms absorb longer unloading times with shorter storage times

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Firms absorb longer unloading times with shorter storage times

Longer storage times have no e ect on customs times

Fact 3- Firm Heterogeneity

Stage	Firm Type	Mean	5th	50th	95th
Total Border	New Importers	24.7	7.0	20.0	60.0
	Incumbent	15.2	4.0	11.0	40.0
Processing	New Importers	9.8	2.0	8.0	25.0
	Incumbent	5.8	1.5	4.0	17.0
Total Border	Non-Exporters	17.2	5.0	13.0	45.0
	Exporters	13.0	4.0	9.0	37.0
Processing	Non-Exporters	7.2	2.0	5.0	20.0
	Exporters	4.8	1.0	3.0	14.0

Variation related to standard trade models hidden in aggregate data.

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Conclusions from empirical facts

Total border times are a combination of storage times and processing times and *endogeneous* to the firms.

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Processing times are determined by customs and port e ciency

- Conditional on xed e ects, less likely to be endogenous
- Easier to measure and monitor
- Processing times are random: random allocation to customs inspection, document handling, port strikes, equipment failure, etc.

Conclusions from empirical facts

- Total border times are a combination of storage times and processing times and endogenous to the firms.
- Processing times are determined by customs and port efficiency
  - Conditional on fixed effects, less likely to be endogenous
  - Easier to measure and monitor
  - Processing times are random: random allocation to customs inspection, document handling, port strikes, equipment failure, etc.
- Firms optimize
  - Longer processing times are correlated with lower buffer times
  - Have to interpret processing costs through firms' supply chain optimization

Theory

Expected Cost Function

Substitue t into objective to obtain:

$$TC = (';!; \quad r;\#) \quad t^{\frac{\#'}{\#}}$$

Empirical Evidence

Data - Snapshot

Year	Import Value	#Importers	#Origins	#Products
2007	19,100	19,290	199	6,989
2008	27,900	22,542	205	6,230
2009	20,600	23,597	201	6,174
2010	28,200	25,592	203	6,233
2011	36,100	26,804	210	6,177
2012	40,200	28,799	211	6,302
2013	41,100	30,131	209	6,303
Percentage Share Callao				
2007	72.3	64.0	86.4	92.4
2008	72.4	65.4	87.3	92.6
2009	73.8	65.7	93.0	93.0
2010	75.5	64.8	84.7	92.9
2011	76.7	65.8	84.8	93.2
2012	75.9	65.5	90.5	93.3
2013	74.7	65.6	88.5	93.2

	Processing Time			Total Time		
	OLS	IV1	IV2	OLS	IV1	IV2
Time	-0.049[a]	-0.236[a]	-0.234[a]	-0.057[a]	-0.556[a]	-0.551[a]
	(0.005)	(0.011)	(0.011)	(0.005)	(0.026)	(0.026)
Trade Costs			-1.541[a]			-1.540[a]
			(0.044)			(0.044)
IV1: Congestion		0.028[a]	0.028[a]		0.009[a]	0.009[a]
		(0.000)	(0.000)		(0.000)	(0.000)
IV2: Channel		0.651[a]	0.651[a]		0.281	0.281[a]
		(0.003)	(0.003)		(0.003)	(0.003)
F-Test		33,593	33,594		6,632	6,,633
		[0.000]	[0.000]		[0.000]	[0.000]
Hansen		0.562	0.570		0.949	0.934
		[0.453]	[0.450]		[0.330]	[0.334]
Firm-Y FE	Yes	Yes	Yes	Yes	Yes	Yes
Orig-Prod-Y FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	589,842	589,842	589,842	589,844	589,844	589,844

The Impact of Border Time on Firms' Imports

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[a]signi cant at 1% - Clustered S.E. at Firm level

Total time overestimates the processing elasticity as our model predicts. *Intuition:* storage time dampens the variation.

High attenuation bias for OLS for total time*Intuition:* rms can actively manage storage (additional endogeneity).

Results - Robustness Checks

Di erent sets of FE:

- Firm-Year
- Origin-Product-Year
- Firm-Product-Year, Origin-Product-Year
- Firm{Origin-Year, Origin-Product-Year
- Firm{Year, Origin-Product-Year, Firm-Product-Origin
- Firm xed e ects

Controling Sample for:

- Shipments pre-processed (small share of shipment)
- Products that requires permits to import
- Light products

IV:

- Di erent windows for congestion: 2-10 days
- Focusing only on physical inspection

Clustering at di erent levels

Alternative speci cation: specify prices and freight charges

Results - Quanti cation

Elasticities are not enough to quantify border processing times:

It requires estimating $(\theta'; \#; r; !)$: ugly function!

θ' is estimated from the processing time distribution

) $t_{median} = \frac{\theta'}{2}\, t_{min}$

With and θ' we can recover #

Lower bound on that depends only on $\theta'; \#$ based on our model

We show that $> \_ = \frac{\frac{\# + \theta'}{\theta'}}{2^{\frac{\#}{\# + \theta'}}}$

In the paper we have mutliple ways to compute lambda

Bootstrapped estimates to evaluate signi cance.

Results - Lower Bound Quanti cation

	IV1	IV2
	2.977	1.541
	0.079[a]	0.152[a]
	(0.008)	(0.008)
'	2.072[a]	2.072[a]
	(0.037)	(0.037)
#	0.082[a]	0.164[a]
	(0.007)	(0.016)
(_ 1)	0.013[a]	0.026[a]
	(0.002)	(0.004)
(Time Cost 1)	0.167[a]	0.346[a]
	(0.015)	(0.036)

At the average median processing time, border processing tari between 17% and 35% where expected late costs are between 4.5% and 9.7%.

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Policy experiment: dropping physical inspection of documents reduces processing from 5 to 2 days and border processing tari to 9% and 12%.

Results - Quanti cation: Firm Heterogeneity

Trade costs are usually assumed homogeneous across rms.

- This mutes policy consequences and conceals rms' optimal responses to trade barriers.

Our results shows heterogeneity across rms.

- Larger and Exporter Firms are more elastic to delays but compensate with investing in supply chain and reducing time.
- New importers face greater costs.

	Size			Export Experience			Import Experience		
	SF	LF	Di	NEF	EF	Di	NIF	IF	Di
Time	-0.204[a]	-0.296[a]	a	-0.199[a]	-0.268[a]	a	-0.422[a]	-0.207[a]	a
	2.922	3.129		2.945	3.038		2.940	2.977	
	0.070[a]	0.094[a]	a	0.068[a]	0.088[a]	a	0.144[a]	0.069[a]	a
'	2.011[a]	2.128[a]		1.999[a]	2.070[a]		3.053[a]	2.037[a]	a
#	0.072	0.099	b	0.070	0.092	b	0.151	0.072	a
(_ 1)	0.011[a]	0.015[a]	c	0.011[a]	0.014[a]	c	0.016[a]	0.011[a]	
Avg Time	6.531	3.771		6.961	3.846		11.868	5.374	
Time Cost	0.153[a]	0.150[a]		0.153[a]	0.142[a]		0.449[a]	0.136[a]	a

Conclusion

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We focus on the role of border processing as a source of border costs.

We model rm's optimal time management to meet delivery schedules when processing times are uncertain. We embed this into an import demand setting to develop an identi cation strategy.

We estimate the model and structural parameters using highly detailed data from Peru.

Our results show

- Border processing imposes a trade cost greater than average applied WTO tari s.

Conclusion

Our results show

Processing tari s are dispersed across products, and especially new trade relationship su er from high border costs.

Aggregate measures of border-processing are di cult to interpret as cost ranking because they combine actual processing times with optimally chosen storage times. Even actual processing times systematically vary with rms and product characteristics. Second moments about the processing distribution would be useful to interpret elasticities.