Don't Throw in the Towel, Throw in Trade Credit!

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Motivation

- How do firms adjust to increased competition resulting from globalization?
  - exit of the least productive firms and reallocation of market shares towards more productive ones (Pavcnik (2002,*REStud*); Melitz (2003,*Ec*))
  - dropping the least performing products and expanding the best performing ones (Bernard, Redding, and Schott (2010,*AER*; 2011, *QJE*); Eckel and Neary (2010,*REStud*); Mayer, Melitz, and Ottaviano (2014,*AER*).

- This paper points out another margin of adjustment:
  - **provision of trade credit**

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- This paper points out another margin of adjustment:
  - **provision of trade credit**

Research question

Do firms respond to increased competitive pressures by providing trade credit?

Anecdotal evidence

Advice given to exporters by the US Department of Commerce:

- *"Insisting on cash-in-advance could, ultimately, cause exporters to lose customers to competitors who are willing to offer more favorable payment terms to foreign buyers"*
- *"Open account terms (i.e. providing trade credit) may help win customers in competitive markets"*

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Preview of the findings

- We exploit an exogenous shock to competition in export markets
- And find that increased competition leads exporters to provide trade credit and drop prices
- The evidence suggests substitution between the two margins of adjustment

Related literature

- Access to finance and exporting (broader perspective): e.g. Manova (2008, *JIE*); Amiti and Weinstein (2011, *QJE*); Paravisini et al. (2015, *RStud*); Chaney (2016, *JEDC*)

- Domestic trade credit: e.g. Petersen and Rajan (1997,*RFS*); McMillan and Woodruff (1999,*QJE*); Fisman and Raturi (2004,*ReStat*); Fabbri and Klapper (2016,*JCF*)

- Financing terms in international trade: Eck et al. (2012, *RWE*); Schmidt-Eisenlohr (2013, *JIE*); Eck et al. (2014, *WE*); Antràs and Foley (2015, *JPE*); Hoefele et al. (2016, *CJE*)

- Impact of abolishing the MFA: e.g. Harrigan and Barrows (2009,*ReStat*); Khandelwal, Schott, and Wei (2013,*AER*))

Institutional Context and Data

A large shock to competition: The End of the Multi-Fibre Agreement

- The MFA, a system of bilateral quotas governing the global trade in textiles and clothing since 1974, was dismantled in 2005. The decision was taken during the Uruguay Round which finished in 1994.
- During 1993-2003, Turkey and China were the leading exporters of textiles and clothing into the EU market (together accounting for 30% of imports to the EU).
- Turkish exports have not been subject to any quota restrictions since 1996 (when Turkey formed a customs union with the EU).
- Chinese exports were subject to MFA quotas which were abolished (with some exceptions) on 1 January 2005.
- Quota fill rates varied from below 10% to 100% in 2004, higher rates indicating greater constraint on Chinese exporters $\Longrightarrow$ a greater increase in competitive pressures after the quota removal.

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Data

- Universe of Turkey's exports of T&C to EU15 for 2003-2005.
- Data disaggregated by firm, product (6-digit HS product code), destination country, and year.
- For each observation, dataset reports
  - Value (free-on-board),
  - Quantity (measured in specified units, e.g. number, pair, etc.),
  - **Breakdown of financing**: cash in advance, open account, letter of credit, and documentary collection.
- Data on quota fill rates comes from *Système Intégré de Gestion de Licenses*.

Financing terms

- **Cash in advance (CIA)**: importer pre-pays and receives the goods later.
- **Open account (OA)**: payment is due after goods are delivered in the destination (usually 30 to 90 days)—closest category to trade credit in domestic transactions.
- **Letter of credit (LC)**: payment is guaranteed by the importer's bank provided that delivery conditions specified in the contract have been met.
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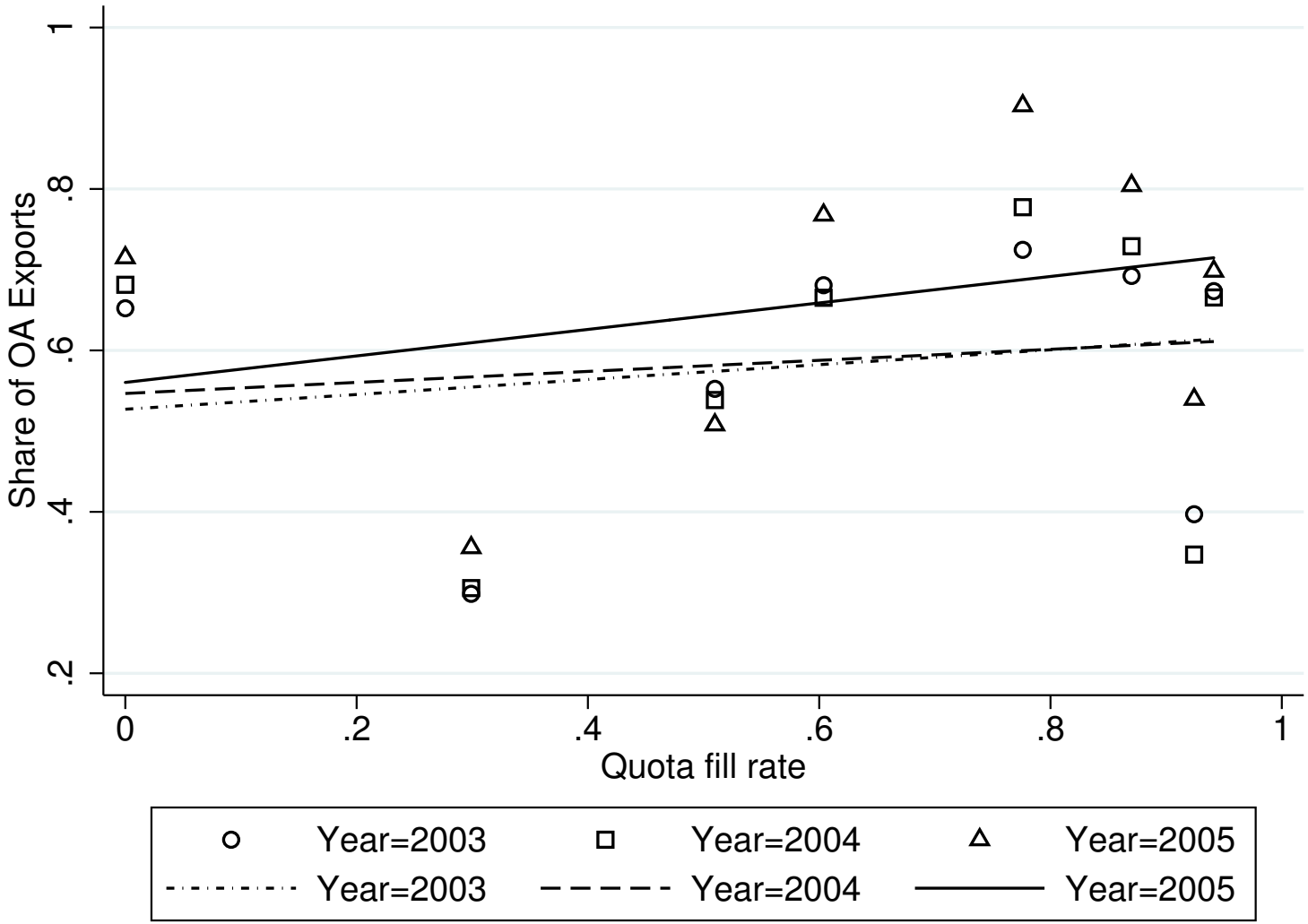
Financing breakdown of Turkey's T&C exports

	2002	
	EU	Non-EU
Share of OA exports	0.60	0.58
Share of CIA exports	0.01	0.03
Share of LC exports	0.07	0.21
Share of DC exports	0.32	0.18

Share of OA Exports before and after the End of the MFA



Notes: A marker represents the average share of OA exports over firms, products and destination countries for a given quota-fill rate and year. Lines represent fitted values of (uncond.) linear predictions.

Theoretical Motivation

Setup

- A simplified version of Schmidt-Eisenlohr (2013) and Antràs and Foley (2015) with heterogenous buyer valuations.
- A Turkish exporter of an intermediate product meets a randomly matched set of foreign buyers, indexed by k.
- Each foreign buyer has a unit demand for the product, which she values at s_k.
- Buyer valuations are drawn from a common and known distribution $g(s_k)$ with positive support on the interval $(\underline{s}, \infty)$ and a continuous cumulative distribution $G(s_k)$.
- Exporter incurs a constant marginal cost that is normalized to zero.
- All agents are risk neutral and have complete information about each others' costs and preferences.

- Exporter has the full bargaining power and makes take-it-or-leave-it offers to independent buyers.
- If the offer is rejected, the buyer reverts to its outside option: $u_{0,b}$.
- We assume contractual frictions: contract negotiated at time $t = 0$ is enforced with some probability λ which increases with rule of law in the relevant country.
- Timing:
  - Under OA: exporter produces and ships the goods at $t = 0$ $\rightarrow$importer pays after one period.
  - Under CIA: importer pays at $t = 0$ $\rightarrow$goods arrive at destination d after one period
  - Under LC: importer's bank guarantees payment to the exporter after the arrival of goods at the destination.

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Open account

- With probability $1-\lambda_d$, rule of law in destination country d breaks down.
- Turkish exporter can recover only a fraction $\gamma \in (0,1)$ of the agreed payment, p_k^{OA}.
- Participation constraint of the foreign buyer k:

$$E[\Pi_{b,k}^{OA}] = \frac{s_k - p_k^{OA}}{1+r_d} \geq u_{0,b}$$

- Expected profit of the Turkish exporter:

$$E[\Pi_{e,k}^{OA}] = \frac{\lambda_d p_k^{OA} + (1-\lambda_d)\gamma p_k^{OA}}{1+r}$$

- r_d and r denote cost of financing in destination d and in Turkey, respectively.

Cash in advance

- With probability $1 - \lambda_{TUR}$, rule of law in Turkey breaks down.
- Foreign buyer can recover only a fraction $\delta \in (0, 1)$ of the shipment value.
- Participation constraint of the foreign buyer k:

$$E[\Pi_{b,k}^{CIA}] = \frac{\lambda_{TUR} + (1 - \lambda_{TUR})\delta}{1 + r_d} s_k - p_k^{CIA} \geq u_{0,b}$$

- Expected profits of the exporter and the importer:

$$E[\Pi_{e,k}^{CIA}] = p_k^{CIA}$$

Letter of credit

- Exporter receives payment with certainty.
- The importer has to pay its bank an ad-valorem fee $f > 1$ which increases the cost of financing to $f(1 + r_d) > (1 + r_d)$, and a fixed fee $F > 0$ to cover document handling and monitoring costs.
- Expected profits of the exporter and the importer:

$$E[\Pi_{b,k}^{LC}] = \frac{s_k - p_k^{LC}}{1 + r_d} - f p_k^{LC} - F \geq u_{0,b}$$

- Expected profits of the exporter and the importer:

$$E[\Pi_{e,k}^{LC}] = \frac{p_k^{LC}}{1 + r}$$

Prices

The exporter sets price under each financing term such that the buyer's participation constraint binds:

$$
\begin{aligned}
p_k^{CIA} &= \frac{\lambda_{TUR} + (1 - \lambda_{TUR})\delta}{1 + r_k} s_k - u_{0,b}, \\
p_k^{OA} &= s_k - (1 + r_d) u_{0,b}, \\
p_k^{LC} &= \frac{s_k - (1 + r_d)(u_{0,b} + F)}{1 + f(1 + r_d)}
\end{aligned}
$$

Choice of financing term

- The exporter chooses the financing term that gives the highest expected profits:

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- Compare OA (trade credit) to LC (bank) financing.
- Consistent with negligible share of CIA financing in the data.
- Also consistent with quality of institutions (λ) being weaker in Turkey than in EU15.

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Share of OA financing

- s^*: valuation of the marginal buyer—the exporter is indifferent between offering trade credit (OA) and asking for bank financing (LC)

$$E[\Pi_e^{OA}(s^*)] = E[\Pi_e^{LC}(s^*)]$$

$$\implies s^* = (1+r_d)u_{0,b} + \frac{(1+r_d)F}{1-\tilde{\lambda}_d(1+f(1+r_d))},$$

where $\tilde{\lambda}_d = \lambda_d + (1-\lambda_d)\gamma \in (0,1)$.

- For any s_k s.t. $s_k < s^*$, offering trade credit is more profitable than asking for bank credit.

- Share of export sales on trade credit:

$$\mu(s^*) = \int_{\underline{s}}^{s^*} dG(s_k)$$

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Predictions: Response to increase in competition ($\Delta u_{0,b}$)

The share of export sales on trade credit increases with the outside option of foreign buyers, $u_{0,b}$.

▸ Proof

Average prices

- Define the average price as

$$\bar{p}_d = \int_{\underline{s}}^{s^*} [s_k - (1+r_d)u_{0,b}] dG(s_k) + \int_{s^*}^{\infty} \frac{s_k - (1+r_d)(u_{0,b}+F)}{1+f(1+r_d)} dG(s_k$$

- Effect of $u_{0,b}$ on prices

$$\frac{d\bar{p}_e}{du_{0,b}} = \underbrace{-(1+r_d)\left[\int_{\underline{s}}^{s^*} dG(s_k) + \frac{1}{1+f(1+r_d)}\int_{s^*}^{\infty} dG(s_k)\right]}_{\text{Direct effect}}$$

$$\underbrace{+\left[p^{OA}(s^*) - p^{LC}(s^*)\right] g(s^*)\frac{ds^*}{du_{0,b}}}_{\text{Indirect effect}}$$

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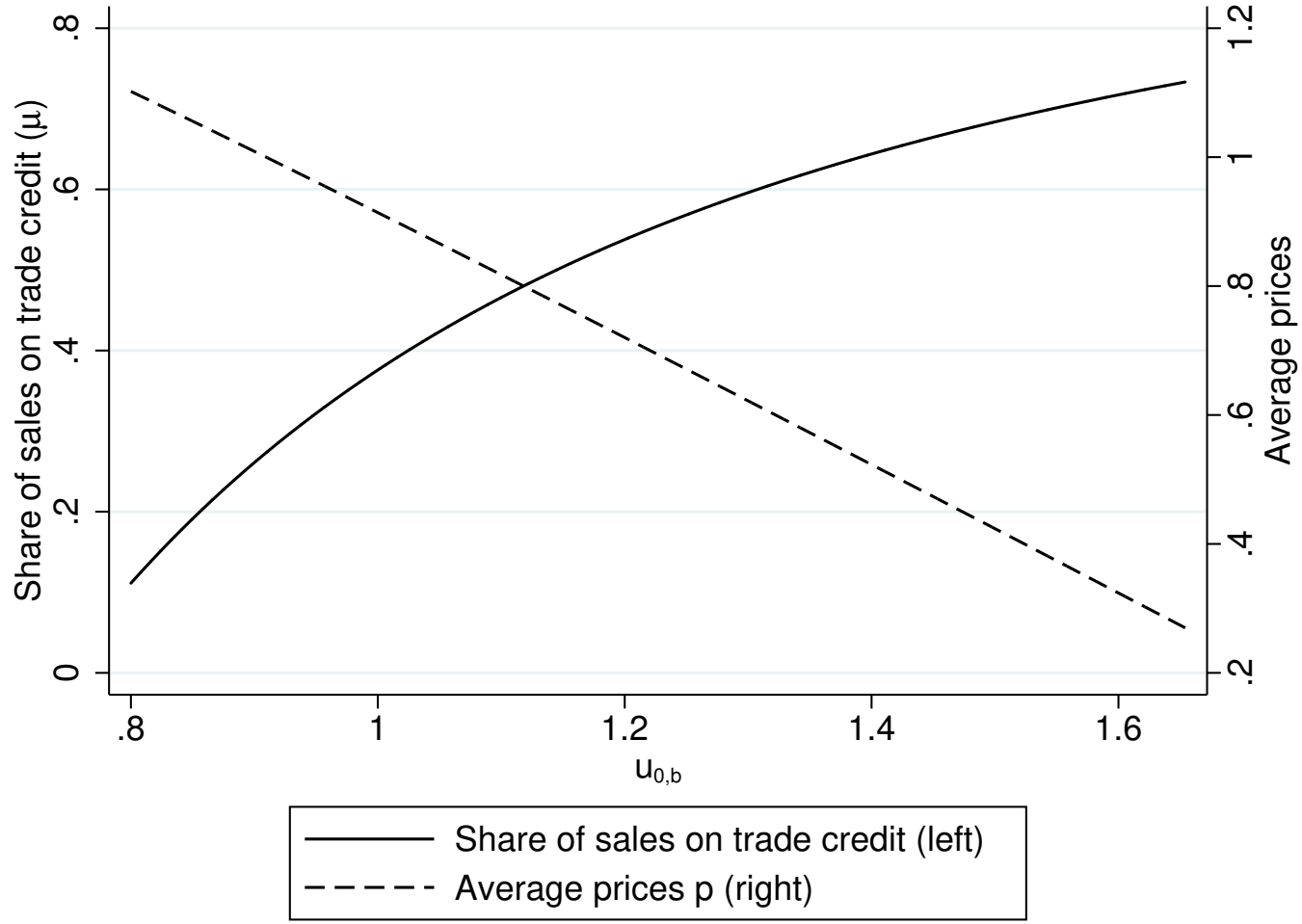
Predictions: Response to increase in competition ($\Delta u_{0,b}$)

The effect of a change in the outside option of foreign buyers on the average price of the exporter is twofold. It has a negative direct effect, which arises from a fall in the optimal price under each financing term. It also has a positive indirect effect through the change in the fraction of buyers sold on trade credit. The overall effect depends on the relative magnitudes of the two effects.

Numerical example: price and trade credit adjustment



Notes: The figure plots the average prices and the share of sales on trade credit against increasing values of $u_{0,b}$.

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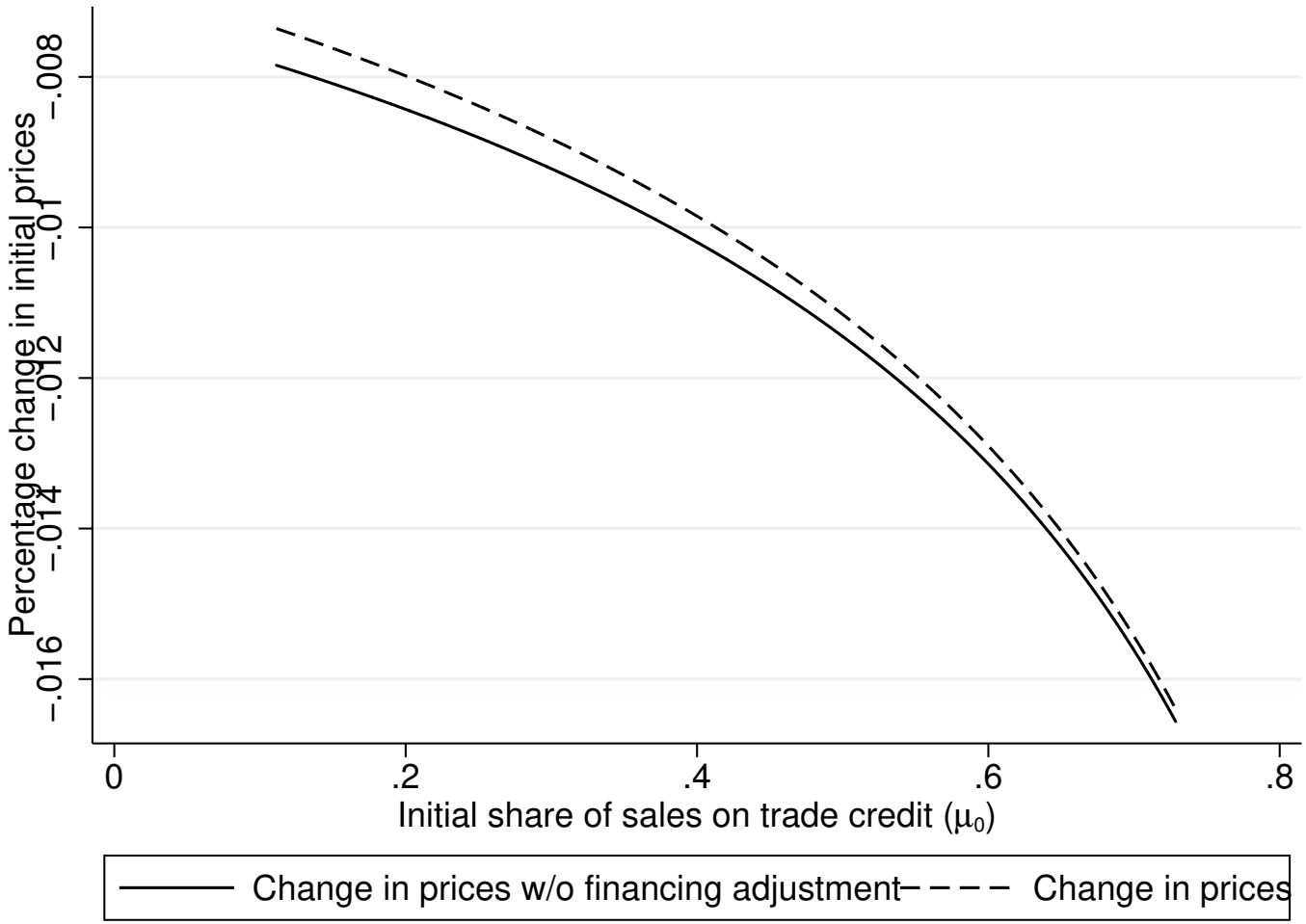

Notes: The figure plots the ratio of the change in average prices without the trade credit (indirect) channel to total price change against the initial share of sales on trade credit.

Empirical Strategy and Results

Difference-in-differences approach

- Did Turkey experience a greater shift towards OA financing in the post-MFA period in products that were subject to binding MFA quotas in 2004 (treated products) relative to the other T&C products (the control products)?
- Baseline equation for $t = \{2004, 2005\}$

$$\Delta X_{ijdt} = \beta_0 + \beta_1 Post_t * Treat_j + \alpha_{dt} + \alpha_j + \alpha_{it} + \epsilon_{ijdt}$$

- ΔX_{ijdt} denotes change in outcome variable X at the firm-product-destination level at time t, $X = \{Sh^{OA}, \ln UV\}$.
- $Post_t$ is a binary variable that is equal to one for $t = 2005$, and zero otherwise
- $Treat_j$ is a binary variable identifying the treated products.
- We expect $\beta_1 > 0$ for $X = Sh^{OA}$, and < 0 for $X = \ln UV$.
- Standard errors clustered at the product level.

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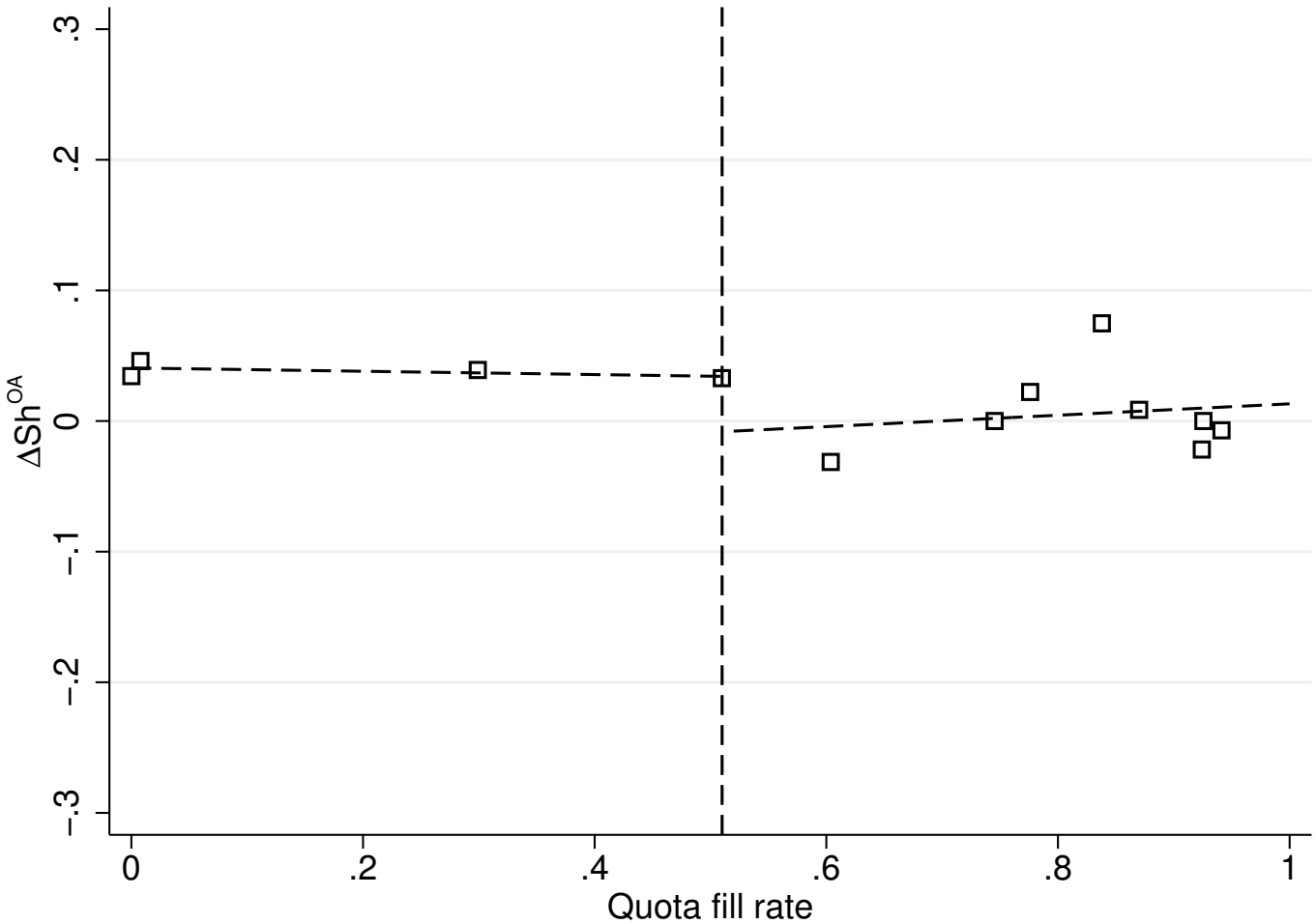
Defining treatment

1. Binary treatment:

$$\begin{aligned} Treat_j &= 1 \text{ , if Quota fill rate}_{j,t=2004} > 0.5 \\ Treat_j &= 0 \text{ , Otherwise} \end{aligned}$$

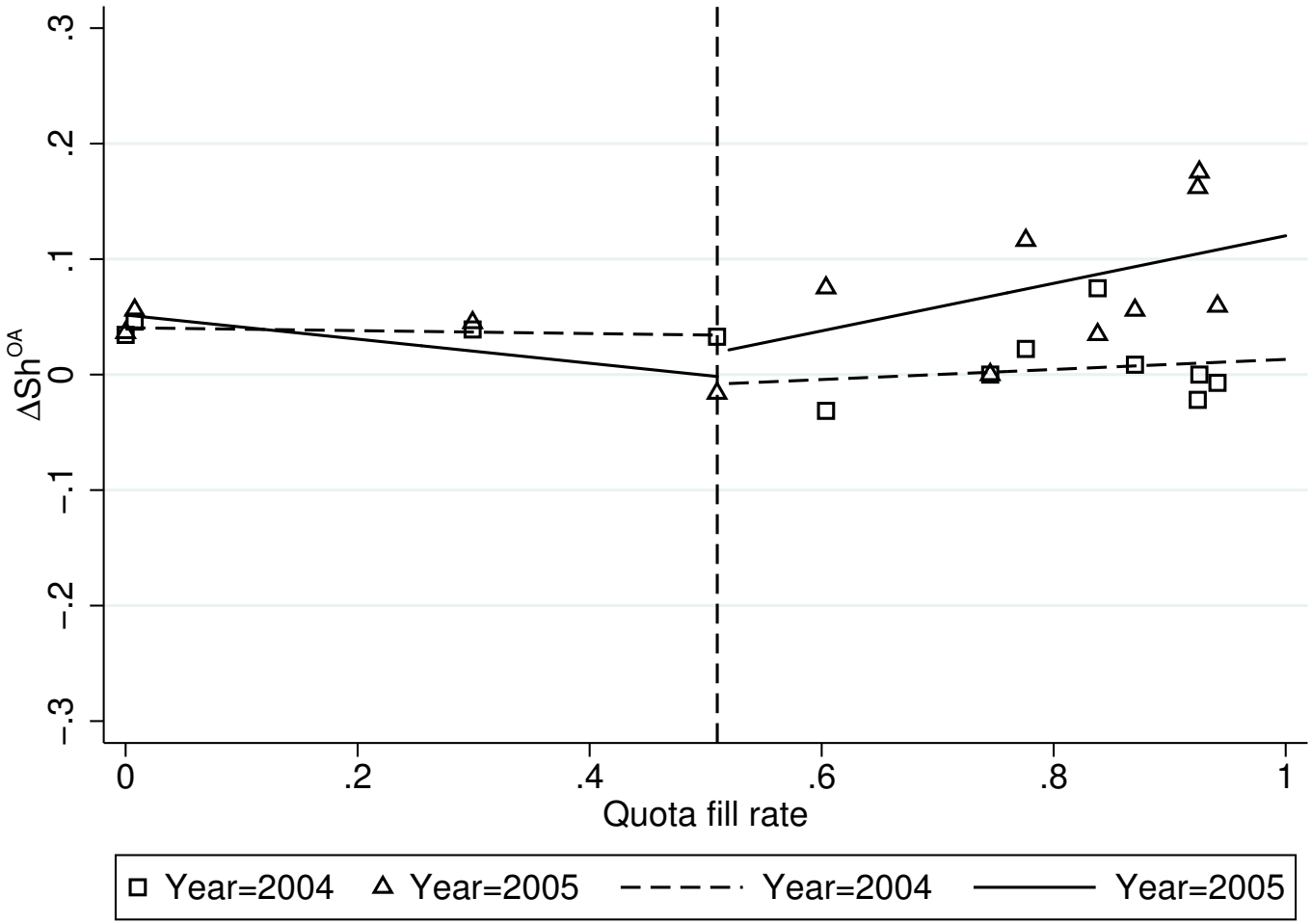
2. Product-specific quota fill rate in 2004: Quota fill rate$_{j,t=2004}$

Change in share of OA exports before the end of the MFA ($t = 2004$)



Notes: ΔSh^{OA} denotes annual change in the share of exports on OA terms. A marker represents average ΔSh^{OA} over firms, products and destination countries for a given quota-fill rate and year. Lines represent fitted values of (unconditional) linear predictions. The vertical line represents the quota fill rate of 0.5 as of 2004.

Change in share of OA exports before and after the end of the MFA



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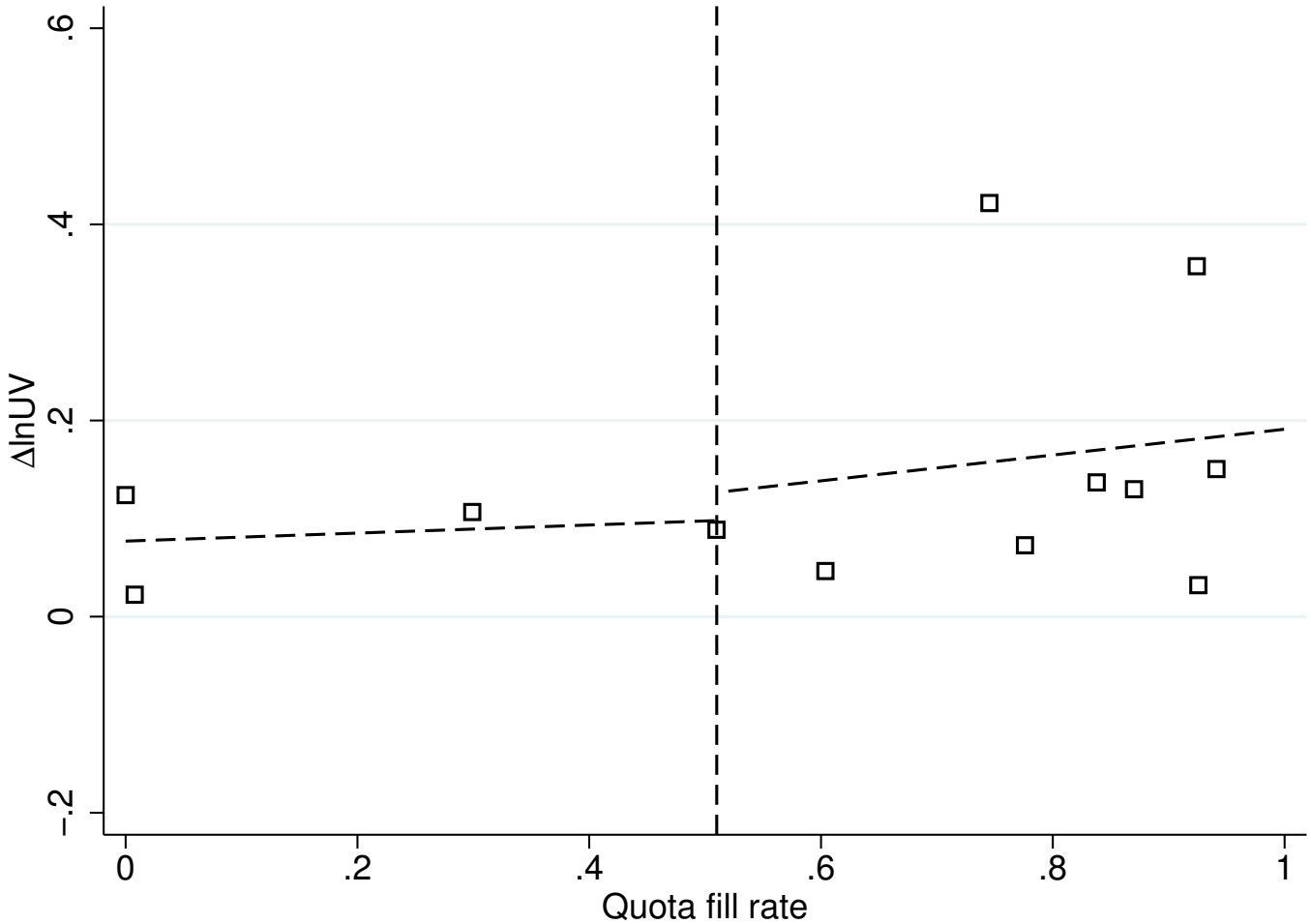
Change in average prices before the end of the MFA ($t = 2004$)



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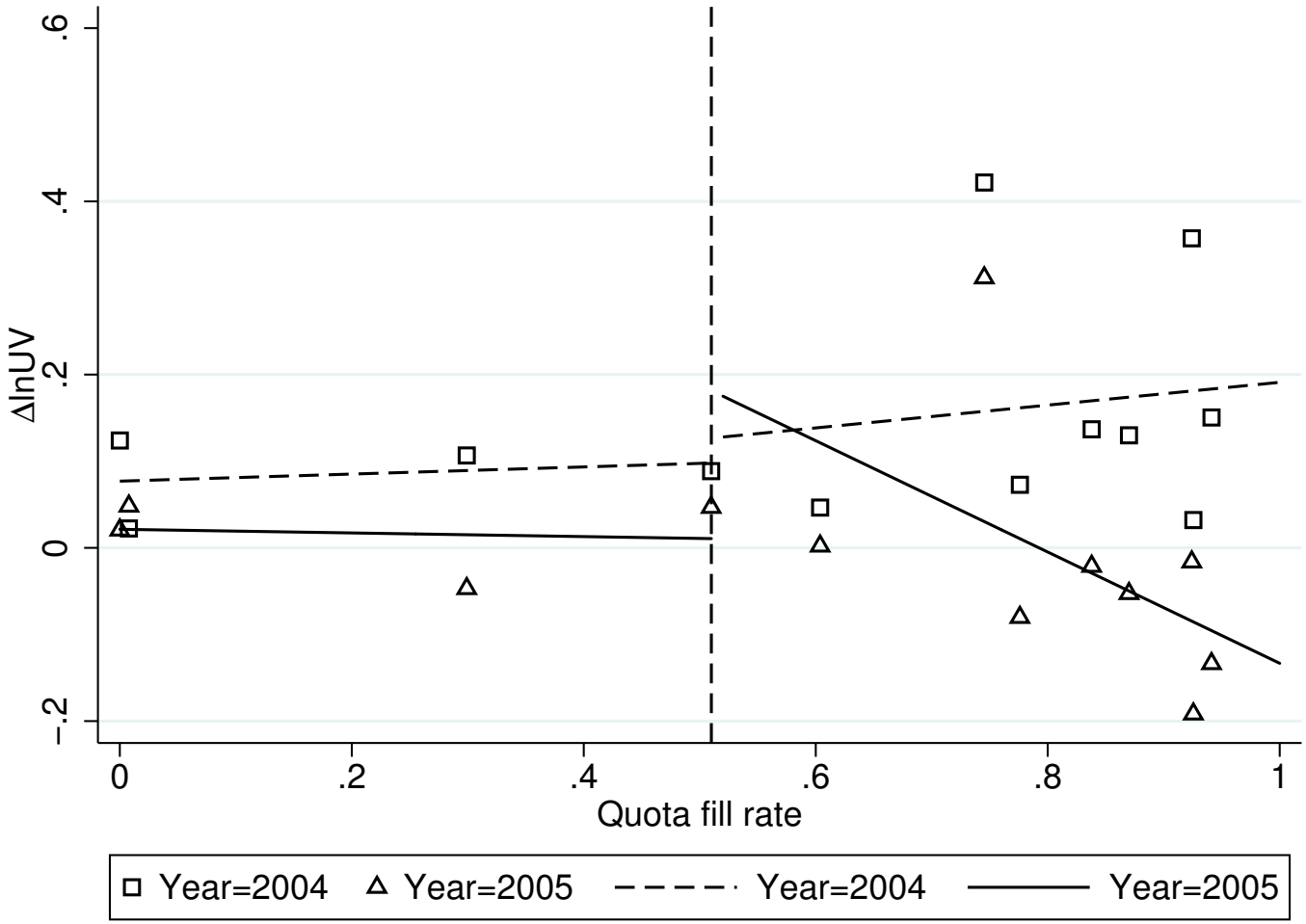

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Summary statistics

	2004		2005	
Avg product per firm	8.620		8.940	
	(10.548)		(11.223)	
Avg destination per firm	5.755		5.748	
	(4.093)		(4.046)	
Avg product per firm-destination	4.520		4.682	
	(5.109)		(5.302)	
Avg value per firm-product-dest (USD)	279,866		262,621	
	(1,226,811)		(1,153,157)	
	Treat	Untreat	Treat	Untreat
Number of firms	338	1652	372	1780
Number of products	95	313	95	316
Share of OA exports	0.697	0.658	0.771	0.691
	(0.422)	(0.437)	(0.388)	(0.426)
Log of unit value	1.171	1.810	1.108	1.829
	(0.542)	(1.163)	(0.535)	(1.168)
Log of value	10.324	10.322	10.226	10.281
	(2.007)	(2.296)	(1.961)	(2.262)

Baseline results: Trade credit

$$\Delta Sh_{ijdt}^{OA} = \beta_0 + \beta_1 Post_t * Treat_j + \alpha_{dt} + \alpha_j + \alpha_{it} + \epsilon_{ijdt}$$

	(1)	(2)	(3)	(4)
$Post_t * Treat_j$	**0.0489*****	**0.0375***		
	(0.0149)	(0.0195)		
$Post_t *$ Quota fill rate$_{j,t=2004}$			**0.0631*****	**0.0467***
			(0.0174)	(0.0239)
N	17852	17852	17852	17852
R^2	0.0258	0.234	0.0259	0.234
Country-year FE	+	+	+	+
Product FE	+	+	+	+
Firm-year FE		+		+

Baseline results: Prices

$$\Delta \ln UV_{ijdt} = \beta_0 + \beta_1 Post_t * Treat_j + \alpha_{dt} + \alpha_j + \alpha_{it} + \epsilon_{ijdt}$$

	(1)	(2)	(3)	(4)
$Post_t * Treat_j$	**-0.0669*****	**-0.0745*****		
	(0.0236)	(0.0284)		
$Post_t *$ Quota fill rate$_{j,t=2004}$			**-0.0985*****	**-0.0839****
			(0.0279)	(0.0370)
N	17852	17852	17852	17852
R^2	0.0511	0.271	0.0513	0.271
Country-year FE	+	+	+	+
Product FE	+	+	+	+
Firm-year FE		+		+

Robustness checks

- Placebo test ▸ Table
- Longer time period ▸ Table
- Controlling for survival ▸ Table

Substitution between providing trade credit and offering price discount

Testing substitution

- Testing substitution is challenging: pricing and financing decisions are made simultaneously.
- So, we take an indirect approach:
- High initial share of OA-financing $\Longrightarrow$ less room for adjustment on the financing
- Test whether flows with a high initial share of OA-financing (sales on trade credit) experienced a larger fall in prices:

$$\begin{aligned}\Delta \ln UV_{ijdt} &= \phi_0 + \phi_1 ShQ^{OA}_{ijd,t=0} * Post_t * Treat_j \\ &+ \phi_2 Post_t * Treat_j + \phi_3 ShQ^{OA}_{ijd,t=0} * Post_t \\ &+ \phi_4 ShQ^{OA}_{ijd,t=0} * Treat_j + \phi_5 ShQ^{OA}_{ijd,t=0} + \alpha_{dt} + \alpha_j \\ &+ \alpha_{it} + e_{ijdt},\end{aligned}$$

- $ShQ^{OA}_{ijd,t=0}$: average share of OA exports for a flow ijd over 2002-2003.

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- $ShQ^{OA}_{ijd,t=0}$: average share of OA exports for a flow ijd over 2002-2003.

Dependent variable:	ΔSh^{OA}_{ijdt}	ΔSh^{OA}_{ijdt}	$\Delta \ln UV_{ijdt}$	$\Delta \ln UV_{ijdt}$
$ShQ^{OA}_{ijd,t=0} * Post_t * Treat_j$	**-0.0688***	**-0.119*****	**-0.111***	**-0.122***
	(0.0408)	(0.0442)	(0.0589)	(0.0730)
$Post_t * Treat_j$	**0.0778***	**0.0921****	0.00275	-0.0301
	(0.0405)	(0.0432)	(0.0470)	(0.0518)
$ShQ^{OA}_{ijd,t=0} * Post_t$	0.178***	0.359***	0.0458	0.00157
	(0.0151)	(0.0323)	(0.0325)	(0.0436)
$ShQ^{OA}_{ijd,t=0} * Treat_t$	-0.0193	0.0403	0.0205	-0.00206
	(0.0208)	(0.0246)	(0.0328)	(0.0438)
$ShQ^{OA}_{ijd,t=0}$	-0.289***	-0.474***	0.00848	0.0226
	(0.0114)	(0.0190)	(0.0178)	(0.0253)
N	13790	13790	13790	13790
R^2	0.121	0.341	0.0538	0.276
Country-year FE	+	+	+	+
Product FE	+	+	+	+
Firm-year FE		+		+

Conclusions

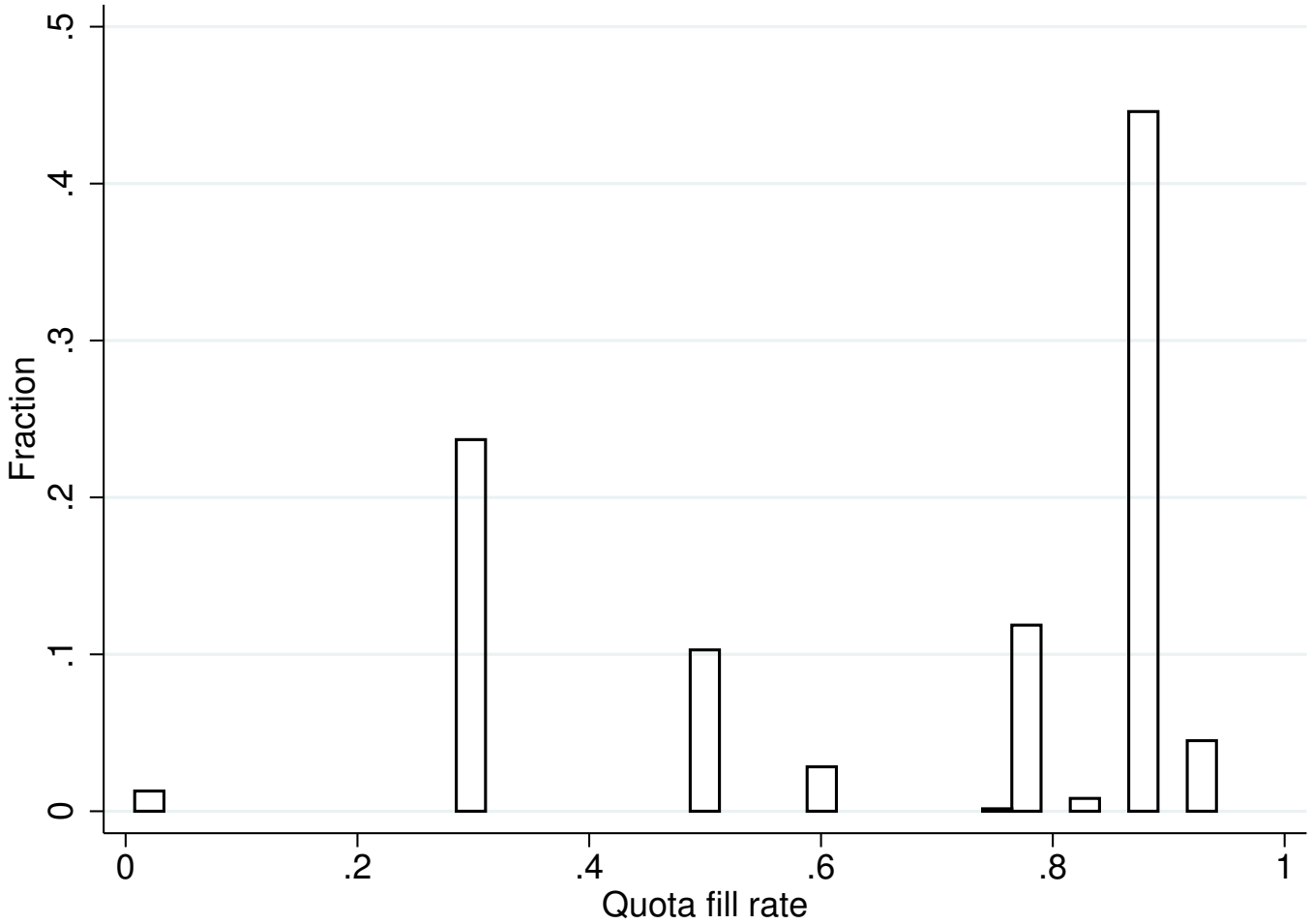
- Provision of trade credit is another margin of adjustment to heightened competition in export markets.
- Increase in competition after the end of the MFA forced Turkish exporters of quota-bound T&C products to provide more trade credit.
- The shock also forced Turkish exporters to lower prices.
- There is some evidence of substitution between adjustment through extending trade credit and lowering prices.

Conclusions

- Price responses to competitive shocks may be underestimated unless the trade credit channel is accounted for.

- Policy implication: ability to provide financing can give producers, particularly emerging market producers that are viewed as risky business partners, a competitive edge in foreign markets.

Distribution of Quota Fill Rates as of 2004



Notes: The figure shows the distribution of quota fill rates (as of 2004) in our data. Observations where quota fill rates are equal to zero are excluded for visibility as they account for about 70% of the sample.

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Placebo date

Assign January 2004 as the placebo date of the MFA quota removal and restrict the sample to the 2003-2004 period:

Dependent variable:	ΔSh_{ijdt}^{OA}	$\Delta \ln UV_{ijdt}$
$D2004_t * Treat_j$	0.0242	0.00837
	(0.0293)	(0.0618)
N	7717	7717
R^2	0.251	0.281
Country-year FE	+	+
Product FE	+	+
Firm-year FE	+	+

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Long-term effects

$DYear_t$ is a dummy variable that takes on the value one for $t = Year$, and zero otherwise.

Dependent variable:	ΔSh^{OA}_{ijdt}	$\Delta \ln UV_{ijdt}$
$D2004_t * Treat_j$	0.0209	-0.0128
	(0.0319)	(0.0577)
$D2005_t * Treat_j$	**0.0491***	**-0.0837***
	(0.0297)	(0.0444)
$D2006_t * Treat_j$	0.0124	-0.0849
	(0.0341)	(0.0528)
$D2007_t * Treat_j$	0.0187	-0.0577
	(0.0282)	(0.0511)
N	25062	25062
R^2	0.236	0.268
Country-year FE	+	+
Product FE	+	+
Firm-year FE	+	+

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Controlling for survival

- Selection bias if exports on OA terms in 2004 were more likely to survive in the post-MFA period.
- Follow Mulligan and Rubinstein (2008, *QJE*) and Paravasini et al.(2015, *RStud*) to address the possible selection bias.
  - Estimate the probability that a given export flow $(ijd, 2004)$ continued in 2005.
  - Estimate the baseline specification in first differences for the whole sample and for $40th$ percentile of the estimated continuation probability.

	Probit	OLS			
Dependent variable:	Survival probability	ΔSh^{OA}_{ijdt}	ΔSh^{OA}_{ijdt}	$\Delta \ln UV_{ijdt}$	$\Delta \ln UV_{ijdt}$
	All	All	$> 40th$ pctl	All	$> 40th$ pctl
$Post_t * Treat_j$		0.0380**	0.0333	-0.0654**	-0.0926***
		(0.0158)	(0.0223)	(0.0266)	(0.0358)
$\ln X_{ijd,2003}$	0.194***				
	(0.0104)				
$ShQ^{OA}_{ijd,t=0}$	-0.00001				
	(0.0590)				
$Treat$	-0.0261				
	(0.0614)				
N	8454	17852	7909	17852	7909
R^2		0.156	0.147	0.175	0.178
Country FE	+				
Firm FE	+	+	+	+	+
Country-year FE		+	+	+	+
Product FE		+	+	+	+

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Proof of Result 1

We are interested in the sign of $d\mu/du_{0,b}$. Using the chain rule, it is equal to:

$$\frac{d\mu}{du_{0,b}} = \frac{\partial \mu}{\partial s^*} \frac{ds^*}{du_{0,b}}.$$

Using Leibniz integral rule, the first term is equal to:

$$\partial \mu / \partial s^* = g(s^*) > 0,$$

and the second term is:

$$ds^*/du_{0,b} = (1 + r_d) > 0.$$

So, we obtain

$$d\mu/du_{0,b} > 0.$$

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