Quantity Restrictions and Price Adjustment of Chinese Textile Exports to the US

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Overview

- An opportunity to study the effect of a trade policy shock on firm behaviour
- Elimination of the Multifibre arrangement (MFA) in 2005
  1. Large scale
  2. Discrete timing
  3. Exogenous to firms and consumers
- Elimination did not affect all textile products, allowing us to use Difference-in-Difference approach
- Our results complement those of Harrigan and Barrows (2009), from the other side of the mirror

- Our contribution:
  1. We provide consistent results to Harrigan and Barrows, using an entirely independent source of data
  2. We use data at a lower level of aggregation, so the unit of analysis is closer to a "product"
  3. We can show how changes in prices came about: within product, within firm, within firm-product
  4. We can show which kinds of firms reduced prices
- Results:
  1. MFA removal reduced average export prices by about 30%
  2. The most important contribution to this price fall is caused by the entry of "low price" firms
  3. Less than one-third of the price reduction is caused by firms lowering prices on products which they sold before and after the quota removal

Theoretical predictions

- No simple tariff equivalent for a binding quota
- But almost all models predict price increases as a result of imposition of a binding quota
- Quality upgrading (Falvey 1979)
  - Changes in characteristics of given varieties (Feenstra 1988)
  - Shift towards higher-value varieties (Boorstein and Feenstra 1991)

Institutional background

- The Multifibre Arrangement (MFA), succeeded by the Agreement on Textiles and Clothing (ATC) after 1995
- Detailed how quotas were imposed and how they would be removed gradually through four phases of integration into GATT/WTO rules (1995, 1998, 2002, and 2005)
- Quotas were to be totally eliminated on 1 January 2005
- US was the second largest market for Chinese textile exports (after Japan)
- After China entered the WTO in 2001 it immediately enjoyed the first three phases of quota removal in 2002
- The US implemented quotas on Chinese textile products through the US Office of Textile and Apparel (OTEXA), which list detailed quota information by year

Institutional background (cont.)

- Quotas were removed on 1 January 2005, however, temporary quantity caps were set against the large influx of some products after the middle of 2005
- New quotas would be in force as safeguard measures for a three-year period (2006–2008)
- See also Brambilla, Khandelwal and Schott (2010) for a description of the effect of ATC on China

Estimates from US data

- Harrigan and Barrows (2009)
- 10-digit transaction level data on imports into the US
- Estimate

$$\ln F_{cgt} = \alpha_{cg} + d_t + \beta^F c_{cgt} + \gamma^F q_{cgt} + \epsilon_{cgt}$$

  where F is a unit price index for imports from country c in "quota group" g at time t
- A quota group is a collection of products from a particular country covered by a particular quota
- c_{cgt} is a dummy variable indicating whether that quota was binding on 31 December 2004
- q_{cgt} indicates whether a quota group had a quota reimposed in 2005

Estimates from US data (cont.)

- β^F is the average change in the price index between quota products and non-quota products, identified by the within country-quota-group change in prices between 2004 and 2005
- For all countries, $\hat{\beta}^F = -0.18$ with a t-statistic of -8.75
- For imports from China, $\hat{\beta}^F = -0.32$ with a t-statistic of -7.06
- γ^F is actually estimated to be *negative*
- β^F in a regression on quality index is also negative and significant
- Our paper can be thought of as a re-examination of the same phenomenon, viewed from the exporting country and using completely independent data
- In addition, Harrigan and Barrows is an entirely product-level analysis; we can also examine firm-level effects

Data

- The Chinese Customs Trade Statistics (CCTS)
  - All exports of MFA/ATC products (92% of the value of all textile products) passing through Chinese customs to the U.S. from 2000 to 2006
  - 8-digit HS code, quantity, FOB value of imports/exports, mode of transportation, origin/destination, etc.
  - Raw monthly data collapsed to years
  - Trading intermediaries are excluded (Wang and Yu 2010)
- Identification of quota products
  - ATC product identified at the 6-digit HS level
  - OTEXA defines 3-digit quota groups which contain multiple HS10 codes
  - However, HS codes are only internationally consistent to the HS6 level; additional digits may be country specific
  - Chinese data is therefore collapsed to 6-digit level
  - This means that some HS6 groups will contain several quota groups

Fill rates and binding quotas

- Exports in some quota groups were less than the actual quota quantity — these quotas may not be binding
- In principle, the fill rate is simply

$$\text{fill rate}_{jt} \equiv \frac{\text{quantity}_{jt}}{\text{quota}_{jt}} \tag{1}$$

where j is the HS6 product category

- In practice, this is difficult because quantity and quota data are recorded at lower levels of aggregation (HS10 or quota-group level)
- quantity_{jt} can be calculated by aggregating HS10 data from US import data (Schott 2008)

$$\text{quantity}_{jt} = \sum_{k \in j} \text{quantity}_{kt} \tag{2}$$

Fill rates and binding quotas (cont.)

- But we don't know quota_{kt} because this is recorded at the OTEXA quota-group level
- Assume that all products within each quota group have the same fill rate, so we can calculate the quota at the HS10 level:

$$\text{quota}_{kt} = \frac{\text{quantity}_{kt}}{\text{fill rate}_{kt}}. \tag{3}$$

- Once we have the quota and the quantity at the HS10 level we can aggregate to the HS6 level
- Figure 1 shows the distribution of estimated fill rates across all HS6 ATC products
- We investigate whether fill rates matter later on
- Khandelwal, Schott and Wei (2010) discuss the misallocation of quota licenses

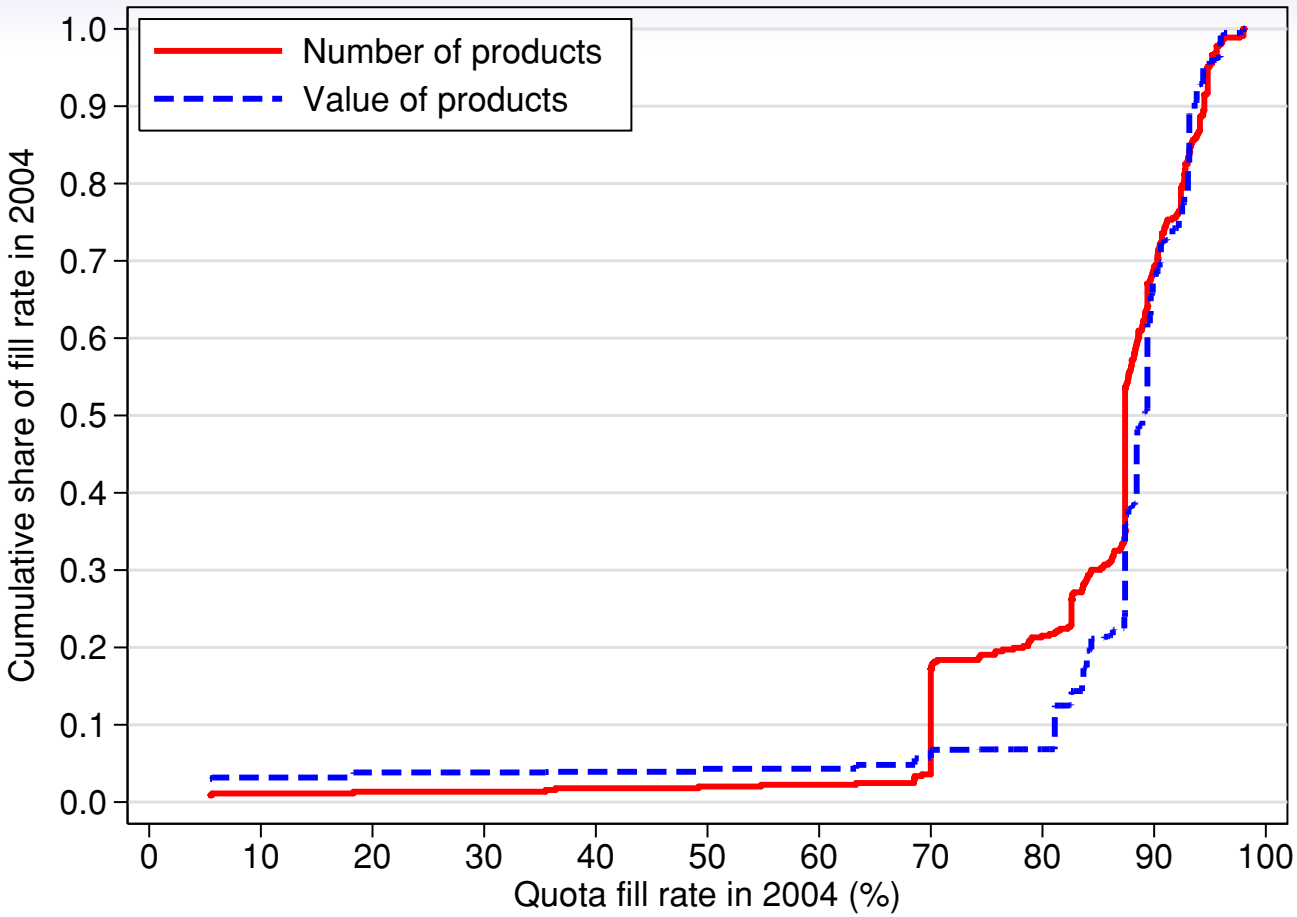

Figure. Cumulative distribution of estimated fill rates across all HS6 ATC products with a quota in 2004. There were 580 HS6 ATC products exported from China to the US in 2004, of which 446 had a quota.

▸ Robustness checks

	Subject to US quotas		Bound by US quotas		
Year	No	Yes	No	Yes	Total
2000	33	471	236	268	504
2001	35	480	380	135	515
2002	40	501	471	70	541
2003	46	529	460	115	575
2004	134	446	443	137	580
2005	554	107	565	96	661
2006	477	179	656	0	656

Table. Numbers of ATC products exported from China to the US 2000–2006

Product-level comparisons

- To start, replicate the analysis of Harrigan and Barrows on product-level data (rather than quota group level)
- Treatment group: those products covered by binding quota in 2004 but not in 2005
- Control group: those products not covered by a binding quota in 2004 or 2005
- Difference-in-differences

$$Y_{jt} = \alpha + \sum_{t \neq 2004} \delta_t \text{YR}_t + \rho \text{TREAT}_j + \sum_{t \neq 2004} \lambda_t (\text{YR}_t \times \text{TREAT}_j) + \varepsilon_{jt}, \tag{4}$$

  Y_{jt} can be quantity, value or unit value of HS6 product j
- A generalization of DiD allows for measurement-unit or product fixed-effects
- This makes no difference in a balanced panel

	Number of products			Value of products (million US$)		
Year	Treatment	Control	Total	Treatment	Control	Total
2000	75	295	370	400	813	1,213
2001	82	300	382	472	873	1,345
2002	87	322	409	424	1,169	1,593
2003	93	344	437	557	2,003	2,560
2004	98	374	472	681	2,830	3,510
2005	98	374	472	1,735	4,540	6,275
2006	96	366	462	2,382	5,531	7,912

Table. Summary of the treatment and control groups. Products are HS6 level. Treatment group: bound by quotas in 2004 and not covered by quota in 2005. Control group: unbound in 2004 and not covered by quota in 2005

Total export value

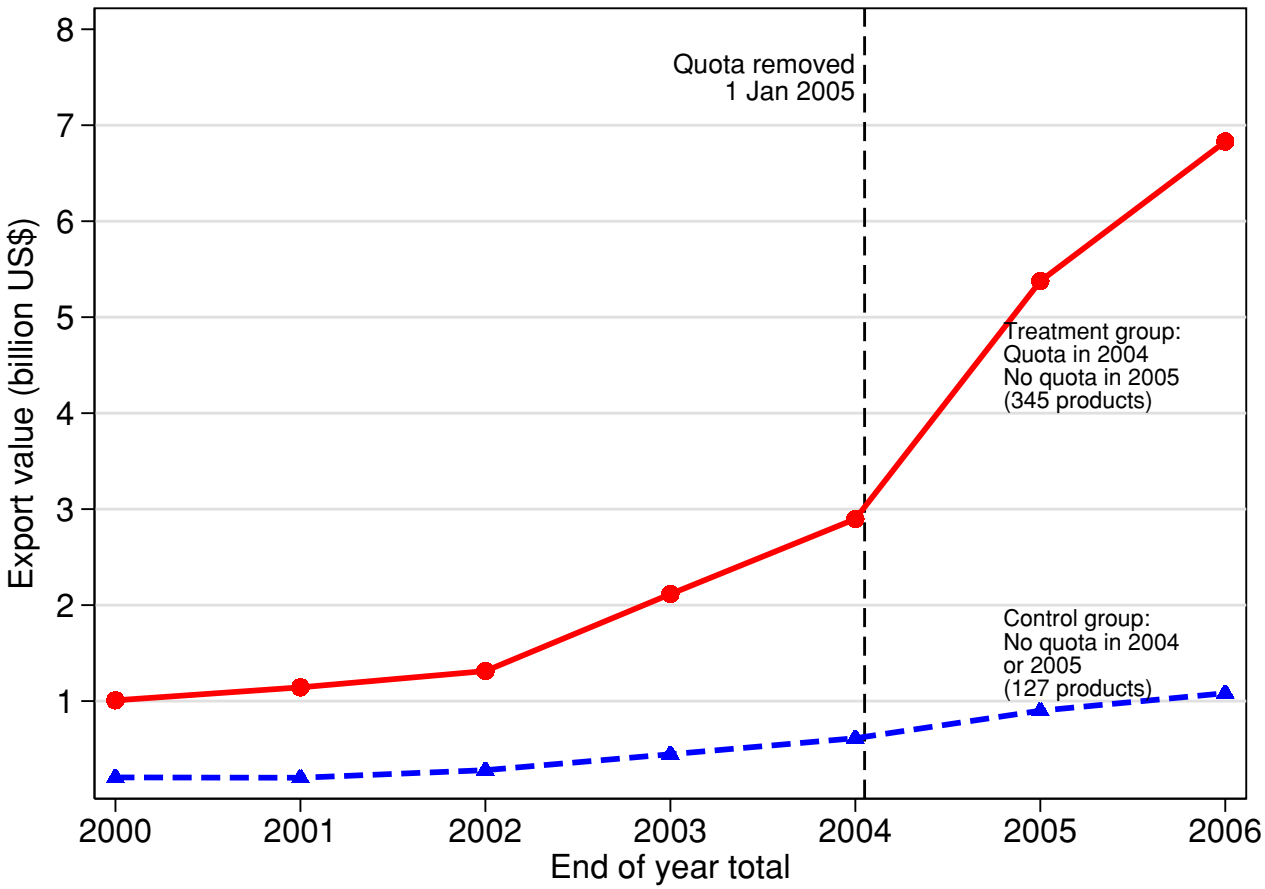

Figure. Comparison 1: comparing quota products with non-quota products

Total export value (cont.)

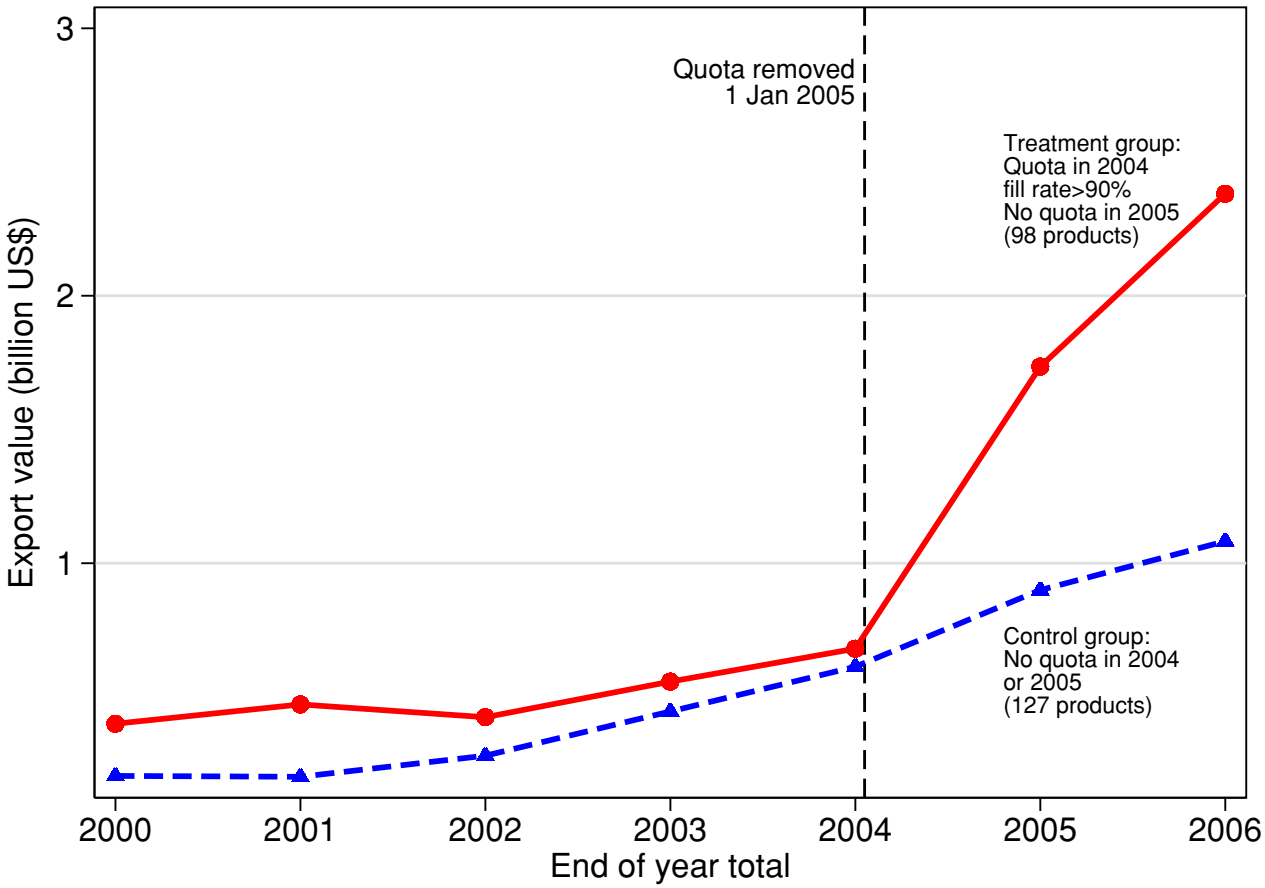

Figure. Comparison 2: comparing binding quota products with non-quota products

Total export value (cont.)

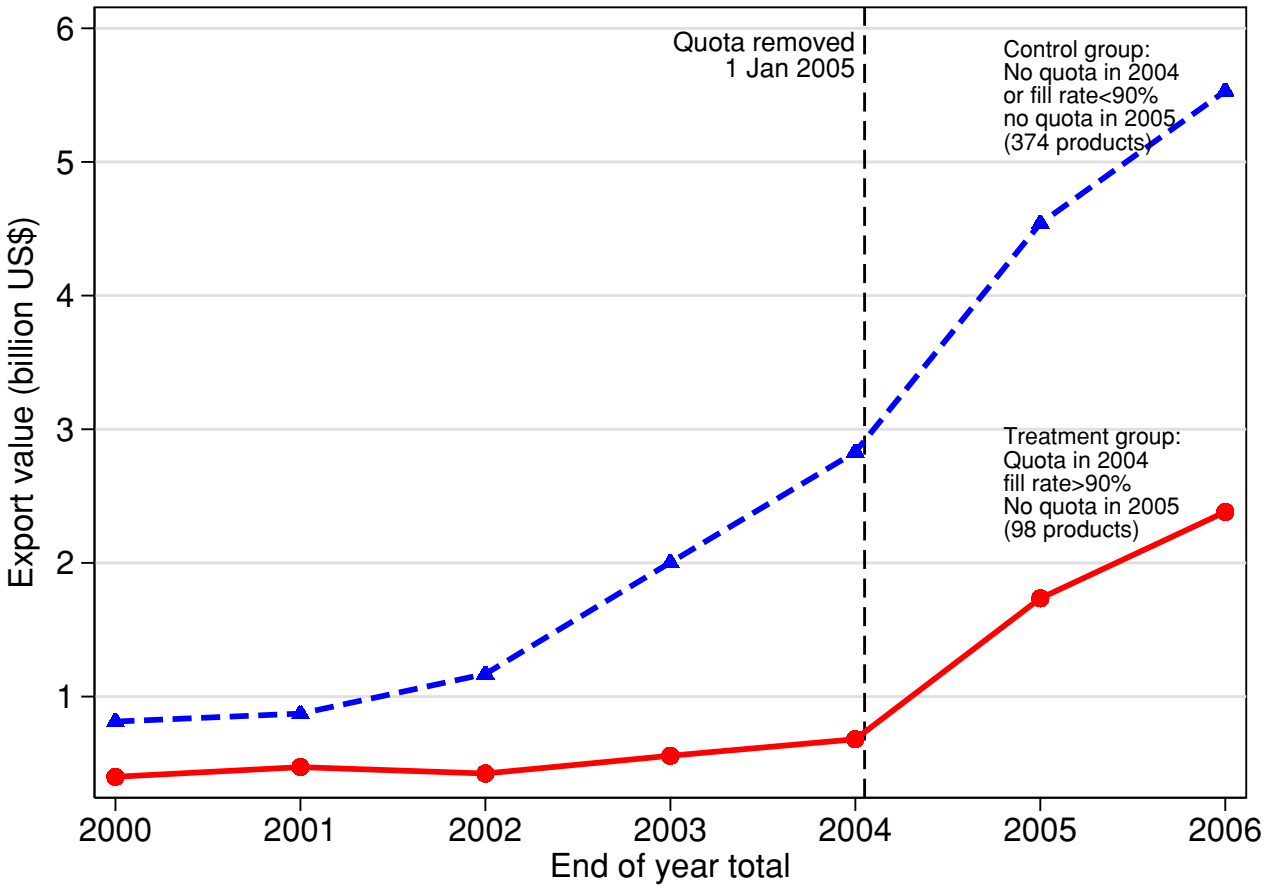

Figure. Comparison 3: comparing binding quota products with non-binding quota products and non-quota products

Unit value

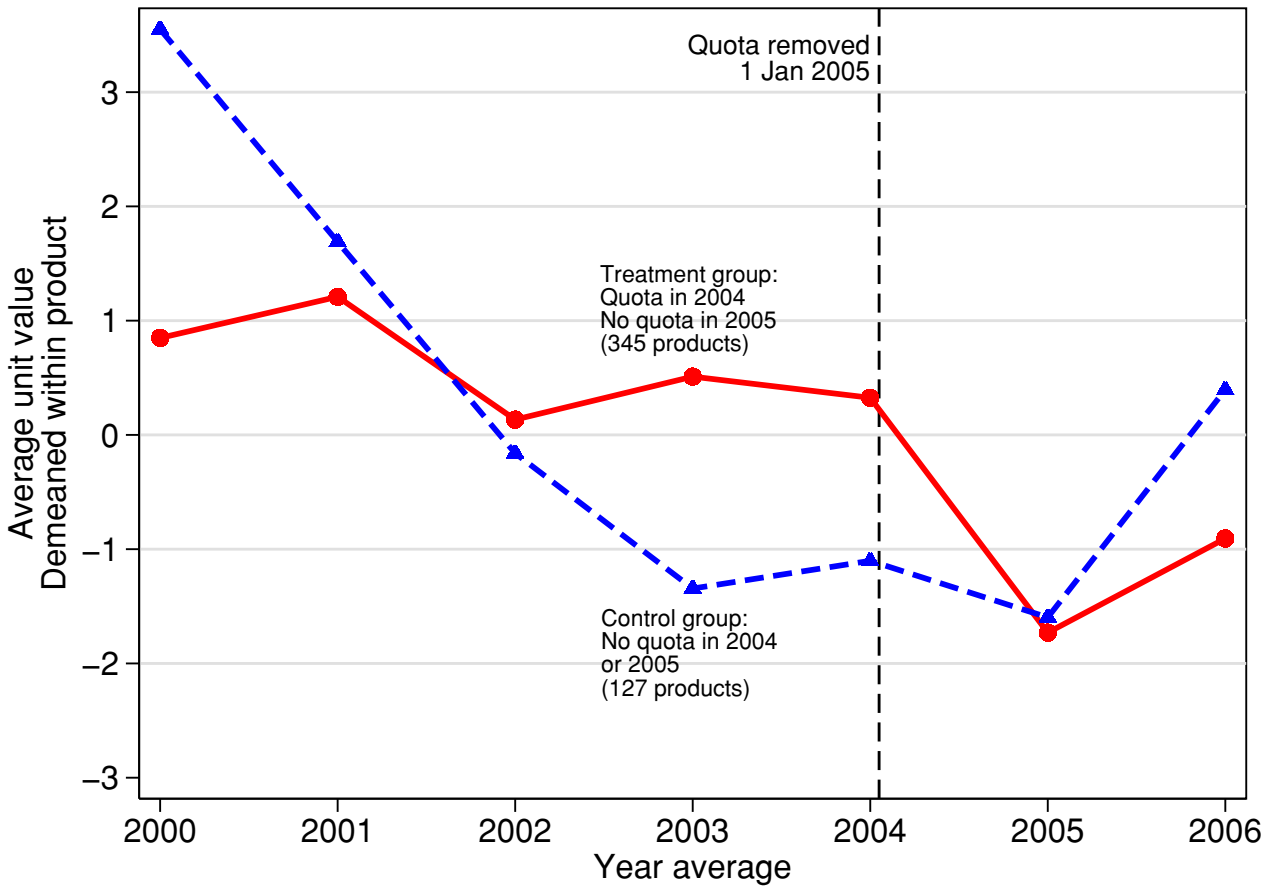

Figure. Comparison 1: comparing quota products with non-quota products

Unit value (cont.)

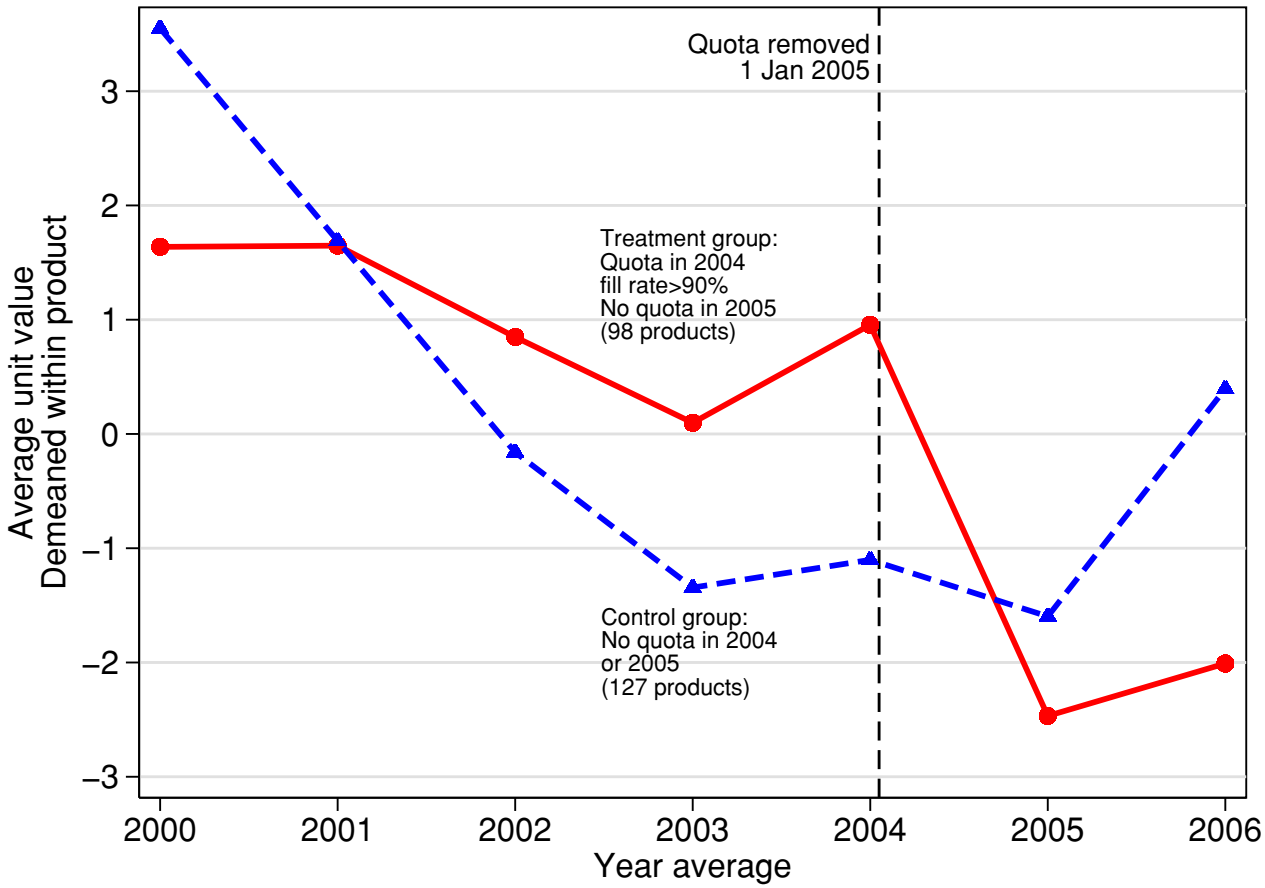

Figure. Comparison 2: comparing binding quota products with non-quota products

Unit value (cont.)

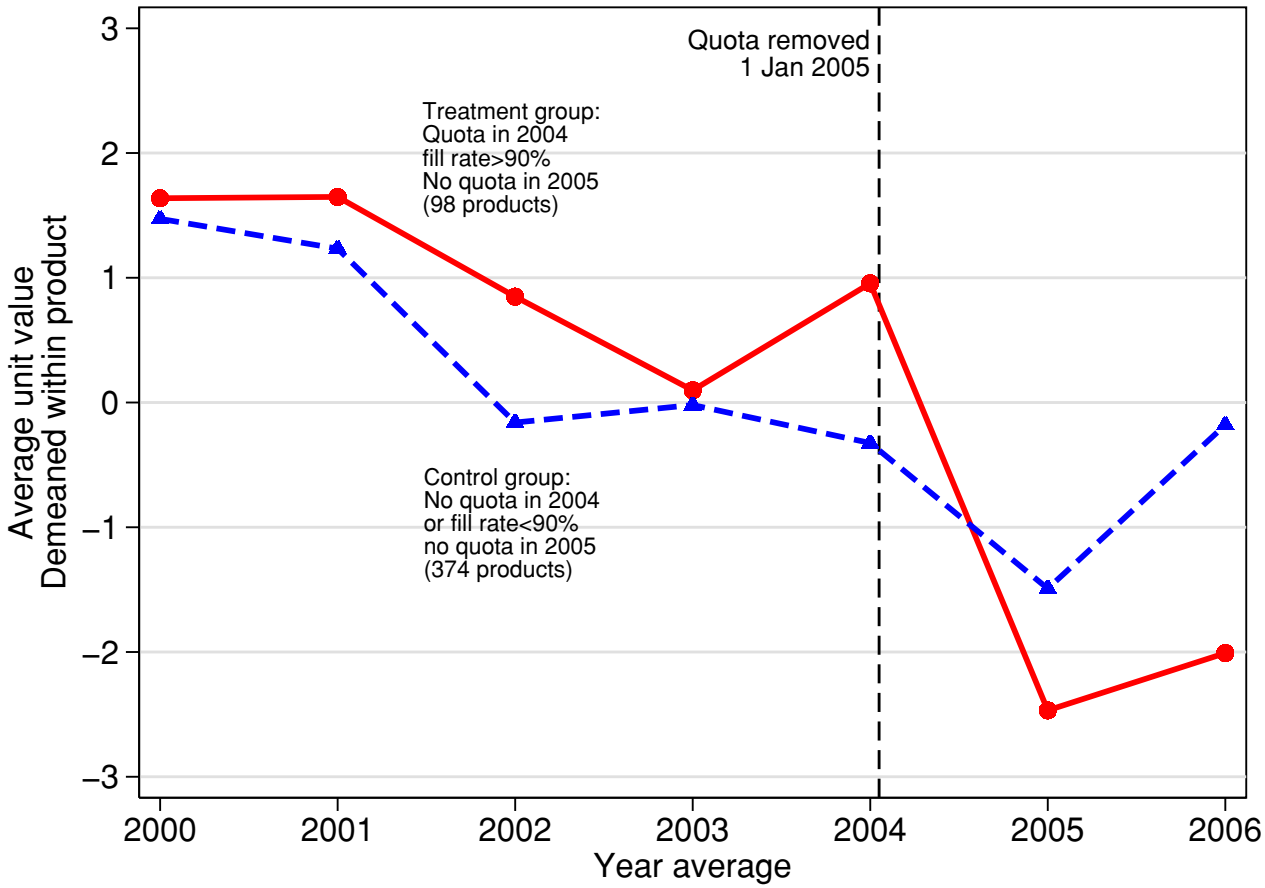

Figure. Comparison 3: comparing binding quota products with non-binding quota products and non-quota products

Table. Product-level estimates of quota effect. Products are HS6 level. Treatment group: bound by quotas in 2004 and not covered by quota in 2005. Control group: unbound in 2004 and not covered by quota in 2005. Standard errors clustered at the HS6 level

	Value: $\ln V_{jt}$		Quantity: $\ln Q_{jt}$		Unit value: $\ln P_{jt}$	
	DiD	Product FE	DiD	Product FE	DiD	Product FE
δ_{2005}	0.944^{***}	0.944^{***}	1.059^{***}	1.059^{***}	-0.115^{***}	-0.115^{**}
	(0.085)	(0.093)	(0.091)	(0.099)	(0.032)	(0.035)
δ_{2006}	1.395^{***}	1.328^{***}	1.388^{***}	1.323^{***}	0.007	0.005
	(0.096)	(0.103)	(0.106)	(0.114)	(0.036)	(0.038)
ρ	0.483		0.061		0.422^{***}	
	(0.325)		(0.325)		(0.116)	
λ_{2003}	-0.203	-0.158	-0.095	-0.037	-0.108	-0.121
	(0.220)	(0.200)	(0.216)	(0.191)	(0.077)	(0.076)
λ_{2005}	0.592^{**}	0.592^{**}	0.878^{**}	0.878^{**}	-0.286^{**}	-0.286^{***}
	(0.195)	(0.213)	(0.211)	(0.230)	(0.062)	(0.068)
λ_{2006}	0.570^{**}	0.571^{**}	0.900^{***}	0.895^{***}	-0.330^{***}	-0.324^{***}
	(0.203)	(0.217)	(0.221)	(0.238)	(0.069)	(0.075)
R^2	0.077	0.807	0.071	0.802	0.018	0.863
J	472	472	472	472	472	472
N	3,003	3,003	3,003	3,003	3,003	3,003

Firm-product-level comparisons

- We also have information on which firms exported which products
- Thus, we can estimate models of the form:

$$Y_{ijt} = \alpha + \sum_{t \neq 2004} \delta_t \text{YR}_t + \rho \text{TREAT}_j + \sum_{t \neq 2004} \lambda_t (\text{YR}_t \times \text{TREAT}_j) + \varepsilon_{ijt} \quad (5)$$

  Y_{ijt} can be quantity, value or unit value of exports by firm i of HS6 product j
- A generalization of DiD allows for firm-level or product-level fixed effects or the inclusion of additional controls
- These fixed effects shed more light on the source of the price fall

Table. Firm-product level estimates of the effect of quota removal. Dependent variable: $\ln P_{ijt}$. Products are HS6 level. Treatment group: bound by quotas in 2004 and not covered by quota in 2005. Control group: unbound in 2004 and not covered by quota in 2005. Standard errors clustered at the HS6 level

	Without control for market share			
	DiD	Product FE	Product FE, Firm FE	Firm-product FE
λ_{2005}	-0.320^{***}	-0.242^{***}	-0.112^{***}	-0.080
	(0.066)	(0.057)	(0.033)	(0.054)
λ_{2006}	-0.350^{***}	-0.261^{***}	-0.136^{***}	-0.096
	(0.074)	(0.064)	(0.038)	(0.062)
R^2	0.025	0.494	0.774	0.958
J	472	472	472	472
N	124,370	124,370	124,370	124,370

Competition effect or quality change?

- Does the fall in price really represent a quality change?
- To test this, we compare the price fall between products which are more or less homogeneous
- Price falls within perfectly homogeneous products cannot be the result of quality changes
- Compare products according to the standard deviation of price in 2004

Table. Description of homogeneous and differentiated products in treatment and control groups in 2004

	Homog. products	Diff. products	All products
Treatment	$N = 52$	$N = 46$	$N = 98$
	$\sigma_p = 0.33$	$\sigma_p = 0.94$	$\sigma_p = 0.62$
Control	$N = 190$	$N = 184$	$N = 374$
	$\sigma_p = 0.27$	$\sigma_p = 1.12$	$\sigma_p = 0.69$
Total	$N = 242$	$N = 230$	$N = 472$
	$\sigma_p = 0.28$	$\sigma_p = 1.09$	$\sigma_p = 0.67$

Note. Products are 6-digit HS products. N is the number of products, and σ_p represents the average standard deviation of log price. Differentiated products: products of which the standard deviation of log price is above the median level of all products in 2004. Homogeneous products: products of which the standard deviation of price variation is below the median level of all products in 2004.

Table. Product level estimates of the effect of quota removal, split between high and low price variance products. Dependent variable: $\ln P_{jt}$. Products are HS6 level. Treatment group: bound by quotas in 2004 and not covered by quota in 2005. Control group: unbound in 2004 and not covered by quota in 2005. Standard errors clustered at the HS6 level.

	Homog. products	Diff. products	Homog. vs. Diff.
λ_{2005} based on sd(price) in 2004	-0.187^{**}	-0.391^{***}	-0.203
	(0.087)	(0.089)	(0.124)
λ_{2005} based on sd(price) in 2004, conditional on number of firms	-0.161^{*}	-0.422^{***}	-0.261^{**}
	(0.085)	(0.091)	(0.124)
λ_{2005} based on sd(price) in 2000–2004	-0.181^{***}	-0.406^{***}	-0.225
	(0.068)	(0.119)	(0.137)
λ_{2005} based on textiles vs. clothing	-0.340^{***}	-0.232^{***}	0.107
	(0.095)	(0.087)	(0.129)

Heterogeneous effects across firms

Table. Estimates of the price effect of quota removal by firm ownership type

	DiD	Product FE
State-owned firms	-0.204^{***}	-0.232^{***}
	(0.056)	(0.037)
Foreign firms	-0.546^{***}	-0.386^{***}
	(0.067)	(0.051)
Other domestic firms	-0.349^{***}	-0.213^{***}
	(0.043)	(0.032)
State-owned vs. other domestic	0.145^{**}	-0.018
	(0.072)	(0.052)
Foreign vs. other domestic	-0.197^{**}	-0.172^{***}
	(0.082)	(0.061)
Large exporters	-0.280^{***}	-0.217^{***}
	(0.030)	(0.021)
Small exporters	-0.573^{***}	-0.428^{***}
	(0.125)	(0.100)
Large vs. small	0.293^{***}	0.211^{***}
	(0.109)	(0.081)

Robustness check 1: varying the definition of binding quotas

Table. Product-level estimates of the price effect of quota using different treatment groups. Dependent variable: $\ln P_{jt}$.

	DiD
Base model: comparison of bound (>90% fill rates) with all other products	−0.286*** (0.062)
Comparison of all quota with non-quota products	−0.191** (0.065)
Comparison of bound (70–80% fill rates) with non-quota products	−0.202*** (0.066)
Comparison of bound (80–90% fill rates) with non-quota products	−0.231*** (0.066)
Comparison of bound (>90% fill rates) with non-quota products	−0.371*** (0.078)

▸ Distribution of fill rates

Robustness check 2: 6-digit vs. 8-digit level results

	DiD	Product FE	Product FE, Firm FE	Firm-product FE
HS6 product-level	-0.286^{***}	-0.286^{***}		
	(0.062)	(0.068)		
HS8 product-level	-0.302^{***}	-0.302^{***}		
	(0.064)	(0.070)		
HS6 firm-product-level	-0.320^{***}	-0.242^{***}	-0.112^{***}	-0.080
	(0.066)	(0.057)	(0.033)	(0.054)
HS8 firm-product-level	-0.324^{***}	-0.225^{***}	-0.098^{***}	-0.063
	(0.064)	(0.052)	(0.031)	(0.052)

Conclusions

- Prices fall on average by about 30% due to the removal of the MFA/ATC quotas
- Consistent result to that achieved from US data
- New results from firm-product data
- A large proportion of the price fall is accounted for by firm entry and exit; the price drop for existing firms is only about 12%
- The within-firm, within-product price effect is small and insignificant
- The price drops are accounted for by reshuffling of product mix within and between firms
- Robustness of the result across specifications
- Heterogeneity in the quota effect across firms

Future work

- Testing the effect across countries
- Using monthly data to examine the re-imposition of quotas in 2005
- Behaviour of multi-product firms: adjustment to core products?
- Linking transaction-level data to census of manufacturing