When the Floodgates Open:

Evidence from the Response of Danish Textile and Apparel Industry to Lifting Trade Restrictions on Chinese Goods

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Motivation

- Increased trade relationship between advanced countries ("north") and low wage countries ("south") is one of the most important consequences of globalization.
- Since globalization changes the underlying environment under which firms operate, the internal structure of firms has also responded

Motivation

- Within firm empirical studies mostly focus on 'productivity' or 'technological change/R&D'
  - Being the measured outcome of a number of changes within firms and plants, productivity studies do not provide particular insight into the inner workings of the firms
  - Technological change, organizational change, and skills may be joint determinants of firm performance, and that focusing only on technical changes as a potential determinant of firm performance may not be enough

Motivation

- Theoretical contributions on the impact of low-wage competition on firm strategies: Thoenig and Verdier (AER, 2003), Thesmar and Thoenig (QJE, 2000)
- Why do not we have sufficient empirical insight on within firm changes in response to external environment?
  - A lack of appropriate micro level data which can provide detailed perspective into within firm changes at multiple margins
  - Scarcity of policy experiments that can allow researchers to deduce causal implications

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- I construct a new data-set that provides detailed information on within firm adjustments in employment and product strategies for Danish Textile and Clothing industry.

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- I construct a new data-set that provides detailed information on within firm adjustments in employment and product strategies for Danish Textile and Clothing industry.
- I utilize the exogenous changes in the Multi-fibre Arrangement quota system due to China's WTO accession and the resulting intensification of Chinese (or "low wage country") competition.
- First those firms with product portfolios containing products that were subject to MFA quotas before the WTO accession of China are identified.

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- I construct a new data-set that provides detailed information on within firm adjustments in employment and product strategies for Danish Textile and Clothing industry.
- I utilize the exogenous changes in the Multi-fibre Arrangement quota system due to China's WTO accession and the resulting intensification of Chinese (or "low wage country") competition.
- First those firms with product portfolios containing products that were subject to MFA quotas before the WTO accession of China are identified.
- Then using the difference-in-difference approach, any disproportionate changes are measured in such firms in response to the quota removal experience after controlling for firm fixed effects and aggregate shocks

The Purpose

- By providing empirical analysis of changes happening at several margins of adjustment in Danish textile and clothing (T&C) industry, including labor and product-level strategies within firms

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- By providing empirical analysis of changes happening at several margins of adjustment in Danish textile and clothing (T&C) industry, including labor and product-level strategies within firms
- The aim is to shed light on the type of restructuring happening in advanced countries' traditionally labor intensive manufacturing sectors faced with the stiff competition from low-wage countries.

Related Literature

- The role of low-wage country competition in explaining
  - Technological change and innovation in advanced countries (Bloom, Draca, and Van Reenen (2011))
  - Labor market outcomes in advanced countries (Autor, Dorn, and Hanson (2011).)
  - Industrial evolution and upgrade in "south" (Utar and Ruiz (2012))

MFA Quotas

- The Multi-fiber agreement (MFA) regulated world trade in textile and clothing (T&C) since 1974
- The Agreement on T&C under WTO provided a schedule for the gradual dismantling of the MFA quotas in four phases
- By being outside of the WTO during the 1990s, China did not benefit from the first two phases of quota abolishment.
- One of the immediate concrete changes that WTO membership brought to China was removal of the first three phases of MFA quotas on China in January 2002

Data

- Danish micro level-data (Danmarks Statistik)
  - Transactional level domestic data 1995-2005
  - Transactional level international data 1993-2007
  - Person-level employee-employer matched data 1995-2007
  - Firm-level accounting and business statistics data 1993-2007
- Quota information is reported in the SIGL (Système Intégré de Gestion de Licenses) database which is constructed by the European Commission and is publicly available.

Data

- T&C license database is classified according to 163 quota categories defined by the EU.
- They are matched with HS-6 product categories.
- 97 HS-6 digit products are identified as being the subject of 2002 quota abolishment for China (8% of the total T&C imports & 7 % of the total T&C exports)
- 187 HS-6 digit products are identified as being the subject of 2005 quota abolishment for China (16% of the total T&C imports & 12 % of the total T&C exports)

Danish Textile and Clothing Industry

- Europe's T&C industry is dominated by a large number of small and medium-sized enterprises, average company employing 19 employees, mostly privately owned (Stengg (2001))
- Danish T&C industry resembles overall European T&C industry
  - Average number of employees is 20 (1995-2007)
  - All firms are privately owned, 26 % of them are proprietorship, 91 % of them are single plants
  - 1092 unique T&C firms between 1995-2007
  - 43 % of them in clothing, the rest in textile

How Binding Are MFA Quotas for China

Transaction level import data between 1995 and 2007 in those goods that are subject to MFA quotas are aggregated into country (k), product (j) and year (t)

$$lnQuantity_{kjt} = \alpha_0 + \alpha_1 Dum02_t * China + \sum_{kj} \delta_{kj}^{FP} Country_k * Product_j + \sum_{t} \delta_{tn}^{YI} Year_t * Industry_n + \epsilon_{kjt}$$

$$Dum02_t = 1 \quad \text{if YEAR} \geqslant 2002$$
$$Dum02_t = 0 \quad otherwise$$

How Binding Are MFA Quotas for China

Panel A Sample: MFAQ2 Imports (1995-2007)	
Variables	Log Quantity
Dum02*China	$\mathbf{1.998}^{***}$
	(0.194)
Year By Industry Fixed Effect	yes
Product (HS6) by Country Fixed Effect	yes
Number of observation	17965
F	19.140

How Binding Are MFA Quotas for China

Panel A Sample: MFAQ2 Imports (1995-2007)	
Variables	Log Quantity	Log Price
Dum02*China	$\mathbf{1.998}^{***}$	$\mathbf{-0.432}^{***}$
	(0.194)	(0.095)
Year By Industry Fixed Effect	yes	yes
Product (HS6) by Country Fixed Effect	yes	yes
Number of observation	17965	17965
F	19.140	11.729

How Binding Are MFA Quotas for China

Panel B Sample: MFAQ5 Imports (1995-2007)	
Variables	Quantity
Dum05*China	$\mathbf{1.607}^{***}$
	(0.150)
Year By Industry Fixed Effect	yes
Product (HS6) by Country Fixed Effect	yes
Number of observation	30979
F	29.590

How Binding Are MFA Quotas for China

Panel B Sample: MFAQ5 Imports (1995-2007)		
Variables	Quantity	Log Price
Dum05*China	$\mathbf{1.607}^{***}$	$\mathbf{-0.211}^{***}$
	(0.150)	(0.042)
Year By Industry Fixed Effect	yes	yes
Product (HS6) by Country Fixed Effect	yes	yes
Number of observation	30979	30979
F	29.590	17.628

Competition Intensifies

- Is there a disproportionate decline in import prices of quota categories in comparison to other T&C products?
- Import data is aggregated into product-year level and the following equation is estimated

$$lnPrice_{jt} = \alpha_0 + \alpha_1 Dum02_t * MFAQ2_j + \sum_j \delta_j^P Product_j + \sum_t \delta_{tn}^{YI} Year_t * Industry_n + \epsilon_{jt}$$

Competition Intensifies

Sample: All T&C Imports (1995-2007)

Variables	Log Price
$Dum02 * MFAQ2_j$	$\mathbf{-0.274}^{***}$
	(0.069)
$Dum02 * MFAQ_j$	
Year By Industry Fixed Effect	yes
Product (HS6) Fixed Effect	yes
Number of observation	10446
Number of Products	901
F	11.312

Competition Intensifies

Sample: All T&C Imports (1995-2007)

Variables	Log Price	Log Price
$Dum02 * MFAQ2_j$	$\mathbf{-0.274}^{***}$	
	(0.069)	
$Dum02 * MFAQ_j$		$\mathbf{-0.105}^{**}$
		(0.035)
Year By Industry Fixed Effect	yes	yes
Product (HS6) Fixed Effect	yes	yes
Number of observation	10446	10446
Number of Products	901	901
F	11.312	11.333

Basic Approach

- Uncertainty associated with WTO membership of China
- Using transaction level export and domestic sales data, firms with product portfolio containing MFA quota goods are identified
- More than 70 % of those firms are found to produce MFAQ2 goods (phase I-II-III) were also producing MFAQ5 (phase V)
- The treatment group is set as those firms that are found to produce goods that have been protected by MFA quota from China in 1999 before China's WTO membership
- Construct $MFAQSold99_i$ and $MFAQShare99_i$

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Basic Approach

- By exploiting the exogenous shocks to the competitive environment, the two main regressions that are used to understand the response of firms to the competition:

$$X_{it} = \alpha_0 + \alpha_1 MFAQSold99_i * Dum02_t + \sum_i \delta_f^F Firm_i + \sum_t \delta_t^Y Year_t + \epsilon_{it}$$

$$X_{it} = \alpha_0 + \alpha_1 MFAQShare99_i * Dum02_t + \sum_i \delta_f^F Firm_i + \sum_t \delta_t^Y Year_t + \epsilon_{it}$$

Sales

Textile and Apparel Manufacturers (1995-2007)

Variable	Log Turnover
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.116^*}$
	(0.056)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	7277
Number of Firms	1092
F	3.030

Sales

Textile and Apparel Manufacturers (1995-2007)

Variable	Log Turnover	Log VAD
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.116^*}$	$\mathbf{-0.147^*}$
	(0.056)	(0.058)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	7277	7255
Number of Firms	1092	1092
F	3.030	6.700

Sales

Textile and Apparel Manufacturers (1995-2007)

Variable	Log Turnover	Log VAD	Log Profit
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.116^*}$	$\mathbf{-0.147^*}$	$\mathbf{-0.074}$
	(0.056)	(0.058)	(0.109)
Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
N	7277	7255	5847
Number of Firms	1092	1092	1035
F	3.030	6.700	3.185

Sales

Textile and Apparel Manufacturers (1995-2007)

Variable	Log Turnover
$\mathbf{MFAQShare99_i * Dum02_t}$	$\mathbf{-0.248^{**}}$
	(0.087)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	7277
Number of Firms	1092
F	3.408

Sales

Textile and Apparel Manufacturers (1995-2007)

Variable	Log Turnover	Log VAD
$\mathbf{MFAQShare99_i * Dum02_t}$	$\mathbf{-0.248^{**}}$	$\mathbf{-0.296^{***}}$
	(0.087)	(0.085)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	7277	7255
Number of Firms	1092	1092
F	3.408	7.200

Sales

Textile and Apparel Manufacturers (1995-2007)

Variable	Log Turnover	Log VAD	Log Profit
$\mathbf{MFAQShare99_i * Dum02_t}$	$\mathbf{-0.248^{**}}$	$\mathbf{-0.296^{***}}$	$\mathbf{-0.335^{*}}$
	(0.087)	(0.085)	(0.150)
Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
N	7277	7255	5847
Number of Firms	1092	1092	1035
F	3.408	7.200	3.546

Employment

Textile and Apparel Manufacturer Firms (1995-2007)

Variable	Log FTE
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.210^{***}}$
	(0.055)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	7216
Number of Firms	1092
F	10.883

Employment

Textile and Apparel Manufacturer Firms (1995-2007)

Variable	Log FTE	Log Labor
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.210^{***}}$	$\mathbf{-0.179^{***}}$
	(0.055)	(0.054)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	7216	7237
Number of Firms	1092	1086
F	10.883	10.345

Employment

Textile and Apparel Manufacturer Firms (1995-2007)

Variable	Log FTE	Log Labor	Log Hours
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.210^{***}}$	$\mathbf{-0.179^{***}}$	$\mathbf{-0.217^{***}}$
	(0.055)	(0.054)	(0.095)
Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
N	7216	7237	7210
Number of Firms	1092	1086	1118
F	10.883	10.345	6.496

Employment

Textile and Apparel Manufacturer Firms (1995-2007)

Variable	Log FTE
$\mathbf{MFAQShare99_i * Dum02_t}$	$\mathbf{-0.324^{***}}$
	(0.087)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	7216
Number of Firms	1092
F	10.934

Employment

Textile and Apparel Manufacturer Firms (1995-2007)

Variable	Log FTE	Log Labor
$\mathbf{MFAQShare99_i * Dum02_t}$	$\mathbf{-0.324^{***}}$	$\mathbf{-0.282^{**}}$
	(0.087)	(0.088)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	7216	7237
Number of Firms	1092	1086
F	10.934	10.233

Employment

Textile and Apparel Manufacturer Firms (1995-2007)

Variable	Log FTE	Log Labor	Log Hours
$\mathbf{MFAQShare99_i * Dum02_t}$	$\mathbf{-0.324^{***}}$	$\mathbf{-0.282^{**}}$	$\mathbf{-0.292^{**}}$
	(0.087)	(0.088)	(0.095)
Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
N	7216	7237	7210
Number of Firms	1092	1086	1118
F	10.934	10.233	6.253

- Intensified competition with China triggered by the MFA quota removal causes firms to decrease their sales, value-added, profit and the level employment.
- Does the competition affect everybody's likelihood of loosing his/her job to the same extent?
- Firms may decrease their production activities on more standard goods while they outsource more and focus on non-production activities such as technical designs, product developments, and marketing.

The Impact of Competition on Employment By Major Occupation Groups

Textile and Apparel Manufacturer Firms (1996-2007)

Variable	Log of Employees in jobs that require Basic Skills
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.312^{***}}$
	(0.075)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	5259
Number of Firms	965
F	21.745

The Impact of Competition on Employment By Major Occupation Groups

Textile and Apparel Manufacturer Firms (1996-2007)

Variable	Log of Employees in jobs that require Basic Skills	Log of Employees in jobs that require Prof. & Tech. Skills
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.312^{***}}$	$\mathbf{-0.046}$
	(0.075)	(0.061)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	5259	3585
Number of Firms	965	733
F	21.745	3.510

The Impact of Competition on Employment By Education Levels

Variable	Log High School or Below Level Emp
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.276}^{***}$
	(0.042)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	6841
Number of Firms	1086
F	17.827

The Impact of Competition on Employment By Education Levels

Variable	Log High School or Below Level Emp	Log College or Above Level Emp
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{-0.276^{***}}$	$\mathbf{0.053}$
	(0.042)	(0.042)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	6841	6841
Number of Firms	1086	1086
F	17.827	2.453

The Impact of Competition on Wages

Variable	Log Avg Wage
$\mathbf{MFAQSold99_i * Dum02_t}$	0.048^*
	(0.023)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	7149
Number of Firms	1086
F	7.926

The Impact of Competition on Wages

		Log Avg
Variable	Log Avg Wage	Basic-Level Jobs Wage
$\mathbf{MFAQSold99_i * Dum02_t}$	0.048^{*}	0.105^{***}
	(0.023)	(0.026)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	7149	5259
Number of Firms	1086	965
F	7.926	6.159

The Impact of Competition on Wages

		Log Avg	Log Avg
Variable	Log Avg Wage	Basic-Level Jobs Wage	High-Level Jobs Wage
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{0.048^*}$	$\mathbf{0.105^{***}}$	$\mathbf{-0.034}$
	(0.023)	(0.026)	(0.037)
Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
N	7149	5259	3585
Number of Firms	1086	965	733
F	7.926	6.159	0.936

Skill Upgrade *within* Occupation

	L. College Rate
Variable	Among Basic Level Jobs
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{0.324^{***}}$
	(0.090)
Year Fixed Effects	yes
Firm Fixed Effects	yes
N	1546
Number of Firms	372
F	8.865

Skill Upgrade *within* Occupation

	L. College Rate	L. High School Rate
Variable	Among Basic Level Jobs	Among Basic Level Jobs
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{0.324^{***}}$	$\mathbf{-0.146^{***}}$
	(0.090)	(0.034)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
N	1546	4559
Number of Firms	372	917
F	8.865	3.645

Skill Upgrade *within* Occupation

	L. College Rate	L. High School Rate	L. Average Experience
Variable	Among Basic Level Jobs	Among Basic Level Jobs	Among Basic Level Jobs
$\mathbf{MFAQSold99_i * Dum02_t}$	$\mathbf{0.324}^{***}$	$\mathbf{-0.146}^{***}$	$\mathbf{0.121}^{***}$
	(0.090)	(0.034)	(0.030)
Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
N	1546	4559	4986
Number of Firms	372	917	958
F	8.865	3.645	37.713

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- New products are defined as products that were not produced by the firm in previous years. Similarly dropped products are defined as products that were not produced in future years.
- Due to the end year of domestic transaction data-set, attention has been restricted to 2002 MFA quota removal experience.
- Since the likelihood of introducing new products, varieties or dropping products is expected to increase as the firms get larger, size quintiles are controlled for in these regressions.

Product Dropping in Response to 2002 Quota Removal

Variables	Log Number of Dropped Products
$\mathbf{MFAQ2Sold99_i * Dum02_t}$	$\mathbf{0.527}^{***}$
	(0.079)
Size (# of products) Quintile II	0.489^{***}
	(0.036)
Size (# of products) Quintile III	1.001^{***}
	(0.041)
Size (# of products) Quintile IV	1.634^{***}
	(0.052)
Size (# of products) Quintile V	2.487^{***}
	(0.066)
Year Fixed Effects	yes
Firm Fixed Effects	yes
Number of Observation	3761
Number of Firms	746
F	146.961

New Product Introductions in Response to 2002 Quota Removal

	Log Number of New Products
Variables	
$\mathbf{MFAQ2Sold99_i * Dum02_t}$	0.160^{*}
	(0.065)
Size Quintile II	0.539^{***}
	(0.032)
Size Quintile III	1.071^{***}
	(0.040)
Size Quintile IV	1.828^{***}
	(0.048)
Size Quintile V	2.759^{***}
	(0.066)
Year Fixed Effects	yes
Firm Fixed Effects	yes
Number of Observation	3858
Number of Firms	779
F	185.567

New Product Introductions in Response to 2002 Quota Removal

Variables	Log Number of New Products	Log Number of New Varieties
$\mathbf{MFAQ2Sold99_i * Dum02_t}$	$\mathbf{0.160^{*}}$	$\mathbf{0.207^{***}}$
	(0.065)	(0.062)
Size Quintile II	0.539^{***}	0.064^{**}
	(0.032)	(0.019)
Size Quintile III	1.071^{***}	0.139^{***}
	(0.040)	(0.022)
Size Quintile IV	1.828^{***}	0.316^{***}
	(0.048)	(0.033)
Size Quintile V	2.759^{***}	0.681^{***}
	(0.066)	(0.056)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
Number of Observation	3858	3858
Number of Firms	779	779
F	185.567	18.323

New Product Introductions in Response to 2002 Quota Removal

	Log Number of
Variables	New Products
	Among Non-MFA Categories
$\mathbf{MFAQ2Sold99_i * Dum02_t}$	$\mathbf{0.214}^{***}$
	(0.063)
Size Quintile II	0.448^{***}
	(0.033)
Size Quintile III	0.985^{***}
	(0.043)
Size Quintile IV	1.684^{***}
	(0.052)
Size Quintile V	2.611^{***}
	(0.068)
Year Fixed Effects	yes
Firm Fixed Effects	yes
Number of Observation	3858
Number of Firms	779
F	156.070

New Product Introductions in Response to 2002 Quota Removal

Variables	Log Number of New Products Among Non-MFA Categories	Log Number of New Varieties Among Non-MFA Categories
$\mathbf{MFAQ2Sold99_i * Dum02_t}$	$\mathbf{0.214^{***}}$	$\mathbf{0.178^{**}}$
	(0.063)	(0.057)
Size Quintile II	0.448^{***}	0.038^{*}
	(0.033)	(0.018)
Size Quintile III	0.985^{***}	0.107^{***}
	(0.043)	(0.021)
Size Quintile IV	1.684^{***}	0.272^{***}
	(0.052)	(0.031)
Size Quintile V	2.611^{***}	0.597^{***}
	(0.068)	(0.052)
Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
Number of Observation	3858	3858
Number of Firms	779	779
F	156.070	15.341

Concluding Remarks

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  - Competition is also shown to induce significant compositional changes within firms
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    - employees with lower level of education are found to have the highest likelihood of being laid off due to competition

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    - employees with lower level of education are found to have the highest likelihood of being laid off due to competition
    - while skill-intensity increases within firms as a result, basic skill category of jobs experiences a disproportionate increase in skill-intensity

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    - employees with lower level of education are found to have the highest likelihood of being laid off due to competition
    - while skill-intensity increases within firms as a result, basic skill category of jobs experiences a disproportionate increase in skill-intensity
- These findings may imply a certain flattening of the firms in accordance with lean production principles.

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  - firms are found to channel their innovative efforts away from the products where China's comparative advantage is now higher
- These results indicate that product mixes of firms are endogenous and respond to the competition and indicate the importance of product margin in linking import competition to firm performance.

Concluding Remarks

- The findings in this study on the negative effect of competition on intangible assets as well as increased product turnover within firms indicate product instability, or in the Schumpeterian language, the 'creative destruction rate' increases with heightened competition with China.
- The findings of increased skilled and educated workers within firms due to Chinese competition provide, in a way, empirical support of Thesmar & Thoenig (2000)'s theoretical argument.