

**Can Belgian Firms cope with the
Chinese Dragon and the Asian
Tigers?
The Export Performance of Multi-
product Firms on Foreign Markets**

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Outline

- Topic and motivation
- Literature
- Measurement of export performance
- Data
- Some stylized facts
- Empirical methodology
- Results
- Conclusions and Implications



Motivation and Topic

- Gloom and doom in the Western industry
 - Increasing competition on our *domestic* as well as on *foreign* markets, in particular from the Chinese Dragon (mainland China) and the Asian Tigers (Hong Kong, Taiwan, Singapore and Korea)

 - General **deindustrialisation** tendency
 - Declining international market shares and shrinking value added in GDP
 - But: uneven pace of deindustrialisation
(Nickell et al. (2008))

<-> Belgium: **Small open economy with an industrial history**: much is at stake!

 - Better understanding of the impact of Asian competition on Belgian exporting firms is crucial for an appropriate reaction by policy-makers and firms
 - We know general macro-economic evidence, but we know too little about the *underlying processes*. Firm-level analysis will contribute to a better understanding.



Motivation and Topic

- More technical motivation
 - Determinants of exports/ export performance by multi-product firms
 - Increased attention in the literature to product heterogeneity AND firm heterogeneity -> as to the product-level dimension
 - Study of variety and quality of international trade
 - Study of margins of trade
 - Study of phenomena like product switching, duration of trade etc.



Motivation and Topic

- This paper:
 - Focus on Belgian manufacturing exporters (i.e. manufacturing goods exported by Belgian firms)
 - 1998-2006
 - Focus on the impact of Asian competition on the Belgian firm-level export performance in foreign markets, controlling for alternative factors
 - Distinguishing between:
 - Industrial *sectors* (HS sections) and *subsectors* (HS 4-digits)
 - Geographical destinations
 - Taking into account:
 - Exports at the *product-level* (CN8) (cfr. Multi-product firms)



Literature

- Determinants of export performance
 - Impact of Firm heterogeneity
 - Theoretical work (Melitz (2003), Bernard et al. (2003), Eaton et al. (2004))
 - Large empirical literature (e.g., Wagner (2007) for an overview, Bernard and Wagner (2007) for Germany, Roberts and Tybout (1997) for Colombia, Clerides et al. (1998) for Colombia, Mexico and Morocco, Bernard and Jensen (1999) for US, Abraham et al. (2010) for China)
 - Specifically for Belgium: Muûls and Pisu (2007), Pisu (2008), Abraham and Van Hove (2008), Abraham et al. (2010)
 - Impact of destination market characteristics
 - Cfr. Gravity approach
 - Even with heterogeneous firms (Chaney (2008))
 - Distinction between bilateral export partners (e.g., Eaton et al. (2004, 2005))



Literature

- **Determinants of export performance**
 - Impact of foreign competition
 - Focus on the “core competence” (Helpman et al. (2008))
 - Firms refocusing due to import competition (e.g., Liu (2010))

- **Focus on the product-level dynamics**
 - Variety and quality of trade: Schott (2004), Hummels and Klenow (2005), Kaplinsky and Santos-Paulino (2005), Hallak (2005), Broda and Weinstein (2006), Van Hove (2010)
 - Multi-product firms (Eckel and Neary (2010), Bernard et al. (2009))
 - Impact of Asian competition: Schott (2008), Fernandes and Paunov (2008)
 - Measurement issues (e.g., Hallak and Schott (2008))
 - Other product-level dynamics: e.g., product-switching (e.g., Bernard et al. (2006))



Data

- Belgian firm-level international trade data
 - Exploiting all dimensions!: product-level (CN8), destination countries and time (1998-2006)
 - Only manufacturing firms
 - Transfer of property

- Belgian annual accounts data

- Macroeconomic data from IMF + geographical elements

- Link with COMTRADE (UN, 2010) for competition effects



Empirical Methodology

- Measurement of export performance
- Determinants of export performance

NOTE: Notation – all dimensions:

- firm i
- product j
- destination market k
- subsector l that product j belongs to
- year t



Measurement of Export Performance

- We distinguish between several measures of export performance taking into account all dimensions of the data (firm x product x destination x time)
 - Export intensity (EXP)
 - Export variety (VAR)
 - Export quality (QUA)
 - Growth in export intensity (Δ EXP)



Measurement of Export Performance

- **Export intensity**: export value of firm i to country k in year t

2 definitions:

- Either at the product-level: for product j
- Or at the sector-level: for subsector l

WHY SUBSECTOR?

1. Sectoral heterogeneity + link with traditional thinking in terms of sectors
2. Parallel with other measures of export performance
3. Link with sector-specific import competition effects

-> DISTINCTION between three sectoral levels: HS2-digits, HS4-digits and HS6-digits (reporting HS4-digits)

- **Export variety**: number of products that firm i exports to country k in year t within sector l (“extensive margin”)



Measurement of Export Performance

■ Export quality:

- Most popular approach in the literature: evolution or differences in export unit values reflect quality
- However:
 - Unit value evolution may reflect other things (competition effects, firm's price strategy,...)
 - Not much evidence on quality of international trade at the firm-level or at the level of the multi-product firm
- Our contribution:
 - measure quality at the firm level
 - Taking into account product-level information
 - Distinguishing by bilateral trading partners
 - Aggregating at the subsectoral level in order to link the evidence to evidence about variety (weighted average of product-level prices)
 - Developing alternative quality indicators



Measurement of Export Performance

■ Export quality (cont.)

$$QUA_{ilkt} = \sum_{j \in l} \frac{EXP_{ijkt}}{UNIT_{ijkt}} \cdot \frac{EXP_{ijkt}}{EXP_{ilkt}}$$

BUT: Unit values may reflect other issues than quality + how to compare across subsectors?

$$\Delta QUA_{ilkt} = \sum_{j \in l} \left(\frac{P_{iljkt}^{up} - P_{iljkt-1}^{up}}{P_{iljkt-1}^{up}} \right) \left(\frac{EXP_{iljkt}}{\sum_{j' \in l} EXP_{ilj'kt}} \right)$$

P ↑ and EXP ↑

BUT: at the subsectoral level number of “quality-upgraded” products could be both large and small...

$$\Delta QUA_{ilkt} = \left[\sum_{j \in l} \left(\frac{P_{iljkt}^{up} - P_{iljkt-1}^{up}}{P_{iljkt-1}^{up}} \right) \left(\frac{EXP_{iljkt}}{\sum_{j' \in l} EXP_{ilj'kt}} \right) \right] \frac{\sum_{j' \in l} EXP_{ilj'kt}^{up}}{\sum_{j' \in l} EXP_{ilj'kt}}$$

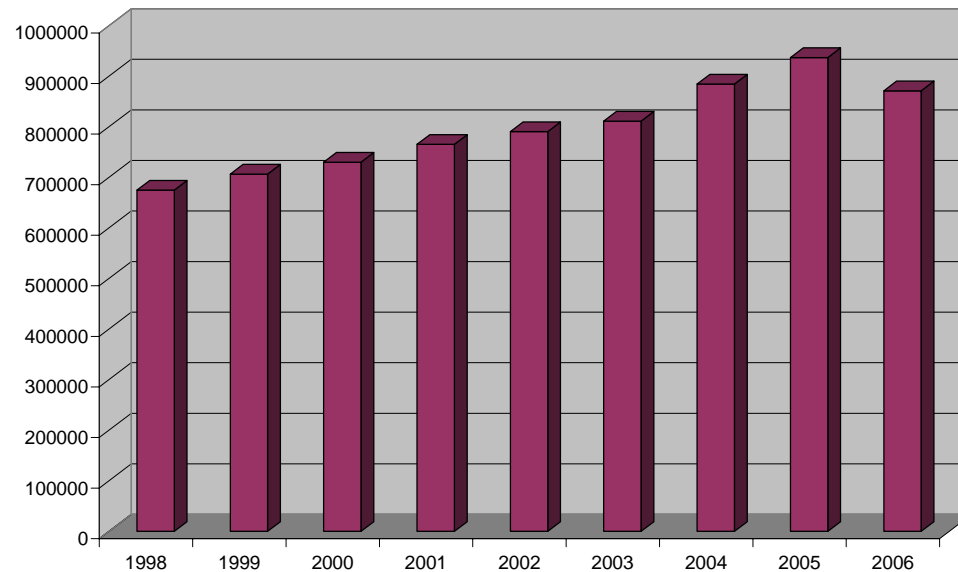
... takes into account the weight of “quality-upgraded” products

Extent of quality upgrading



Some Stylized Facts

- Combination of dimensions results in unique and enormous database: over 7 million observations
 - 1 observation = 1 “variety” = export value for 1 product by 1 firm to 1 country in 1 year





The number of firms by export variety, 1998-2006

Variety	Number of firms								
	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	8026	3193	1920	1336	1053	812	711	607	491
2	3193	3099	3204	3148	3200	2886	2714	2698	2705
3	1920	1761	1977	1982	1810	1815	1727	1654	1555
4	1336	1250	1361	1428	1394	1240	1263	1099	1126
5	1053	1037	1015	1003	1012	976	949	924	782
6	812	796	843	905	836	808	704	727	622
7	711	664	671	731	716	670	634	651	530
8	607	595	597	616	588	589	576	511	445
9	491	494	524	517	497	447	471	478	376
10	464	470	501	473	500	481	430	404	333
11-20	2876	2832	2888	2990	2907	2870	2820	2737	2092
21-50	3008	3087	3126	3211	3176	3147	3158	3104	2330
51-100	1418	1398	1466	1550	1495	1565	1579	1622	1276
101-500	1148	1206	1277	1284	1317	1356	1410	1408	1266
501-1000	105	117	116	122	125	122	139	164	176
1001-10000	38	50	49	59	73	70	86	92	94
>10000	0	0	0	0	0	1	2	2	2



Total Export Variety per Sector, 1998-2006

	HS Sector	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	Animals	16291	16874	17532	18424	18170	18320	19154	18682	15955
2	Vegetables	24948	26744	25150	25722	26177	27057	28239	27898	22983
3	Fats & Oils	2725	2915	2874	2802	2938	2970	3179	3173	3085
4	Food & Beverages	31127	32315	33544	35079	36773	37445	39516	39149	35589
5	Minerals	5004	5270	5234	5526	5526	5632	5926	5968	5306
6	Chemicals	72406	75757	78081	81317	84072	85896	93243	98238	95191
7	Plastics	49079	52635	54345	50660	52783	54379	59121	64282	61474
8	Leather	908	944	981	1037	952	962	1023	1189	962
9	Wood	3778	4072	4248	4659	4895	5031	5317	5683	4700
10	Paper	25962	27198	27356	28129	29269	29671	32251	33223	30083
11	Textiles	73405	75041	79368	80890	82710	83229	89106	92531	83859
12	Footwear	5246	5194	5594	5931	6330	6901	8306	9291	8944
13	Glass & Stone	10687	11616	12194	13026	13623	13608	15244	16498	14131
14	Precious Items	5215	5394	5623	4840	3228	1385	1770	2119	1815
15	Base Metals	64042	67072	67663	71628	74581	77401	84389	92634	86672
16	Machinery	85103	90687	93575	93682	97177	100900	112155	122826	116913
17	Transport Equipment	28885	26496	29422	32064	32411	32431	31619	29814	29538
18	Specific Machinery	10232	11323	11357	12281	13178	13612	15417	16908	16849
19	Arms	284	254	297	253	249	257	240	252	224
20	Miscellaneous	19144	20828	22404	23868	24532	25240	27322	28971	25250
21	Art	828	912	1099	1042	1058	931	1008	1111	1077
	TOTAL	535299	559541	577941	592860	610632	623258	673545	710440	660600

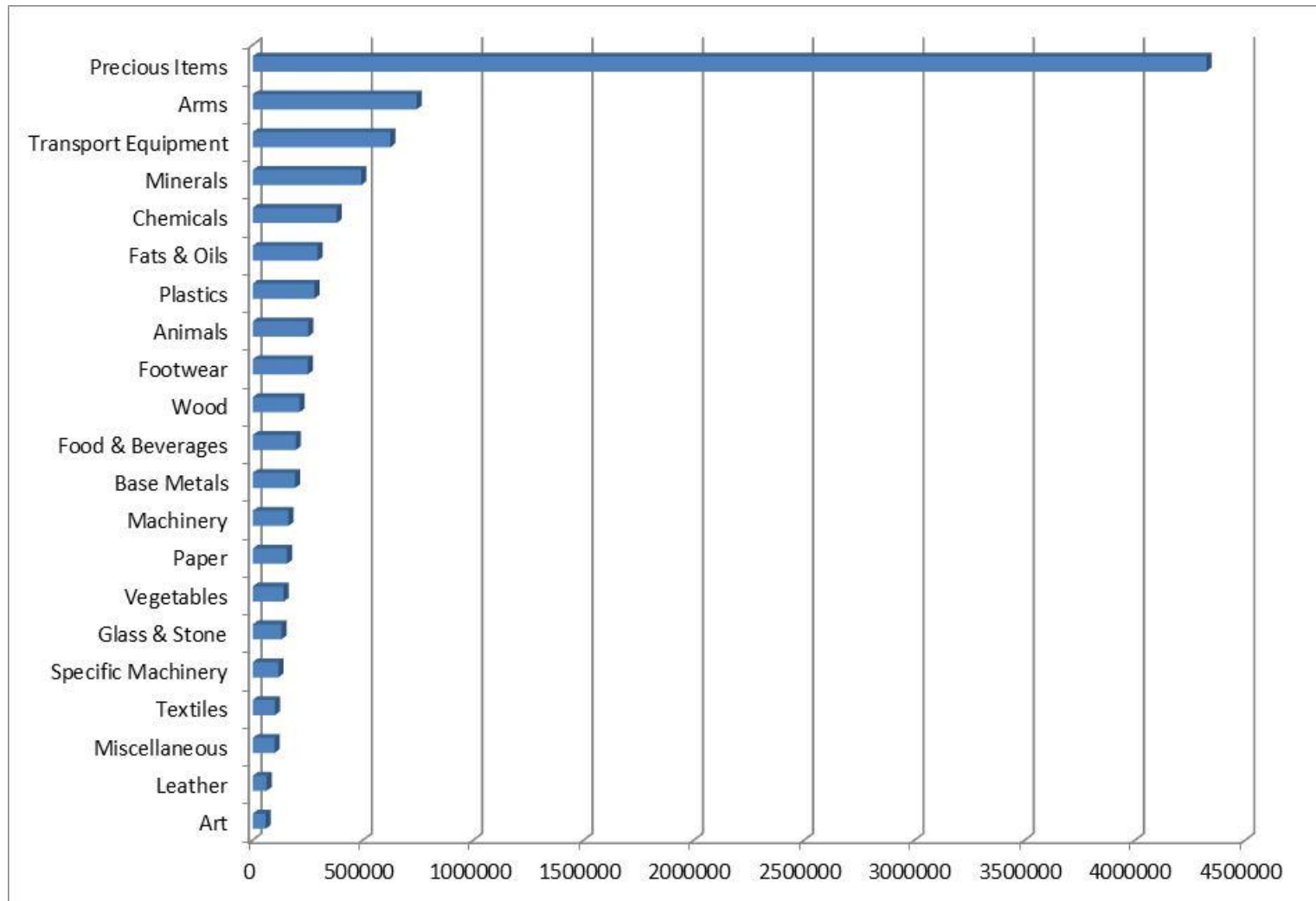


Average Export Intensity per Sector, 1998-2006

	HS Sector	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average 1998-2006
1	Animals	254519.5	222220.5	253974.8	261156.1	246379.6	234591.9	244582.8	254249.2	298004.2	252186.5
2	Vegetables	136253.3	128541.4	125683.4	132166.0	135132.3	139818.0	135900.8	146132.9	186735.4	140707.1
3	Fats & Oils	346584.4	288527.5	262882.6	289849.7	292429.7	296013.2	286558.6	281150.3	300271.7	293807.5
4	Food & Beverages	182099.6	171613.1	181798.7	189614.6	190157.4	198540.9	195782.8	205144.1	239121.6	194874.8
5	Minerals	309726.6	335535.3	480445.1	465215.3	336786.5	450457.3	563445.3	641314.1	849807.3	492525.9
6	Chemicals	264305.3	275321.9	310110.8	327182.0	446273.3	429859.0	435704.2	447699.3	491616.3	380896.9
7	Plastics	241783.9	241110.1	280136.3	290316.0	277917.4	271848.7	276837.5	291723.9	346280.0	279772.6
8	Leather	102844.8	88022.3	130218.2	113375.3	27660.9	29787.4	29780.8	21169.2	24933.2	63088.0
9	Wood	181742.5	174563.1	179112.6	183281.1	230293.9	227154.7	236199.9	221767.6	280574.4	212743.3
10	Paper	146843.0	151093.3	175603.1	164717.3	159186.9	154387.7	148290.3	141753.0	161176.6	155894.6
11	Textiles	111564.7	107067.1	110006.7	108841.5	107507.4	97758.6	90272.1	85934.8	97343.2	101810.7
12	Footwear	243081.5	261234.4	271500.2	304911.2	301641.2	230162.8	198760.1	204699.0	238423.7	250490.5
13	Glass & Stone	142451.0	126996.5	134156.7	128871.0	133117.0	131296.6	122444.2	117663.7	136463.1	130384.4
14	Precious Items	1693318.0	1997210.0	2338679.0	2389102.0	3781367.0	7243148.0	6338518.0	6048898.0	7084687.0	4323880.8
15	Base Metals	182751.5	165148.4	199814.3	181117.1	171709.1	171901.3	194215.5	197260.6	265575.6	192165.9
16	Machinery	159557.5	160828.3	189620.3	181514.1	169941.1	157361.7	148988.3	144747.8	155124.2	163075.9
17	Transport Equipment	618490.6	687200.3	501227.9	545278.9	553170.7	584271.4	659054.1	716635.3	755706.7	624559.5
18	Specific Machinery	95738.6	108741.1	118740.6	120776.4	113097.8	123754.3	118956.9	122916.2	129208.9	116881.2
19	Arms	707513.8	710460.5	597874.9	1153553.0	725235.7	605572.5	758432.1	640122.4	791196.4	743329.0
20	Miscellaneous	114581.6	107194.1	106749.6	102082.2	98829.3	96409.6	89290.9	83988.6	91710.4	98981.8
21	Art	68618.8	61265.1	64813.7	58542.4	51743.7	42839.4	62645.2	65555.3	58897.3	59435.7



Average Export Intensity per Sector (average 1998-2006)





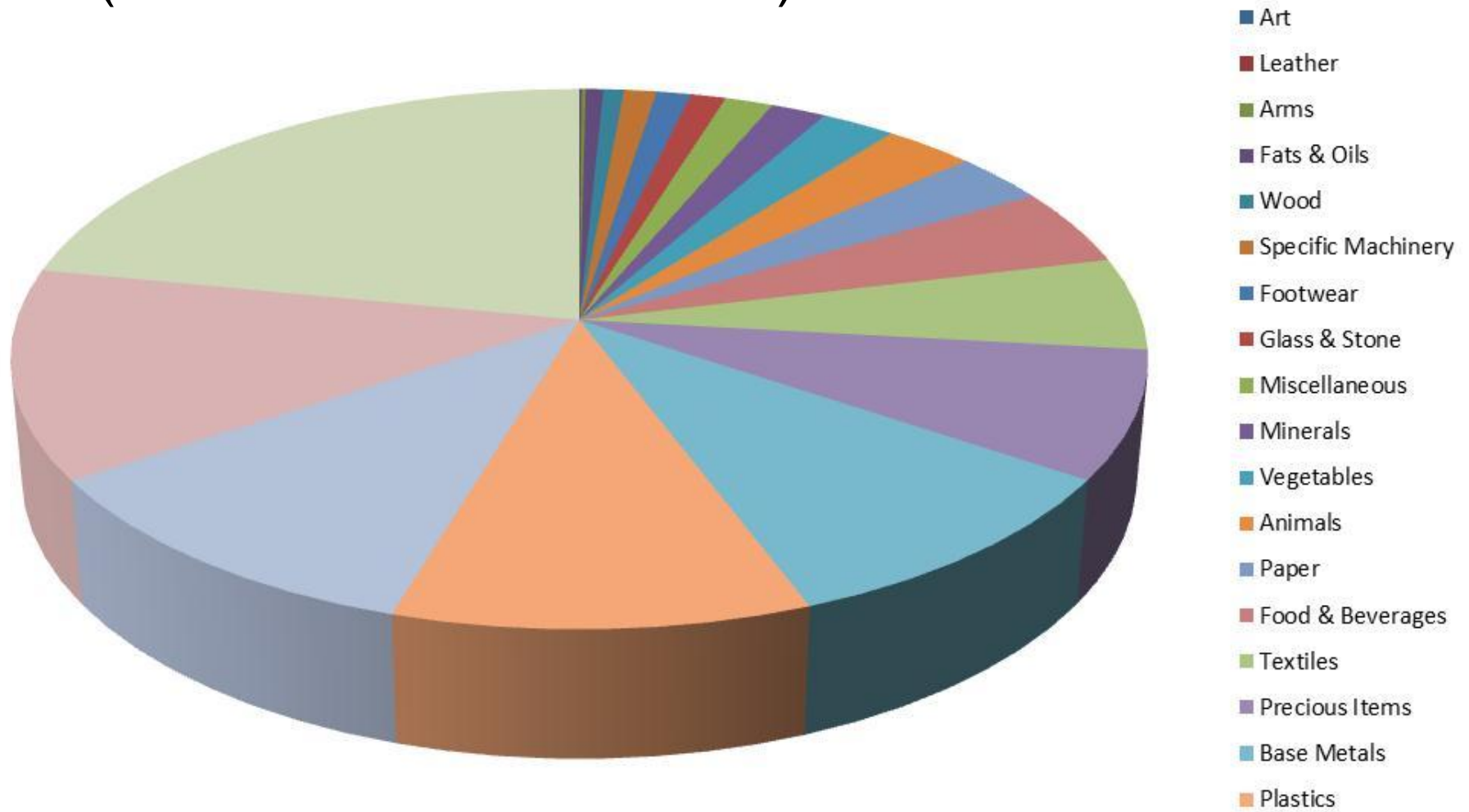
Total Export Intensity per Sector, 1998-2006

	HS Sector	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average 1998-2006	Sum 1998-2006	Share in Total 1998-2006
1	Animals	4.15E+09	3.75E+09	4.45E+09	4.81E+09	4.48E+09	4.30E+09	4.68E+09	4.75E+09	4.75E+09	4.46E+09	4.01E+10	2.96
2	Vegetables	3.40E+09	3.44E+09	3.16E+09	3.40E+09	3.54E+09	3.78E+09	3.84E+09	4.08E+09	4.29E+09	3.66E+09	3.29E+10	2.43
3	Fats & Oils	9.44E+08	8.41E+08	7.56E+08	8.12E+08	8.59E+08	8.79E+08	9.11E+08	8.92E+08	9.26E+08	8.69E+08	7.82E+09	0.58
4	Food & Beverages	5.67E+09	5.55E+09	6.10E+09	6.65E+09	6.99E+09	7.43E+09	7.74E+09	8.03E+09	8.51E+09	6.96E+09	6.27E+10	4.63
5	Minerals	1.55E+09	1.77E+09	2.51E+09	2.57E+09	1.86E+09	2.54E+09	3.34E+09	3.83E+09	4.51E+09	2.72E+09	2.45E+10	1.81
6	Chemicals	1.91E+10	2.09E+10	2.42E+10	2.66E+10	3.75E+10	3.69E+10	4.06E+10	4.40E+10	4.68E+10	3.30E+10	2.97E+11	21.91
7	Plastics	1.19E+10	1.27E+10	1.52E+10	1.47E+10	1.47E+10	1.48E+10	1.64E+10	1.88E+10	2.13E+10	1.56E+10	1.41E+11	10.38
8	Leather	9.34E+07	8.31E+07	1.28E+08	1.18E+08	2.63E+07	2.87E+07	3.05E+07	2.52E+07	2.40E+07	6.19E+07	5.57E+08	0.04
9	Wood	6.87E+08	7.11E+08	7.61E+08	8.54E+08	1.13E+09	1.14E+09	1.26E+09	1.26E+09	1.32E+09	1.01E+09	9.12E+09	0.67
10	Paper	3.81E+09	4.11E+09	4.80E+09	4.63E+09	4.66E+09	4.58E+09	4.78E+09	4.71E+09	4.85E+09	4.55E+09	4.09E+10	3.02
11	Textiles	8.19E+09	8.03E+09	8.73E+09	8.80E+09	8.89E+09	8.14E+09	8.04E+09	7.95E+09	8.16E+09	8.33E+09	7.49E+10	5.54
12	Footwear	1.28E+09	1.36E+09	1.52E+09	1.81E+09	1.91E+09	1.59E+09	1.65E+09	1.90E+09	2.13E+09	1.68E+09	1.52E+10	1.12
13	Glass & Stone	1.52E+09	1.48E+09	1.64E+09	1.68E+09	1.81E+09	1.79E+09	1.87E+09	1.94E+09	1.93E+09	1.74E+09	1.57E+10	1.16
14	Precious Items	8.83E+09	1.08E+10	1.32E+10	1.16E+10	1.22E+10	1.00E+10	1.12E+10	1.28E+10	1.29E+10	1.15E+10	1.04E+11	7.65
15	Base Metals	1.17E+10	1.11E+10	1.35E+10	1.30E+10	1.28E+10	1.33E+10	1.64E+10	1.83E+10	2.30E+10	1.48E+10	1.33E+11	9.83
16	Machinery	1.36E+10	1.46E+10	1.77E+10	1.70E+10	1.65E+10	1.59E+10	1.67E+10	1.78E+10	1.81E+10	1.64E+10	1.48E+11	10.93
17	Transport Equipment	1.79E+10	1.82E+10	1.47E+10	1.75E+10	1.79E+10	1.89E+10	2.08E+10	2.14E+10	2.23E+10	1.88E+10	1.70E+11	12.53
18	Specific Machinery	9.80E+08	1.23E+09	1.35E+09	1.48E+09	1.49E+09	1.68E+09	1.83E+09	2.08E+09	2.18E+09	1.59E+09	1.43E+10	1.06
19	Arms	2.01E+08	1.80E+08	1.78E+08	2.92E+08	1.81E+08	1.56E+08	1.82E+08	1.61E+08	1.77E+08	1.90E+08	1.71E+09	0.13
20	Miscellaneous	2.19E+09	2.23E+09	2.39E+09	2.44E+09	2.42E+09	2.43E+09	2.44E+09	2.43E+09	2.32E+09	2.37E+09	2.13E+10	1.57
21	Art	5.68E+07	5.59E+07	7.12E+07	6.10E+07	5.47E+07	3.99E+07	6.31E+07	7.28E+07	6.34E+07	5.99E+07	5.39E+08	0.04
	TOTAL	1.18E+11	1.23E+11	1.37E+11	1.41E+11	1.52E+11	1.50E+11	1.65E+11	1.77E+11	1.91E+11		1.35E+12	100



Total Export Intensity per Sector

(share in total 1998-2006)





Stylized Facts: Variety

- Many Belgian firms appear to be single-variety firms, exporting one product to one destination
BUT: This number of firms is substantially decreasing over time!
<-> concept of *single-product firm*

- Substantial variation in terms of variety across firms
 - Variety ranges from 1 till over 10000!

- Number of very-large-variety-firms is limited



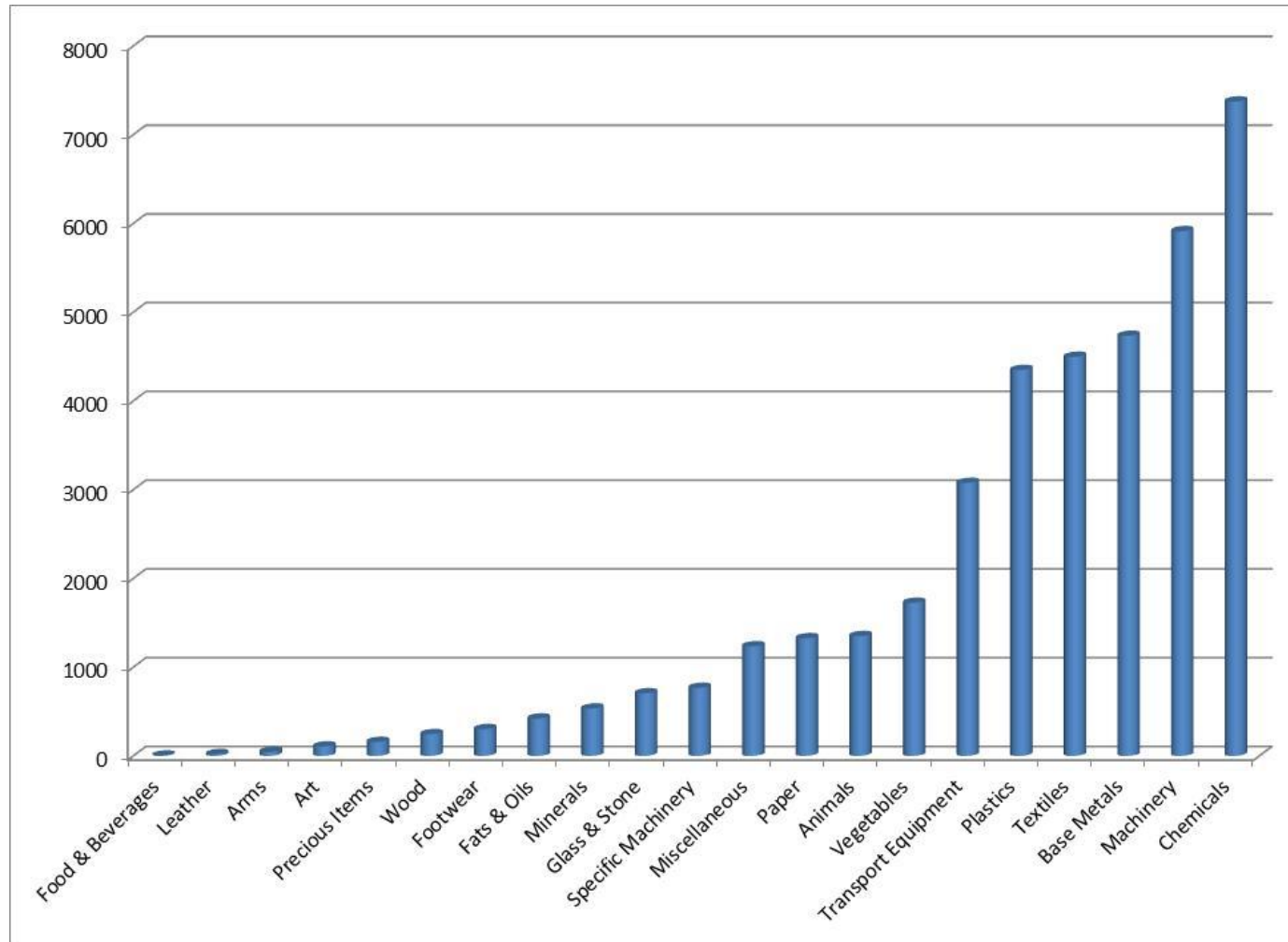
Stylized Facts: Variety

- Moreover heterogeneity is even larger if one distinguishes:
 - Between sectors
 - Between bilateral trading partnersHence: we have to take this into account!
- Export variety substantially varies across manufacturing sectors, but sectoral pattern is relatively stable over time
- Export variety is largest in Machinery, Textiles, Chemicals, Base Metals and Plastic (main sectors of the Belgian economy)
- Export variety largest when exports directed to other European countries (in particular neighbouring countries) as well as to large or rich countries



Stylized Facts: Quality

Number of 'firms x products' quality upgrades





Stylized Facts: Quality

- More specific approach to quality needed:
 - To allow cross-sectoral and cross-country comparisons: focus on percentages
 - To control for non-quality related issues
 - Focus on the % change between two periods, i.e. 1998-2001 and 2002-2006 (cfr. China's WTO membership)

- Again large heterogeneity:
 - Across firms
 - Across destination markets: no clear conclusions
 - Across sectors: especially in largest sectors, both labour-intensive and capital-intensive ones (from an international perspective)



Stylized Facts: Quality

- Since unity has to be the same within each subsectoral level: 1610802 observations deleted
- Average taken over the two subperiods: 1998-2001 and 2002-2006
 - 717379 products that were exported in 1998-2001 no longer exported in 2002-2006
 - But: 1094897 new products exported in 2002-2006 compared to 1998-2001
 - Only 506439 products are kept in both periods
- Out of the 506439 products 147060 products experienced a quality upgrading (about 30 %)
- Hence: indication that **product switching** might be substantial in Belgian firm- and product-level exports, but also **quality upgrading** happens rather frequently.
- Note: Small exports values might cause strange quality-values -> thresholds applied to minimum export values



Determinants of Export Performance

- Three groups of **potential determinants** of different aspects of export performance:
 - **Firm-level characteristics (FIRMCHAR)**

Cfr. Firm-heterogeneity literature

 - Number of FTE employees -> *firm size*
 - Value added per worker -> *productivity*
 - Average remuneration -> proxy for *human capital intensity*
 - Capital per worker -> *capital intensity*
 - Immaterial fixed assets per worker -> *innovation intensity*
 - **Destination market characteristics (DEST)**

Cfr. Gravity determinants, including geography

 - GDP, GDP per capita, distance, common border, EU15, EU27
 - **Third-market import competition at sectoral level (COMP)**

Focus on competition from China and Asian tigers

 - Dummy = 1 if country is active within subsector in the market
 - Share of each Asian country in destination market's total subsectoral imports (at HS 4-digit level)



Export Intensity

At the product level

$$[1] \quad EXP_{ijkt} = \delta_0 + \delta_1 FIRMCHAR_{it} + \delta_2 DEST_{kt} + \delta_3 COMP_{lkt} + \mu_{ijkt}$$

At the sector level

$$[1'] \quad EXP_{ilkt} = \delta_0 + \delta_1 FIRMCHAR_{it} + \delta_2 DEST_{kt} + \delta_3 COMP_{lkt} + \mu_{ijkt}$$



Export variety and Export quality

Export variety

$$[2] \quad VAR_{ilkt} = \beta_0 + \beta_1 FIRMCHAR_{it} + \beta_2 DEST_{kt} + \beta_3 COMP_{lkt} + \varepsilon_{ijt}$$

Export quality

$$[3] \quad \Delta QUA_{ilkt} = \lambda_0 + \lambda_1 FIRMCHAR_{it} + \lambda_2 DEST_{kt} + \lambda_3 \Delta COMP_{lkt} + \varepsilon_{ijt}$$

-Quality measured as “percentage change” in quality between 1998-2001 and 2002-2006

-Average levels of FIRMCHAR and DEST

-Change in third-market import competition between 1998-2001 and 2002-2006



Growth in export intensity

Since variety and quality of trade are fundamental characteristics of the export pattern, they may affect changes in the export intensity.

$$[4] \quad \Delta EXP_{ijkt} = \delta_0 + \delta_1 FIRMCHAR_{it} + \delta_2 DEST_{kt} + \delta_3 \Delta COMP_{lkt} + \delta_4 \Delta VAR_{ilkt} + \delta_5 \Delta QUA_{ilkt} + \mu_{ijkt}$$

NOTE: Some econometric issues

- Panel structure
 - Firm-level fixed effects
 - Sectoral fixed effects -> at the HS2-level
- Robust SE
- Correction for clustering

Results

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Overview of the Results

- Detailed Report on the results for the total sample

 - Summary of Results after splitting-up the sample
 - Distinction between industrial sectors (HS sections)
 - Geographical distinctions: regions
 - Europe
 - Russia and Far-Eastern Europe (“East”)
 - Asia
 - North America
 - South America
 - Middle East and Mediterranean countries (“Middle East”)
 - Oceania
- > Focus on the *Asian competition* effects



Results for export intensity (product-level)

	[3]				[4]			
	coef.	SE	t		coef.	SE	t	
GDP	-0.01	0.00	-7.43	***	0.01	0.00	6.10	***
GDP per capita	0.01	0.00	14.32	***	0.01	0.00	6.47	***
Distance	-0.01	0.00	-13.88	***	-0.02	0.00	-12.92	***
Border	0.04	0.00	16.39	***	0.02	0.00	4.33	***
EU15	0.02	0.00	5.89	***	0.02	0.01	3.08	***
EU27	0.01	0.00	2.83	***	0.00	0.00	0.88	
Number of FTE employees	0.02	0.00	6.93	***	0.03	0.00	6.40	***
Average remuneration	0.00	0.00	-0.13		0.01	0.00	3.03	***
Value added per worker	0.01	0.00	5.06	***	0.01	0.00	3.30	***
Capital per worker								
Immaterial fixed assets per worker								
China active in sector and market	0.03	0.00	7.91	***				
Korea active in sector and market	0.03	0.00	10.79	***				
Taiwan active in sector and market	0.00	0.00	-1.32					
Singapore active in sector and market	0.04	0.00	13.79	***				
Hong Kong active in sector and market	0.00	0.00	-0.31					
China's share in market's sectoral imports					-0.02	0.02	-0.85	
Korea's share in market's sectoral imports					-0.09	0.04	-2.29	**
Taiwan's share in market's sectoral imports					0.01	0.04	0.23	
Singapore's share in market's sectoral imports					0.19	0.04	4.76	***
Hong Kong's share in market's sectoral imports					-0.19	0.05	-4.24	***
Constant	0.00	0.04	0.03		-0.03	0.06	-0.40	
Sectoral Fixed Effects	yes				yes			
Firm Fixed Effects	yes				yes			
R ²	0.11				0.06			
F	151.91				104.24			

Note: Results based on a fixed-effects panel data estimation with robust standard errors and adjusted for clustering at the firm level; ***, **, * respectively denote statistical significance at 1 %, 5 % and 10 % level.



Results for export intensity (subsector-level)

	[3]				[4]			
	coef.	SE	t		coef.	SE	t	
GDP	0.21	0.01	15.86	***	0.25	0.02	12.17	***
GDP per capita	-0.06	0.02	-3.16	***	-0.09	0.02	-5.21	***
Distance	-0.18	0.02	-9.61	***	-0.21	0.03	-7.80	***
Border	0.40	0.05	8.73	***	0.40	0.05	7.46	***
EU15	-0.02	0.05	-0.43		0.07	0.08	0.87	
EU27	-0.41	0.05	-8.27	***	-0.52	0.08	-6.85	***
Number of FTE employees	0.20	0.05	4.16	***	0.25	0.04	5.58	***
Average remuneration	-0.14	0.05	-2.58	***	-0.10	0.08	-1.35	
Value added per worker	0.08	0.04	2.10	**	0.04	0.05	0.82	
Capital per worker	0.00	0.02	0.05		-0.01	0.02	-0.31	
Immaterial fixed assets per worker	0.00	0.01	0.13		0.00	0.01	0.16	
China active in sector and market	0.03	0.03	1.04					
Korea active in sector and market	0.15	0.02	6.70	***				
Taiwan active in sector and market	-0.01	0.04	-0.18					
Singapore active in sector and market	0.09	0.03	3.39	**				
Hong Kong active in sector and market	-0.11	0.02	-5.00	**				
China's share in market's sectoral imports					-0.69	0.22	-3.16	***
Korea's share in market's sectoral imports					0.52	0.48	1.07	
Taiwan's share in market's sectoral imports					-1.07	0.42	-2.56	***
Singapore's share in market's sectoral imports					0.32	0.41	0.79	
Hong Kong's share in market's sectoral imports					-1.00	0.38	-2.65	***
Constant	11.70	1.12	10.49	***	12.53	1.46	8.60	***
Sectoral Fixed Effects	yes				yes			
Firm Fixed Effects	yes				yes			
R ²	0.11				0.11			
F	50.29				54.74			

Note: Results based on a fixed-effects panel data estimation with robust standard errors and adjusted for clustering at the firm level; ***, **, * respectively denote statistical significance at 1 %, 5 % and 10 % level.



Results for export intensity

■ Firm-specific characteristics

- Significantly positive effects from firm size
(note: size² not significant)
- At the product-level also positive effects from
 - remuneration per worker -> skills effect
 - (productivity)
- Capital Intensity and Innovation Intensity not significant
(cfr. Previous studies for Belgium)

■ Destination market characteristics

- Country size mostly a positive effect (note: impact of competition)
- GDP per capita positive effect at product-level while negative effect at subsector-level (hence: aggregation level matters)
- Distance negative effect while border positive effect
- EU effects: difference between “old” and “new” EU: strong focus on neighbouring countries



Results for export intensity

■ Asian competition

□ Effect of Asian presence in the market

- At the product-level: positive effects from China, Korea and Singapore -> they are active on the same markets!
- At the sector-level: positive effects for Korea and Singapore and negative effect for Hong Kong (cfr. Chinese exports through Hong Kong)

□ Effect of Asian import market shares

- At the product-level: negative effects from Korea and Hong Kong – positive effect from Singapore
- At the sector-level: negative effects from China, Taiwan and Hong Kong

□ Hence

- The competitive threat from China may operate through **both Hong Kong and mainland China!**
- **Korea and Singapore** appear to be the main competitors for Belgian firms because of the overlap with Belgian export destinations rather than because of how much they export to the same market



Results for export variety (subsector-level)

	[3]				[4]			
	coef.	SE	t		coef.	SE	t	
GDP	-0.01	0.00	-4.13	***	0.02	0.00	6.93	***
GDP per capita	0.03	0.00	9.03	***	0.01	0.00	4.03	***
Distance	-0.03	0.00	-9.50	***	-0.04	0.01	-8.19	***
Border	0.09	0.01	10.92	***	0.03	0.01	2.41	**
EU15	0.05	0.01	4.80	***	0.02	0.01	1.31	
EU27	0.03	0.01	3.69	***	0.05	0.02	3.33	***
Number of FTE employees	0.06	0.01	4.41	***	0.09	0.02	5.75	***
Average remuneration	0.01	0.01	1.19		0.04	0.01	2.52	**
Value added per worker	0.00	0.01	0.66		0.01	0.01	0.81	
Capital per worker	0.01	0.01	1.88	*	0.01	0.01	1.82	*
Immaterial fixed assets per worker	0.00	0.00	0.33		0.00	0.00	1.16	
China active in sector and market	0.05	0.01	5.18	***				
Korea active in sector and market	0.05	0.01	7.30	***				
Taiwan active in sector and market	0.02	0.01	2.06	**				
Singapore active in sector and market	0.09	0.01	10.83	***				
Hong Kong active in sector and market	0.02	0.01	3.18	***				
China's share in market's sectoral imports					-0.20	0.05	-3.75	***
Korea's share in market's sectoral imports					-0.42	0.12	-3.46	***
Taiwan's share in market's sectoral imports					0.29	0.11	2.60	***
Singapore's share in market's sectoral imports					0.15	0.10	1.43	
Hong Kong's share in market's sectoral imports					-0.34	0.10	-3.40	***
Constant	-0.19	0.19	-1.01		-0.67	0.27	-2.48	**
Sectoral Fixed Effects	yes				yes			
Firm Fixed Effects	yes				yes			
R ²	0.12				0.12			
F	36.74				54.74			

Note: Results based on a fixed-effects panel data estimation with robust standard errors and adjusted for clustering at the firm level; ***, **, * respectively denote statistical significance at 1 %, 5 % and 10 % level.



Results for variety

- Firm-level characteristics:
 - Size, productivity and capital intensity matter!

- Destination market characteristics:
 - GDP mostly positive effect (again affected by competition)
 - Export variety is larger if
 - Oriented towards richer markets
 - Trading partners are closer to Belgium, in particular within the EU27, or even larger when directed to neighbouring countries

- Asian competition effects:
 - Asian presence effects: Positive for all!
 - Asian market share effects: negative for China, Korea, Hong Kong – positive for Taiwan



Results for quality

	[3]				[4]			
	coef.	SE	t		coef.	SE	t	
GDP	0.08	0.07	1.10		-0.01	0.02	-0.67	
GDP per capita	-0.02	0.02	-0.94		-0.02	0.01	-1.56	
Distance	-0.13	0.13	-0.99		0.03	0.03	1.05	
Border	0.13	0.10	1.26		0.14	0.10	1.44	
EU15	-0.13	0.06	-2.03	**	-0.23	0.12	-1.99	**
EU27	0.00	0.08	0.00		0.13	0.10	1.27	
Number of FTE employees	-0.23	0.40	-0.58		-0.56	0.52	-1.09	
Average remuneration	-2.69	1.62	-1.66	*	-1.83	0.97	-1.90	*
Value added per worker	0.22	0.33	0.66		-0.30	0.33	-0.91	
Capital per worker	0.14	0.43	0.32		0.23	0.21	1.12	
Immaterial fixed assets per worker	0.17	0.19	0.92		-0.57	0.55	-1.04	
China active in sector and market	-0.76	0.85	-0.90		0.08	0.17	0.46	
Korea active in sector and market	-0.34	0.35	-0.96					
Taiwan active in sector and market	0.04	0.10	0.35					
Singapore active in sector and market	-0.06	0.10	-0.66					
Hong Kong active in sector and market	0.16	0.22	0.73					
Change in China's share in market's sectoral imports					0.02	0.02	0.89	
Change in Korea's share in market's sectoral imports					-0.02	0.02	-0.94	
Change in Taiwan's share in market's sectoral imports					-0.01	0.01	-0.77	
Change in Singapore's share in market's sectoral imports					0.01	0.01	0.41	
Change in Hong Kong's share in market's sectoral imports					-0.02	0.03	-0.84	
Constant	22.09	10.48	2.11	**	27.53	13.72	2.01	**
Sectoral Fixed Effects	yes				yes			
Firm Fixed Effects	yes				yes			
R ²	0.00				0.01			
F	335.33				9.41E+07			

Note: Results based on a fixed-effects panel data estimation with robust standard errors and adjusted for clustering at the firm level; ***, **, * respectively denote statistical significance at 1 %, 5 % and 10 % level.



Results for quality

■ Weaker results

- Not many significant determinants
 - Low explanatory power
 - Some indication for EU-effects and a human capital effect
- > Similar results if year-by-year, other sample splits, other quality indicators!

■ Still measurement of quality is useful:

- Literature claims that in particular firm-level effects should matter for export quality
- Quality upgrading can be used as an *indicator to explain* export evolutions

Results for growth in export intensity

	[4]				[5]			
	coef.	SE	t		coef.	SE	t	
Quality upgrading	0.00	0.00	7.87	***	0.00	0.00	9.99	***
Variety expansion	1.15	0.05	22.50	***	1.13	0.05	23.59	***
GDP	0.04	0.01	4.70	***	0.04	0.01	4.39	***
GDP per capita	-0.02	0.01	-1.55		-0.04	0.01	-3.53	***
Distance	0.02	0.01	1.62		0.04	0.01	2.69	***
Border	-0.08	0.03	-2.91	***	-0.07	0.03	-2.07	**
EU15	0.05	0.03	1.52		0.06	0.05	1.25	
EU27	0.09	0.03	3.61	***	0.08	0.04	1.98	**
Number of FTE employees	0.74	0.17	4.32	***	0.76	0.21	3.62	***
Average remuneration	2.37	0.38	6.20	***	2.77	0.69	4.03	***
Value added per worker	0.41	0.12	3.41	***	0.43	0.18	2.43	**
Capital per worker	-0.09	0.05	-1.91	*	-0.15	0.06	-2.33	**
Immaterial fixed assets per worker	-0.07	0.03	-2.72	***	-0.08	0.04	-2.36	**
China active in sector and market	-0.07	0.04	-1.67	*				
Korea active in sector and market	-0.06	0.03	-2.47	**				
Taiwan active in sector and market	0.04	0.03	1.45					
Singapore active in sector and market	-0.03	0.02	-1.29					
Hong Kong active in sector and market	-0.04	0.03	-1.58					
Change in China's share in market's sectoral imports					0.01	0.01	0.90	
Change in Korea's share in market's sectoral imports					-0.01	0.01	-1.29	
Change in Taiwan's share in market's sectoral imports					0.00	0.01	-0.67	
Change in Singapore's share in market's sectoral imports					-0.01	0.00	-2.09	**
Change in Hong Kong's share in market's sectoral imports					0.01	0.01	0.99	
Constant	-27.61	4.44	-6.22	***	-33.71	7.61	-4.43	***
Sectoral Fixed Effects	yes				yes			
Firm Fixed Effects	yes				yes			
R ²	0.13				0.13			
F	64.57				2.00E+11			

Note: Results based on a fixed-effects panel data estimation with robust standard errors and adjusted for clustering at the firm level; ***, **, * respectively denote statistical significance at 1 %, 5 % and 10 % level.



Results for growth in export intensity

- Results for other determinants: in line with previous findings

- MAIN finding: quality upgrading and variety expansion lead to growth in export intensity!
 - Hence: compensating effects for e.g. Asian competition
 - Effect of variety expansion is larger than of quality upgrading
 - Very significant effects!



Results at the Sectoral Level

- Main points are confirmed at the sectoral level

- China:
 - gradually moving from labour-intensive sectors towards higher-value-added sectors
 - Traditional strongholds in Belgian industry
 - China-effect and Hong-Kong-effect differ at the sectoral level

- Asian Tigers: Very diverse and offsetting effects

- *Product differentiation* is chosen as a strategy regardless of the sector's factor intensity and appears to be a successful strategy in most industrial sectors in order to boost exports

- *Quality upgrading* is an adequate strategy in many sectors, but not in labour-intensive sectors producing standardized goods



Results by Regions of the World

- Overall strong competitive pressure from China on Belgian export intensity (idem Hong Kong)
 - In Europe and Africa: pressure from Hong Kong and China
 - Elsewhere: especially through Hong Kong!
 - In Latin America no effect

- Core competence story holds for Belgian exports towards Europe, Russia and Far-eastern Europe <-> product differentiation strategy in Asian, Middle-East and Mediterranean (no effect in Africa and Americas)

- Diverse effect of Asian tigers on Belgian export variety in different regions



Summary of Results

- Unique dataset with detailed levels
- Combination of explanations for export intensity, export variety, export quality and growth in export intensity:
 - Firm characteristics
 - Country characteristics
 - Asian Competition effects
- Current results imply that variety expansion and quality upgrading are important corporate strategies and good economic policies to cope with Asian competition.
- We know some factors that drive export intensity and export variety, but we don't know much (yet) about quality of international trade.



Robustness checks and extensions

- For firm-level characteristics: age, turnover, profitability, capital structure, entry and exit, starting to export
- Careful calculation of quality within the current concept
- Different sectoral levels



Conclusions and Implications

1. Belgian exporting firms are heterogeneous which affects export performance.
 - Many Belgian exporters are single-variety firms
 - Gradually more and more companies are becoming multi-variety firms – substantial variation in the number of exported varieties
 - Number of very-large-variety firms is limited
 - Large, more productive and skill-intensive firms export more and sell more products in foreign markets
 - Capital intensity and innovation intensity do not affect export intensity
 - Firm characteristics hardly matter for quality of trade
2. Not all export markets are equal for Belgian exporters
 - Strong focus on bordering EU trading partners
 - Also variety much higher in neighbouring countries
 - Distance reduces the variety in Belgian exports
 - Exports primarily directed to larger and richer countries



Conclusions and Implications

3. Impact of Asian competition is clearly felt by Belgian exporters
 - Export markets of Belgian and Asian firms overlap! Hence strong competition within Europe!
 - Different effects for different Asian competitors
 - “Double-headed Chinese Dragon”
 - Korea: serious competitor in Europe and Asia
 - Singapore: competitor in Europe and North America (variety!)
 - Taiwan: only strong competitor in selected markets
4. Belgian exporters cope well with Chinese and Asian competition in traditionally strong sectors of Belgian manufacturing
 - Both capital-intensive sectors (e.g., chemicals and plastic) and labour-intensive sectors (e.g., leather and food and beverages)
 - BUT: strong Chinese competition in labour-intensive sectors as well as in some higher value-added sectors!
 - Both in capital-intensive and labour-intensive sectors Belgian firms opt for a product differentiation strategy when facing Asian competition



Conclusions and Implications

5. Both a variety expansion strategy and a quality upgrading strategy may lead to an expansion of exports by Belgian firms
 - Compensation for Asian competition
 - Variety expansion strategy is most effective



The Future of Belgian Exports

- Scope for product differentiation is not yet exhausted
 - Should be achieved in neighbouring European countries by smaller exporters
 - Should also be possible for larger, multi-product exporters in more distant export markets

- Quality upgrading, including focusing on higher value added goods, is an alternative strategy, except for industrial sectors mainly consisting of standardized goods

- Belgian exporters should focus more on fastly-growing markets outside Europe (cfr. Germany, Switzerland)