

German Firms in International Trade: Evidence from Recent Transaction-level Data

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Motivation

- Recent theoretical literature on heterogeneous firms highly influenced by empirical findings from micro-level data [Melitz \(2003\)](#), [Bernard and Jensen \(1995, 1999\)](#)
 - Internationally active firms differ substantially from purely domestic firms
 - Within the group of internationally active firms, activities are highly concentrated
- Customs transaction data has been used to explore the role of firms for a number of developing countries, but also developed countries such as
 - United States (US) in 1997 and 2007 [Bernard et al. \(2007, 2018\)](#)
 - France in 2003 [Mayer and Ottaviano \(2008\)](#)
 - Hungary in 1999 [Békés et al. \(2011\)](#)
- We use German transaction-level data for the year 2018 to explore the differences in activities within the group of trading German firms
 - Largest European economy
 - Third largest exporter and importer of the world after China and the US
 - Very recent period after the financial crisis

German transaction-level data

- Covers most in- and outgoing German extra-EU transactions (some transactions cannot be assigned to firms) and a large proportion of German intra-EU transactions (due to reporting thresholds and practices) for the years 2009-2018
- For each export/import transaction, we observe i.a. time (month/year), German firm ID, 8-digit product ID, country of origin/destination, and transaction value
- Via firm ID, we can merge information on main economic activity according to the Statistical Classification of Economic Activities in the European Community (NACE, Rev. 2) from firm register data
 - Allows to distinguish manufacturing firms from wholesale and retail firms
[Bernard et al. \(2010, 2015\)](#)
- Earlier versions have been used to answer a whole array of specific questions related to firm heterogeneity [Wagner \(2016, 2019, 2021\)](#), [Schank et al. \(2007\)](#)

This paper

- Focus on the most recent year available (2018; we will update this to 2019 in the upcoming version of the paper)
- Detailed dissection of German exports and imports along multiple firm-level margins
 - Who trades what?
 - Trade by firm categories (manufacturing, wholesaler, retailer, rest)
 - Trade by product types (HS sections: 22 categories)
 - Trade by firm categories and product types
 - Margin decompositions
 - Joint country-product distributions
- Coherent „grand picture“ of recent German firm-level trade

Data

The main data: AH-Core (AH for Außenhandel)

- Prepared by the German Federal Statistical Office
- Problem 1: Intra-EU trade value can be collectively reported by a conglomerate in the raw data → distribution to subsidiaries using additional data
- Problem 2: Unlike extra-EU trade, where tariffs require precise data collection, intra-EU trade is only recorded when firms surpass specific reporting thresholds → redistribution using VAT data [Kruse et al. \(2021\)](#)
- Subject to continuous updates
- Will be made available to the research community (2023?)

2018 Coverage	Extra	Intra
Exports	85.38 (87.86)	77.78 (82.73)
Imports	82.67 (87.34)	79.44 (83.48)

Data Infrastructure

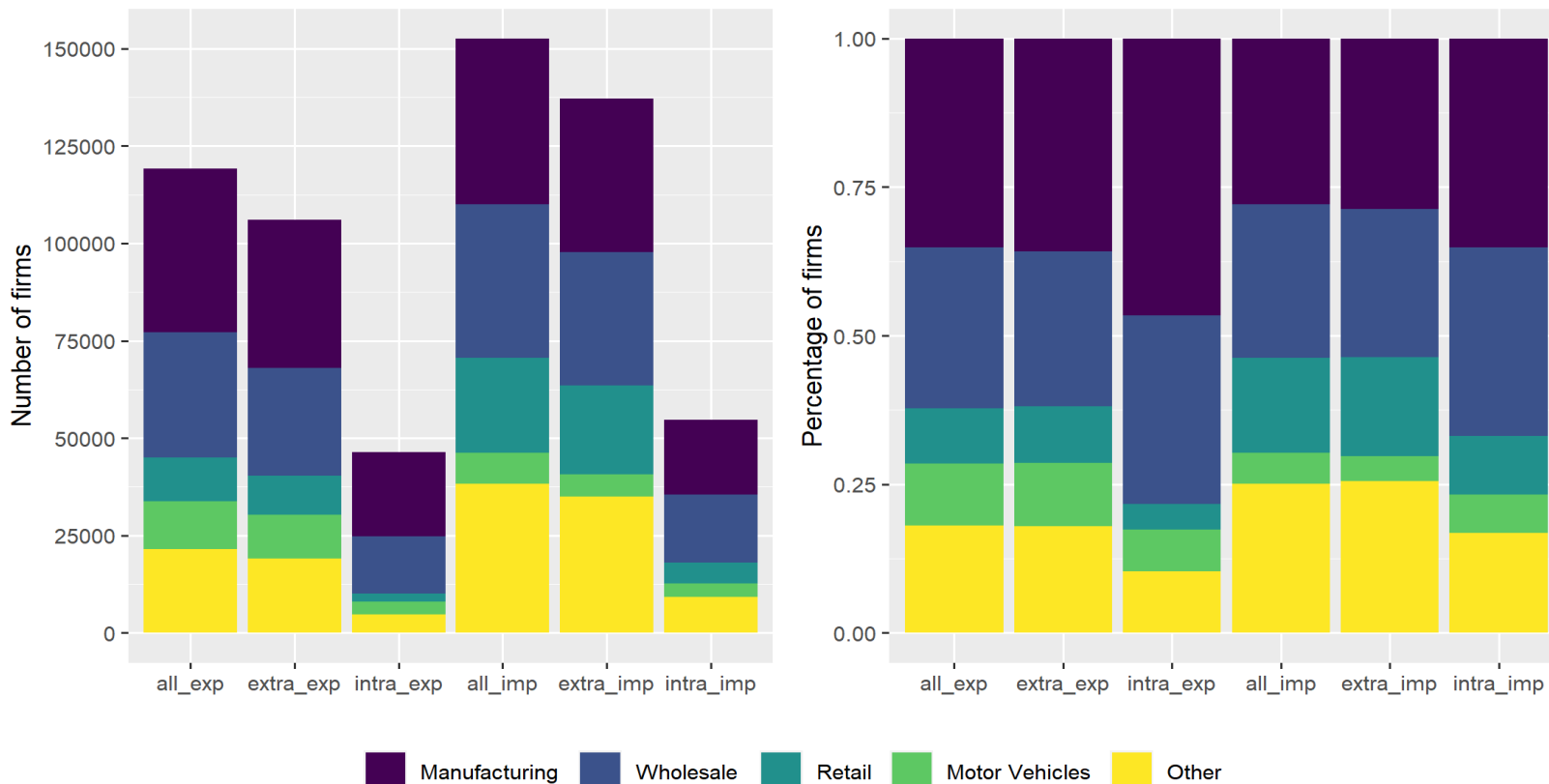
- **AH-Core** (extra- and intra-EU trade subject to restrictions, mergeable)
- AH-Extra (almost 100% coverage of extra-EU trade, not mergeable)
- **AH-Steuer** (intra-EU trade below reporting thresholds, no product info)
- **URS-Merkmale** (basic firm information such as sector, revenue, state, employees)
- Invest-Core (detailed investment data, not all firms/sectors)
- Produktionsmerkmale (product-level production values and quantities, not all firms/sectors)
- Eventually: Bundesbank data on trade in services

Who trades what?

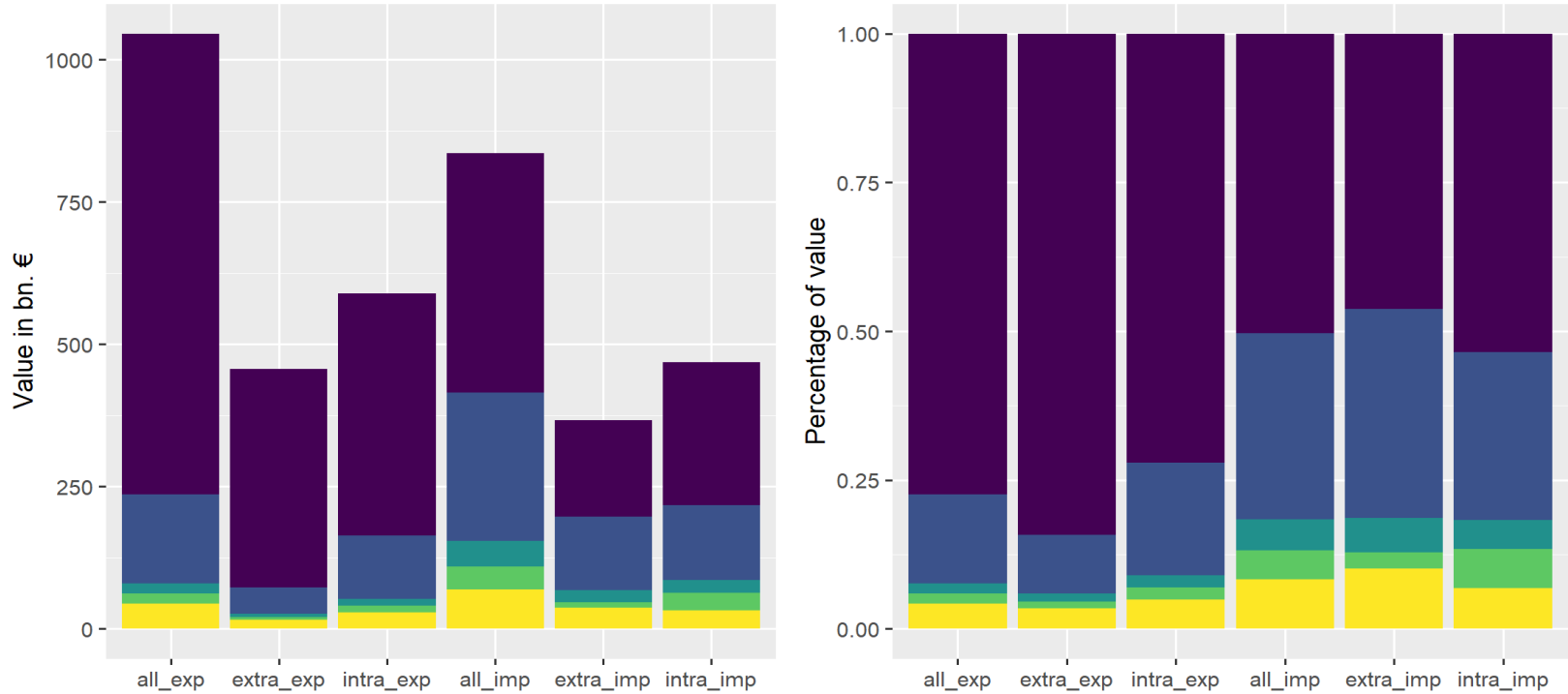
Trade by firm categories

- Merge firms' **primary economic activity**
 - Five categories (Manufacturing, Wholesale, Retail, Vehicles, Others)
Bernard et al. (2010), Blum et al. (2010), etc.
- Focus for now on the **firms** (ignoring information about products): What are the differences in the trade activities of manufacturing firms vs. wholesalers/retailers?
- We count for each firm category and trade direction:
 - the **number of trading firms** in total, extra-EU and intra-EU
 - the **value of traded goods** in total, extra-EU and intra-EU

Trade by firm categories: Firms (2018)



Trade by firm categories: Value (2018)



Manufacturing
 Wholesale
 Retail
 Motor Vehicles
 Other

Trade by firm categories

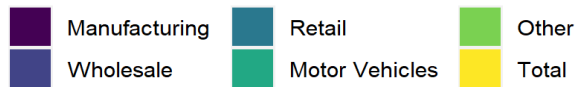
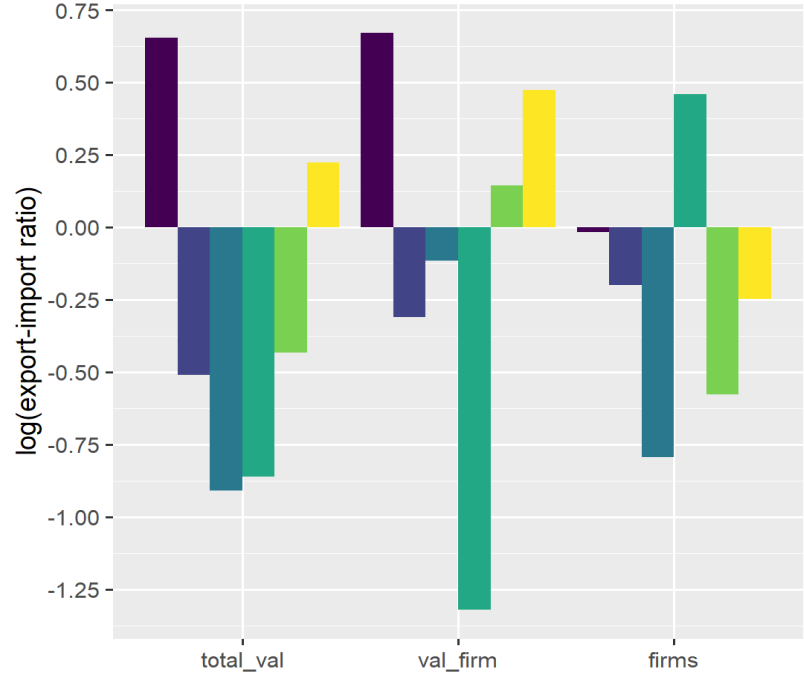
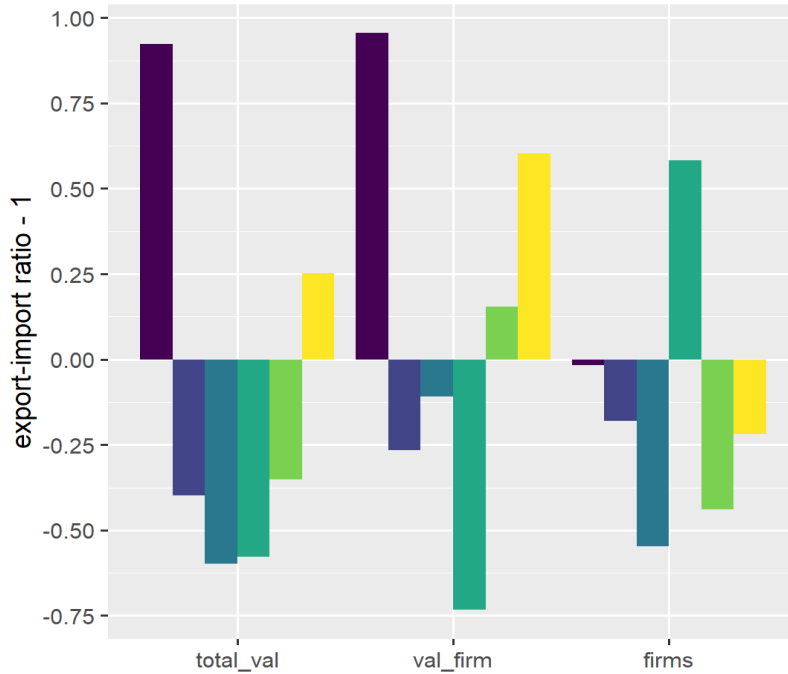
Firm Category	All Trade		Extra-EU		Intra-EU	
	# of exporters	# of importers	# of exporters	# of importers	# of exporters	# of importers
Manufacturing	41,908	42,605	38,045	39,325	21,628	19,243
Wholesale	32,273	39,386	27,590	34,272	14,698	17,390
Retail	11,066	24,467	10,017	22,751	1,973	5,374
Motor Vehicles	12,341	7,796	11,323	5,762	3,292	3,551
Other	21,520	38,345	19,043	35,000	4,775	9,194
Total	119,108	152,599	106,018	137,110	46,366	54,752

Firm Category	Exports (bn. €)	Extra-EU share	Imports (bn. €)	Extra-EU share
Manufacturing	809.4	47.5%	420.7	40.3%
Wholesale	156.7	28.8%	260.8	49.4%
Retail	17.8	34.3%	44.2	47.7%
Motor Vehicles	17.2	30.2%	40.7	24.8%
Other	44.8	35.3%	69.1	53.5%
Total	1045.9	43.7%	835.5	43.9%

Trade by firm categories

- In total, we have 119k exporting and 153k importing firms in the data
- Intra-EU trade somewhat underrepresented due to **reporting limits**
- **Exports**: Most firms active in manufacturing and wholesale; ca. 80% of the export value from the manufacturing sector (about half of this goes to non-EU destinations)
- **Imports**: relatively more retailers and other firms; only 50% of the import volume comes from manufacturing firms (about half of this comes from non-EU origins), a third comes from wholesalers (thereof only one quarter from non-EU origins)

Trade surplus (2018)



Trade surplus

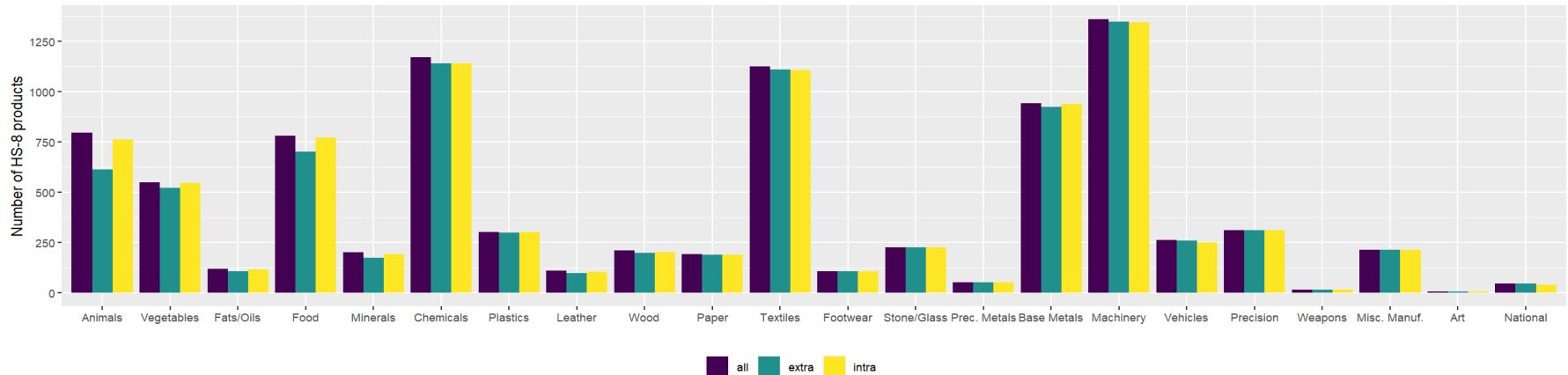
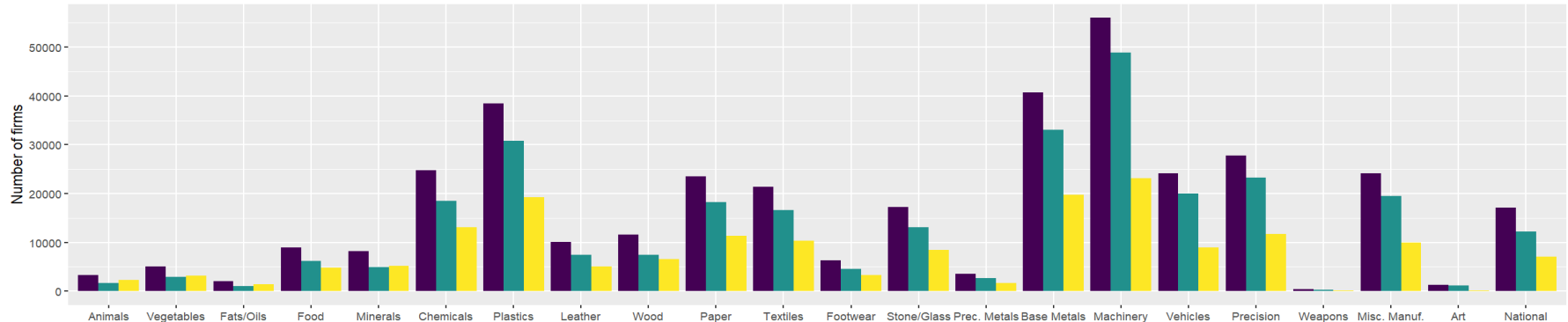
	Ratio of exports to imports		
Firm Category	Total values	Values per firm	Number of firms
Manufacturing	1.924	1.956	0.984
Wholesale	0.601	0.733	0.819
Retail	0.403	0.890	0.452
Vehicles	0.423	0.297	1.583
Other	0.648	1.155	0.561
Total	1.252	1.604	0.781

- Overall trade surplus driven by an overproportionately large intensive margin surplus
- Strongest surplus found in manufacturing, driven entirely by the intensive margin
- All other sectors actually exhibit trade deficits

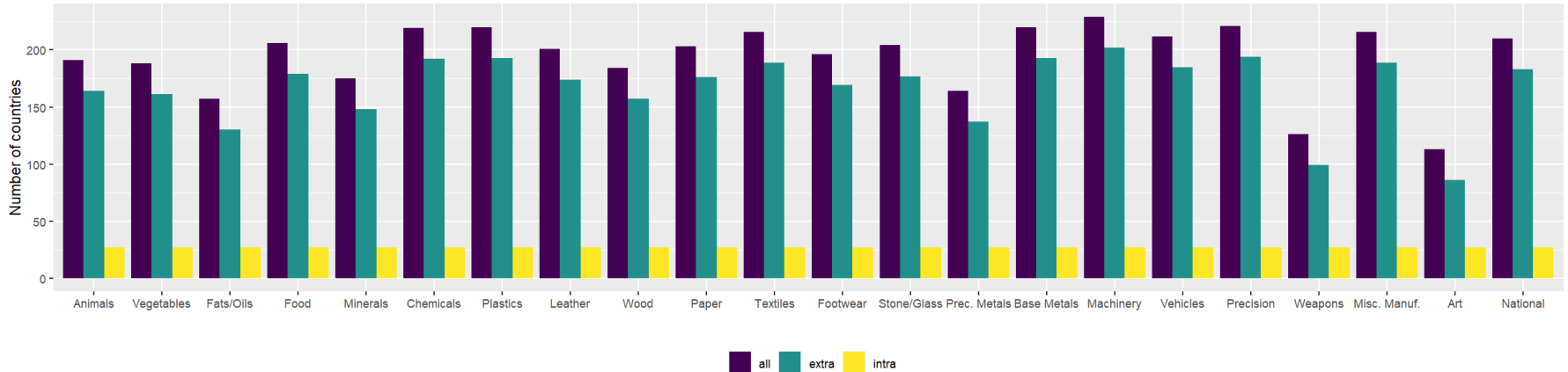
Trade by product types

- Focus now on the **traded products**
- We switch the scope of our analysis to the **HS section** level
 - 22 product sections (21 standard + 1 national categories)
- We count for each product group and trade direction:
 - the number of trading firms
 - the number of traded 8-digit products (within the HS section)
 - the number of partner countries

Trade by product types: Exports (2018)



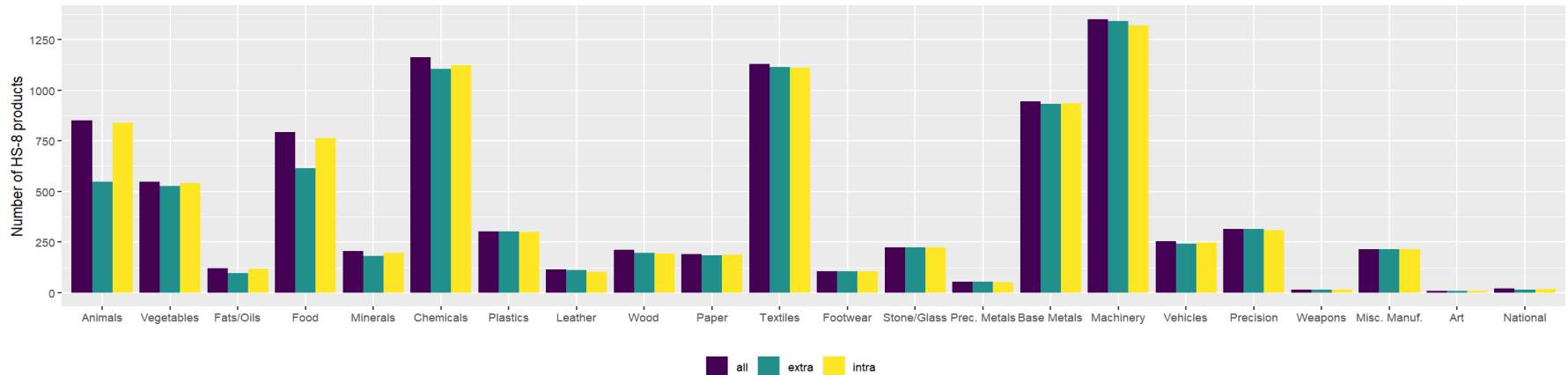
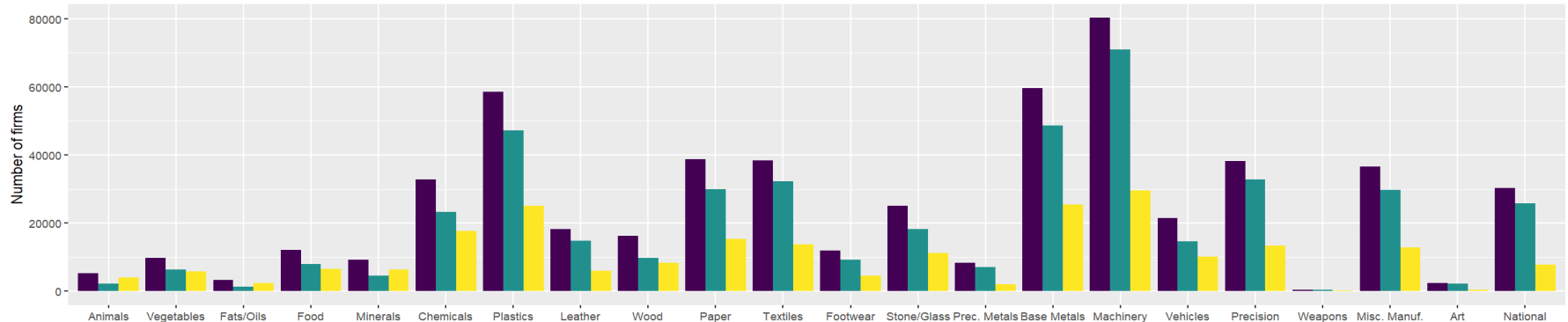
Trade by product types: Exports (2018)



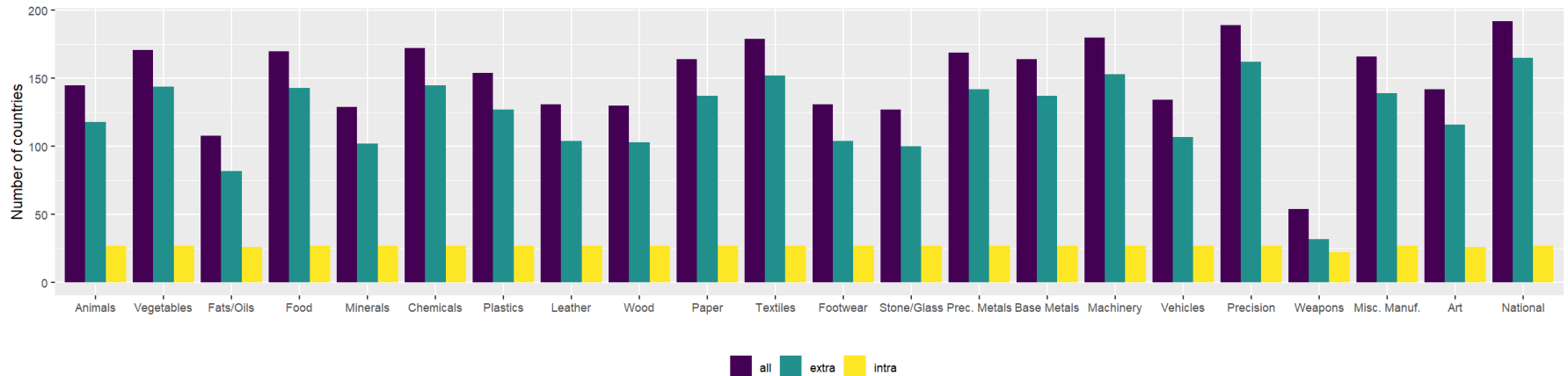
Trade by product types: Exports

HS Section	Description	Number of firms			Number of products				Number of countries		
		Total	Extra-EU	Intra-EU	Maximum	Total	Extra-EU	Intra-EU	Total	Extra-EU	Intra-EU
	1 Live Animals; Animal Products	3,273	1,664	2,232	953	797	613	763	191	164	27
	2 Vegetable Products	5,018	2,902	3,158	550	550	520	546	188	161	27
	3 Animal or Vegetable Fats and Oils	2,076	1,054	1,438	129	118	106	115	157	130	27
	4 Food, Beverages, Tobacco	8,979	6,218	4,784	864	781	702	772	206	179	27
	5 Mineral Products	8,193	4,910	5,216	233	200	172	193	175	148	27
	6 Chemical Products	24,734	18,522	13,050	1,225	1,172	1,142	1,142	219	192	27
	7 Plastics and Rubber	38,410	30,738	19,233	301	300	297	300	220	193	27
	8 Leather	10,056	7,439	5,035	130	108	98	102	201	174	27
	9 Wood	11,576	7,394	6,549	233	210	199	202	184	157	27
	10 Paper	23,504	18,212	11,276	195	191	189	190	203	176	27
	11 Textiles	21,340	16,569	10,369	1,140	1,126	1,110	1,108	216	189	27
	12 Footwear and Headgear	6,300	4,543	3,246	106	106	106	106	196	169	27
	13 Stone Products	17,178	13,041	8,494	234	225	225	224	204	177	27
	14 Precious Metals	3,495	2,619	1,618	56	51	50	51	164	137	27
	15 Base Metals	40,695	33,070	19,708	950	943	925	940	220	193	27
	16 Machinery and Electronics	56,015	48,853	23,089	1,362	1,361	1,349	1,344	229	202	27
	17 Vehicles	24,117	19,985	8,884	268	262	258	251	212	185	27
	18 Precision Instruments	27,754	23,285	11,687	313	312	311	310	221	194	27
	19 Weapons	371	247	203	16	16	16	16	126	99	27
	20 Miscellaneous Manufacturing	24,092	19,528	9,971	214	214	214	213	216	189	27
	21 Art	1,230	1,158	147	7	7	7	7	113	86	27
	22 National Categories	17,079	12,222	7,006	NA	44	44	39	210	183	27
	Total	119,108	106,018	46,366	9,479	9,094	8,653	8,934	243	216	27

Trade by product types: Imports (2018)



Trade by product types: Imports (2018)



Trade by product types: Imports

HS Section	Description	Number of firms			Number of products			Number of countries			
		Total	Extra-EU	Intra-EU	Maximum	Total	Extra-EU	Intra-EU	Total	Extra-EU	Intra-EU
	1 Live Animals; Animal Products	5,274	2,245	3,992	953	851	548	837	145	118	27
	2 Vegetable Products	9,675	6,426	5,722	550	549	526	542	171	144	27
	3 Animal or Vegetable Fats and Oils	3,312	1,353	2,411	129	122	97	117	108	82	26
	4 Food, Beverages, Tobacco	12,028	7,876	6,525	864	793	614	762	170	143	27
	5 Mineral Products	9,228	4,558	6,418	233	205	182	195	129	102	27
	6 Chemical Products	32,763	23,243	17,598	1,225	1,162	1,106	1,124	172	145	27
	7 Plastics and Rubber	58,502	47,216	25,112	301	301	301	298	154	127	27
	8 Leather	18,218	14,752	5,893	130	116	112	101	131	104	27
	9 Wood	16,159	9,804	8,355	233	210	197	193	130	103	27
	10 Paper	38,740	29,968	15,310	195	191	183	188	164	137	27
	11 Textiles	38,458	32,249	13,773	1,140	1,129	1,113	1,110	179	152	27
	12 Footwear and Headgear	11,989	9,275	4,544	106	106	106	106	131	104	27
	13 Stone Products	25,012	18,200	11,242	234	225	225	223	127	100	27
	14 Precious Metals	8,334	7,135	1,979	56	54	54	51	169	142	27
	15 Base Metals	59,530	48,556	25,353	950	946	931	936	164	137	27
	16 Machinery and Electronics	80,266	70,939	29,615	1,362	1,351	1,341	1,321	180	153	27
	17 Vehicles	21,387	14,671	10,205	268	254	241	249	134	107	27
	18 Precision Instruments	38,122	32,726	13,307	313	313	313	309	189	162	27
	19 Weapons	454	370	143	16	16	16	16	54	32	22
	20 Miscellaneous Manufacturing	36,489	29,664	12,804	214	214	214	214	166	139	27
	21 Art	2,358	2,140	341	7	7	7	7	142	116	26
	22 National Categories	30,211	25,704	7,835	NA	21	15	19	192	165	27
	Total	152,599	137,110	54,752	9,479	9,136	8,442	8,918	243	216	27

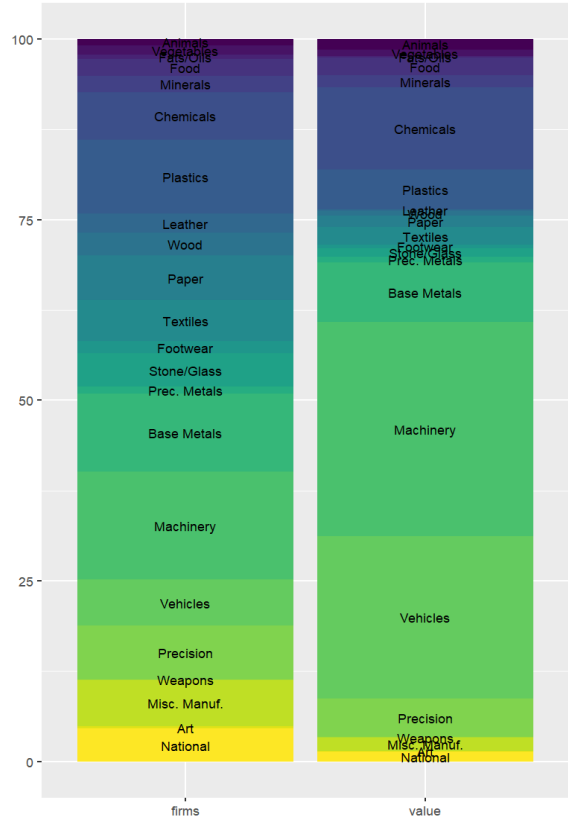
Trade by product types

- Almost half of all firms export **machinery and electronics** products
- There, as in most other product groups, the exported products are **well balanced** (almost all products are exported by at least one German firm) and have their destinations **all over the world**
- More than half of all importing firms also source machinery and electronics products, suggesting a strong presence of **intra-industry trade** and input-output linkages

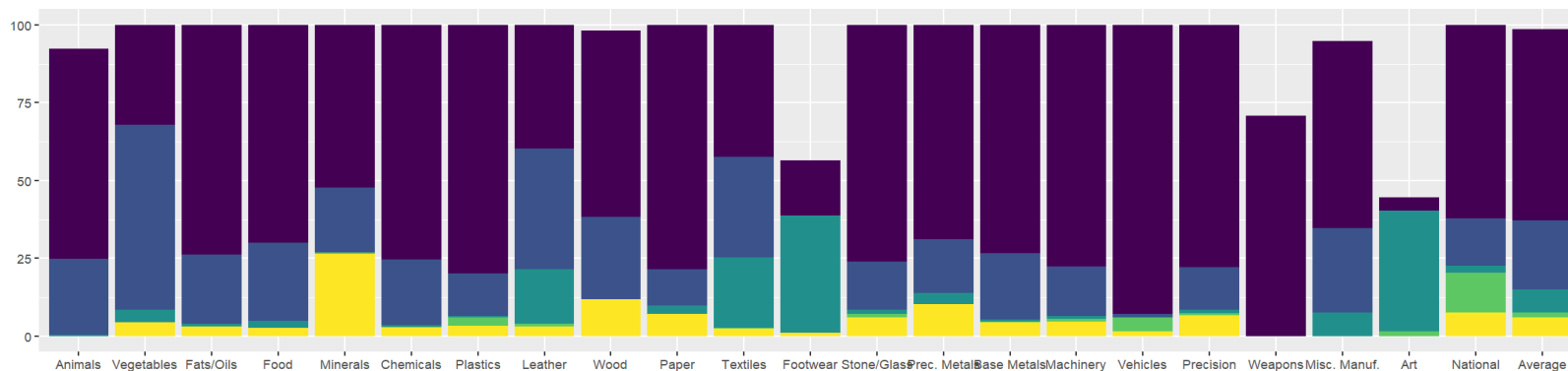
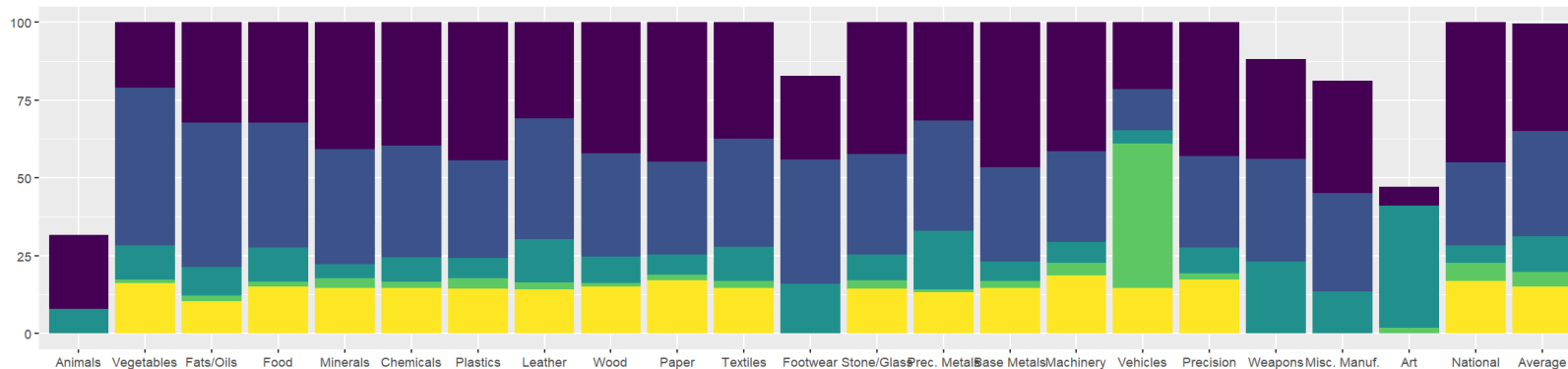
Trade by firm categories and product types

- Focus now simultaneously on both dimensions: **Who** (firms in their categories) trades **what** (products in their HS sections)?
- We compute for each product group and trade direction:
 - the relative composition of trade (number of firms and value) **across all firm categories** (first two columns, columns sum to 100%)
 - the relative composition of trade (number of firms and value) **within the firm categories** (remaining columns, rows sum to 100%)

Trade by firm categories and product types: Exports (2018)



Trade by firm categories and product types: Exports (2018)



manu whole retail motor other

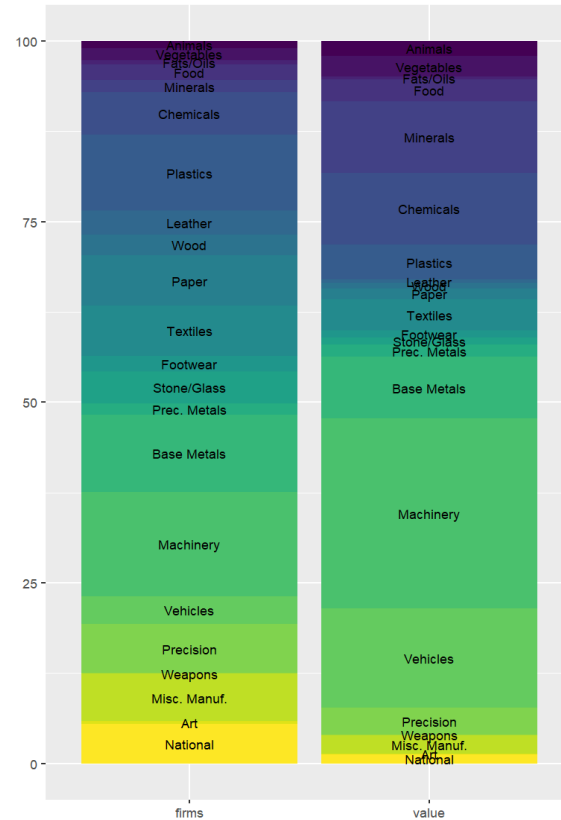
Trade by firm categories and product types: Exports

HS Section	Description	Total		Manufacturing		Wholesale		Retail		Motor Vehicles		Other	
		Exporters	Exports	Exporters	Exports	Exporters	Exports	Exporters	Exports	Exporters	Exports	Exporters	Exports
1	Live Animals; Animal Products	0.87	1.49	23.95	67.43	45.22	24.48	7.79	0.33	NA	NA	NA	NA
2	Vegetable Products	1.34	0.90	20.92	32.16	50.82	59.32	11.04	NA	1.00	NA	16.22	4.47
3	Animal or Vegetable Fats and Oils	0.55	0.15	32.27	73.89	46.44	22.09	9.10	0.91	1.78	0.00	10.40	3.11
4	Food, Beverages, Tobacco	2.39	2.52	32.26	69.98	40.06	25.08	11.08	2.25	1.44	0.03	15.16	2.65
5	Mineral Products	2.18	1.64	40.69	52.23	37.13	20.85	4.46	0.14	3.19	0.37	14.54	26.41
6	Chemical Products	6.59	11.36	39.65	75.28	35.92	21.20	7.86	0.56	1.97	0.06	14.60	2.91
7	Plastics and Rubber	10.23	5.48	44.32	79.80	31.49	13.76	6.34	0.54	3.39	2.54	14.46	3.37
8	Leather	2.68	0.24	30.93	39.62	38.77	38.80	13.78	17.55	2.36	0.95	14.16	3.08
9	Wood	3.08	0.67	42.02	59.94	33.22	26.32	8.47	NA	1.19	NA	15.10	11.91
10	Paper	6.26	1.62	44.81	78.49	29.89	11.66	6.50	2.65	NA	NA	NA	NA
11	Textiles	5.68	2.41	37.39	42.31	34.74	32.31	10.97	22.80	2.34	0.25	14.56	2.34
12	Footwear and Headgear	1.68	0.45	26.98	17.62	39.78	42.73	16.00	37.66	2.86	0.85	14.38	1.14
13	Stone Products	4.57	1.17	42.25	75.94	32.43	15.57	8.23	1.37	2.72	1.08	14.37	6.04
14	Precious Metals	0.93	0.86	31.50	68.83	35.57	17.23	18.77	3.73	0.97	NA	13.19	NA
15	Base Metals	10.84	8.17	46.68	73.36	30.15	21.41	6.29	0.57	2.17	0.24	14.71	4.42
16	Machinery and Electronics	14.92	29.66	41.50	77.60	28.97	15.88	6.93	1.01	3.93	0.85	18.67	4.66
17	Vehicles	6.42	22.50	21.49	92.90	13.29	1.05	4.18	0.14	46.43	4.29	14.61	1.62
18	Precision Instruments	7.39	5.33	43.01	77.91	29.42	13.53	8.21	1.26	1.99	0.55	17.37	6.76
19	Weapons	0.10	0.04	32.08	70.72	32.88	NA	23.18	NA	NA	NA	NA	NA
20	Miscellaneous Manufacturing	6.42	1.89	36.17	59.97	31.47	27.19	13.56	7.55	2.52	NA	16.28	NA
21	Art	0.33	0.07	5.93	4.11	9.67	NA	39.27	NA	NA	NA	NA	NA
22	National Categories	4.55	1.37	44.93	62.20	26.82	15.26	5.52	2.10	5.82	12.85	16.92	7.58
	Total/Mean	100.00	100.00	34.63	61.47	33.96	22.26	11.25	7.31	4.79	1.51	15.07	6.10

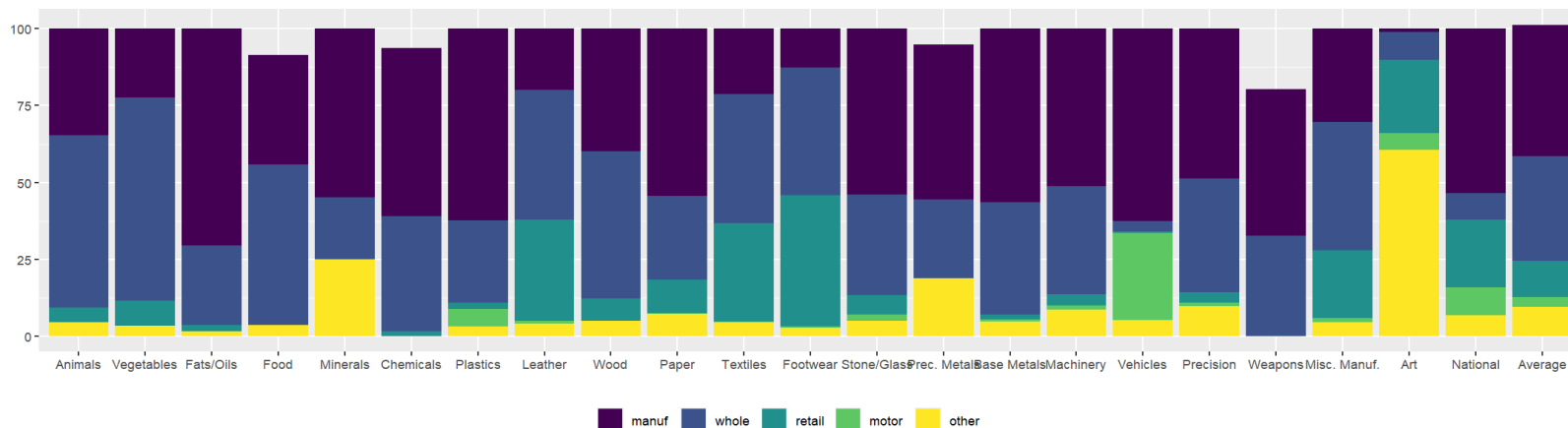
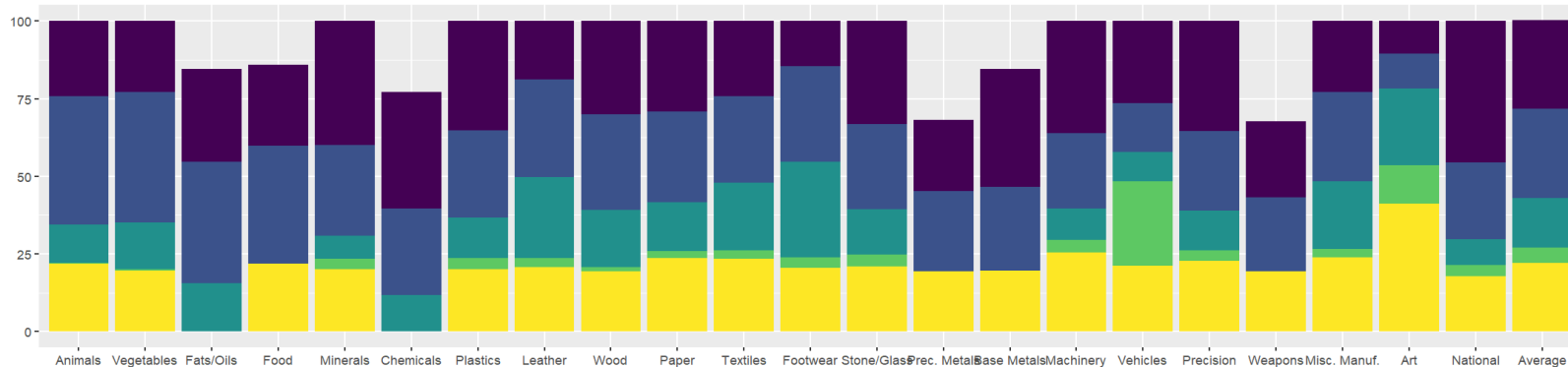
Trade by firm categories and product types: Exports

- About half of all exports are **machinery and electronics** or **vehicles**
- Here, firms export **overproportionately large trade volumes**, while this is reversed for most other product groups (except chemicals)
- For **vehicles**, 93% of volume is exported by manufacturing firms, although 46% of active firms are vehicles traders (only 4% of volume)

Trade by firm categories and product types: Imports (2018)



Trade by firm categories and product types: Imports (2018)



Trade by firm categories and product types: Imports

HS Section	Description	Total		Manufacturing		Wholesale		Retail		Motor Vehicles		Other	
		Importers	Imports	Importers	Imports	Importers	Imports	Importers	Imports	Importers	Imports	Importers	Imports
1	Live Animals; Animal Products	0.95	2.06	24.16	34.67	41.39	56.09	12.31	4.66	NA	NA	NA	NA
2	Vegetable Products	1.74	2.91	22.80	22.37	42.12	66.12	14.96	NA	0.44	NA	19.68	3.44
3	Animal or Vegetable Fats and Oils	0.60	0.33	29.92	70.46	39.19	25.93	15.52	2.14	0.42	0.01	14.95	1.45
4	Food, Beverages, Tobacco	2.16	3.04	26.06	35.75	38.08	52.25	13.42	8.41	0.68	0.07	21.76	3.52
5	Mineral Products	1.66	9.93	39.89	54.87	29.28	19.95	7.40	0.17	3.46	0.02	19.97	25.00
6	Chemical Products	5.89	9.88	37.49	54.62	28.00	37.45	11.63	1.61	2.07	0.11	20.80	6.21
7	Plastics and Rubber	10.51	4.88	35.27	62.31	28.04	26.77	13.12	2.16	3.52	5.54	20.05	3.22
8	Leather	3.27	0.46	18.86	19.79	31.41	42.43	26.01	32.84	2.90	0.94	20.81	4.01
9	Wood	2.90	0.78	30.16	39.88	30.68	47.82	18.45	NA	1.25	NA	19.46	4.87
10	Paper	6.96	1.42	29.07	54.47	29.40	27.12	15.53	10.97	NA	NA	NA	NA
11	Textiles	6.91	4.36	24.26	21.36	27.74	41.90	21.93	32.07	2.55	0.27	23.52	4.40
12	Footwear and Headgear	2.15	0.94	14.52	12.69	30.89	41.42	30.78	42.73	3.26	0.49	20.55	2.68
13	Stone Products	4.49	1.06	33.28	53.87	27.41	32.86	14.47	6.22	3.98	2.05	20.87	4.99
14	Precious Metals	1.50	1.65	22.88	50.33	25.85	25.76	30.05	5.14	1.76	NA	19.46	NA
15	Base Metals	10.70	8.55	38.03	56.36	26.95	36.74	12.24	1.57	3.19	0.54	19.59	4.79
16	Machinery and Electronics	14.42	26.28	36.04	51.16	24.42	35.35	10.06	3.45	3.96	1.49	25.52	8.55
17	Vehicles	3.84	13.71	26.46	62.48	15.77	3.48	9.30	0.43	27.33	28.43	21.12	5.17
18	Precision Instruments	6.85	3.79	35.38	48.62	25.65	37.22	12.95	3.21	3.29	1.30	22.73	9.65
19	Weapons	0.08	0.02	24.45	47.52	23.79	NA	30.18	NA	NA	NA	NA	NA
20	Miscellaneous Manufacturing	6.56	2.60	22.88	30.30	28.82	41.81	21.81	22.04	2.65	NA	23.84	NA
21	Art	0.42	0.05	10.39	0.96	11.41	NA	24.64	NA	NA	NA	NA	NA
22	National Categories	5.43	1.29	45.51	53.40	24.83	8.63	8.19	22.01	3.56	9.15	17.91	6.80
	Total/Mean	100.00	100.00	28.53	42.65	28.69	34.05	16.06	11.97	4.82	3.18	22.15	9.42

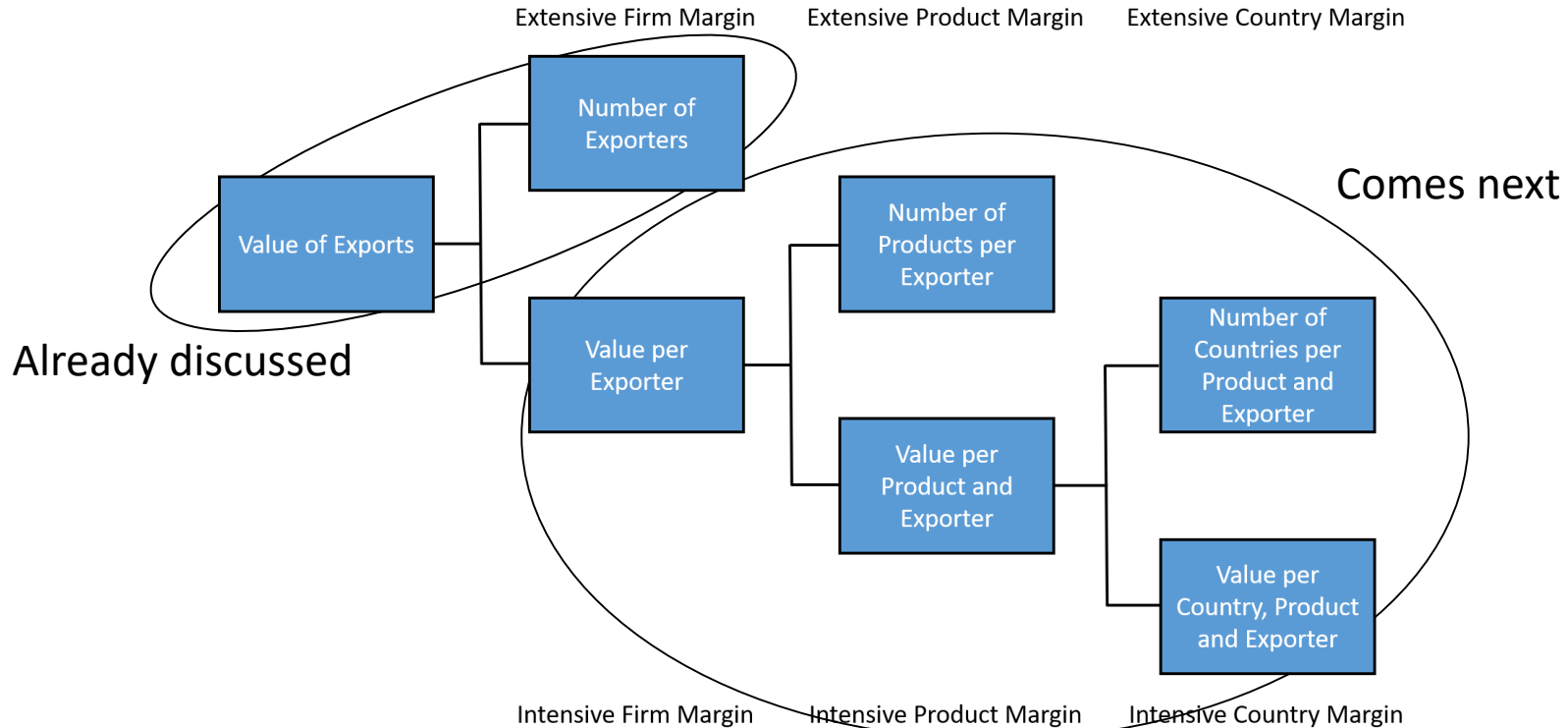
Trade by firm categories and product types: Imports

- Similar pattern for **imports**, dominating sectors exhibit significantly larger value shares than firm shares, but the difference is somewhat less pronounced
- Manufacturing firms are slightly less prominent compared to exports, many product groups where **wholesalers** are more important
- **Inter-industry** trade e.g. for import-heavy minerals, but many groups with high levels of **intra-industry** trade

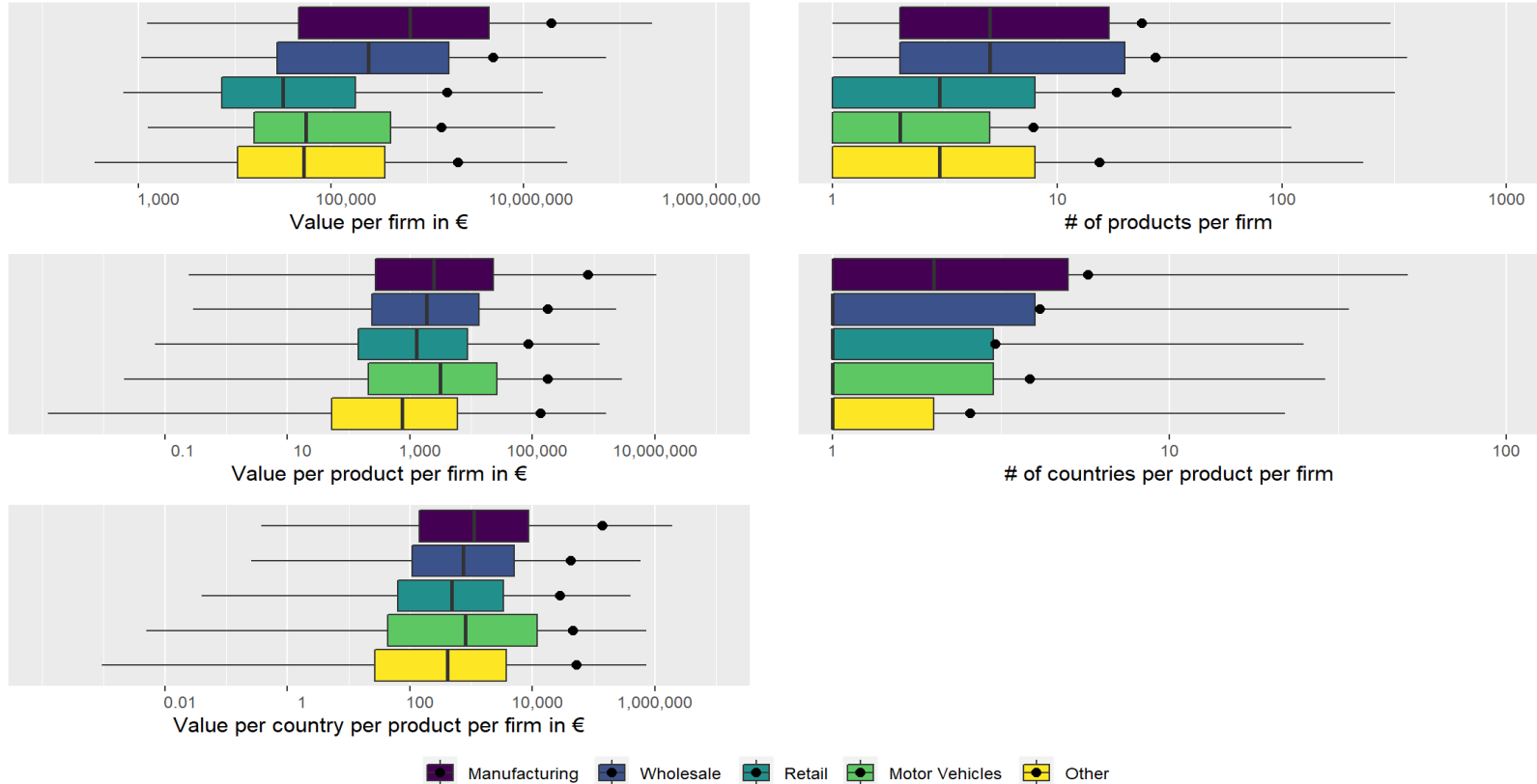
Margin decompositions

Margin decompositions

Mayer and Ottaviano (2008)



Margin decomposition for total exports (2018)



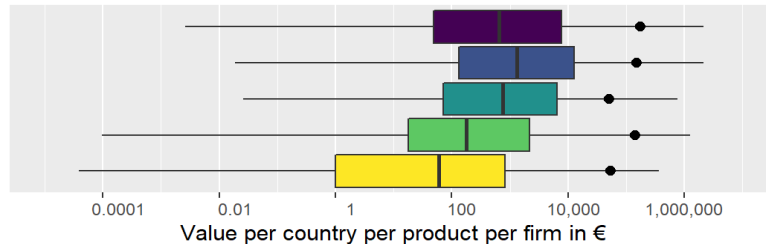
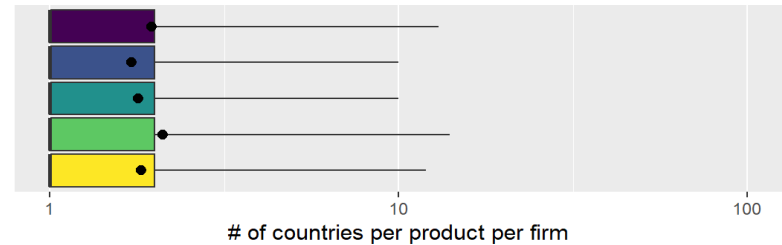
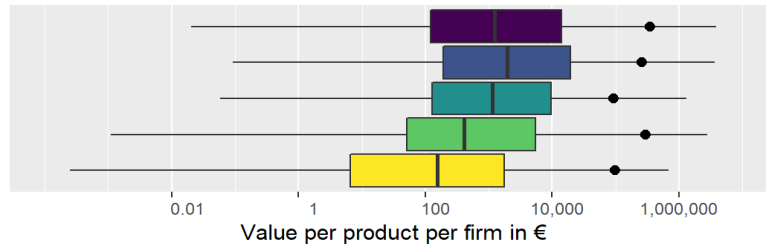
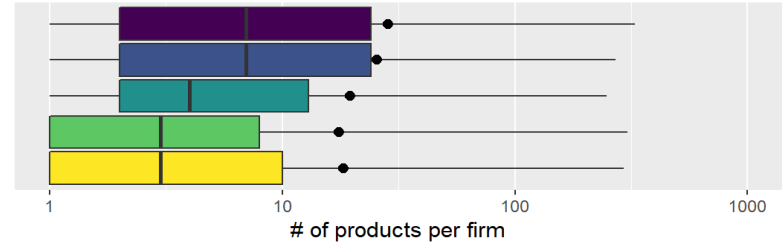
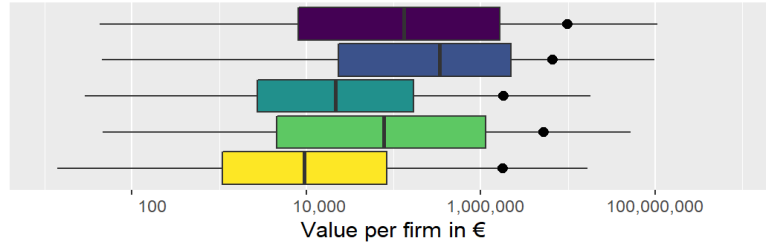
Margin decomposition for total exports

Margin	Firm Category	Mean	Std. Dev.	P1	P25	P50	P75	P99
Value per firm	Manufacturing	19,312,758	466,455,577	1,238	46,360	654,461	4,350,107	214,945,207
	Wholesale	4,853,957	50,981,476	1,066	27,504	241,645	1,681,189	72,265,616
	Retail	1,611,315	38,447,890	695	7,345	31,750	177,984	15,830,258
	Motor Vehicles	1,394,436	9,589,693	1,251	15,908	54,703	414,705	21,039,573
	Other	2,081,470	39,218,885	350	10,729	52,100	364,238	28,213,194
# of products per firm	Manufacturing	23.9	63.3	1	2	5	17	305
	Wholesale	27.5	76.6	1	2	5	20	360
	Retail	18.5	80.6	1	1	3	8	318
	Motor Vehicles	7.9	39.9	1	1	2	5	110
	Other	15.4	63.4	1	1	3	8	231
Value per product per firm	Manufacturing	808,282	33,584,734	0	273	2,456	22,916	10,677,176
	Wholesale	176,817	6,546,193	0	242	1,859	13,417	2,331,660
	Retail	87,067	1,374,757	0	145	1,280	8,700	1,257,474
	Motor Vehicles	177,132	1,930,131	0	208	3,163	25,998	2,859,507
	Other	134,874	4,007,334	0	53	755	6,031	1,604,956
# of countries per product per firm	Manufacturing	5.7	10.1	1	1	2	5	51
	Wholesale	4.1	6.8	1	1	1	4	34
	Retail	3.1	4.7	1	1	1	3	25
	Motor Vehicles	3.9	6.3	1	1	1	3	29
	Other	2.6	4.3	1	1	1	2	22
Value per country per product per firm	Manufacturing	140,660	6,365,609	0	141	1,100	8,731	1,885,958
	Wholesale	42,726	2,130,101	0	110	750	5,080	580,830
	Retail	28,521	557,335	0	64	477	3,348	395,161
	Motor Vehicles	45,916	525,228	0	44	805	11,900	720,764
	Other	52,526	1,477,676	0	27	410	3,696	720,004

Margin decomposition for total exports

- Export value per firm: On average highest for manufacturing firms, but huge variance
- The average wholesaler exports more products than the average manufacturing firm, but the former have a much lower value per product
- Manufacturing firms tend to export their products in more countries than wholesalers and retailers and account for much larger export revenues per product and country
- In general: high levels of variance within and across firm categories, especially for intensive margins

Margin decomposition for total imports (2018)



■ Manufacturing
 ■ Wholesale
 ■ Retail
 ■ Motor Vehicles
 ■ Other

Margin decomposition for total imports

Margin	Firm Category	Mean	Std. Dev.	P1	P25	P50	P75	P99
Value per firm	Manufacturing	9,875,453	200,265,425	43	8,090	131,854	1,665,258	106,523,525
	Wholesale	6,621,141	66,603,319	45	23,177	338,778	2,236,827	97,752,638
	Retail	1,804,906	54,900,612	29	2,726	21,368	170,812	18,114,518
	Motor Vehicles	5,219,341	67,101,222	46	4,548	76,921	1,144,002	52,110,809
	Other	1,801,596	49,633,525	14	1,094	9,394	83,304	16,784,216
# of products per firm	Manufacturing	28.5	78.6	1	2	7	24	328
	Wholesale	25.6	61.2	1	2	7	24	272
	Retail	19.6	57.7	1	2	4	13	249
	Motor Vehicles	17.5	59.6	1	1	3	8	306
	Other	18.3	80.0	1	1	3	10	293
Value per product per firm	Manufacturing	346,843	13,908,057	0	120	1,239	13,996	3,822,322
	Wholesale	258,789	8,781,011	0	192	1,948	19,430	3,660,729
	Retail	91,879	2,775,857	0	128	1,136	9,514	1,294,265
	Motor Vehicles	298,671	9,069,717	0	51	409	5,403	2,804,858
	Other	98,322	10,728,687	0	7	154	1,739	677,348
# of countries per product per firm	Manufacturing	2.0	2.5	1	1	1	2	13
	Wholesale	1.7	1.8	1	1	1	2	10
	Retail	1.8	2.0	1	1	1	2	10
	Motor Vehicles	2.1	2.6	1	1	1	2	14
	Other	1.8	2.2	1	1	1	2	12
Value per country per product per firm	Manufacturing	177,001	6,907,832	0	49	654	7,803	2,131,812
	Wholesale	150,879	6,084,062	0	134	1,320	12,800	2,121,206
	Retail	51,171	1,734,767	0	71	754	6,418	770,400
	Motor Vehicles	141,761	5,567,281	0	18	178	2,165	1,270,779
	Other	53,639	7,737,558	0	1	61	823	362,357

Margin decomposition for total imports

- Average import value per firm: Wholesalers much closer to manufacturing firms than for exports, manufacturing more right-skewed while non-manufacturing is less right-skewed
- Wholesalers import on average fewer products than manufacturing firms and tend to spend less per product, but especially the extensive country margins are very similar across firm categories

Joint country-product distributions

Joint country-product distributions

- For each trade direction, we count:
 - the share of firms that trades a certain number of HS 8-digit products with a certain number of partner countries
 - the trade value share handled by these firms
- The share of firms that export/import just one or two products to/from at least five countries is very small and thus anonymized

Total exports

Share of Firms in %	Number of Countries							
Number of Products	1	2	3	4	5	6-10	11+	Total
1	20.72	2.71	1.06	0.64	0.40	0.87	0.79	27.19
2	5.76	3.44	1.25	0.68	0.43	1.01	0.99	13.55
3	2.73	1.57	1.07	0.63	0.38	0.95	1.05	8.38
4	1.63	0.95	0.63	0.47	0.35	0.95	1.02	5.99
5	1.09	0.65	0.41	0.32	0.26	0.76	0.96	4.45
6-10	2.53	1.47	0.96	0.78	0.66	2.14	3.90	12.45
11+	2.85	1.83	1.34	1.04	0.95	3.75	16.22	27.98
Total	37.31	12.61	6.73	4.57	3.42	10.43	24.93	100.00

Share of Value in %	Number of Countries							
Number of Products	1	2	3	4	5	6-10	11+	Total
1	1.33	0.31	0.57	0.15	NA	NA	NA	NA
2	0.27	0.45	0.11	0.13	NA	NA	NA	NA
3	0.14	0.26	0.13	0.07	0.09	0.28	0.71	1.67
4	0.09	0.18	0.09	0.05	0.07	0.36	0.65	1.48
5	0.07	0.10	0.07	0.19	0.08	0.27	0.73	1.50
6-10	0.15	0.20	0.21	0.18	0.19	0.86	3.58	5.38
11+	0.39	0.50	0.40	0.59	0.51	3.28	79.32	84.98
Total	2.44	2.00	1.57	1.35	NA	NA	NA	NA

- Ca. 21% of exporters export one product to one country... and account for 1.33% of export volume
- 16% of exporters export 11+ products in 11+ countries... and account for ca. 80% of export volume!
- Relatively few small and many large firms compared to US/French data, driven by intra-EU trade (cutoff problem)

Total imports

Share of Firms in %		Number of Countries						
Number of Products	1	2	3	4	5	6-10	11+	Total
1	21.02	1.09	0.27	0.13	0.08	0.14	0.03	22.76
2	6.60	4.11	0.62	0.19	0.11	0.20	0.03	11.87
3	3.16	2.62	1.26	0.34	0.15	0.23	0.05	7.81
4	1.89	1.72	1.13	0.50	0.21	0.26	0.05	5.77
5	1.20	1.24	0.91	0.51	0.26	0.33	0.06	4.51
6-10	2.61	2.93	2.51	1.81	1.22	2.15	0.41	13.66
11+	1.91	2.46	2.42	2.30	2.16	8.51	13.86	33.62
Total	38.40	16.18	9.12	5.78	4.20	11.83	14.51	100.00
Share of Value in %		Number of Countries						
Number of Products	1	2	3	4	5	6-10	11+	Total
1	0.67	0.17	0.06	0.04	NA	NA	NA	NA
2	0.25	0.26	0.12	0.07	NA	NA	NA	NA
3	0.12	0.16	0.16	0.08	0.04	0.13	0.05	0.75
4	0.09	0.13	0.12	0.09	0.12	0.12	0.07	0.74
5	0.07	0.08	0.20	0.07	0.06	0.18	0.12	0.78
6-10	0.17	0.24	0.35	0.34	0.31	1.23	0.78	3.43
11+	0.24	0.39	0.42	0.71	1.13	6.13	83.14	92.15
Total	1.61	1.44	1.44	1.39	NA	NA	NA	NA

- 21% of importing firms source one product from a single country... and account for less than 1% of import volume
- Ca. 14% of importers source 11+ products from 11+ origin countries... and thereby account for more than 83% of import volume!

Concluding remarks

Summary and further results

- Summary
 - We use novel micro-data to conduct a descriptive analysis of German firms in international trade
 - We dissect the data along several dimensions: firms, products and countries and find that all dimensions matter
 - Firm heterogeneity in trade needs to be taken into account in quantitative trade modeling
- Further results
 - Systematic differences between intra-EU and extra-EU trade and across firm categories (manufacturing, wholesale, retail, others)

Further research

- Use AH-Steuer to address selection bias among smaller intra-EU firms
- Shed light on the two-way-trader status among firms, thus highlighting the prevalence of intra-industry trade on the firm level
- Add the time dimension and examine salient dynamic features of the different margins over the recent years, or even different months
- Adding firm size (e.g. employees or revenues)
- Examine how firm-level covariates correlate with the margins (exporter/importer premia)
- Allow for simple gravity regressions (e.g. with standard country-level covariates)
- Explore relationship between goods trade and services trade
- ...

Thank you for your attention!

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Backup Slides

Margin Decomposition for Extra-EU Exports

Margin	Firm Category	Mean	Std. Dev.	P1	P25	P50	P75	P99
Value per firm	Manufacturing	10,105,720	289,831,737	1,225	28,890	204,826	1,499,691	108,687,364
	Wholesale	1,639,358	24,670,169	1,053	16,695	81,495	430,839	23,915,632
	Retail	613,461	23,514,484	915	6,643	25,875	105,296	5,826,676
	Motor Vehicles	460,115	4,629,829	1,287	14,200	40,294	142,900	7,838,576
	Other	827,091	7,637,343	400	9,081	37,990	178,474	13,360,693
# of products per firm	Manufacturing	17.9	52.2	1	1	4	11	251
	Wholesale	18.2	53.4	1	2	4	13	235
	Retail	12.3	56.7	1	1	2	7	179
	Motor Vehicles	5.4	22.5	1	1	2	4	63
	Other	10.9	38.1	1	1	2	7	155
Value per product per firm	Manufacturing	565,192	27,669,484	3	344	2,578	20,042	6,711,136
	Wholesale	90,312	3,754,467	4	321	1,911	10,537	1,054,115
	Retail	49,909	1,004,307	5	262	1,478	7,302	587,853
	Motor Vehicles	85,710	1,117,043	5	453	4,150	22,260	1,140,730
	Other	75,798	1,903,286	3	240	1,426	7,600	951,760
# of countries per product per firm	Manufacturing	4.0	7.4	1	1	1	4	39
	Wholesale	2.4	4.2	1	1	1	2	22
	Retail	1.5	2.2	1	1	1	1	10
	Motor Vehicles	2.1	3.8	1	1	1	2	17
	Other	1.8	3.0	1	1	1	1	14
Value per country per product per firm	Manufacturing	140,465	6,997,496	2	200	1,380	9,364	1,762,534
	Wholesale	37,282	1,477,563	3	195	1,122	5,862	473,461
	Retail	33,842	750,247	5	227	1,242	5,700	409,697
	Motor Vehicles	40,851	427,793	3	250	2,794	14,377	608,962
	Other	41,400	1,186,726	3	183	1,100	5,710	568,348

Margin Decomposition for Extra-EU Exports

- Export value per firm: on average for manufacturing firms 7 times as high as for wholesalers (ratio is much higher than for total exports)!
- Average number of exported products similar for manufacturing and wholesaling firms
- Stark differences between manufacturing and wholesale in the average export value per product and per product and country

Margin Decomposition for Intra-EU Exports

Margin	Firm Category	Mean	Std. Dev.	P1	P25	P50	P75	P99
Value per firm	Manufacturing	19,645,227	288,979,715	3,684	827,117	2,203,512	7,781,111	205,268,137
	Wholesale	7,580,750	56,173,007	1,571	486,800	1,289,713	3,788,558	102,992,356
	Retail	5,922,845	72,801,102	173	80,450	635,978	1,700,777	85,822,571
	Motor Vehicles	3,644,852	12,831,912	2,900	369,674	996,904	2,431,313	54,710,323
	Other	6,082,292	79,124,934	280	150,812	810,341	2,266,947	84,835,696
# of products per firm	Manufacturing	28.6	65.3	1	2	7	25	308
	Wholesale	38.4	93.9	1	3	10	33	499
	Retail	57.0	157.9	1	1	7	42	882
	Motor Vehicles	14.5	67.4	1	2	4	7	305
	Other	30.7	110.9	1	1	4	15	540
Value per product per firm	Manufacturing	686,015	21,515,281	0	207	2,059	23,457	10,134,809
	Wholesale	197,567	6,430,307	0	176	1,630	15,320	2,765,374
	Retail	103,932	1,477,368	0	63	882	9,479	1,611,998
	Motor Vehicles	252,034	2,167,556	0	78	1,989	40,879	4,205,045
	Other	198,060	5,044,198	0	2	140	3,596	2,531,494
# of countries per product per firm	Manufacturing	4.9	5.7	1	1	2	6	24
	Wholesale	4.3	5.2	1	1	2	5	24
	Retail	3.9	4.9	1	1	2	5	24
	Motor Vehicles	5.2	5.9	1	1	2	7	26
	Other	3.2	4.1	1	1	1	4	21
Value per country per product per firm	Manufacturing	140,837	5,732,360	0	102	862	8,108	1,991,554
	Wholesale	45,418	2,387,774	0	83	593	4,642	634,453
	Retail	26,342	455,364	0	41	295	2,411	386,504
	Motor Vehicles	48,529	568,982	0	16	342	9,550	786,244
	Other	61,487	1,675,626	0	3	109	1,962	859,669

Margin Decomposition for Intra-EU Exports

- Average export value per manufacturing firm twice as high in intra-EU trade compared to extra-EU trade (careful: sample bias)
 - Mainly driven by the number of products: average values per product and per product and country and their distributions are very similar
- The role of wholesalers is more pronounced compared to total or extra-EU trade (smaller differences for the intensive margins)
- Wholesalers and retailers clearly dominate manufacturing firms at the extensive product margin

Margin Decomposition for Extra-EU Imports

Margin	Firm Category	Mean	Std. Dev.	P1	P25	P50	P75	P99
Value per firm	Manufacturing	4,313,271	80,718,223	26	4,299	41,626	371,848	45,420,097
	Wholesale	3,761,042	50,057,554	20	8,815	82,623	695,298	51,347,164
	Retail	927,364	21,195,226	21	2,226	14,591	82,069	7,047,549
	Motor Vehicles	1,744,774	26,957,360	31	1,554	15,110	106,395	21,694,514
	Other	1,055,913	32,758,231	4	808	5,929	40,369	7,248,663
# of products per firm	Manufacturing	17.5	43.3	1	2	5	16	191
	Wholesale	17.7	39.1	1	2	6	17	180
	Retail	12.9	37.1	1	1	4	10	142
	Motor Vehicles	13.6	34.9	1	1	3	9	169
	Other	11.5	56.2	1	1	3	8	151
Value per product per firm	Manufacturing	246,343	12,632,058	0	133	974	8,405	2,300,659
	Wholesale	212,389	8,602,681	1	174	1,499	14,193	2,726,473
	Retail	71,750	2,847,048	0	120	887	6,795	991,701
	Motor Vehicles	127,860	4,643,180	0	69	362	3,172	973,915
	Other	91,850	8,652,148	0	40	300	2,332	495,457
# of countries per product per firm	Manufacturing	1.5	1.5	1	1	1	1	8
	Wholesale	1.4	1.2	1	1	1	1	7
	Retail	1.4	1.3	1	1	1	1	7
	Motor Vehicles	1.5	1.3	1	1	1	2	7
	Other	1.5	1.7	1	1	1	1	8
Value per country per product per firm	Manufacturing	159,583	7,732,223	0	94	700	6,049	1,598,244
	Wholesale	148,376	6,389,440	0	144	1,188	11,049	1,957,982
	Retail	49,563	2,179,437	0	89	706	5,593	751,644
	Motor Vehicles	82,550	3,151,112	0	44	234	1,973	608,459
	Other	61,089	6,778,760	0	24	204	1,498	334,836

Margin Decomposition for Extra-EU Imports

- Average import value: Wholesalers and manufacturers go head to head (wholesalers' import value at the 99th percentile even exceeds that of manufacturing firms)
- Also only minor differences for the remaining margins
- The means for each margin lie below those for total exports

Margin Decomposition for Intra-EU Imports

Margin	Firm Category	Mean	Std. Dev.	P1	P25	P50	P75	P99
Value per firm	Manufacturing	13,050,163	205,792,710	34	227,124	1,213,451	4,409,644	126,750,377
	Wholesale	7,583,774	56,029,209	91	322,997	1,223,744	3,678,661	108,805,058
	Retail	4,291,433	101,884,290	42	34,504	577,295	1,558,481	41,343,745
	Motor Vehicles	8,627,597	89,324,004	40	204,646	1,000,633	2,821,916	69,140,719
	Other	3,494,156	75,944,889	7	3,677	143,625	1,045,443	38,275,390
# of products per firm	Manufacturing	35.8	95.2	1	3	11	30	457
	Wholesale	29.6	71.0	1	2	9	27	337
	Retail	47.5	88.4	1	3	9	60	412
	Motor Vehicles	21.7	75.3	1	1	3	7	368
	Other	41.1	115.2	1	2	6	26	747
Value per product per firm	Manufacturing	364,301	10,242,009	0	79	1,449	20,672	4,596,566
	Wholesale	256,374	7,676,705	0	201	2,401	24,011	3,903,659
	Retail	90,268	2,193,777	0	81	1,140	10,661	1,270,695
	Motor Vehicles	397,795	10,793,443	0	23	336	7,099	3,833,582
	Other	85,102	11,547,734	0	1	24	737	758,150
# of countries per product per firm	Manufacturing	1.9	2.0	1	1	1	2	11
	Wholesale	1.7	1.5	1	1	1	2	8
	Retail	1.7	1.5	1	1	1	2	8
	Motor Vehicles	2.1	2.2	1	1	1	2	12
	Other	1.8	1.8	1	1	1	2	10
Value per country per product per firm	Manufacturing	191,089	6,160,874	0	22	606	9,868	2,553,922
	Wholesale	153,408	5,759,046	0	122	1,482	14,820	2,286,797
	Retail	52,737	1,146,786	0	52	814	7,294	788,018
	Motor Vehicles	185,399	6,820,200	0	6	132	2,380	1,711,382
	Other	47,040	8,496,991	0	0	7	305	386,995

Margin Decomposition for Intra-EU Imports

- Average import value: Once again wholesalers are less prominent than manufacturers
- Mirroring the case for extra-EU imports, the average values of all margins lie above those for total imports, even for the intensive country margin
 - Unlike for exports, where the intensive country margin is similar between intra-EU and extra-EU trade, the average imports per product and country are higher for EU origin countries than for non-EU countries

Extra-EU Exports

Share of Firms in %		Number of Countries						
Number of Products	1	2	3	4	5	6-10	11+	Total
1	24.04	3.01	1.10	0.60	0.36	0.61	0.26	29.98
2	6.93	4.26	1.52	0.75	0.46	0.87	0.37	15.15
3	3.31	2.01	1.32	0.75	0.45	0.89	0.46	9.19
4	1.98	1.20	0.80	0.61	0.41	0.93	0.45	6.38
5	1.35	0.80	0.56	0.39	0.31	0.75	0.45	4.62
6-10	3.01	1.89	1.32	1.02	0.79	2.16	1.88	12.06
11+	3.15	2.14	1.61	1.34	1.17	4.28	8.92	22.61
Total	43.77	15.31	8.23	5.46	3.94	10.49	12.78	100.00
Share of Value in %		Number of Countries						
Number of Products	1	2	3	4	5	6-10	11+	Total
1	2.29	0.56	0.18	0.05	NA	NA	NA	NA
2	0.67	0.89	0.18	0.08	NA	NA	NA	NA
3	0.28	0.48	0.21	0.24	0.10	0.27	0.47	2.05
4	0.18	0.26	0.13	0.15	0.15	0.23	0.36	1.45
5	0.15	0.89	0.36	0.12	0.06	0.34	0.35	2.29
6-10	0.39	0.44	0.60	0.29	0.36	1.29	2.13	5.50
11+	0.87	1.01	0.77	0.79	1.15	6.32	72.04	82.95
Total	4.83	4.53	2.43	1.72	NA	NA	NA	NA

- In extra-EU trade, the 9% of exporters that export 11+ products in 11+ countries make up 72% of exports
- In contrast, the share of firms that only export one product to one country is higher than in total trade

Intra-EU Exports

Share of Firms in %	Number of Countries							
Number of Products	1	2	3	4	5	6-10	11+	Total
1	5.57	1.84	1.29	1.14	0.92	3.43	4.98	19.17
2	1.21	1.26	0.83	0.69	0.62	2.39	2.98	9.98
3	0.62	0.61	0.67	0.50	0.43	1.73	2.24	6.81
4	0.45	0.41	0.38	0.37	0.35	1.50	1.86	5.33
5	0.26	0.31	0.27	0.31	0.27	1.23	1.78	4.42
6-10	0.79	0.65	0.64	0.70	0.81	3.46	6.85	13.91
11+	1.64	1.24	1.13	1.17	1.19	6.46	27.56	40.40
Total	10.54	6.32	5.21	4.89	4.60	20.19	48.26	100.00

Share of Value in %	Number of Countries							
Number of Products	1	2	3	4	5	6-10	11+	Total
1	1.06	0.38	0.93	0.29	NA	NA	NA	NA
2	0.27	0.24	0.16	0.14	NA	NA	NA	NA
3	0.16	0.18	0.11	0.11	0.09	0.64	1.22	2.51
4	0.08	0.06	0.08	0.07	0.29	0.56	1.08	2.22
5	0.07	0.08	0.05	0.07	0.09	0.42	0.91	1.69
6-10	0.17	0.17	0.25	0.18	1.27	1.28	4.39	7.71
11+	0.49	0.39	0.49	0.73	0.65	4.62	69.94	77.31
Total	2.30	1.52	2.08	1.59	NA	NA	NA	NA

- In intra-EU trade, the share of exporters that make up about the same 70% of export volume is much larger (28%)

Extra-EU Imports

Share of Firms in %		Number of Countries						
Number of Products	1	2	3	4	5	6-10	11+	Total
1	24.32	0.98	0.15	0.05	0.02	0.02	0.01	25.55
2	7.59	4.80	0.53	0.12	0.03	0.04	0.01	13.11
3	3.59	3.12	1.39	0.27	0.07	0.06	0.01	8.52
4	2.12	2.05	1.27	0.50	0.15	0.09	0.01	6.19
5	1.35	1.45	1.05	0.56	0.21	0.14	0.01	4.79
6-10	2.75	3.45	3.05	2.04	1.23	1.36	0.11	13.99
11+	1.80	2.66	2.80	2.77	2.65	8.17	6.99	27.86
Total	43.53	18.52	10.24	6.32	4.37	9.88	7.15	100.00
Share of Value in %		Number of Countries						
Number of Products	1	2	3	4	5	6-10	11+	Total
1	0.85	0.10	0.02	0.01	NA	NA	NA	NA
2	0.35	0.33	0.10	0.02	NA	NA	NA	NA
3	0.17	0.23	0.26	0.06	0.02	0.06	0.02	0.82
4	0.12	0.18	0.16	0.21	0.06	0.06	0.02	0.82
5	0.13	0.12	0.15	0.15	0.06	0.08	0.29	1.00
6-10	0.22	0.37	0.62	0.63	0.48	1.65	0.34	4.30
11+	0.29	0.66	0.79	1.28	1.80	11.11	75.02	90.96
Total	2.14	2.00	2.10	2.37	NA	NA	NA	NA

- In extra-EU trade, 7% of all importers are responsible for 75% of the import volume

Intra-EU Imports

Share of Firms in %	Number of Countries							
Number of Products	1	2	3	4	5	6-10	11+	Total
1	12.21	1.74	0.85	0.59	0.45	1.13	0.38	17.36
2	2.93	2.93	0.97	0.52	0.37	0.75	0.23	8.69
3	1.38	1.37	1.43	0.66	0.33	0.73	0.16	6.06
4	0.99	0.85	1.04	0.82	0.41	0.67	0.13	4.92
5	0.70	0.57	0.72	0.76	0.51	0.79	0.12	4.15
6-10	1.98	1.30	1.63	1.93	1.89	4.34	0.59	13.65
11+	1.97	1.73	2.02	2.45	3.08	18.04	15.88	45.17
Total	22.15	10.47	8.66	7.73	7.04	26.45	17.49	100.00
Share of Value in %	Number of Countries							
Number of Products	1	2	3	4	5	6-10	11+	Total
1	1.20	0.38	0.25	0.14	NA	NA	NA	NA
2	0.38	0.53	0.20	0.15	NA	NA	NA	NA
3	0.23	0.24	0.25	0.23	0.09	0.29	0.17	1.50
4	0.11	0.36	0.17	0.21	0.19	0.25	0.18	1.47
5	0.12	0.13	0.12	0.24	0.14	0.33	0.14	1.24
6-10	0.25	0.27	0.54	0.49	0.63	2.10	0.75	5.02
11+	0.55	1.24	0.77	0.70	2.31	13.81	66.44	85.82
Total	2.85	3.15	2.30	2.16	NA	NA	NA	NA

- In intra-EU trade, 16% of all importers are responsible for 66% of the import volume
- 18% of intra-EU importers import 11+ products from 6-10 countries, accounting for almost 14% of imports