

Inside the White Box: Unpacking the Determinants of Quality and Vertical Specialization

Online Appendix

Esteban Jaimovich, Boryana Madzharova, Vincenzo Merella

December 8, 2022

A.2 Identifying country of origin

Key to our empirical analysis is the availability of information on where firms manufacture different refrigerator models. This data serves two purposes: i) to build an instrumental variable based on bilateral exchange rate variation; ii) to study patterns of quality specialization. The panel data on refrigerator sales by model provided by GfK does not contain information on production location. We are not aware of any direct source of such information either, at least not for a large number of refrigerators in the time period under consideration. Given the need to rely on credible information on manufacturing location by model, we assemble a data set from various sources, herein official certificates by trade authorities, instruction manuals, and retailers' web sites.

Since it is not mandatory for producers to disclose the manufacturing location of goods sold in the EU (the reference region of our main database, GfK MDA EU), obtaining data on country of origin from EU sources is difficult. However, in order to issue a so-called "Certificate of Conformity," the Customs Union of the Republic of Belarus, the Republic of Kazakhstan, and the Russian Federation (EEU), requires a precise declaration of the production location site for a given good as a prerequisite for supplying certain types of goods (refrigerators included) to its territory. More precisely, to fulfil the agreement on common principles and rules of technical regulation that the State Members signed on November 18, 2010, manufacturers intending to sell within the EEU must first submit a "Declaration of Conformity" that provides the required information regarding their products, based on which a Certificate of Conformity is subsequently issued by the authorities. As mentioned above, in the case of refrigerators, the set of reporting requirements includes production location. A dedicated Model Reference Number (MRN) identifies each refrigerator model.

Three separate sources of data contributed to the data collection of refrigerator models' country of origin:

1. **Certificate/Declaration of Conformity**

Whenever available, we directly examined a refrigerator's Certificate of Conformity

or Declaration of Conformity. (See Figure A.5 for an example of a Certificate of Conformity.) We used several Internet sources to access the relevant Declarations and Certificates, including the websites of the Eurasian Commission, the Eurasian Economic Community, the East Certificate, and the Customs Union Certification and Declaration as outlined in Column (1) of Table A.8.

2. Instruction manuals

For refrigerator models for whom both Certificate and Declaration of Conformity were missing, we proceeded by inspecting their instruction manuals, if available. We looked into whether they contained information on a model's production location. In some cases, the instruction manuals also refer to groups of refrigerators with distinct MRNs: under these circumstances, we used the information for every model belonging to the relevant group. We accessed several Internet sources to collect instruction manuals listed Column (2) of Table A.8.

3. Web scraping

We further augmented our search by web scraping data from all major Russian online retailers.¹ Data extraction from web sites was automated using tools such as the Google Chrome Web Scraper plug-in and the webscraper.io tool. The collected information was then manually checked for consistency. We used several Internet sources to access the relevant data, which are shown in Column (3) of Table A.8.

Some brands in the database have only one manufacturing location. This information, gathered directly from each brand's official web site, was automatically linked to every model produced by the relevant brand. We also surveyed online catalogues and consumer web sites to extend the coverage of the country of origin database. The information was extensively corroborated by cross-referencing the above-listed sources. We have found no evidence of appliances manufactured in more than one production location throughout their market life.

Table A.10 outlines brand-specific plant distribution across countries in our estimation sample. Most brands produce in at least two countries, the maximum number of production locations is eight, and the median value of locations is three. The table also reports the number of models included in the data set that each brand supplies. This number varies substantially across brands (from one- to three-digit figures) and, quite naturally, correlates positively (0.44) with the number of locations where brands manufacture their models.

Table A.9 displays a number of summary statistics splitting the sample of countries between EU and non-EU countries. The rationale for this is to give a quick sense of broad patterns of quality specialisation across those two main regions. As it can be observed from that table, EU countries are on average richer, and tend to produce models with greater quality, more expensive, and with higher energy efficiency ratings. Analogous results arise when splitting the sample of countries between OECD and non-OECD countries (these results are available from the authors upon request).

¹Multiple other online shops, stores, retail chains, and marketplaces in other countries in the data were web-scraped for information on country of origin, without yielding any result.

TABLE A.8 – LIST OF SOURCE WEB SITES

Certificates	Manuals	Web scraping
www.eurasiancommission.org	www.manualsdir.ru	www.webscraper.io
www.evrazes.com	www.manualspdf.ru	www.goods.ru
www.east-certificate.eu	www.rembitteh.ru	www.dns-shop.ru
customsunioncertificate.com	www.mcgrp.ru	www.eldorado.ru
	www.mnogo-dok.ru	www.holodilnik.ru
		www.btest.ru
		www.holodilnik.info
		www.holodilnik-info.ru
		www.xolodilnik.info
		www.potrebitel.info
		www.vashdom.info
		www.citilink.ru

Notes: The table lists web sites per type of source, namely Certificates/Declarations of Conformity, instruction manuals, and web sites of online Russian retails, which were used in the scraping exercise. At the time of access, over 2018-2019, all links were active.

TABLE A.9 – PRODUCTION LOCATIONS: SUMMARY STATISTICS EU vs. NON-EU

Manufacturing Origin	EU countries		Non-EU countries	
	Mean	Std. Dev.	Mean	Std. Dev.
log price	7.74	0.83	7.35	0.98
Inferred quality	0.30	0.93	-0.14	1.01
Energy efficiency	2.07	0.76	1.51	0.83
log GDP p.c.	10.38	0.33	9.81	0.39
N models		1,446		623

Notes: This table provides summary statistics by country of origin of models, averaged across EU and non-EU countries. Prices are measured in Euro. Quality refers to non-homothetic estimates. Energy efficiency uses the numerical scale from 0 to 4.

TABLE A.10 – BRANDS AND PRODUCTION LOCATIONS IN ESTIMATION SAMPLE

Brand	Nº Models	Nº sites	Countries of origin
Electrolux	188	8	China, Germany, Hungary, Italy, Russia, South Korea, Sweden, Thailand
Bosch	146	6	China, Germany, Greece, Russia, South Korea, Spain
Beko	101	5	China, Hungary, Romania, Russia, Turkey
Hotpoint	72	5	Austria, Italy, Poland, Russia, Turkey
Indesit	49	5	China, Italy, Poland, Russia, Turkey
Samsung	175	5	China, Poland, Russia, South Korea, Thailand
Siemens	79	5	China, Germany, Greece, Russia, Spain
AEG	39	4	Hungary, Italy, South Korea, Sweden
Candy	50	4	China, Czech Republic, Italy, Russia
Daewoo	36	4	China, Russia, South Korea, Taiwan
Gorenje	111	4	China, Serbia, Slovakia, Slovenia
LG	81	4	China, Indonesia, Russia, South Korea
Whirlpool	168	4	Brazil, Italy, Poland, Turkey
Zanussi	41	4	Bulgaria, Hungary, Italy, Russia
De Dietrich	12	3	France, Italy, Mexico
Gaggenau	13	3	Germany, Spain, Turkey
Liebherr	439	3	Austria, Bulgaria, Germany
Miele	53	3	Austria, Bulgaria, Germany
Nardi	6	3	Denmark, Italy, Russia
Neff	13	3	Germany, Greece, South Korea
Smeg	144	3	Hungary, Italy, Turkey
Teka	8	3	China, Italy, Turkey
Vestfrost	16	3	Denmark, Thailand, Turkey
Bauknecht	7	2	Germany, Italy
Blomberg	8	2	Germany, Turkey
Bomann	46	2	China, Germany
Franke	6	2	Poland, Russia
Haier	9	2	China, Italy
Hansa	4	2	China, Poland
Panasonic	7	2	Serbia, Taiwan
Ardo	62	1	Italy
Atlant	110	1	Belarus
Fagor	4	1	Spain
Hisense	5	1	China
Kueppersbusch	3	1	Germany
Nord	1	1	Ukraine
Severin	3	1	Russia
Sharp	8	1	Thailand
Shivaki	4	1	Russia
Snaige	80	1	Lithuania
Vestel	3	1	Russia

Notes: The table summarizes number of models, number of production or assembly sites and respective country names by brand, given the product composition and duration of the estimation sample.

FIGURE A.5 – TR CU (EAC) CERTIFICATE OF CONFORMITY

ТАМОЖЕННЫЙ СОЮЗ	
СЕРТИФИКАТ СООТВЕТСТВИЯ	
№ ТС <u>RU C-JP.ME10.A.03724</u>	
Серия RU № 0326250	
ОРГАН ПО СЕРТИФИКАЦИИ	
Орган по сертификации бытовой электротехники ТЕСТБЭТ Общества с ограниченной ответственностью "МП Сертификационная лаборатория бытовой электротехники ТЕСТБЭТ" адрес 109240, Москва, ул. Верхняя Радищевская, д. 4, стр.3-4-5 фактический адрес 119334, Москва, Андреевская наб., 2 тел/факс +7(499)137 6607 эл.почта testbet@testbet.ru регистрационный № РОСС RU.0001.11ME10 выдан 01.04.2013 Федеральной службой по аккредитации	
ЗАЯВИТЕЛЬ	
ООО "Панасоник Рус" ОГРН 1047796709510 Россия 115191, Москва, ул. Б. Тульская, д.11 тел. +74956654205 факс. +74956654224 эл.почта info@ru.panasonic.com	
ИЗГОТОВИТЕЛЬ	
Panasonic Corporation, Япония 1006, Oaza Kadoma, Kadoma-shi, Osaka, 571-8501, филиалы Gorenje Aparati Za Domacinstvo d.o.o. Valjevo Bulevar palih boraca 91/92 godine br. 5, 14000 Valjevo, Сербия	
ПРОДУКЦИЯ	
Холодильник-морозильник "Panasonic" модели по приложению бланк № 0035570 партия по контракту № PRA-002 от 07.12.2009 г. с приложением от 23.11.2015 г. в количестве 7000 штук	
КОД ТН ВЭД ТС 8418102001	
СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ	
ТР ТС 004/2011 "О безопасности низковольтного оборудования" ТР ТС 020/2011 "Электромагнитная совместимость технических средств"	
СЕРТИФИКАТ ВЫДАН НА ОСНОВАНИИ	
Протокол № 2044 от 14.12.2015 выд. ИЛ "ТЕСТБЭТ" ООО "ТЕСТБЭТ" атт. № РОСС RU.0001.21МЮ06 выд. 24.08.2011 действ. до 24.08.2016, Протокол № 2045 от 14.12.2015 выд. ИЛ "ТЕСТБЭТ" ООО "ТЕСТБЭТ" атт. № РОСС RU.0001.21МЮ06 выд. 24.08.2011 действ. до 24.08.2016	
ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ	
Срок службы определяется изготовителем Хладагент R600a	
СРОК ДЕЙСТВИЯ С <u>15.12.2015</u> ПО <u>не установлен</u> ВКЛЮЧИТЕЛЬНО	
Руководитель (уполномоченное лицо) органа по сертификации <u>М.В. Якушев</u> (подпись) (инициалы, фамилия)	
Эксперт (эксперт-аудитор) (эксперты (эксперты-аудиторы)) <u>Е.Г. Журавлева</u> (подпись) (инициалы, фамилия)	
ТАМОЖЕННЫЙ СОЮЗ	
ПРИЛОЖЕНИЕ	
К СЕРТИФИКАТУ СООТВЕТСТВИЯ № ТС <u>RU C-JP.ME10.A.03724</u>	
Серия RU № 0035570 Лист № 1	
Холодильник-морозильник "Panasonic" модели: NR-BN34EX1-E в количестве 1000 штук; NR-BN31EW1-E в количестве 1000 штук; NR-BN31EX1-E в количестве 1000 штук; NR-BN31AX1-E в количестве 1000 штук; NR-BN32AXA-E в количестве 1000 штук; NR-BN32AWA-E в количестве 1000 штук; NR-BN34AX1-E в количестве 1000 штук	

Notes: An example of a TR CU (EAC) Certificate of Conformity (in Russian). The third entry lists the manufacturer, and manufacturing branch. The last part of the document lists the model numbers of the products for whom this certificate is valid.