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Product Quality Perception of Former Centrally Planned EU Countries' Imports and Exports*

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Abstract

After Comecon's dissolution, agents' lack of experience in product differentiation could have triggered demand-side mechanisms affecting trade flows between the two sides of the fallen Iron Curtain. Specifically, producers from a block of countries might have faced a quality perception gap when exporting to the other block. We investigate this issue empirically by examining EU custom data. Our findings are consistent with products originating from former centrally planned countries being penalized by consumers from established decentralized economies. The magnitude of this effect lowers over time and vanishes when we consider extra-EU exporters. The evidence aligns with psychology and marketing contributions and may have important implications for the literature on international trade and economic development dealing with quality differentiation and foreign direct investment.

JEL Classification: F10, F40, P20.

Keywords: Developing Countries, EU, Former Centrally Planned Countries, Import Origin, International Trade, Market Segmentation, Nonhomothetic preferences, Pricing-to-market, Product Quality Perception.

1 Introduction

In the wake of the 1989 events that culminated with the dissolution of the Comecon, several former centrally planned (hereafter labeled $\mathcal{C}$) European countries engaged in the transition to a market economy. After a decade of economic turbulence, the transition began to stabilize. Eleven $\mathcal{C}$ countries negotiated

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membership and eventually joined the European Union (EU). The media and political attention turned from the initial concerns regarding the new institutional design and the massive privatization of state-owned assets to political affairs related to the accession to an integrated economic area. One matter that caught the public interest was the quality of goods supplied to $\mathcal{C}$ countries by existing EU members, chiefly the neighboring Austria and Germany. The pioneering initiatives promoted by single countries (especially those belonging to the Visegrád group) opened the way for several inquiries, reports, and directives within the EU. These political actions lasted for nearly ten years and led to extensive media coverage, which occasionally escalated to speculations about producers' and retailers' potentially discriminatory conduct towards consumers from the newly incorporated $\mathcal{C}$ countries.[1]

Motivated by the $\mathcal{C}$ countries' concerns, we exploit the aftermath of the Iron Curtain fall to investigate whether we can find evidence of quality perception biases in international trade data. Back then, both consumers and producers in the $\mathcal{C}$ block were novices in the global market, an environment in which there is no denying that products are tailored to the destination market's preferences and economic conditions. This standard practice typically involves market segmentation and pricing-to-market, differentiating strategies extensively analyzed in the international trade literature and used by exporters to adjust their products' quality levels and prices to demand in the importing country depending on the stability of the local economic environment and competition faced.[2] Could $\mathcal{C}$ countries' lack of experience have triggered market outcomes susceptible to be interpreted as originating from markedly aggressive applications of such strategies?

Psychology and marketing contributions show that quality perception is a learning process (e.g., Alba and Hutchinson, 1987), and producers devote considerable effort to influencing customer value (e.g., Woodruff, 1997). The European $\mathcal{C}$ countries underwent a dramatic increase in trade openness during the years straddling the XX and XXI centuries. Consumers were rapidly exposed to a massive range of foreign products. After almost five decades of virtually no product competition under central planning, consumer preferences needed reshaping to adapt to the broader consumption choice. The new products originated from countries more adept at differentiating products and were designed to satisfy "cultivated" domestic consumers. Hence, it is plausible that $\mathcal{C}$ consumers might have attributed a quality premium to such products (Batra et al., 2000).[3] In turn, the resulting upward-shifted demand might have steered $\mathcal{C}$ countries' trade inflows towards market outcomes in line with the $\mathcal{C}$ countries' concerns: higher prices for the same products or lower quality for identically priced products might have prevailed in the new markets. (Henceforth, we refer to this conjecture as Hypothesis 1).

Similar reasoning leads to the conjecture that consumers in established decentralized economies (hereafter labeled $\mathcal{M}$) might have penalized $\mathcal{C}$ products. The absence of incentives to differentiate products in

[1] These actions resulted in heated discussions within the European Commission and the European Parliament, which eventually approved an amendment to the Unfair Commercial Practices Directive in 2019 to address this issue. See Item [37] in the Webpage List. Appendix A summarizes the chronology of events leading to the Directive.

[2] Market segmentation typically concerns the nonhomothetic behavior of demand along the quality dimension and results in selecting specific products to ship to each destination country (e.g., Goldberg and Verboven, 2005; Flach, 2016; Rodrigue and Tan, 2019). Pricing-to-market chiefly relates to competition elements and results in adjusting prices to the particular markets to which exporters supply their products (e.g., Atkeson and Burstein, 2008; Arkolakis, Costinot, Donaldson and Rodríguez-Clare, 2019).

[3] With a slight abuse of terminology, we refer to 'consumers in a $\mathcal{C}$ country' as '$\mathcal{C}$ consumers.' Hereafter, we repeatedly resort to such shortcuts to simplify the exposition.

a planned economy meant that $\mathcal{C}$ producers lacked the experience of tailoring their products to specific consumer tastes regarding quality. Anticipating this matter, $\mathcal{M}$ consumers might have been wary of the product quality level of imports from $\mathcal{C}$ countries. This circumstance might have caused a downward shift in the demand for the relevant products that, in turn, might have resulted in lower prices for the same products or higher quality for identically priced products supplied by $\mathcal{C}$ producers to $\mathcal{M}$ countries. (Henceforth, we refer to this conjecture as Hypothesis 2.)

We look into custom data disaggregated at the product level to detect the emergence of systematic product quality bias characterizing intra-EU trade between one block of countries ($\mathcal{C}$ or $\mathcal{M}$) and the other (respectively, $\mathcal{M}$ or $\mathcal{C}$). We first examine import *unit values*, which we compute for each year, product, and country (the importer) as the value-to-volume ratio of the observed trade flow with every other country (the exporter). After controlling for well-established trade patterns, unit values are discerned through indicator functions using three of the four $\mathcal{C}$-$\mathcal{M}$ combinations, which we then analyze to reveal systematic import price differentials between the two blocks. On the one hand, our findings suggest that the variation of average unit values in the $\mathcal{C}$ countries across exporters blocks is not statistically significant. On the other hand, $\mathcal{C}$ exporters command substantially lower average unit values in the $\mathcal{M}$ block. The evidence is thus consistent with Hypothesis 2 but not with Hypothesis 1.

Several contributions in the international trade literature use unit values as a proxy for product quality levels (e.g., Schott, 2004). Accordingly, one might be tempted to interpret average unit value differentials as evidence of quality perception bias. However, various confounding factors might play a critical role in the case under consideration; for example, heterogeneous exporters' input costs and bilateral pricing-to-market (e.g., Khandelwal, 2010; Simonovska, 2015). With the help of a theoretical framework, we follow the literature and measure product quality levels as quantitative market share residuals after controlling for unit values. The model is a version of the demand-side frameworks featured in, e.g., Khandelwal, Schott, and Wei (2013) and Jaimovich, Madzharova, and Merella (2023). It is adapted to an environment comprising two blocks of countries ($\mathcal{C}$ and $\mathcal{M}$), with consumer preferences varying over products sourced from the two blocks. We also add some supply-side structure to this setup to better identify the role of quality perception heterogeneity on the endogenous import choice along the product quality dimension. Our theoretical exercise leads to testable predictions that can be examined through indicator functions analogous to those described above. The results mirror the findings concerning the unit values analysis: they reveal no quality perception bias in $\mathcal{C}$ markets and a negative one in $\mathcal{M}$ countries towards products imported from the $\mathcal{C}$ block.

We contrast our intra-EU findings with those involving EU import data on products sourced from the rest of the world. The rationale for the exercise is to determine whether the market outcomes hinge on producers being located in the EU (and hence exposed to the impact of the Iron Curtain fall on trade openness). We detect no statistically significant variation in average unit values and product quality perception towards extra-EU imports between $\mathcal{C}$ and $\mathcal{M}$ exporters. The implication is that the European $\mathcal{M}$ markets' negative leaning only concerns $\mathcal{C}$ products originating from the EU. This result is suggestive of a pivotal role played by the sudden variation in European $\mathcal{C}$ countries' trade openness in revealing $\mathcal{M}$ consumers' preferences towards the newly available products sourced from the $\mathcal{C}$ block.[4]

[4] The events triggering the change in foreign economic relations involved only a fraction of the $\mathcal{C}$ countries outside the EU. From this perspective, the absence of substantial differences in average unit values and quality perception across the two exporters' blocks is, therefore, as expected.

In view of these results, our analysis does not lend support to the idea that $\mathcal{C}$ countries' concerns originate from a positive disposition in their local markets towards products supplied by the $\mathcal{M}$ block. There might have been other reasons to prompt such concerns. For example, the phenomenon might have involved specific product niches rather than the whole market; or issues transcending economic arguments might have been at stake. So far as the investigation of the observed trade flows goes, the most immediate interpretation is that the rapid evolution of events may have been overly hectic not only for economic agents but also for the media and $\mathcal{C}$ countries' officials, possibly leading to neglect the local producers' situation while blowing the overall discussion regarding domestic consumers out of proportion.

In the period under consideration, $\mathcal{C}$ and $\mathcal{M}$ countries exhibit a substantial gap in per-capita GDP. This income disparity implies that consumers and producers exchange products at different quality levels in the international markets depending on their trade partners.[5] Our setup accounts for this fact by allowing for nonhomothetic preferences along the quality dimension and heterogeneous productivity levels across countries. In this respect, the paper relates to the branch of the international trade literature investigating the links between product quality, the importer's income, and the exporter's stage of development.[6] We control for such countries' characteristics to obtain our results, which are robust to two different measures of exporter productivity.

Our findings are qualitatively invariant to using two sets of price elasticity estimations. The first set is produced by Broda, Greenfield, and Weinstein (2006) and provides estimates for 73 countries worldwide. Since these estimations directly cover most of the importers in our dataset, we use this set for our benchmark exercises. The second set, produced by Broda and Weinstein (2006), comprises price elasticities estimated on US data and conveniently supplied at a more disaggregated level. We use the second set for our robustness exercises. These estimates are well-established, primarily because the authors conscientiously deal with the endogeneity issues that arise when bringing demand-based regression equations to the data due to producers simultaneously choosing product prices and quality levels.

The results are also robust to examining two distinct periods (2000-2002 and 2003-2007). Interestingly, the magnitude of the negative quality perception bias ascribed to European $\mathcal{C}$ products in $\mathcal{M}$ markets lowers in the later period. This finding suggests that, while persistent, the bias tends to fade over time. A possible implication is that a newly introduced product in a foreign market may face steeper hurdles than the incumbents. Hurdles that fade over time as consumers get accustomed to the product. These considerations complement the supply-side notions of *extended gravity* (firms choose markets with similar characteristics to those already supplied when expanding their trade routes; see Morales, Sheu, and Zahler, 2019) and *incumbency* (the cost of foreign market access lowers with tenure; see Föllmi, Schetter, and Torin, 2022).

We may also interpret the presence and persistence of the detected trade flow differentials as the economic consequence of the learning process underlying product quality perception. The psychology

[5] See, for example, Hummels and Klenow (2005), Bastos and Silva (2010), and Manova and Zhang (2012). Indeed, we find that import prices behave consistently with these observations (see Table 2 below).

[6] Theoretical foundations on the link between product quality and importer income can be found, e.g., in Fajgelbaum, Grossman and Helpman (2011) and Jaimovich and Merella (2012, 2015). For seminal work on investigating the relationship empirically, see Hallak (2006) and Verhoogen (2008). See Feenstra and Romalis (2014) and Merella and Santabarbara (2016) for refined methods considering supply-side heterogeneity.

literature stresses the role of the country of origin as a halo or cue influencing or summarizing beliefs about product quality, particularly regarding new imports with short tenure (e.g., Schooler and Sunoo, 1969; Han, 1989). The evidence we produce aligns with this conceptualization. If products sourced from $\mathcal{C}$ countries are associated with a negative cue in $\mathcal{M}$ markets, then we expect their demand to be weaker when supplied therein after controlling for trade partners' and bilateral flows' characteristics. From this viewpoint, our findings also complement the branch of marketing literature studying the consumers' preferential attitudes in developing countries towards products imported from developed countries (for a review, see Heslop and Papadopoulos, 1993). Finally, the key role played in our study by producers' lack of experience in product quality differentiation may spark novel motivational plots for foreign direct investment in developing countries (e.g., De Mello, 1997; Paul and Feliciano-Cestero, 2021). In an environment where the targeted country is productive but fails to tailor products to end-user requirements, multinationals may be incentivized to acquire local firms and increase their value by injecting the appropriate know-how regarding product quality differentiation and strategic marketing.

The structure of the paper is as follows. Section 2 describes the data. Section 3 discusses the empirical analysis involving unit values. Section 4 presents a simple model of consumer demand with heterogeneous quality perception on products originating from the different country blocks. Section 5 illustrates our product quality analysis, which we perform empirically using regression equations derived from the model's predictions. Section 6 concludes.

2 Description of data and geographical notation

Shortly after the accession to the European Union, consumers of several $\mathcal{C}$ members experienced a rising perception of differences in quality levels between the $\mathcal{M}$-sourced goods sold in their local markets and those supplied to $\mathcal{M}$ countries. This sentiment was revealed by several surveys focusing on product composition and consequently investigated by $\mathcal{C}$ nations' official bodies and research institutions.[7] The issue was referred to country representatives at the national and EU level and resulted in changes in EU legislation following relevant studies released by the European Commission.[8] The discussion also extended to the difference in prices of identical products sold in $\mathcal{C}$ and $\mathcal{M}$ countries.[9]

As discussed in the previous section, a possible rationale for such concerns is $\mathcal{C}$ agents' lack of experience in product differentiation, which could have prompted quality perception gaps in consumers of one block of countries towards products imported from the other block. This paper investigates whether evidence of price and quality differentials consistent with this conjecture can be systematically found in international trade data. As such, our empirical analysis resorts to volumes and values traded across countries at the product level. Customs data is a notoriously rich source of this type of observations. The remainder of this section illustrates how our dataset is drawn from the COMEXT database managed by Eurostat, the Statistical Office of the European Commission.

Data Eurostat's COMEXT reports trade statistics on the value and quantity of goods exchanged between EU members and traded by EU members from and to third countries at a finely disaggregated level.

[7] See, e.g., Items [38]-[41] in the Webpage List.

[8] See Items [37] and [42]-[45] in the Webpage List.

[9] See, e.g., Item [46] in the Webpage List.

As such, COMEXT is an excellent building block for our investigation. For our purposes, sourcing data from COMEXT has two key advantages. First, it provides records on several countries that underwent centralized forms of economic activity. Second, it also provides records on other countries, members of the same economic area and fairly comparable in geographical and socio-economic aspects, that did not experience any centralized economic system.

A sensitive choice we must make is the period to consider in our study. An important aspect to weigh up in our decision concerns the proximity to the event of the $\mathcal{C}$ countries' economic systems switching from centralized to unplanned. COMEXT includes data on these countries since 1999. This date is ideal for taking up our analysis since it follows the initial instability experienced by $\mathcal{C}$ countries during their transition to a market economy.[10] However, COMEXT offers data on former centrally planned countries only for Slovakia in 1999. The set of $\mathcal{C}$ countries extends to 4 in 2000, 9 in 2001, and all 11 nations in 2002.[11] Since accession to the EU for eight such countries occurred in 2004, potential economic and statistical disruption suggests avoiding including 2003-2005 and limiting the benchmark dataset to 2000-2002.[12] Nevertheless, we extend the dataset five years to 2007 to produce robustness checks.[13] We exclude undifferentiated goods from our investigation since we look into product quality differentials. We adopt Rauch's (1999) classification, which separates differentiated products from those traded on an organized exchange or reference-priced.

COMEXT provides trade data at the CN8-digit product level. We use values and volumes of the imported products to compute the products' unit values, which play a role in the empirical analysis concerning import prices presented in the next section and product quality levels reported in Section 5. Along with distinguishing between $\mathcal{C}$ and $\mathcal{M}$ importers and exporters, we complement these data with values and quantities of domestic goods, countries' human capital and income per head, and estimated price elasticities.

We infer data on domestic goods from the observations provided by Eurostat's PRODCOM database. Entries consist of values and quantities of total production, imports, and exports of products at a distinct 8-digit level classification, limiting the correspondence to the CN categorization at a 6-digit level. For each product, we use the difference between total production and exports (both in value and volume) as a proxy for local consumption of the domestic variety. This measure is, in turn, used to calculate the total market volume in computing products' quantitative market shares. Data on per capita GDP (purchasing power parity, 2011 international dollars) are sourced from the International Monetary Fund's World Economic Outlook database. The Human Capital Index is compiled by the World Bank.

Using a similar framework to the one presented in Section 4, Broda, Greenfield, and Weinstein (2006)

[10] There is consensus that the most turbulent period of the economic transition that followed the 1989 events in Central and Eastern Europe ended with the crises that hit the region in 1997 and 1998. See Roaf, Atoyan, Joshi, and Krogulski (2014) for a review of the economic transition of the relevant countries.

[11] Specifically, out of 27 EU members, 11 countries are $\mathcal{C}$ economies (in parenthesis, the first years the country appears as a COMEXT declarant): Slovakia (1999); Estonia, Lithuania, and Romania (2000); Bulgaria, the Czech Republic, Hungary, Latvia, and Slovenia (2001); Croatia and Poland (2002).

[12] The eight $\mathcal{C}$ economies that were granted accession to the EU in 2004 are the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia.

[13] We do not include the subsequent years to avoid the instability caused by the 2008 financial crisis and its aftermath. Incorporating more recent years far beyond (20+ years) of the 1989 events seems an unnecessary extension to our purposes, which primarily look into the *existence* of a dissimilar product quality perception between $\mathcal{C}$ and $\mathcal{M}$ countries rather than its potential *persistence*.

Table 1.
Summary statistics.

	(1) 2000	(2) 2001	(3) 2002	(4) 2000-2002	(5) 2003-2007
No. products	2,341	2,351	2,309	2,334	2,422
No. varieties	82,863	83,842	85,556	84,087	91,099
No. varieties (FCP)	18,382	19,594	20,336	19,437	22,837
No. observations	340,888	367,061	411,366	1,119,315	2,170,323
No. obs. (FCP exp.)	62,171	73,194	85,106	220,471	490,291
No. obs. (FCP imp.)	39,613	75,491	109,965	225,069	653,055
No. HS-6 categories	1,301	1,288	1,263	1,399	1,656
No. HS-3 categories	114	114	117	120	140
No. exporters (total)	215	218	219	217	219
No. exporters (FCP)	42	42	42	42	42
No. importers (total)	18	23	25	22	27
No. importers (FCP)	4	9	11	8	11

Note. The table reports summary statistics for the years from 2000 to 2002 [Columns (1)-(3)] and for the periods 2000-2002 [Column (4)] and 2003-2007 [Column (5)]. The number of varieties and observations are reported gross of reductions applied to price elasticities. The reported numbers of HS categories are net of such reductions. Product, categories, and varieties are treated as independent over time. Hence, the pooled datasets comprise yearly figure means for these variables, as well as for importers and exporters.

produce price elasticity estimates at the HS 3-digit level for 73 countries in the world (we henceforth refer to this set as the *importers'* price elasticities). Since these estimates are well-established and allow us to bypass the endogeneity issues that arise when bringing regression equations based on demand systems to the data, we use them as a benchmark in computing a suitable composite dependent variable.[14] However, HS 3-digit codes require a relatively high level of aggregation across products. Furthermore, the estimates are unavailable for three of the eleven $\mathcal{C}$ countries featured as importers in our dataset (Bulgaria, the Czech Republic, and Estonia). For this reason, we also utilize the U.S. price elasticity estimates produced by Broda and Weinstein (2006), which have the advantage of being provided at the HS 10-digit level. We associate the U.S. price elasticities to COMEXT (and PRODCOM) products at the HS 6-digit level.

We deal with outliers by reducing the dataset in several dimensions to prevent our results from being driven or tainted by extreme values in the data. In line with the literature, values and quantities of each product are trimmed below the 5th and above the 95th percentile. The reduction applies to observations sourced from both the COMEXT and PRODCOM databases. We also trim the importers' price elasticities using the same strategy. Along this dimension, the excluded subset contains values that are, on average, larger than the included ones by a factor of 27 (specifically, the means on included and

[14] For a discussion of the issues arising when estimating this type of regression equation, see, e.g., Berry (1994) and Feenstra (1994).

excluded price elasticities are 4.57 and 127.2, respectively). We operate a similar trimming also on the U.S. price elasticities, though the outliers are identified within each product category at the HS 6-digit level.[15]

Table 1 reports summary statistics of the dataset we use for our study. For a more transparent understanding of the data structure, the figures are provided annually (for 2000-2002) and pooled into two disjoint periods (2000-2002 and 2003-2007). Overall, the dataset features almost 3.3 million observations (gross of the reductions applied to price elasticity outliers), with an average of more than 870,000 (710,000) concerning $\mathcal{C}$-importers (exporters). The upward trends in the number of products, varieties, and observations are possibly due to the growing set of EU declarants, classification adjustments, and international trading intensification. Moderate trends also appear in most entries for the period 2003-2007.

The dataset resulting from the procedure detailed above is the building block of our empirical analysis. We use it to compute unit values and infer product quality using the price and quantity information it comprises. The next section preliminarily inspects the relationship between importing from a given country block and the unit values of the traded goods. We then investigate whether the $\mathcal{C}$ markets' price and quality measures differ from those obtained for their $\mathcal{M}$ counterparts.

Geographical notation Each country in the world belongs to either of two blocks, which we generically denote $\mathcal{B} = \{\mathcal{C}, \mathcal{M}\}$, with $\mathcal{C}$ indicating former centrally planned economies and $\mathcal{M}$ the historically decentralized ones. In our setting, all countries are exporters (denoted by x). We distinguish them by EU membership. Formally, we let $\mathcal{R} = \{\mathcal{EU}, \mathcal{W}\}$, with $\mathcal{EU}$ comprising EU countries and $\mathcal{W}$ the rest of the world. Importers (denoted by j) are all EU members. As a result, we identify four exporter areas resulting from all region-block combinations (i.e., $x \in \mathcal{R} \cap \mathcal{B}$, $\forall \mathcal{R}, \mathcal{B}$) and two importer areas discerned by country block (i.e., $j \in \mathcal{EU} \cap \mathcal{B}$, $\forall \mathcal{B}$). Furthermore, we let $\mathcal{J} = \{j, US\}$ denote the data source for product price elasticity estimations, distinguishing between EU countries (j) and the United States (US).

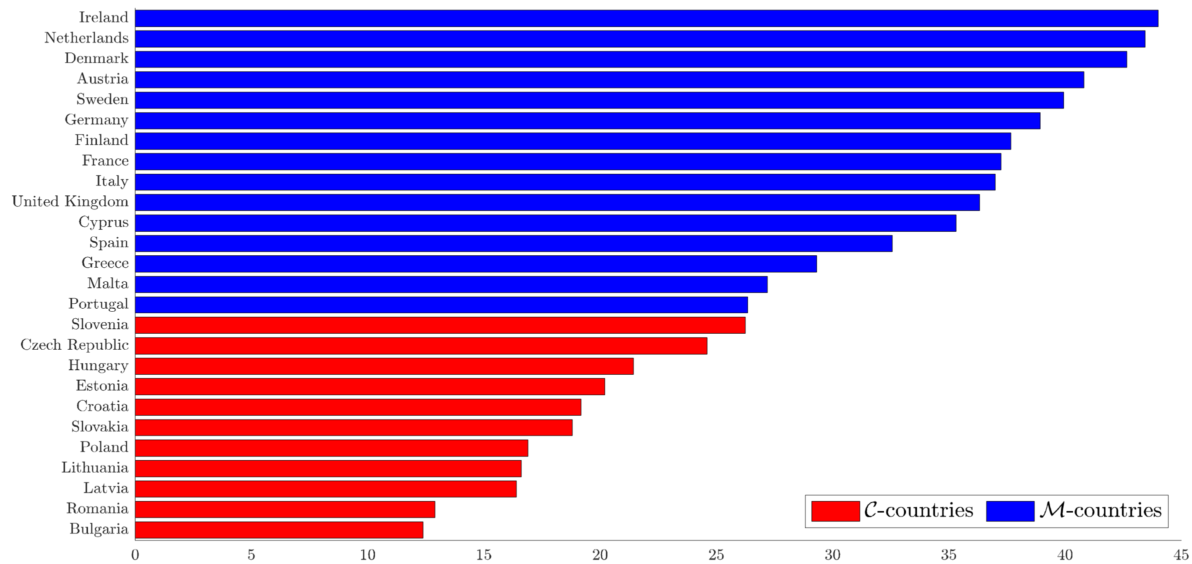
3 Import price analysis

Our objective is to pinpoint systematic discrepancies in the price and quality of products sourced from $\mathcal{M}$ countries between $\mathcal{M}$ and $\mathcal{C}$ markets within the EU. We begin by looking into unit values' differentials. Unit values are typically used as measures of the average price of traded products (though they have also been considered proxies for the quality level of those products). The strategy consists of identifying the potential unit value differences between pairs of country blocks through indicator functions, which correspond to three of the four combinations resulting from considering the groups $\mathcal{C}$ and $\mathcal{M}$ as blocks of importers and exporters. We implement this strategy quantitatively by estimating the correlation between unit values and the indicator functions using a pooled regression after controlling for product-year fixed effects and some established income-related stylized facts emerging from existing studies concerning the observed trade patterns. In order to investigate whether the produced evidence pertains solely to European countries, we compare the results based on intra-EU data with those obtained examining trade flows originating from exporters outside the Union (hereafter referred to as *extra*-EU).

[15] The results shown throughout the paper are robust to sensitivity analysis, which we perform along every dimension discussed in this paragraph. The relevant results are available from the authors upon request.

Figure 1.

EU members' average income per head in the period 2000-2007.



Note. The figure portrays the average per capita GDP (PPP, thousands of 2011 international dollars) for the EU members in the period from 2000 to 2007. The countries are split in two subsets. The bottom subset (labelled '$\mathcal{C}$-countries') comprises members that experienced centrally planned economic systems in their past; the top one ('$\mathcal{M}$-countries') those that did not.

Perhaps the most challenging issue we face when considering the relevant stylized facts is disentangling the impact on unit values of a centrally planned past from the development stage of $\mathcal{C}$ countries relative to their $\mathcal{M}$ counterparts. The issue arises from considering two aspects in conjunction. On the one hand, as Figure 1 illustrates, all $\mathcal{C}$ countries' average incomes per head were lower than $\mathcal{M}$ countries' during 2000-2007 (the time frame of our analysis). On the other hand, a large bulk of literature shows that unit values correlate with the importer's and exporter's income per head.[16] As a result, any influence that former centralized economies might have on the price and quality of products traded in the relevant markets could be biased, if not reversed, by other income-related mechanisms.

In practical terms, due to the correlation between independent variables, the indicator functions may partly capture the effect of income variations on unit values and vice versa. We opt for a conservative approach and run a two-step regression exercise. We initially estimate the effect of importer's and exporter's per capita GDP on unit values. We then use the resulting residuals (hereafter referred to as *adjusted* unit values) to estimate the effect of the indicator functions, thereby restricting the impact of consumer preferences heterogeneity across country blocks on unit values to the variation not explained by importer income. Formally, we run the first-step regression

$$p^{\mathcal{R}}_{j,x_s,t} = \gamma^{\mathcal{R}} + \gamma^{\mathcal{R}}_{Y_j} \log Y_{j,t} + \gamma^{\mathcal{R}}_{Y_x} \log Y^{\mathcal{R}}_{x,t} + \mathbb{D}_{s,t} + \tilde{p}^{\mathcal{R}}_{j,x_s,t}, \tag{1}$$

[16] Here and for the remainder of this section, we refer to the introductory section for a discussion of the relevant literature.

Table 2.
Unit value differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries.

	(1) $p^{\mathcal{EU}}_{j,x_s,t}$	(2) $\tilde{p}^{\mathcal{EU}}_{j,x_s,t}$	(3) $p^{\mathcal{W}}_{j,x_s,t}$	(4) $\tilde{p}^{\mathcal{W}}_{j,x_s,t}$
$\log Y_{j,t}$	0.212^{***}		0.462^{***}	
	(0.024)		(0.059)	
$\log Y^{\mathcal{R}}_{x,t}$	0.275^{**}		0.297^{***}	
	(0.117)		(0.043)	
$\mathbb{I}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}}$		-0.222^{***}		-0.193^{**}
		(0.049)		(0.075)
$\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}}$		-0.047		0.039
		(0.031)		(0.067)
$\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}}$		-0.141^{**}		-0.181^{***}
		(0.051)		(0.064)
Observations	515,661	515,661	362,931	362,931
R^2	0.660	0.009	0.575	0.005

Note. The table reports the results of two pairs of estimations: Columns 1 and 2 involve EU countries ($\mathcal{R} = \mathcal{EU}$); Columns 3 and 4 the rest of the world ($\mathcal{R} = \mathcal{W}$). Columns 1 and 3 illustrate the estimation of (1); Columns 2 and 4 of (2). All estimations include product-year fixed effects, with robust standard errors (in parentheses) clustered by exporter. Significance levels: ***0.01; **0.05; *0.10.

Table 3.
Tests on parameter restrictions (unit value differentials).

	(1) value	(2) F-test	(3) p-value
$\tilde{\gamma}^{\mathcal{EU}}_{\mathcal{C},\mathcal{M}}$	-0.047	2.30	0.141
		(1, 26)	
$\tilde{\gamma}^{\mathcal{EU}}_{\mathcal{C},\mathcal{C}} - \tilde{\gamma}^{\mathcal{EU}}_{\mathcal{M},\mathcal{C}}$	0.081^{***}	9.48	0.005
		(1, 26)	
$\tilde{\gamma}^{\mathcal{W}}_{\mathcal{C},\mathcal{M}}$	0.039	0.35	0.555
		(1, 155)	
$\tilde{\gamma}^{\mathcal{W}}_{\mathcal{C},\mathcal{C}} - \tilde{\gamma}^{\mathcal{W}}_{\mathcal{M},\mathcal{C}}$	0.012	0.10	0.754
		(1, 155)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table 2. Column 1 indicates the point estimate values of the restrictions; Column 2 the value of the F-test (with the relevant degrees of freedom in parentheses underneath); Column 3 the associated p-value. Significance levels: ***0.01; **0.05; *0.10.

where s indicates the product category, j the importer, x the exporter, t the year, $\mathcal{R} = \{\mathcal{EU}, \mathcal{W}\}$ the exporters' region (EU, rest of the world), Y the log per capita GDP, and $\mathbb{D}$ the set of dummies. For the dataset concerning each exporter's region $\mathcal{R}$, the log unit value of product s imported by j from x in year t is denoted by $p^{\mathcal{R}}_{j,x_s,t}$; the relevant adjusted unit value by $\tilde{p}^{\mathcal{R}}_{j,x_s,t}$. Columns 1 and 3 of Table 2 report our findings for intra-EU and extra-EU trade flows, respectively. In line with the existing literature, the coefficients of the importer's and exporter's log per capita GDP are positive and statistically significant in both exercises.

The second-step regression reads

$$\tilde{p}^{\mathcal{R}}_{j,x_s,t} = \tilde{\gamma}^{\mathcal{R}} + \tilde{\gamma}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}} \mathbb{I}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}} + \tilde{\gamma}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}} \mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}} + \tilde{\gamma}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}} \mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}} + \varepsilon^{\mathcal{R}}_{j,x_s,t}, \tag{2}$$

where $\mathcal{M}$ and $\mathcal{C}$ respectively indicate established decentralized economies and former centrally planned countries as before, $\mathbb{I}$ denotes an indicator function, and ε is the estimation residual. The subscripts involving country blocks refer to the importer first, then the exporter. That is, the generic indicator function $\mathbb{I}^{\mathcal{R}}_{\mathcal{B},\mathcal{B}'}$, with $\mathcal{B}, \mathcal{B}' = \{\mathcal{C}, \mathcal{M}\}$, identifies trade flows between an importer from block $\mathcal{B}$ and an exporter from block $\mathcal{B}'$.

By regressing the adjusted unit values against the indicator functions, we investigate potential systematic price differentials across bilateral trade flows at the regional level that are not explained by typical income and productivity variations, considering the whole set of imports and accounting for product-year specificities. More precisely, the constant $\tilde{\gamma}^{\mathcal{R}}$ captures the average adjusted unit value prevailing in the trade flows within the country block $\mathcal{M}$; the indicator function' regression coefficient $\tilde{\gamma}^{\mathcal{R}}_{\mathcal{B},\mathcal{B}'}$, with $(\mathcal{B}, \mathcal{B}') \neq (\mathcal{M}, \mathcal{M})$, expresses the differential in the average adjusted unit value in trade flow from $\mathcal{B}'$ to $\mathcal{B}$ relative to $\tilde{\gamma}^{\mathcal{R}}$. Columns 2 and 4 of Table 2 report our findings for intra-EU and extra-EU trade flows, respectively. The coefficients $\tilde{\gamma}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}}$ and $\tilde{\gamma}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}}$ are negative and statistically significant, while the one of $\tilde{\gamma}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}}$ is not. Products from $\mathcal{C}$ countries invariably obtain lower import prices, regardless of the EU block served.

The empirical exercise provides preliminary evidence on the working hypotheses discussed in the introductory section regarding consumers' product perception biases. On the one hand, if $\mathcal{C}$ consumers attributed a premium to products originating from $\mathcal{M}$ countries, then $\mathcal{M}$ producers would command higher *adjusted* unit values when exporting to countries in the $\mathcal{C}$ block than the $\mathcal{M}$ block (Hypothesis 1). The coefficient of the indicator function $\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}}$ identifies the relevant impact; hence we would expect $\tilde{\gamma}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}} > 0$. On the other hand, if $\mathcal{C}$ producers were penalized in the $\mathcal{M}$ region's markets, then lower *adjusted* unit values for $\mathcal{C}$ products would emerge in those markets relative to $\mathcal{C}$ countries (Hypothesis 2). In this case, the difference between the coefficients of the indicator functions $\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}}$ and $\mathbb{I}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}}$ measures the relevant effect; therefore, we would expect $\tilde{\gamma}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}} - \tilde{\gamma}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}} > 0$.

Table 3 illustrates in the first (respectively, last) two rows the results of parameters restriction tests performed on the estimations reported in Column 2 (respectively, Column 4). The first and third rows merely confirm the results of Table 2: the coefficient of the indicator function $\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}}$ is not statistically significant (i.e., Hypothesis 1 is rejected). The second and fourth rows show that the difference between the coefficients of $\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}}$ and $\mathbb{I}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}}$ is positive and statistically significant only when dealing with data on ($\mathcal{C}$ countries') EU exporters. This finding suggests that the average adjusted unit value of products from the $\mathcal{C}$ block of EU countries is lower in $\mathcal{M}$ than in $\mathcal{C}$ markets. We cannot, therefore, exclude that $\mathcal{M}$ consumers tend to penalize products imported from European $\mathcal{C}$ countries (i.e., Hypothesis 2 cannot be rejected). Furthermore, no substantial adjusted unit value difference arises when looking at trade flows originating from the rest of the world. The negative bias towards $\mathcal{C}$ imports seemingly pertains solely to the EU.[17]

As discussed above, several contributions in the literature have considered a product unit value a proxy for its quality level. One might consequently contemplate interpreting the evidence regarding (adjusted!) $\mathcal{C}$ import price differentials between $\mathcal{C}$ and $\mathcal{M}$ markets as resulting from varying product quality perceptions. However, the unit value analysis may not suffice to identify quality perception heterogeneity, since confounding effects might materialize when comparing trade flows reaching the two blocks of countries. For example, different degrees of competition intensity could lead to distinct pricing-to-market strategies, which could, in turn, have assorted impacts on product prices.

We follow the literature and measure product quality levels using quantitative market shares after controlling for prices. To this baseline setting, we add some supply-side structure and examine the importer's product quality selection from a given exporter to disentangle the effect of quality perception from other channels exerting influence at a bilateral level. The following section describes the model that guides our reasoning and produces relevant testable predictions.

4 A model with heterogeneous product quality perception

We set up a simple framework for studying product selection and inferring product quality. We consider a generic importer j and let $s \in \mathcal{S}$ index the large number of products traded between countries. Every exporter $x \in \mathcal{X}$ offers many versions of each product. Among these, country j optimally selects one version to import. We define a *variety* as the version of product s imported by j from country x and denote it $x_s \in \mathcal{X}_s$. Therefore, for any given importer j, we have one domestic variety ($x_s = j_s$) and several imported varieties ($x_s \neq j_s$) of every product s. The complete derivations of the formal expressions shown below are relegated to Appendix B.

Preferences Country j has a representative household. We model their choice as the solution of a two-step problem, in which the household decides on (i) how to allocate resources across varieties, taking the choice of each variety version as given, and (ii) which version to consume per variety, taking the resources allocated to each of them as given. We assume that the representative household j's utility of consuming variety x_s is

$$u_{j,x_s} = \lambda_{j,x_s}^{\frac{1}{\sigma_s - 1}} q_{j,x_s}, \tag{3}$$

which we aggregate across exporters and products to obtain the preference representation

$$U_j = \prod_{s \in \mathcal{S}} \left[\left(\sum_{x_s \in \mathcal{X}_s} \lambda_{j,x_s}^{\frac{1}{\sigma_s}} q_{j,x_s}^{\frac{\sigma_s - 1}{\sigma_s}} \right)^{\frac{\sigma_s}{\sigma_s - 1}} \right]^{\alpha_s}. \tag{4}$$

The CES specification (4) is an adapted version of the one used by Broda and Weinstein (2006) and

[17] Tables C.1 and C.2 in Appendix C show that the estimates are robust to an alternative first-step regression specification inspired by the theoretical predictions regarding product quality discussed in Section 4 below. Specifically, the alternative estimation features importer-product-year and exporter-year fixed effects and an importer-exporter log income per head interaction term.

in many other contributions in the literature.[18] The right-hand side of (4) features a two-tier aggregator. The outer Cobb-Douglas aggregator bundles *products* $s \in \mathcal{S}$, each associated to the share $\alpha_s \in (0,1)$ with $\sum_{s\in\mathcal{S}} \alpha_s = 1$. The inner CES aggregator bundles *varieties* $x_s \in \mathcal{X}_s$, for each product s, with an elasticity of substitution $\sigma_s \geq 1$.[19] The remaining elements of the preference specification are $q_{j,x_s} \geq 0$, which denotes the quantity consumed of variety x_s in country j, and the demand shifter $\lambda_{j,x_s} \geq 0$, specific to country j and variety x_s.

Resource allocation over varieties We first solve the representative household's problem of maximizing (4) subject to a standard budget constraint and taking variety selection (and hence the values of product quality and demand shifter) as given. From the first-order conditions of the constrained problem, we derive the demand function for variety x_s in country j

$$q_{j,x_s} = \Gamma_{j,s} p_{j,x_s}^{-\sigma_s} \lambda_{j,x_s}, \tag{5}$$

with

$$\Gamma_{j,s} \equiv (\alpha_s P_j Y_j)^{\sigma_s} \left(\sum_{x'_s \in \mathcal{X}_s} \lambda_{j,x'_s}^{\frac{1}{\sigma_s}} q_{j,x'_s}^{\frac{\sigma_s - 1}{\sigma_s}} \right)^{-\sigma_s},$$

where p_{j,x_s} is the price of variety x_s in country j, Y_j indicates real expenditure (j-th representative household's income, or country j's income per head), and P_j is the price index associated to Y_j. Demand exhibits the typical structure of this type of model: it increases linearly in the demand shifter and declines in the price, with price elasticity taking the value $-\sigma_s$. The term $\Gamma_{j,s}$ varies across importers and products.[20]

Optimal variety selection The representative household selects the optimal variety version by relating the demand shifter and producer's pricing to product quality, taking (5) as a constraint. To solve this problem, we need some additional structure on these two elements of the model to link them to the quality (denoted by $\theta_{j,x_s} > 1$) of variety x_s consumed in country j.

We let the demand shifter be

$$\lambda_{j,x_s} = e^{\varsigma} \theta_{j,x_s}^{1+\eta \log Y_j}, \tag{6}$$

where ς is a parameter that governs the importer j's product quality perception of the variety sourced from exporter x. More precisely, the parameter's value depends on to which block of countries the importer and exporter pertain. It may accordingly take four different values (one for each $\mathcal{C}$-$\mathcal{M}$ combination): formally, $\varsigma = \varsigma_{\mathcal{B},\mathcal{B}'}$, with $\mathcal{B}, \mathcal{B}' = \{\mathcal{C}, \mathcal{M}\}$. The exponent of product quality governs the nonhomothetic behavior of preferences. The demand shifter raises with income (larger Y_j), signaling the greater household's appetite for quality, and increasingly so for higher quality varieties (larger θ_{j,x_s}). The parameter η regulates the

[18] The main difference between our setup and the one in Broda and Weinstein (2006) is that we let the domestic varieties be nested within the variety aggregator of each product. Other examples of CES preference representation in applied international trade can be found in Feenstra (1994), Khandelwal, Schott, and Wei (2013), and Jaimovich, Mazdharova, and Merella (2023).

[19] Since the Cobb-Douglas aggregator entails a unit elasticity of substitution across goods, $\sigma_s \geq 1$ means that the elasticity *across* products cannot be larger than *within* products.

[20] The term $\Gamma_{j,s}$ is instead invariant to the negligible impact of variety x_s within the aggregator due to the large number of varieties considered.

intensity of this effect. Note that the functional form of the demand shifter allows insulating quality perception towards an exporter block from product quality levels of the varieties actively supplied by its members.

We define the price function as

$$p_{j,x_s} = \tau_{j,x_s} \kappa_x e^{\theta_{j,x_s}^{\upsilon} (\kappa_x \varphi_s)^{-1}}, \ \upsilon > 1, \tag{7}$$

where $\tau_{j,x_s} > 0$ collects any bilateral importer-exporter element influencing the price of the traded variety other than quality, $\kappa_x > 0$ measures the exporter's efficiency in producing higher-quality products (and also wages in efficiency units), $\varphi_s > 0$ allows for the efficiency to vary across different products, and $\upsilon > 1$ is a technological parameter dictating the cost of product quality upgrading. Note that the exporter's level of development impacts the price in two ways. A larger value of κ_x means higher wages (captured by the term multiplying the exponential function), which imply higher prices for all products exported by x, and a more efficient production of high quality varieties (captured by the term at the exponent), whose prices become relatively cheaper.

The representative household's problem consists of maximizing (3) subject to the constraints represented by the expressions in (5)-(7). The problem's solution leads to the expression identifying the optimal variety

$$\theta_{j,x_s} = \left(\frac{\kappa_x \varphi_s}{\upsilon} \frac{1 + \eta \log Y_j}{\sigma_s - 1} \right)^{\frac{1}{\upsilon}}. \tag{8}$$

Wealthier consumers import higher quality goods (larger Y_j) from more efficient exporters (higher κ_x). Note that, due to the absence of interaction between quality level and perception in (6), the optimal variety selection does not depend on product quality perception.

Quantitative market shares We let $m_{j,x_s} \equiv q_{j,x_s}/Q_{j,s}$ be the quantitative market share of variety x_s in country j, where $Q_{j,s} \equiv \sum_{x_s \in \mathcal{X}_s} q_{j,x_s}$ defines the aggregate quantity of product s consumed in country j across all varieties x_s. Using (5), the quantitative market share reads

$$m_{j,x_s} = p_{j,x_s}^{-\sigma_s} \lambda_{j,x_s} \Omega_{j,s}, \tag{9}$$

where $\Omega_{j,s} \equiv \left(\sum_{x_s \in \mathcal{X}_s} p_{j,x_s}^{-\sigma_s} \lambda_{j,x_s} \right)^{-1}$ is a country- and product-specific collective term, which can be interpreted as the harmonic mean of price-quality ratios, adjusted for the price sensitivity, of the varieties of product s supplied to market j.

Taking logs of (9) and using (6) and (8) leads to

$$z_{j,x_s} \equiv \log m_{j,x_s} + \sigma_s \log p_{j,x_s} = \phi_{Y_j,\kappa_x} \log Y_j \times \log \kappa_x + \psi_x + \delta_{j,s} + \tilde{\theta}_{j,x_s}, \tag{10}$$

with $\phi_{Y_j,\kappa_x} = \eta/\upsilon$, $\phi_{\kappa_x} = (1/\upsilon) \log \kappa_x$, and

$$\delta_{j,s} \equiv \frac{1 + \eta \log Y_j}{\upsilon} \log \left(\frac{1 + \eta \log Y_j}{\sigma_s - 1} \frac{\varphi_s}{\upsilon} \right) + \log \Omega_{j,s}.$$

We can read (10) as a regression equation, where the independent variable is a function of the quantitative market share and price of variety x_s in country j, the income-productivity interaction term is the dependent variable, ψ_x and $\delta_{j,s}$ respectively discipline exporter and importer-product specificities, and

$\tilde{\theta}_{j,x_s}$ is the regression residual, from which we isolate the bilateral country-block effect ς exploiting the equation

$$\tilde{\theta}_{j,x_s} = \varsigma + \epsilon_{j,x_s}, \tag{11}$$

where ϵ_{j,x_s} is the error term of the residual decomposition.

5 Import quality analysis

In Section 3, we have shown that consistently with Hypothesis 2, European $\mathcal{C}$ exporters' *adjusted* unit values of imports, computed as residuals average unit-values after controlling for income-related trade patterns, are systematically lower in $\mathcal{M}$ than in $\mathcal{C}$ markets. Rather than interpreting unit values as proxies for product quality levels, in Section 4, we have developed a model to derive a quality measure from a demand system. This strategy has two advantages. First, it allows to address the analysis of product price and quality separately. Second, the theoretical framework helps in disentangling the effect of potential quality perception biases from other phenomena influencing bilateral trade in a transparent fashion. Using the dataset illustrated in Section 2, we proceed to use the expressions in (10) and (11) to produce our empirical result.

Estimation strategy The last section has abstracted from referring explicitly to time to ease notation. Since we use annual data for several years in our pooled regressions, we add the subscript t to every time-varying element of (10) and (11). Furthermore, as explained in Section 2, we use two sets of price elasticity estimates to compute the independent variable in (10). Henceforth, we let $\sigma_s^{\mathcal{J}}$ denote generic the price elasticity, with $\mathcal{J} = \{j, US\}$, where j (resp., US) indicates that the elasticity was estimated using data on importer j (resp., the United States). Restating the independent variable as $z_{j,x_s,t}^{\mathcal{R},\mathcal{J}} \equiv \log m_{j,x_s,t}^{\mathcal{R}} + \sigma_s^{\mathcal{J}} \log p_{j,x_s,t}^{\mathcal{R}}$, the regression equation reads

$$z_{j,x_s,t}^{\mathcal{R},\mathcal{J}} = \phi_{Y_j,\kappa_x}^{\mathcal{R},\mathcal{J}} \log Y_{j,t} \times \log \kappa_{x,t}^{\mathcal{R}} + \psi_x^{\mathcal{R}} + \delta_{j,s,t} + \tilde{\theta}_{j,x_s,t}^{\mathcal{R},\mathcal{J}}. \tag{12}$$

As discussed in the previous section, the effect of the quality perception bias is embedded in the regression residual $\tilde{\theta}_{j,x_s,t}^{\mathcal{R},\mathcal{J}}$. Following a similar line of reasoning as in Section 3, we perform a residual decomposition through indicator functions identifying the trade flows' origin-destination pairs of country blocks. Formally, we estimate

$$\tilde{\theta}_{j,x_s,t}^{\mathcal{R},\mathcal{J}} = \varsigma_{\mathcal{M},\mathcal{M}}^{\mathcal{R},\mathcal{J}} + \tilde{\varsigma}_{\mathcal{M},\mathcal{C}}^{\mathcal{R},\mathcal{J}}\, \mathbb{I}_{\mathcal{M},\mathcal{C}}^{\mathcal{R}} + \tilde{\varsigma}_{\mathcal{C},\mathcal{M}}^{\mathcal{R},\mathcal{J}}\, \mathbb{I}_{\mathcal{C},\mathcal{M}}^{\mathcal{R}} + \tilde{\varsigma}_{\mathcal{C},\mathcal{C}}^{\mathcal{R},\mathcal{J}}\, \mathbb{I}_{\mathcal{C},\mathcal{C}}^{\mathcal{R}} + \epsilon_{j,x_s,t}^{\mathcal{R},\mathcal{J}}, \tag{13}$$

where $\mathbb{I}_{\mathcal{B},\mathcal{B}'}^{\mathcal{R}}$, with $\mathcal{B}, \mathcal{B}' \neq (\mathcal{M}, \mathcal{M})$, is an indicator function taking value one when the importer belongs to block $\mathcal{B}$ and the exporter to $\mathcal{B}'$, and zero otherwise. The constant $\varsigma_{\mathcal{M},\mathcal{M}}^{\mathcal{R},\mathcal{J}}$ captures the product quality perception prevailing in the trade flows within the country block $\mathcal{M}$. The regression coefficients express the perception differential relative to $\varsigma_{\mathcal{M},\mathcal{M}}^{\mathcal{R},\mathcal{J}}$: Hence, the remaining values that ς can take are such that $\varsigma_{\mathcal{B},\mathcal{B}'}^{\mathcal{R},\mathcal{J}} = \varsigma_{\mathcal{M},\mathcal{M}}^{\mathcal{R},\mathcal{J}} + \tilde{\varsigma}_{\mathcal{B},\mathcal{B}'}^{\mathcal{R},\mathcal{J}}$, for all $(\mathcal{B}, \mathcal{B}') \neq (\mathcal{M}, \mathcal{M})$.

We are interested in examining the differentials in product quality perception between $\mathcal{C}$ and $\mathcal{M}$ markets for imports originating from a specific country block. In particular, we wish to establish whether:

Hypothesis 1 $\mathcal{C}$ consumers attribute a premium to products originating from $\mathcal{M}$ countries, i.e., $\varsigma_{\mathcal{C},\mathcal{M}}^{\mathcal{R},\mathcal{J}} - \varsigma_{\mathcal{M},\mathcal{M}}^{\mathcal{R},\mathcal{J}} = \tilde{\varsigma}_{\mathcal{M},\mathcal{C}}^{\mathcal{R},\mathcal{J}} > 0$;

Table 4.

Quality perception differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries ($\mathcal{EU}$ exporters).

	(1) $z^{\mathcal{EU},j}_{j,x_s,t}$	(2) $\tilde{\theta}^{\mathcal{EU},j}_{j,x_s,t}$	(3) $z^{\mathcal{EU},US}_{j,x_s,t}$	(4) $\tilde{\theta}^{\mathcal{EU},US}_{j,x_s,t}$
$\log Y_{j,t} \times \log \kappa^{\mathcal{EU}}_{x,t}$	0.730***		0.552***	
	(0.223)		(0.171)	
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{M},\mathcal{C}}$		– 1.140***		– 1.145***
		(0.300)		(0.295)
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{C},\mathcal{M}}$		– 0.016		– 0.083
		(0.141)		(0.152)
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{C},\mathcal{C}}$		– 0.784**		– 0.617*
		(0.320)		(0.304)
Observations	515,226	515,226	539,237	539,237
R^2	0.733	0.018	0.753	0.016

Note. The table reports the results of two pairs of estimations concerning EU exporters: Columns 1 and 2 involve the importer elasticities; Columns 3 and 4 the United States'. Columns 1 and 3 estimate (12) and include importer-product-year fixed effects; Columns 2 and 4 estimate (13). Standard errors (in parentheses) are robust and clustered by exporter in all specifications. Significance levels: ***0.01; **0.05; *0.10.

Table 5.

Tests on parameter restrictions (quality perception differentials, $\mathcal{EU}$ exporters).

	(1) value	(2) F-test	(3) p-value
$\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{M}}$	– 0.016	0.01	0.908
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{M},\mathcal{C}}$	0.356***	9.26	0.005
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{C},\mathcal{M}}$	– 0.083	0.30	0.589
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{M},\mathcal{C}}$	0.528***	41.65	0.000
		(1, 26)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table 4. Column 1 indicates the point estimate values of the restrictions; Column 2 the value of the F-test (with the relevant degrees of freedom in parentheses underneath); Column 3 the associated p-value. Significance levels: ***0.01; **0.05; *0.10.

Table 6.

Quality perception differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries ($\mathcal{W}$ exporters).

	(1) $z^{\mathcal{W},j}_{j,x_s,t}$	(2) $\tilde{\theta}^{\mathcal{W},j}_{j,x_s,t}$	(3) $z^{\mathcal{W},US}_{j,x_s,t}$	(4) $\tilde{\theta}^{\mathcal{W},US}_{j,x_s,t}$
$\log Y_{j,t} \times \log \kappa^{\mathcal{W}}_{x,t}$	0.219*		0.238***	
	(0.116)		(0.084)	
$\mathbb{I}^{\mathcal{W}}_{\mathcal{M},\mathcal{C}}$		0.201		0.285
		(0.603)		(0.631)
$\mathbb{I}^{\mathcal{W}}_{\mathcal{C},\mathcal{M}}$		0.097		0.101
		(0.145)		(0.127)
$\mathbb{I}^{\mathcal{W}}_{\mathcal{C},\mathcal{C}}$		– 0.167		– 0.129
		(0.375)		(0.361)
Observations	360,871	360,871	372,943	372,943
R^2	0.698	0.000	0.720	0.001

Note. The table reports the results of two pairs of estimations concerning non-EU exporters: Columns 1 and 2 involve the importer elasticities; Columns 3 and 4 the United States'. Columns 1 and 3 estimate (12) and include importer-product-year fixed effects; Columns 2 and 4 estimate (13). Standard errors (in parentheses) are robust and clustered by exporter in all specifications. Significance levels: ***0.01; **0.05; *0.10.

Table 7.

Tests on parameter restrictions (quality perception differentials, $\mathcal{W}$ exporters).

	(1) value	(2) F-test	(3) p-value
$\tilde{\varsigma}^{\mathcal{W},j}_{\mathcal{C},\mathcal{M}}$	0.097	0.45	0.503
		(1, 155)	
$\tilde{\varsigma}^{\mathcal{W},j}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{W},j}_{\mathcal{M},\mathcal{C}}$	– 0.368	1.60	0.208
		(1, 155)	
$\tilde{\varsigma}^{\mathcal{W},US}_{\mathcal{C},\mathcal{M}}$	0.101	0.62	0.431
		(1, 155)	
$\tilde{\varsigma}^{\mathcal{W},US}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{W},US}_{\mathcal{M},\mathcal{C}}$	– 0.414	1.52	0.219
		(1, 155)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table 4. Column 1 indicates the point estimate values of the restrictions; Column 2 the value of the F-test (with the relevant degrees of freedom in parentheses underneath); Column 3 the associated p-value. Significance levels: ***0.01; **0.05; *0.10.

Hypothesis 2 $\mathcal{M}$ consumers penalize imports from the $\mathcal{C}$ block, i.e., $\varsigma^{\mathcal{R},\mathcal{J}}_{\mathcal{C},\mathcal{C}} - \varsigma^{\mathcal{R},\mathcal{J}}_{\mathcal{M},\mathcal{C}} = \tilde{\varsigma}^{\mathcal{R},\mathcal{J}}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{R},\mathcal{J}}_{\mathcal{M},\mathcal{C}} > 0$.

Main findings Column 1 of Table 4 illustrates the results of estimating (12) in the benchmark case considering intra-EU trade flows in 2000-2002, measuring the exporter's productivity with log per capita GDP, and computing the dependent variable using importer-specific price elasticity estimates. The coefficient $\phi^{\mathcal{EU},j}_{Y_j,\kappa_x}$ is positive and statistically significant as expected. In the presence of nonhomothetic preferences, wealthier importers demand higher quality products, more efficiently supplied by more productive countries. Column 2 reports the estimates of the coefficients in (13) based on the previous regression's residuals. We observe a general heterogeneity in product quality perception across importer's and exporter's blocks. Relative to the average perceived product quality prevailing within the $\mathcal{M}$ block's trade flows, products originating from $\mathcal{C}$ countries appear penalized in both blocks. Somewhat surprisingly, $\mathcal{M}$ products do not command a premium in the $\mathcal{C}$ block.

We repeat the exercise using United States' price elasticity estimates. The ensuing results, which we outline in Columns 3 and 4, show that our findings remain qualitatively intact. We observe that the magnitude of the first-step regression coefficient declines by about 24%. We note a similar drop in the quality perception of products traded within the C block (relative to those exchanged within the M block). The coefficient referring to C products' quality perception in M markets remains virtually unchanged.

Table 5 details the outcomes of the parameter restriction tests designed to establish whether quality perception biases for products originating from a specific country block exist across markets in different blocks. The first row confirms that $\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{M}}$ is not significantly different from zero, suggesting that no bias arises for $\mathcal{M}$ products in either block and that Hypothesis 1 should be rejected. The second row indicates that $\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{M},\mathcal{C}}$ is positive and statistically significant. Hence we cannot exclude that products originating from the $\mathcal{C}$ block are penalized in $\mathcal{M}$ markets, and Hypothesis 2 cannot be rejected. The third and fourth rows confirm such findings using the alternative set of price elasticities (US). We point out a marked rise in the magnitude of the estimates, with the statistically significant coefficient increasing by more than 60%.

We proceed to assess whether the negative quality perception bias detected above is likely linked to the events following the Iron Curtain fall or has to do with the more general notion of countries having a centralized economic system. We address this issue by performing our analysis again, this time on the observed trade flows originating from extra-EU exporters. Tables 6 and 7 give an account of this exercise's outcomes. As expected, the first-step estimations (Columns 1 and 3 of Table 6) align with those obtained examining intra-EU trade. Relative to our benchmark exercises, the coefficients' magnitudes drop drastically (to one-third when considering the importer's elasticities; to less than half with United States' elasticities).

The second-step estimations (Columns 2 and 4 of Table 6) reveal no statistically significant quality perception differentials across all country-block combinations. The parameter restriction tests (Table 7) second this result: none of them reject the null hypothesis of no quality perception bias across importers' blocks for products originating from either exporters' block. We conclude that the phenomenon is specific to the EU and, as such, is likely surfacing due to the intensified trade links between $\mathcal{C}$ and $\mathcal{M}$ countries that followed the Iron Curtain fall, both at the intensive and extensive margin.

Table 8.
Quality perception differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries ($\log \kappa^{\mathcal{EU}}_{x,t} = H^{\mathcal{EU}}_{x,t}$).

	(1) $z^{\mathcal{EU},j}_{j,x_s,t}$	(2) $\tilde{\theta}^{\mathcal{EU},j}_{j,x_s,t}$	(3) $z^{\mathcal{EU},US}_{j,x_s,t}$	(4) $\tilde{\theta}^{\mathcal{EU},US}_{j,x_s,t}$
$\log Y_{j,t} \times \log \kappa^{\mathcal{EU}}_{x,t}$	0.679*		0.577*	
	(0.388)		(0.308)	
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{M},\mathcal{C}}$		– 2.402***		– 2.332***
		(0.187)		(0.198)
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{C},\mathcal{M}}$		– 0.077		0.116
		(0.128)		(0.141)
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{C},\mathcal{C}}$		– 1.544**		– 1.400***
		(0.202)		(0.205)
Observations	515,226	515,226	539,237	539,237
R^2	0.724	0.075	0.745	0.065

Note. The table reports the results of two pairs of estimations concerning EU exporters: Columns 1 and 2 involve the importer elasticities; Columns 3 and 4 the United States'. Columns 1 and 3 estimate (12) and include importer-product-year fixed effects; Columns 2 and 4 estimate (13). Standard errors (in parentheses) are robust and clustered by exporter in all specifications. Significance levels: ***0.01; **0.05; *0.10.

Table 9.
Tests on parameter restrictions (quality perception differentials, $\log \kappa^{\mathcal{EU}}_{x,t} = H^{\mathcal{EU}}_{x,t}$).

	(1) value	(2) F-test	(3) p-value
$\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{M}}$	– 0.077	0.36	0.555
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{M},\mathcal{C}}$	0.858***	44.16	0.000
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{C},\mathcal{M}}$	– 0.116	0.68	0.418
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{M},\mathcal{C}}$	0.932***	80.36	0.000
		(1, 26)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table 4. Column 1 indicates the point estimate values of the restrictions; Column 2 the value of the F-test (with the relevant degrees of freedom in parentheses underneath); Column 3 the associated p-value. Significance levels: ***0.01; **0.05; *0.10.

Table 10.

Quality perception differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries (2003-2007).

	(1) $z^{\mathcal{EU},j}_{j,x_s,t}$	(2) $\tilde{\theta}^{\mathcal{EU},j}_{j,x_s,t}$	(3) $z^{\mathcal{EU},US}_{j,x_s,t}$	(4) $\tilde{\theta}^{\mathcal{EU},US}_{j,x_s,t}$
$\log Y_{j,t} \times \log \kappa^{\mathcal{EU}}_{x,t}$	0.388**		0.476***	
	(0.173)		(0.137)	
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{M},\mathcal{C}}$		– 1.127***		– 1.121***
		(0.298)		(0.295)
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{C},\mathcal{M}}$		0.018		– 0.046
		(0.111)		(0.133)
$\mathbb{I}^{\mathcal{EU}}_{\mathcal{C},\mathcal{C}}$		– 0.862***		– 0.705**
		(0.303)		(0.289)
Observations	946,394	946,394	1,207,108	1,207,108
R^2	0.735	0.018	0.755	0.015

Note. The table reports the results of two pairs of estimations concerning the period 2003-2007: Columns 1 and 2 involve the importer elasticities; Columns 3 and 4 the United States'. Columns 1 and 3 estimate (12) and include importer-product-year fixed effects; Columns 2 and 4 estimate (13). Standard errors (in parentheses) are robust and clustered by exporter in all specifications. Significance levels: ***0.01; **0.05; *0.10.

Table 11.

Tests on parameter restrictions (quality perception differentials, 2003-2007).

	(1) value	(2) F-test	(3) p-value
$\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{M}}$	0.018	0.26	0.873
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{EU},j}_{\mathcal{M},\mathcal{C}}$	0.265**	5.95	0.022
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{C},\mathcal{M}}$	– 0.046	0.12	0.733
		(1, 26)	
$\tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{EU},US}_{\mathcal{M},\mathcal{C}}$	0.416***	24.11	0.000
		(1, 26)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table 4. Column 1 indicates the point estimate values of the restrictions; Column 2 the value of the F-test (with the relevant degrees of freedom in parentheses underneath); Column 3 the associated p-value. Significance levels: ***0.01; **0.05; *0.10.

Robustness checks We perform two sets of robustness exercises. The first set deals with the concern that the exporters' log per capita GDP may not represent an ideal measure of their productivity level. Tables 8 and 9 summarize our findings when the same routine as above is executed after replacing income per head with the World Bank's Human Capital Index. The results are generally confirmed, although we record a decline in the statistical significance of the first-step estimates (Columns 1 and 3 of Table 8) accompanied by a rise in the magnitude of the coefficients expressing product quality perception differentials (Columns 2 and 4 of Table 8) and biases ($\mathcal{M}$ importers' towards $\mathcal{C}$ exporters, Table 9).

The second set of exercises carries out the analysis of the trade flows observed in 2003-2007. The goal is twofold. On the one hand, we wish to test the validity of our findings against a different set of data. On the other hand, opting for a successive adjacent period allows appraising whether product quality perception biases are likely to persist over time. Tables 10 and 11 illustrate the outcomes of this exercise. The results are analogous to the ones obtained with the benchmark study. Relative to the latter, there is a spike in the statistical significance of the coefficients estimating the quality perception differentials involving $\mathcal{C}$ exporters (Columns 2 and 4 of Table 10) and a decline of over 20% in the magnitude of the corresponding quality perception biases (Rows 2 and 4 of Table 11), which nevertheless remain positive and highly significant. These findings still support Hypothesis 2 and suggest that the penalty $\mathcal{M}$ consumers inflict on $\mathcal{C}$ products is persistent, but its extent shows a tendency to decline over time.

Lastly, Appendix C contains outcome reports on some additional exercises, which confirm our findings in some interesting dimensions. In particular, two sets of results are robust to replacing income per head with Human Capital Index as a measure of the exporter's productivity; namely: (i) Tables C.3 and C.4 confirm the absence of quality perception biases towards extra-EU exporters (as depicted by Tables 6 and 7 above); (ii) Tables C.5 and C.6 restate the presence of a negative bias in $\mathcal{M}$ markets towards $\mathcal{C}$ imports between 2003 and 2007 (as described in Tables 10 and 11 above).

6 Conclusion

Among the many issues caused by the turbulent events that former centrally planned European countries experienced in the last decade of the XX century, one concerning international trade flows caught the attention of the public eye. Was the dramatic boost of trade openness detrimental to consumers in the $\mathcal{C}$ block? Although it is certainly plausible that phenomena consistent with this notion occurred in some market niches, we have not found systematic evidence in the trade flows recorded by customs offices. In fact, our analysis suggests that $\mathcal{C}$ *producers* might have been penalized in $\mathcal{M}$ markets due to a negative quality perception bias associated with their exports.

It could be argued that the existence of a home market effect at the block level in $\mathcal{M}$ countries might counterbalance the impact of a quality premium attributed to $\mathcal{M}$ products by $\mathcal{C}$ consumers. However, the data do not seem to support the presence of a home market effect in the $\mathcal{C}$ block, leading to an additional asymmetry across consumers in different country blocks. While this feature is theoretically possible, it should be noted that it does not crowd out the impact of product quality perception bias. It simply offers a different interpretation of the observed outcomes. The data available to us do not allow discerning between the two interpretations. Hence, we stick to our reading of the phenomena while acknowledging this caveat and leave the matter to future research.

We conducted our analysis exploring potential import price differentials and, with the help of a simple theoretical framework, product quality differentials. The results of the two investigations are analogous and survive several robustness exercises. It is worth noting that we have adopted a conservative approach in facing the marked correlation arising by construction between country blocks' indicator functions and the average per capita GDP. Specifically, we have attributed to product quality perception bias only the impact not explained by income-related phenomena. For this reason, the magnitude of the results reported in the paper should be regarded as a 'floor' of the estimated effect.

Our study offers stimulating cues that relate to other fields. We have found evidence suggesting that product quality perception biases are persistent, but their magnitude declines over time. This observation could have repercussions on the competitive environment faced by new products, creating a demand-induced addition to the extended gravity and incumbency market features discussed in existing contributions of international trade. It is also consistent with product quality perception being susceptible to modifications due to internal learning processes and external producer-generated stimuli, as suggested by the psychology and marketing literature. The cause that we conjecture sparks quality perception biases also conveys an interesting postulation concerning the branch of economic development dealing with foreign direct investment. It may be especially profitable for experienced companies in the international markets to take over firms located in productive environments characterized by a weak tendency to differentiate products.

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Appendix

A. Chronology of actions on price/quality differential within the EU

In 2004, the European Union was enlarged to include the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Slovakia, Poland, Slovenia, and Malta. It was a historical milestone in the transformation process of Central and Eastern European countries, which could then be considered finalized. However, it was clear that a long way would remain to catch up with the existing member states in terms of economic development. A few years later, consumers in Central and East Europe began lamenting the allegedly lower quality of imported products, even when these were presented as the same products with identical brands and names. In 2011, the Public Opinion Research Centre of the Czech Republic conducted an extensive questionnaire survey with more than 1,000 respondents focused on food safety and quality.[21] About 58% of people considered the differences in quality levels significant. Another 28% thought that there were only minor differences. In both cases, the questions referred to the quality of imported products, whereas 71% of the respondents perceived locally produced goods as fine.

This general opinion was empirically confirmed in 2017 when the Ministry of Agriculture of The Czech Republic funded a topical University of Chemistry and Technology Prague's Research Project.[22] The project compared selected foods from the Czech Republic, Slovakia, Austria, Germany, and Hungary to determine whether products with different properties, such as composition, amount of ingredients, or product weight, were sold under the same name and packaging. The study tested 21 products sold in different countries under the same brand. The study found that thirteen were different, five slightly different, and three were identical. In addition, five products had other volumes with the same package size. Although the results were not strong enough to conclude that the quality of imported food to the Central European countries was significantly lower, some differences were considered significant.[23]

Although studies on perceived differences in quality referred mainly to food, other products were also tested for quality differences. The study mentioned above included an analysis of the composition of the washing powders. From a chemical standpoint, the study showed that the same washing powders have a significantly higher proportion of active ingredients in Austria and Germany. In several studies, an independent Czech consumer organization called dTest also dealt with differences in the quality of food and washing powders, toilet paper, toothpaste, and detergents.[24] Albeit the results are not robust

[21] See Item [38] in the Webpage List.

[22] See Item [39] in the Webpage List.

[23] For instance, Luncheon sold in Germany contained meat in larger quantities and of higher quality. Other products like Nutella and Nestea had more sugar, added vitamins, and lower contents of artificial sweeteners. Some dairy products had slightly increased protein and fat and lower sugar content.

[24] See Item [40] in the Webpage List.

and often criticized by the producers for their weak methodology, they boosted political actions. Similar initiatives took place in Slovakia, Hungary, Poland, and Slovenia. Since the general results in all these countries confirmed lower quality of imported goods than Germany and Austria, these countries started coordinated actions in EU institutions to address the issue of quality differences.

In 2018, The European Parliament approved a report on dual product quality in the single market, presented by the Czech representative Olga Sehnalová.[25] The report calls for intensified work on dual food quality and emphasizes that food safety and quality and protecting consumers from confusion are among the EU's top priorities.[26] After subsequent discussions among the bodies of the European Union, The European Parliament approved an amendment to the Unfair Commercial Practices Directive in 2019.[27] The obligation to provide clear information on different compositions, which was pivotal in the original proposal, disappears from the Directive. The final document clarifies that not every difference in composition would represent unfair commercial practices. Even substantial differences in the composition of a good supplied with the same packaging to different countries would still be possible if justified by legitimate and objective factors.[28] This solution was considered unsatisfactory by the Central and East European countries.

In 2019 European Commission released a study assessing differences in the composition of EU food products.[29] The study evaluated 1,380 samples of 128 food products from 19 Member States and found that 9% of products presented as the same across the EU had a different composition. Moreover, 22% of products offered similarly had a different composition. Simultaneously, the study found no consistent geographical pattern in differences and concluded that differences in composition do not mean differences in quality. Two years after, the second part of the study was conducted. This time, it focused on sensory differences in food products.[30] Trained experts for sensory properties tested the same products as those for which the first study found differences in composition. The analysis confirmed that products with different compositions were also sensorially perceived differently. However, the discrepancies were almost unrecognizable unless the composition was strikingly different.

In 2021, an amendment to the Food and Tobacco Products Act, which addresses the issue of dual food quality and amends the Consumer Protection Act, came into force in the Czech Republic.[31] From that date, it was forbidden to place on the Czech market food products that are "seemingly identical to food placed on the market in the other Member States of the European Union if the food supplied to the Czech market has a significantly different composition or properties." Exceptions would apply when "justified by legitimate and objective facts and the food would provide easily accessible and sufficient information on the different composition or properties."[32]

[25] See Item [41] in the Webpage List.
[26] See Item [42] in the Webpage List.
[27] See Item [37] in the Webpage List.
[28] See Item [41] in the Webpage List.
[29] See Item [43] in the Webpage List.
[30] See Item [44] in the Webpage List.
[31] See Item [45] in the Webpage List.
[32] See Item [41] in the Webpage List.

B. Mathematical derivations

Derivation of eq. (5). Consider country-j representative household's problem of maximizing the objective function (4) subject the budget constraint

$$\sum_{s\in\mathcal{S}}\sum_{x_s\in\mathcal{X}_s} p_{j,x_s}q_{j,x_s} \leq P_jY_j. \tag{14}$$

Letting ν denote the Lagrange multiplier on this constraint, we may write the Lagrangian

$$\mathcal{L}=\prod_{s\in\mathcal{S}}\left(\sum_{x_s\in\mathcal{X}_s}\lambda_{j,x_s}^{\frac{1}{\sigma_s}}q_{j,x_s}^{\frac{\sigma_s-1}{\sigma_s}}\right)^{\frac{\alpha_s\sigma_s}{\sigma_s-1}}+\nu\left(P_jY_j-\sum_{s\in\mathcal{S}}\sum_{x_s\in\mathcal{X}_s}p_{j,x_s}q_{j,x_s}\right),$$

from which we obtain the first-order condition

$$\frac{\partial\mathcal{L}}{\partial q_{j,x_s}}=\frac{\alpha_s}{q_{j,x_s}}\frac{\lambda_{j,x_s}^{\frac{1}{\sigma_s}}q_{j,x_s}^{\frac{\sigma_s-1}{\sigma_s}}}{\sum_{x_s\in\mathcal{X}_s}\lambda_{j,x_s}^{\frac{1}{\sigma_s}}q_{j,x_s}^{\frac{\sigma_s-1}{\sigma_s}}}U_j-\nu p_{j,x_s}=0,\quad\forall\, x_s\in\mathcal{X}_s,\, s\in\mathcal{S},\, j\in\mathcal{J}, \tag{15}$$

where we have assumed that the budget constraint binds.

Rearranging, multiplying the whole expression by q_{j,x_s} and summing over the set $\mathcal{X}_s$ yields

$$\alpha_s\frac{\sum_{x_s\in\mathcal{X}_s}\lambda_{j,x_s}^{\frac{1}{\sigma_s}}q_{j,x_s}^{\frac{\sigma_s-1}{\sigma_s}}}{\sum_{x_s\in\mathcal{X}_s}\lambda_{j,x_s}^{\frac{1}{\sigma_s}}q_{j,x_s}^{\frac{\sigma_s-1}{\sigma_s}}}U_j=\alpha_sU_j=\nu\sum_{x_s\in\mathcal{X}_s}p_{j,x_s}q_{j,x_s}.$$

Furthermore, summing over the set $\mathcal{S}$, imposing the parameter restriction $\sum_{s\in\mathcal{S}}\alpha_s=1$, and recalling that the aggregate expenditure is $\sum_{s\in\mathcal{S}}\sum_{x_s\in\mathcal{X}_s}p_{j,x_s}q_{j,x_s}=P_jY_j$, we have

$$U_j=\sum_{s\in\mathcal{S}}\alpha_sU_j=\nu\sum_{s\in\mathcal{S}}\sum_{x_s\in\mathcal{X}_s}p_{j,x_s}q_{j,x_s}=\nu P_jY_j.$$

Replacing this result into (15) and rearranging, we obtain the country-j demand function (5) of variety x_s. ■

Derivation of eq. (8). Using (3), (6), (7), and taking (5) into account, the representative household's problem reads

$$\begin{aligned}\sup_{\theta_{x_s}}u_{j,x_s}(\theta_{x_s}) &= \lambda_{j,x_s}^{\frac{1}{\sigma_s-1}}q_{j,x_s},\\ s.t.\ q_{j,x_s} &= \Gamma_{j,s}p_{j,x_s}^{-\sigma_s}\lambda_{j,x_s},\\ \lambda_{j,x_s} &= e^{\varsigma}\theta_{j,x_s}^{1+\eta Y_j},\\ p_{j,x_s} &= \tau_{j,x_s}\kappa_xe^{\theta_{j,x_s}^{\upsilon}(\kappa_x\varphi_s)^{-1}}.\end{aligned}$$

Plugging the constraints into the objective function, we can rewrite the problem as an unconstrained variant as

$$\sup_{\theta_{x_s}}u_{j,x_s}(\theta_{x_s})=\Gamma_{j,s}\tau_{j,x_s}^{-\sigma_s}\kappa_xe^{\frac{\sigma_s\varsigma}{\sigma_s-1}}\theta_{x_s}^{\frac{\sigma_s}{\sigma_s-1}(1+\eta Y_j)}e^{-\sigma_s\theta_{j,x_s}^{\upsilon}(\kappa_x\varphi_s)^{-1}}.$$

The problem's first-order condition is

$$\frac{\sigma_s}{\sigma_s-1}(1+\eta Y_j)\frac{u_{j,x_s}(\theta_{j,x_s})}{\theta_{j,x_s}}-\frac{\sigma_s\upsilon}{\kappa_x\varphi_s}\theta_{j,x_s}^{\upsilon}\frac{u_{j,x_s}(\theta_{j,x_s})}{\theta_{j,x_s}}=0.$$

The problem's second-order condition for a maximum is satisfied since

$$u''_{j,x_s}(\theta_{j,x_s}) = -\sigma_s \frac{u_{j,x_s}(\theta_{j,x_s})}{\theta_{j,x_s}} \left(\frac{1+\eta Y_j}{\sigma_s - 1} \frac{1}{\theta_{j,x_s}} + \frac{\upsilon(\upsilon - 1)}{\kappa_x \varphi_s} \theta_{j,x_s}^{\upsilon-1} \right) \leq 0.$$

Rerranging the first-order condition, we obtain (8). ■

Derivation of $u''_{j,x_s}(\theta_{j,x_s})$. Note that the first derivative of $u_{j,x_s}(\theta_{j,x_s})$ reads

$$u'_{j,x_s}(\theta_{j,x_s}) = \sigma_s \left(\frac{1+\eta Y_j}{\sigma_s - 1} \frac{1}{\theta_{j,x_s}} - \frac{\upsilon}{\kappa_x \varphi_s} \theta_{j,x_s}^{\upsilon-1} \right) u_{j,x_s}(\theta_{j,x_s}).$$

Then, the second-order derivative is

$$u''_{j,x_s}(\theta_{j,x_s}) = \sigma_s u_{j,x_s}(\theta_{j,x_s}) \frac{\partial}{\partial \theta_{j,x_s}} \left(\frac{1+\eta Y_j}{\sigma_s - 1} \frac{1}{\theta_{j,x_s}} - \frac{\upsilon}{\kappa_x \varphi_s} \theta_{j,x_s}^{\upsilon-1} \right) + \sigma_s \left(\frac{1+\eta Y_j}{\sigma_s - 1} \frac{1}{\theta_{j,x_s}} - \frac{\upsilon}{\kappa_x \varphi_s} \theta_{j,x_s}^{\upsilon-1} \right) \frac{\partial u_{j,x_s}(\theta_{j,x_s})}{\partial \theta_{j,x_s}}.$$

where the second addend on the right-had side vanishes since, at the optimum, $\partial u_{j,x_s}(\theta_{j,x_s}) / \partial \theta_{j,x_s} = 0$. ■

Derivation of eq. (9). We define the aggregate consumption of good s across all varieties j_s in country i as

$$Q_{i,s} \equiv \sum_{j_s \in \mathcal{J}_s} q_{j_s} = \alpha_s^{\sigma_s} P_i^{\sigma_s} Y_i^{\sigma_s} \left(\sum_{j_s \in \mathcal{J}_s} \lambda_{i,j_s}^{\frac{1}{\sigma_s}} q_{j_s}^{\frac{\sigma_s - 1}{\sigma_s}} \right)^{-\sigma_s} \sum_{j_s \in \mathcal{J}_s} p_{j_s}^{-\sigma_s} \lambda_{i,j_s}. \tag{16}$$

Imposing the identity $m_{i,j_s} \equiv q_{i,j_s}/Q_{i,s}$, using (5) and (16), and simplifying, we obtain (9). ■

Derivation of eq. (10). Taking logs of (9) yields

$$\log m_{j,x_s} = -\sigma_s \log p_{j,x_s} + \log \lambda_{j,x_s} + \log \Omega_{j,s}.$$

Rearranging, using the definition of z_{j,x_s} and (6), we obtain

$$z_{j,x_s} = \varsigma + (1 + \eta \log Y_j) \log \theta_{j,x_s} + \log \Omega_{j,s},$$

from which exploiting (8) we get

$$z_{j,x_s} = \frac{1+\eta \log Y_j}{\upsilon} \log \left(\frac{\kappa_x \varphi_s}{\upsilon} \right) + \log \left(\frac{1+\eta \log Y_j}{\sigma_s - 1} \right) + \log \Omega_{j,s} + \varsigma.$$

Rearranging and using the definitions of ϕ_{Y_j,κ_x}, ψ_x, and $\delta_{j,s}$ leads to (10). ■

C. Additional tables

Table C.1.

Unit value differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries.

	(1) $p^{\mathcal{EU}}_{j,x_s,t}$	(2) $\tilde{p}^{\mathcal{EU}}_{j,x_s,t}$	(3) $p^{\mathcal{W}}_{j,x_s,t}$	(4) $\tilde{p}^{\mathcal{W}}_{j,x_s,t}$
$\log Y_{j,t} \times \log Y^{\mathcal{R}}_{x,t}$	0.082*		0.053**	
	(0.048)		(0.022)	
$\mathbb{I}^{\mathcal{R}}_{\mathcal{M},\mathcal{C}}$		– 0.189***		– 0.177**
		(0.049)		(0.073)
$\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{M}}$		– 0.002		0.021
		(0.029)		(0.054)
$\mathbb{I}^{\mathcal{R}}_{\mathcal{C},\mathcal{C}}$		– 0.131**		– 0.157**
		(0.050)		(0.062)
Observations	515,226	515,226	360,871	360,871
R^2	0.693	0.008	0.615	0.005

Note. The table reports the results of estimations as per equations (12)-(13) with log unit values replacing the independent variable. All estimations include importer-product-year fixed effects, with robust standard errors (in parentheses) clustered by exporter. Significance levels: ***0.01; **0.05; *0.10.

Table C.2.

Tests on parameter restrictions (unit value differentials).

	(1) value	(2) F-test	(3) p-value
$\tilde{\gamma}^{\mathcal{EU}}_{\mathcal{C},\mathcal{M}}$	– 0.002	0.01	0.939
		(1, 26)	
$\tilde{\gamma}^{\mathcal{EU}}_{\mathcal{C},\mathcal{C}} - \tilde{\gamma}^{\mathcal{EU}}_{\mathcal{M},\mathcal{C}}$	0.058**	4.77	0.038
		(1, 26)	
$\tilde{\gamma}^{\mathcal{W}}_{\mathcal{C},\mathcal{M}}$	0.021	0.16	0.693
		(1, 155)	
$\tilde{\gamma}^{\mathcal{W}}_{\mathcal{C},\mathcal{C}} - \tilde{\gamma}^{\mathcal{W}}_{\mathcal{M},\mathcal{C}}$	0.020	0.35	0.556
		(1, 155)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table C.1. The columns indicate the values of the restriction, the F-test (degrees of freedom in parentheses), and the associated p-value. Significance levels: ***0.01; **0.05; *0.10.

Table C.3.
Quality perception differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries ($\mathcal{W}$ exporters, $\log \kappa^{\mathcal{EU}}_{x,t} = H^{\mathcal{EU}}_{x,t}$).

	(1) $z^{\mathcal{W},j}_{j,x_s,t}$	(2) $\tilde{\theta}^{\mathcal{W},j}_{j,x_s,t}$	(3) $z^{\mathcal{W},US}_{j,x_s,t}$	(4) $\tilde{\theta}^{\mathcal{W},US}_{j,x_s,t}$
$\log Y_{j,t} \times \log \kappa^{\mathcal{W}}_{x,t}$	0.315		0.437***	
	(0.195)		(0.094)	
$\mathbb{I}^{\mathcal{W}}_{\mathcal{M},\mathcal{C}}$		– 0.336		– 0.216
		(0.654)		(0.688)
$\mathbb{I}^{\mathcal{W}}_{\mathcal{C},\mathcal{M}}$		0.136		0.139
		(0.113)		(0.104)
$\mathbb{I}^{\mathcal{W}}_{\mathcal{C},\mathcal{C}}$		– 0.652		– 0.590
		(0.436)		(0.417)
Observations	352,189	352,189	364,129	364,129
R^2	0.708	0.002	0.726	0.002

Note. The table reports the results of two pairs of estimations: Columns 1 and 2 involve the importer elasticities; Columns 3 and 4 the United States'. Columns 1 and 3 estimate (12) and include importer-product-year fixed effects; Columns 2 and 4 estimate (13). Standard errors (in parentheses) are robust and clustered by exporter in all specifications. Significance levels: ***0.01; **0.05; *0.10.

Table C.4.
Tests on parameter restrictions (quality perception differentials, $\mathcal{W}$ exporters, $\log \kappa^{\mathcal{EU}}_{x,t} = H^{\mathcal{EU}}_{x,t}$).

	(1) value	(2) F-test	(3) p-value
$\tilde{\varsigma}^{\mathcal{W},j}_{\mathcal{C},\mathcal{M}}$	0.136	1.44	0.233
		(1, 115)	
$\tilde{\varsigma}^{\mathcal{W},j}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{W},j}_{\mathcal{M},\mathcal{C}}$	– 0.316	1.58	0.211
		(1, 115)	
$\tilde{\varsigma}^{\mathcal{W},US}_{\mathcal{C},\mathcal{M}}$	0.139	1.78	0.185
		(1, 115)	
$\tilde{\varsigma}^{\mathcal{W},US}_{\mathcal{C},\mathcal{C}} - \tilde{\varsigma}^{\mathcal{W},US}_{\mathcal{M},\mathcal{C}}$	– 0.374	1.45	0.230
		(1, 115)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table C.3. Column 1 indicates the point estimate values of the restrictions; Column 2 the value of the F-test (with the relevant degrees of freedom in parentheses underneath); Column 3 the associated p-value. Significance levels: ***0.01; **0.05; *0.10.

Table C.5.
Quality perception differentials between $\mathcal{C}$-countries and $\mathcal{M}$-countries (2003-2007, $\log \kappa_{x,t}^{\mathcal{EU}} = H_{x,t}^{\mathcal{EU}}$).

	(1) $z_{j,x_s,t}^{\mathcal{EU},j}$	(2) $\tilde{\theta}_{j,x_s,t}^{\mathcal{EU},j}$	(3) $z_{j,x_s,t}^{\mathcal{EU},US}$	(4) $\tilde{\theta}_{j,x_s,t}^{\mathcal{EU},US}$
$\log Y_{j,t} \times \log \kappa_{x,t}^{\mathcal{EU}}$	0.987***		0.794**	
	(0.328)		(0.286)	
$\mathbb{I}_{\mathcal{M},\mathcal{C}}^{\mathcal{EU}}$		– 2.154***		– 2.079***
		(0.190)		(0.203)
$\mathbb{I}_{\mathcal{C},\mathcal{M}}^{\mathcal{EU}}$		0.016		– 0.066
		(0.105)		(0.120)
$\mathbb{I}_{\mathcal{C},\mathcal{C}}^{\mathcal{EU}}$		– 1.602***		– 1.354***
		(0.208)		(0.199)
Observations	946,394	946,394	1,207,108	1,207,108
R^2	0.729	0.062	0.750	0.053

Note. The table reports the results of two pairs of estimations: Columns 1 and 2 involve the importer elasticities; Columns 3 and 4 the United States'. Columns 1 and 3 estimate (12) and include importer-product-year fixed effects; Columns 2 and 4 estimate (13). Standard errors (in parentheses) are robust and clustered by exporter in all specifications. Significance levels: ***0.01; **0.05; *0.10.

Table C.6.
Tests on parameter restrictions (quality perception differentials, 2003-2007, $\log \kappa_{x,t}^{\mathcal{EU}} = H_{x,t}^{\mathcal{EU}}$).

	(1) value	(2) F-test	(3) p-value
$\tilde{\varsigma}_{\mathcal{C},\mathcal{M}}^{\mathcal{EU},j}$	0.016	0.02	0.883
		(1, 26)	
$\tilde{\varsigma}_{\mathcal{C},\mathcal{C}}^{\mathcal{EU},j} - \tilde{\varsigma}_{\mathcal{M},\mathcal{C}}^{\mathcal{EU},j}$	0.552***	22.55	0.000
		(1, 26)	
$\tilde{\varsigma}_{\mathcal{C},\mathcal{M}}^{\mathcal{EU},US}$	– 0.066	0.31	0.585
		(1, 26)	
$\tilde{\varsigma}_{\mathcal{C},\mathcal{C}}^{\mathcal{EU},US} - \tilde{\varsigma}_{\mathcal{M},\mathcal{C}}^{\mathcal{EU},US}$	0.725***	75.39	0.000
		(1, 26)	

Note. The table reports the results of two sets of parameter restriction tests performed on the coefficients reported in Columns 2 and 4 of Table C.5. Column 1 indicates the point estimate values of the restrictions; Column 2 the value of the F-test (with the relevant degrees of freedom in parentheses underneath); Column 3 the associated p-value. Significance levels: ***0.01; **0.05; *0.10.