Technical Appendix for "Estimating Cross-Country Differences in Product Quality"*

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Abstract

This web-based technical appendix provides additional information on the data and estimation techniques used in the above-referenced paper. It also reports the full set of quality index intercepts and slopes discussed in the paper in tabular form, as well as their standard errors, by country and industry.

Keywords: Export Unit Values; Export Quality; Revealed Preference; Vertical Differentiation; Horizontal Differentiation

JEL classification: F1; F2; F4

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1. Introduction

This web-based technical appendix provides additional information related to the results reported in "Estimating Cross-Country Differences in Product Quality". Section 2 discusses issues related to dataset construction. Section 3 compares first-stage estimates reported in the paper to first-stage estimates derived from alternate estimators. Section 4 reports estimated Quality Index intercepts and slopes by country and industry, along with their standard errors.

2. Dataset Construction

2.1. Net Trade

We use trade data from the United Nations Commodity Trade Statistics Database (COMTRADE) to construct countries' trade balances with the world (i.e., the other countries in the sample) during the sample period.[1] Trade balances are computed for overall manufacturing, by one-digit SITC manufacturing industry, and for Textiles (two-digit SITC 65) and Apparel (two-digit SITC 84).

Records in the COMTRADE data track reporting countries' bilateral trade flows with each of their partner countries by industry and year. Our approach is to subtract each country's total reported imports from its total reported exports by industry and year.[2] Here, we note caveats and adjustments. Our exact algorithm for refining the trade data can be found by examining the Stata programs used to construct the trade balances.

- *Missing data.* One-year gaps in reporting (i.e. the absence of data for imports, exports or both in a particular country-year) occur in a number of countries that otherwise exhibit regular reporting. All of the reports for Japan and Pakistan, for example, are missing for 1992 and 1994, respectively. Short gaps in trade reporting were interpolated from the closest years available.

[1] COMTRADE data are revised over time. The data described here were accessed on June 8, 2006 via the website http://unstats.un.org/unsd/comtrade.

[2] Unfortunately, country pairs' reported trade flows with each other are often mutually inconsistent. Since our principal interest is the accuracy of countries' overall net trade with the world, we favor this approach, which maximizes reporting consistency within countries, to the one taken by Feenstra et al. (1997, 2000), which generally relies on reporting countries' import statistics to estimate bilateral trade flows.

- *CIF versus FOB:* Imports are reported CIF while exports are reported FOB. Exports are adjusted by an estimated year-sector-country-pair transport cost spread.

- *Entrepôt trade.* Hong-Kong and Singapore act as entrepôts for exports from China and Malaysia, respectively. In COMTRADE data, countries importing goods from either China or Malaysia via Hong-Kong or Singapore attribute the entire value of the import to the country of origin, although value is added by the entrepôt. Reports from both exporting countries in turn reflect this addition of value: exports from the country of origin (entrepôt) to the final destination are lower (higher) than reported by the country of destination. To avoid error in origin attribution, we assign preference to reports from Hong-Kong, Singapore, China and Malaysia over those of other countries in exports as well as imports.

- *COMTRADE does not include Taiwanese trade data.* Taiwan is excluded from COMTRADE. We identify Taiwanese trade from flows reported by all countries in the database in which the partner is classified under UN code 490 ("other Asia, not elsewhere specified"), which reporting countries generally use to classify trade with Taiwan. However, given countries' standard practice of reporting imports under the "country-of-origin" criterion noted above, employing partner reports in this manner would lead to double counting of Taiwan's exports to areas in which there is entrepôt trade. A Taiwanese export that passes through customs in Singapore and is later re-exported to Malaysia, for example, would be registered by both countries as an import from UN code 490. To avoid double counting, we employ Taiwan's own data of exports to the People's Republic of China, Hong Kong, Malaysia, Indonesia and Singapore, downloaded from Taiwan's Bureau of Foreign Trade (eweb.trade.gov.tw).

- *Missing reports of Singapore's trade with Indonesia.* Singapore does not report any trade with Indonesia on COMTRADE prior to 2003, even though Indonesia is one of its main trade partners. We employ the ratio of Singapore and Indonesia's trade reports for a same trade flow in 2003 and 2004 to create sector-specific adjustment factors. We proxy Singapore's missing trade reports as Indonesia's factor-adjusted reports up to 2002.

- *Unspecified origin.* Imports reported to originate in general unspecified areas – i.e., "bunkers" (UN code 837), "free zones" (838), "special categories" (839) and "areas not elsewhere specified" (899) – are attributed to partners reporting exports in excess of specified import value. For a country-year-sector in which unidentified imports are greater than the sum of bilateral gaps between specified imports and partner exports, the entire value of unidentified imports is allocated to close the gaps, and any remainder kept as unspecified imports. Where unspecified imports are insufficient to close all gaps, unspecified imports are distributed across partners in proportion to gap value. Exports to unspecified areas are not attributed: because a reporter's fob export value should always be below partners' cif values there is no natural basis for attribution.

- *Non-ferrous metals.* Following standard practice, we remove non-ferrous metals (two-digit SITC 68) from manufactured goods. Products in this category are generally considered commodities. We note that removing trade values at the two-digit level from one-digit data is non-trivial because quality in reporting degrades with disaggregation. We proxy for gaps in reporting because otherwise the construction of bilateral trade flows in one-digit SITC 6 would employ data from different directions of trade when netting imports in two-digit SITC 68. In a number of cases, that would lead to substantial mismatches. A gap in the two-digit record of a given country A with partner B is adjusted if it meets three conditions: i) country A reports a flow from B under one-digit SITC code 6 but not under two-digit code 68, ii) A reports a flow of non-ferrous metals from B in the same direction of trade for some other year during the period, and iii) B claims the existence of the flow in that particular year. We construct an average ratio of flows in two-digit SITC 68 to flows in one-digit SITC 6 for the country pair. To proxy A's report at two-digits, we adjust its one-digit reported value by this average ratio. The average ratio is obtained from the two years surrounding the missing data. If a ratio was unavailable from either surrounding year, the ratio from the other was used. If a ratio in both surrounding years was unavailable, ratios from the closest years available were used.

2.2. Trade Costs

Tariff information comes from the Trade Analysis and Information System (TRAINS) Database maintained by the United Nations Conference on Trade and Development (UNCTAD). Using the World Integrated Trade Solution (WITS) internet interface, we download publicly available data on reporting countries' most favored nation (MFN) and bilateral preferential (PRF) tariff rates for pooled manufacturing goods as well as for manufacturing goods by one-digit SITC industry and select two-digit SITC industries (see main text).[3]

Countries assign tariffs according to six- to ten-digit Harmonized System product classifications. Here, we make use of UNCTAD-constructed weighted average tariff rates computed across all tariff lines available for pooled manufacturing and for manufacturing by one-digit SITC industry and for select two-digit SITC industries. These weighted average tariffs use reporting countries' import values as weights.[4]

Unfortunately, the tariff data are available only sparsely. Table 1, for example, reports MFN data availability for pooled manufacturing across the countries in our sample, where EUN refers to the countries of the European Union. Each cell of the table either contains the reporter's weighted average MFN tariff or is missing (i.e., "."). As indicated in the table, MFN data is available for just under half of the cells. Data availability for one-digit manufacturing industries as well as for bilateral preferential tariffs is similarly limited.

Our construct of a trade-cost dataset has three steps. First, we construct a balanced panel of MFN tariffs for both pooled manufacturing and for one-digit manufacturing industries. In both cases, we use the following algorithm. Start with the raw data from TRAINS. Fill in missing reporter-year (MFN) observations by using data for the last year available. For example, if country c reports a pooled-manufacturing MFN tariff of 10 percent in 1995 and 8 percent in 2000, we assume it has pooled-manufacturing MFN tariffs of 10 percent and 8 percent for years 1995 to 1999 and for 2000 to 2004, respectively. Missing observations before the first year of data

[3]The data can be accessed at http://wits.worldbank.org via Microsoft's Internet Explorer after installing the WITS software (http://wits.worldbank.org/install.htm) and registering with the World Bank. For MFN tariffs, we use reporting countries MFN tariff *vis a vis* the world. For PRF tariffs, we use the preferential tariffs countries report separately for each partner country.

[4]We do not observe changes in the set of tariff lines used to construct these averages across either time or country pairs. As a result, they are likely influenced by composition.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ARG	.	.	.	14	14	.	12	14	15	16	15	15	14	13	14
AUS	.	.	12	.	10	.	.	5	5	5	5	5	4	5	5
AUT	.	11	.	.	.	.	.	.	.	.	.	.	.	.	.
BRA	37	28	23	21	16	16	14	16	16	18	16	15	12	12	12
CAN	8	.	.	.	8	.	7	5	5	4	3	3	3	3	3
CHE	.	0	.	.	0	.	0	0	0	0	0	0	0	0	0
CHL	.	.	.	11	11	11	11	.	11	11	10	9	8	7	.
CHN	.	.	.	36	33	30	.	18	15	15	14	13	13	.	7
COL	.	.	6	10	.	11	12	11	11	.	10	11	10	11	.
EUN	6	7	7	7	7	7	6	5	5	4	3	3	3	4	4
FIN	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HKG	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.
HUN	.	.	12	.	10	.	.	9	9	.	.	.	.	8	.
IDN	15	16	.	.	14	.	13	9	.	.	8	7	5	6	6
IND	.	71	.	44	.	.	.	.	21	.	32	.	28	.	.
ISR	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.
JPN	4	3	3	3	3	3	3	3	2	2	2	2	2	2	2
KOR	13	11	.	10	.	.	7	8	.	.	6	.	.	5	.
MAR	.	.	.	.	55	.	.	.	18	.	.	26	26	26	25
MEX	.	.	13	.	.	.	12	.	12	12	15	15	14	15	14
MYS	.	.	11	.	9	.	.	6	6	.	.	.	5	5	5
NOR	.	.	.	.	6	.	6	5	.	2	.	2	2	1	1
NZL	.	.	.	10	9	.	.	8	6	5	5	4	.	5	5
PAK	.	.	.	.	.	.	49	.	.	44	.	.	21	18	17
PHL	23	15	.	15	15	15	14	.	.	6	6	4	3	2	2
POL	.	.	.	11	.	.	10	13	10	10	9	10	8	8	8
ROM	.	.	18	.	.	.	.	.	.	.	14	.	15	.	.
SGP	1	.	.	.	.	.	0	.	.	.	.	.	0	0	0
SWE	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
THA	35	.	34	.	37	.	16	.	.	.	.	10	11	.	11
TUR	.	.	.	.	8	.	7	.	6	.	5	.	.	.	5
TWN	11	.	.	6	.	.	.	4	.	.	5	3	3	3	3
ZAF	.	11	12	.	14	.	.	9	6	.	5	.	6	.	.

Notes: Table displays mean weighted average MFN tariff by reporting country and year. "." denotes data unavailability. EUN denotes European Union countries.

Table 1: MFN Data Availibility in the TRAINS Dataset, 1989 to 2003

availability are filled in with the next available observation.

Second, we construct a similar panel of preferential tariffs but omit the final step, i.e., we do not assume preferential tariffs exist before the first year they show up in TRAINS. Our assumption is that preferential tariffs are most likely to appear around the time they are introduced or changed, and casual analysis of the data appears consistent with this assumption.[5]

Third, fill in a complete bilateral database for years 1989 to 2003 using the constructed MFN dataset described above. Then, using the constructed PRF dataset just described, replace the MFN tariff with a PRF tariff if it is available.[6] The final dataset, therefore, contains a mixture of MFN and PRF tariff rates under the

[5] The preferential tariffs associated with Mercosur, for example, first show up in 1995.

[6] We keep the MFN tariff in the small number of cases in which the MFN tariff is lower than the PRF tariff.

assumption that the country pair is governed by MFN rules if preferential rates do not appear in TRAINS. These tariff rates are combined with the estimated transport costs described in the main text to compute the structural trade cost parameters used in the estimation.

Our trade barrier data have three known weaknesses. First, they are available for less than half of the reporter-partner-year cells in our sample period. As a result, we must impute a large number of MFN and PRF tariffs using neighboring values. Second, due to changes in product categorization over time as well as uneven reporting of tariffs across countries and years, the weighted-average tariff rates we rely upon are based upon a non-constant mix of products, introducing potential composition bias. Finally, the TRAINS data do not provide meaningful information about countries' non-tariff barriers, such as apparel and textile quotas.

2.3. Real Exchange Rates

To fill in the missing EIU data, we normalize the World Bank data to the EIU data in overlap years and use the WB data for years missing in the EIU dataset. Comparisons of the series in the overlap years indicate a relatively close match and are available upon request. RER data for any remaining holes in the dataset are computed using raw nominal exchange rate and CPI deflator data available in the International Financial Statistics published by the IMF. These data are available at www.imf.org.

3. Alternate First-Stage Estimators

In this section we describe three alternative first-stage estimators and discuss the sensitivity of results to their use. The first, which we refer to as the "V" estimator, is defined by a quadratic penalty function centered at the midpoint (F_s^{cd}) of each country pair's interval,

$$\Psi^V = \sum_c \sum_{d>c} \left(\ln F_s^{cd} - \ln P_s^{cd} \right)^2 . \tag{1}$$

Since the midpoint of the interval is equal to the (log of the) Fisher index defined by the intervals' Paasche and Laspeyres bounds ($F_s^{cd} = \sqrt{H_s^{cd} L_s^{cd}}$), this penalty function

is similar in spirit to other multilateral indexes proposed in the index number literature (see, for example, Diewert and Nakamura 1993). Though this approach has the advantage of rewarding estimates that are closer to the middle of the interval, where conformance with the bounds is less likely to be driven by measurement error, it has the undesirable feature of treating equally deviations from the Fisher index that are inside versus outside of the theoretically mandated bounds.

A second alternative penalty function, which we refer to as the "sink" estimator, only penalizes estimates outside the interval:

$$\Psi^S = \sum_c \sum_{d>c} 1_s^{cd} * \left[\min\left\{abs\left(\ln P_s^{cd} - \ln H_s^{cd}\right), abs\left(\ln L_s^{cd} - \ln P_s^{cd}\right)\right\}\right]^2 \tag{2}$$

where 1_s^{cd} is an indicator variable equalling zero for $\ln H_s^{cd} \leq \ln P_s^{cd} \leq \ln L_s^{cd}$ and one otherwise. While this approach properly favors estimates within the interval, it ignores potential measurement error. Our proposed estimator, by contrast, penalizes estimates within and outside the interval, but only according to the likelihood that conformance to the theory is a consequence of measurement error.

Finally, we investigate the use of an index proposed by Hummels and Klenow (2005),

$$HK_s^{kW} = \prod_{z \in I_s^{kW}} \left(\frac{p_z^k}{p_z^W}\right)^{w_z^k}, \quad k = 1, ..., C \tag{3}$$

where

$$s_z^k = \frac{p_z^k q_z^k}{\sum_{z' \in I_s^{kW}} p_{z'}^k q_{z'}^k}, \; s_z^W = \frac{p_z^W q_z^W}{\sum_{z' \in I_s^{cW}} p_{z'}^W q_{z'}^W}, \; w_z^k = \frac{\frac{s_z^k - s_z^W}{\ln s_z^k - \ln s_z^W}}{\sum_{z' \in I_s^{cW}} \frac{s_{z'}^k - s_{z'}^W}{\ln s_{z'}^k - \ln s_{z'}^W}}. \tag{4}$$

HK_s^{kW} compares country k's prices to those of the world (W) over the set of goods country k has in common with the world ($z \in I_s^{kW}$). The world (W) is an aggregate of all countries – in our case the 43 countries in the sample – except for country k. Therefore, the "world" price of product z, p_z^W, is just total world value divided by total world quantity, q_z^W, omitting country k in the calculation.[7] Though this index has the

[7]Since country k is not included to calculate world prices, the set of countries in W varies with k. We do not subindex W by k to simplify notation.

advantage that it can be computed rather than estimated, it has the disadvantage of treating an aggregation of countries as a single entity without theoretical justification. Finally, a bilateral index for country pair c and d, HK_s^{cd}, is computed as the ratio HK_s^{cW}/HK_s^{dW}.[8]

Goodness of fit, i.e., percent of first-stage Impure Price Index estimates that lie within the Paasche-Laspeyres bounds, for these alternate estimates is generally lower than for our preferred estimator. As reported in Table 2, the "V" performs best among the alternatives, with the "sink" a close second. The performance of the "HK" estimator, on the other hand, is poor: on average, just 43 percent of the bilateral Impure Price Indexes lie within the theoretically mandated Paasche and Laspeyres bounds. Similar differences are manifest in the first-stage estimates: though we find a high cross-country correlation between Impure Price Indexes estimated by our preferred estimator and those estimated by the "V" and the "sink" (the average cross-sectional correlation across years is above 0.99 in both cases), the correlation with the computed "HK" indexes is much lower (an average across years of 0.43).[9] Given the similarity of the preferred, "V" and "sink" estimates, it is not surprising that the second-stage quality estimates to which they give rise are also quite similar.

4. Quality Index Intercepts and Slopes

Tables 3, 4 and 5 report the Quality Index intercepts and slopes for each country in the sample for All Manufacturing, one-digit SITC sectors 5, 6, 7, and 8, and two-digit SITC sectors 65, 84, and 65&84. Intercepts and slopes are obtained from the second stage of the estimation.

[8]Note that since the HK index is a bilateral index applied to a multilateral purpose, it does not satisfy transitivity, i.e., it cannot be obtained from applying equation (3) directly to countries c and d. Formally, $HK_s^{cd} \neq \prod_{z \in I_s^{cd}} \left(\frac{p_z^c}{p_z^d}\right)^{w_z^{cd}}$.

[9]In a few cases, for a given country-year the "sink" estimator yields an indeterminate solution over a compact interval. This indeterminacy occurs for one country per year on average. Choosing alternative points within the interval has negligible effects on the cross-country correlations cited in the text.

	First-Stage Estimator			
	Preferred	V	Sink	HK
1989	90.4	88.2	86.1	46.4
1990	90.8	89.3	85.3	37.0
1991	91.5	90.0	84.8	36.7
1992	91.2	90.7	85.9	37.5
1993	90.6	89.4	86.9	37.6
1994	91.8	90.5	89.0	40.2
1995	94.2	91.7	88.5	45.4
1996	93.5	93.1	90.2	46.8
1997	93.3	93.5	87.8	46.8
1998	93.5	94.2	88.1	43.8
1999	93.7	94.0	87.9	44.7
2000	93.0	92.2	88.3	47.0
2001	94.1	94.2	89.9	44.0
2002	94.5	93.4	86.8	41.7
2003	93.8	92.7	90.5	45.3
Mean	92.7	91.8	87.7	42.7

Notes: Table compares the share of first-stage estimates lying between country-pairs' Paasche and Laspeyres bounds, by year.

Table 2: Goodness of Fit Across Alternative First-Stage Estimators, By Year

References

Diewert, W. Erwin and Alice Nakamura, 1993. *Essays in Index Number Theory*, Volume 1. North Holland. Amsterdam.

Feenstra, Robert C., Robert E. Lipsey and Harry P. Bowen, 1997. "World Trade Flows, 1970-1992, with Production and Tariff Data," NBER Working Paper 5910.

Feenstra, Robert C., 2000. "World Trade Flows, 1980-1997," Center for International Data, UC Davis.

Hummels, David and Peter Klenow, 2005. The Variety and Quality of a Nation's Exports. American Economic Review, 95: 704-723.

	Quality Intercept		Quality Slope	
Country	Coeff	StdErr	Coeff	StdErr
Argentina (ARG)	-0.097	0.005	-0.002	0.004
Australia (AUS)	0.230	0.066	-0.033	0.004
Austria (AUT)	0.453	0.008	-0.017	0.000
Belgium (BEL)	0.507	0.076	0.001	0.001
Brazil (BRA)	-0.138	0.045	-0.014	0.006
Canada (CAN)	0.135	0.030	-0.024	0.002
Switzerland (CHE)	0.855	0.031	-0.011	0.002
Chile (CHL)	-0.749	0.111	0.022	0.001
China (CHN)	-0.418	0.035	-0.008	0.002
Colombia (COL)	-0.379	0.034	-0.010	0.004
Germany (DEU)	0.723	0.070	-0.024	0.001
Denmark (DNK)	0.501	0.014	-0.018	0.002
Spain (ESP)	0.239	0.004	-0.021	0.003
Finland (FIN)	0.622	0.048	-0.001	0.004
France (FRA)	0.642	0.028	-0.019	0.002
UK (GBR)	0.470	0.012	-0.020	0.003
Greece (GRC)	-0.450	0.076	0.000	0.004
Hong Kong (HKG)	0.137	0.081	-0.037	0.007
Hungary (HUN)	-0.220	0.027	0.033	0.003
Indonesia (IDN)	-0.547	0.033	0.024	0.007
India (IND)	-0.399	0.061	-0.008	0.005
Ireland (IRL)	0.521	0.019	0.076	0.017
Israel (ISR)	0.185	0.031	-0.006	0.003
Italy (ITA)	0.623	0.063	-0.016	0.002
Japan (JPN)	0.479	0.071	-0.021	0.003
Korea (KOR)	0.076	0.070	0.003	0.002
Morocco (MAR)	-0.599	0.043	0.021	0.002
Mexico (MEX)	-0.320	0.006	-0.005	0.002
Malaysia (MYS)	-0.696	0.104	0.066	0.020
Netherlands (NLD)	0.244	0.008	0.000	0.000
Norway (NOR)	0.236	0.075	0.002	0.003
New Zealand (NZL)	0.095	0.092	-0.034	0.003
Pakistan (PAK)	-0.738	0.020	0.014	0.001
Philippines (PHL)	-0.694	0.095	0.043	0.010
Poland (POL)	-0.469	0.020	-0.001	0.008
Portugal (PRT)	-0.016	0.031	-0.002	0.003
Romania (ROM)	-0.581	0.067	0.009	0.010
Singapore (SGP)	-0.007	0.023	0.055	0.018
Sweden (SWE)	0.796	0.049	-0.018	0.001
Thailand (THA)	-0.649	0.082	0.018	0.008
Turkey (TUR)	-0.336	0.011	-0.003	0.003
Taiwan (TWN)	0.133	0.130	-0.021	0.004
South Africa (ZAF)	-0.400	0.038	0.006	0.002

Notes: Columns display estimated quality fixed effect and time trend from 2SLS estimation of equation (23) of the main text relative to their respective means across all countries in the sample. Standard errors are heteroskedasticity-robust and adjusted for clustering at the country level. Country codes noted in parentheses next to country names.

Table 3: Quality Index Intercepts and Slopes for All Manufacturing

	Intercept								Slope							
	5-Chemicals		6-Manuf Mat		7-Machinery		8-Misc Manuf		5-Chemicals		6-Manuf Mat		7-Machinery		8-Misc Manuf	
Country	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr
ARG	-0.249	0.121	-0.121	0.015	0.197	0.026	-0.311	0.188	-0.029	0.125	0.003	0.003	-0.004	0.011	0.002	0.002
AUS	0.369	0.402	0.091	0.040	0.529	0.089	-0.003	0.296	-0.032	0.110	-0.004	0.001	-0.072	0.013	-0.017	0.004
AUT	0.004	0.305	0.376	0.061	0.469	0.016	0.225	0.383	0.017	0.067	0.000	0.002	-0.034	0.002	-0.004	0.008
BEL	0.128	1.340	0.440	0.126	0.844	0.143	-0.142	0.336	0.016	0.115	-0.007	0.003	-0.041	0.011	0.031	0.013
BRA	-0.399	0.351	-0.092	0.048	-0.113	0.115	-0.478	0.133	0.003	0.168	-0.011	0.003	-0.017	0.015	-0.007	0.002
CAN	-0.047	0.350	-0.014	0.022	0.363	0.060	-0.260	0.326	-0.031	0.134	0.001	0.002	-0.049	0.008	-0.009	0.004
CHE	0.682	2.610	0.934	0.029	0.888	0.083	0.601	0.130	0.006	0.032	-0.003	0.002	-0.058	0.010	0.014	0.008
CHL	.	.	-0.512	0.050	.	.	-0.780	0.266	.	.	0.020	0.000	.	.	-0.002	0.009
CHN	-0.490	0.408	-0.580	0.028	-1.154	0.095	0.157	0.432	-0.016	0.088	-0.005	0.002	0.004	0.006	0.014	0.012
COL	.	.	-0.128	0.001	.	.	-0.412	0.020	.	.	-0.007	0.002	.	.	-0.014	0.011
DEU	0.290	1.461	0.324	0.024	1.151	0.226	0.334	0.243	-0.006	0.076	-0.006	0.001	-0.043	0.005	-0.016	0.004
DNK	0.061	0.191	0.405	0.026	0.949	0.083	0.345	0.055	0.006	0.023	-0.031	0.001	-0.056	0.012	0.014	0.000
ESP	-0.132	0.286	0.158	0.009	0.320	0.043	-0.004	0.236	-0.008	0.102	-0.006	0.001	-0.029	0.009	-0.009	0.002
FIN	-0.103	0.420	0.430	0.160	0.736	0.018	0.676	0.264	0.025	0.067	0.012	0.003	0.007	0.009	-0.048	0.003
FRA	0.183	0.760	0.372	0.015	0.808	0.103	0.552	0.245	0.003	0.062	-0.001	0.001	-0.044	0.006	-0.013	0.000
GBR	0.037	0.782	0.252	0.012	0.731	0.076	0.169	0.220	0.013	0.085	0.003	0.001	-0.049	0.011	-0.019	0.004
GRC	.	.	-0.068	0.058	.	.	-0.600	0.106	.	.	-0.015	0.001	.	.	0.014	0.015
HKG	-0.544	1.643	-0.564	0.167	-0.703	0.060	3.426	2.160	0.011	0.025	-0.002	0.006	-0.044	0.016	-0.125	0.066
HUN	.	.	-0.108	0.014	-0.962	0.166	-0.195	0.048	.	.	0.004	0.008	0.106	0.015	0.020	0.008
IDN	.	.	-0.209	0.069	-1.578	0.257	-0.335	0.093	.	.	-0.008	0.002	0.056	0.016	0.043	0.025
IND	-0.488	0.363	-0.349	0.054	-0.497	0.204	-0.734	0.104	0.001	0.036	-0.010	0.002	-0.029	0.019	0.019	0.010
IRL	0.826	1.669	0.516	0.042	0.546	0.067	0.667	0.074	0.132	1.580	0.007	0.001	0.024	0.004	0.014	0.009
ISR	0.268	0.703	0.041	0.069	0.665	0.094	0.126	0.071	-0.030	0.065	0.017	0.007	-0.033	0.010	-0.042	0.011
ITA	0.162	0.327	0.287	0.040	0.447	0.138	0.800	0.115	-0.025	0.064	-0.006	0.000	-0.018	0.008	-0.007	0.001
JPN	0.530	0.425	0.269	0.013	0.697	0.267	0.193	0.154	-0.002	0.072	0.007	0.001	-0.043	0.011	-0.014	0.003
KOR	-0.438	1.294	0.017	0.070	-0.445	0.058	0.675	0.451	0.017	0.059	-0.007	0.001	0.066	0.016	-0.098	0.049
MAR	.	.	.	.	.	.	-0.719	0.056	.	.	.	.	.	.	0.094	0.037
MEX	-0.398	0.062	-0.216	0.007	-0.193	0.067	-0.856	0.266	-0.015	0.178	-0.016	0.005	0.005	0.002	0.016	0.014
MYS	.	.	-0.479	0.094	-1.661	0.304	0.190	0.203	.	.	0.026	0.007	0.178	0.056	-0.009	0.011
NLD	0.282	2.390	0.128	0.023	0.598	0.013	-0.180	0.369	-0.008	0.075	0.002	0.001	-0.033	0.004	0.017	0.014
NOR	0.240	0.231	0.176	0.040	0.307	0.129	.	.	-0.033	0.142	0.003	0.002	0.011	0.008	.	.
NZL	.	.	-0.014	0.042	0.270	0.133	.	.	.	.	-0.014	0.001	-0.071	0.013	.	.
PAK	.	.	-0.215	0.158	.	.	-0.711	0.131	.	.	-0.010	0.001	.	.	0.032	0.012
PHL	.	.	-0.424	0.081	-1.628	0.283	-0.186	0.112	.	.	-0.007	0.002	0.143	0.038	0.023	0.013
POL	.	.	-0.342	0.036	-0.638	0.071	-0.960	0.120	.	.	0.006	0.006	-0.018	0.017	0.063	0.009
PRT	.	.	0.068	0.014	-0.733	0.193	0.730	0.397	.	.	0.000	0.001	0.006	0.001	-0.029	0.030
ROM	.	.	.	.	.	.	-1.016	0.067	.	.	.	.	.	.	0.123	0.043
SGP	.	.	-0.374	0.250	1.123	0.477	-1.171	0.656	.	.	0.044	0.013	0.057	0.017	0.033	0.027
SWE	0.394	0.091	0.416	0.075	1.451	0.156	-0.055	0.341	-0.012	0.004	0.006	0.000	-0.055	0.004	0.018	0.010
THA	-0.873	2.562	-0.620	0.093	-1.559	0.298	0.492	0.509	0.021	0.007	0.005	0.004	0.065	0.023	-0.016	0.007
TUR	.	.	-0.150	0.017	-1.026	0.241	-0.376	0.038	.	.	-0.003	0.000	0.047	0.006	0.029	0.015
TWN	-0.326	1.510	-0.108	0.097	-0.461	0.114	1.357	0.965	-0.022	0.059	-0.009	0.002	0.044	0.010	-0.146	0.075
ZAF	.	.	-0.008	0.034	-0.741	0.177	-1.230	0.231	.	.	0.019	0.003	0.023	0.006	0.012	0.004

Notes: Columns display estimated quality fixed effect and time trend from 2SLS estimation of equation (23) of the main text relative to their respective means across all countries in the sample. Standard errors are heteroskedasticity-robust and adjusted for clustering at the country level. "." indicates country does not appear in sample.

Table 4: Quality Index Intercepts and Slopes, by Manufacturing Industry

	Intercept						Slope					
	6 less 65		8 plus 65		65 plus 84		6 less 65		8 plus 65		65 plus 84	
Country	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr	Coeff	StdErr
ARG	-0.104	0.013	-0.349	0.131	-0.607	0.097	0.001	0.002	0.005	0.002	-0.008	0.002
AUS	0.118	0.026	-0.001	0.267	0.098	0.184	-0.004	0.001	-0.013	0.002	-0.010	0.002
AUT	0.310	0.053	0.296	0.256	0.473	0.174	0.004	0.001	-0.007	0.006	0.004	0.001
BEL	0.336	0.077	0.166	0.097	0.433	0.044	-0.006	0.001	0.016	0.007	0.009	0.003
BRA	-0.150	0.034	-0.430	0.076	-0.381	0.089	-0.009	0.002	-0.004	0.004	-0.015	0.003
CAN	-0.003	0.026	-0.220	0.278	-0.126	0.190	0.001	0.001	-0.009	0.005	-0.001	0.003
CHE	0.981	0.026	0.575	0.083	0.630	0.220	-0.005	0.001	0.009	0.006	0.013	0.004
CHL	-0.409	0.033	-0.807	0.248	-0.809	0.187	0.014	0.001	0.008	0.004	0.028	0.005
CHN	-0.667	0.021	0.077	0.404	0.104	0.298	-0.001	0.002	0.014	0.008	-0.002	0.003
COL	-0.189	0.007	-0.403	0.004	-0.370	0.004	0.001	0.000	-0.015	0.011	-0.016	0.007
DEU	0.287	0.019	0.333	0.152	0.568	0.182	-0.005	0.000	-0.011	0.003	-0.026	0.003
DNK	0.312	0.024	0.365	0.043	0.231	0.151	-0.025	0.000	0.013	0.001	0.025	0.002
ESP	0.180	0.010	-0.004	0.169	0.155	0.146	-0.008	0.001	-0.005	0.002	-0.014	0.002
FIN	0.393	0.164	0.639	0.212	.	.	0.012	0.003	-0.050	0.004	.	.
FRA	0.308	0.016	0.588	0.170	0.717	0.144	0.000	0.001	-0.013	0.001	-0.013	0.001
GBR	0.256	0.010	0.171	0.175	0.286	0.167	0.005	0.001	-0.013	0.003	-0.014	0.001
GRC	0.075	0.035	-0.623	0.142	-0.436	0.020	-0.033	0.001	0.016	0.008	0.016	0.006
HKG	-0.457	0.092	2.189	1.334	1.373	0.805	-0.009	0.002	-0.070	0.031	-0.080	0.038
HUN	0.148	0.011	-0.291	0.078	-0.497	0.057	-0.006	0.006	0.013	0.009	0.038	0.004
IDN	-0.310	0.046	-0.223	0.157	-0.198	0.129	-0.006	0.001	0.043	0.021	0.018	0.012
IND	-0.351	0.029	-0.598	0.080	-0.448	0.098	-0.015	0.001	0.024	0.008	0.011	0.006
IRL	0.632	0.039	0.566	0.060	-0.019	0.190	0.013	0.000	0.013	0.006	0.008	0.001
ISR	0.075	0.040	0.029	0.103	-0.040	0.093	0.023	0.006	-0.034	0.006	-0.028	0.004
ITA	0.193	0.028	0.804	0.125	0.784	0.009	-0.005	0.000	-0.006	0.002	-0.006	0.002
JPN	0.256	0.012	0.216	0.108	0.247	0.134	0.009	0.001	-0.011	0.003	0.001	0.001
KOR	-0.081	0.023	0.680	0.446	0.629	0.350	-0.007	0.001	-0.079	0.036	-0.063	0.021
MAR	.	.	-0.587	0.012	-0.449	0.075	.	.	0.037	0.003	0.038	0.007
MEX	-0.214	0.012	-0.765	0.179	-0.666	0.133	-0.011	0.003	0.008	0.007	-0.003	0.005
MYS	-0.358	0.070	0.000	0.124	0.014	0.139	0.023	0.006	0.003	0.015	-0.009	0.003
NLD	0.134	0.020	-0.056	0.264	0.368	0.218	-0.003	0.001	0.016	0.013	-0.006	0.008
NOR	0.067	0.022	0.388	0.380	.	.	0.014	0.002	0.004	0.008	.	.
NZL	0.003	0.026	-0.184	0.322	-0.058	0.213	-0.017	0.001	-0.021	0.003	-0.007	0.002
PAK	-0.360	0.019	0.290	0.662	0.621	0.806	0.007	0.001	0.029	0.011	0.019	0.011
PHL	-0.276	0.053	-0.381	0.008	-0.487	0.055	0.007	0.001	0.019	0.009	0.014	0.013
POL	-0.325	0.039	-0.890	0.113	-0.888	0.079	0.009	0.004	0.047	0.004	0.041	0.004
PRT	0.155	0.003	0.497	0.241	0.592	0.255	-0.012	0.001	-0.015	0.020	-0.017	0.017
ROM	-0.174	0.076	-0.861	0.076	-1.174	0.024	-0.004	0.008	0.053	0.004	0.072	0.006
SGP	-0.167	0.166	-1.284	0.653	-0.601	0.256	0.032	0.008	0.057	0.037	0.003	0.011
SWE	0.391	0.078	0.045	0.254	0.334	0.227	0.007	0.000	0.018	0.008	0.019	0.006
THA	-0.600	0.089	0.307	0.388	0.187	0.252	0.009	0.004	-0.010	0.005	-0.019	0.004
TUR	-0.229	0.010	-0.427	0.185	-0.055	0.179	-0.002	0.001	0.033	0.013	0.031	0.017
TWN	-0.234	0.027	1.291	0.888	0.524	0.393	-0.006	0.001	-0.126	0.059	-0.056	0.019
ZAF	0.051	0.046	-1.130	0.190	-1.055	0.143	0.010	0.003	0.013	0.003	0.006	0.003

Notes: Columns display esimated quality fixed effect and time trend from 2SLS estimation of equation (23) of the main text relative to their respective means across all countries in the sample. Standard errors are heteroskedasticity-robust and adjusted for clustering at the country level. "." indicates country does not appear in sample.

Table 5: Quality Index Intercepts and Slopes for Apparel and Textiles