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**Quality Competition, Pricing-To-Market and Non-Tariff Measures:
A Unified Framework for the Analysis of Bilateral Unit Values¹**

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ABSTRACT

This paper presents a unified framework for analyzing several factors that have been independently studied as determinants of unit values in international trade: product differentiation by quality (which suggests that unit values should be positively correlated with exporters' per capita income), pricing-to-market (which suggests they should be positively correlated with importers' per capita income), and non-tariff measures (which suggests that remaining residuals may contain evidence of trade barriers). On a large sample of bilateral unit values for 2005, we find that about 58 percent of all HS-6 products demonstrate both significant quality-ladder effects and pricing-to-market effects, with quality-ladder effects predominating in importance. Distance-related effects appearing directly in prices appear significantly larger than one would expect as a result of shipping margins. We also rank importers by the remaining unexplained variation in import prices, and examine whether these variations are plausibly related to non-tariff measures.

JEL Classification: F12, F14

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Introduction

The abundance of data on unit values in trade has generated a large number of explorations into the stylized facts generating them. The present paper presents a unified framework for identifying systematic variation in unit values, using multilateral data at the HS-6 level. This compares to research on unit values that is motivated either by supply-side considerations relating to product quality, associating higher unit values with exporters' per capita income, or by demand-side considerations of pricing-to-market associating higher unit values with importers' per capita income. The former work includes Schott (2008) focusing on China, and Fontagné, Gaulier and Zignagno (2008) which use a unit-value classification to motivate an extended gravity model of trade flows. The latter is exemplified by Alessandria and Kaboski (2007) and Co (2007).

Most of this work (except for Fontagné et al.) tends to focus on a single exporter or importer rather than on the multilateral trade data we employ, or on a particular motivation for variation in unit values in trade. We find that both quality effects and pricing-to-market effects are important in determining trade prices, but that quality effects are relatively more important. The variation in the size of these effects across industries is indicative of the relative degree of product homogeneity. We also illustrate how the substantial amount of remaining variation in the data can be used to diagnose the possible presence of non-tariff measures.

Table 1 illustrates the type of variation one finds in the unit value data, for a particular HS-6 subheading, “watches (excluding wristwatches) with cases of or clad with precious metal, electrically operated.” The example, which reflects the largest trade

flows for this subheading in quantity terms², illustrates several features which are frequently observed for a wide variety of products. First, the range in unit values is very broad, amounting to three or four orders of magnitude. Exports from Switzerland to Great Britain have a unit value of \$1,001.68, while exports from China to Japan sell for \$0.56 apiece. These are highly unlikely to represent the same product. Second, higher-income countries tend to sell a higher-priced product; in this sample, Swiss watches are always higher-priced than Chinese watches. Third, higher-income countries tend to pay more for products in this category; compare imports of Great Britain and the Netherlands vs. imports of Bulgaria, South Africa, and Mexico. Fourth, there are observations that are exceptions to both the second and third rules. These are the features of the data which we will exploit in the analysis below.

Previous literature and theoretical motivation

Traditionally, models of trade assumed perfect competition and perfectly substitutable goods in deriving the notion of a single world price for traded commodities. In such a world, well-defined traded goods would have the same import and export unit values regardless of the identity of the exporting and importing country. An early effort to relax this was the Armington (1969) model. The Armington assumption is that, within a particular product category, countries tend to specialize in exporting particular varieties while all importing countries tend to purchase a bundle of varieties. This should imply that the variation in import unit values across countries (for particular product categories) is far lower than the variation in export unit values across countries. From the perspective of a particular country we would expect the data to be consistent with its

² After data cleaning; see below.

producing (or at least exporting) a single variety within a product category (with a relatively low coefficient of variation (CV) of export unit values across all destination markets), but importing numerous varieties from the world (so a higher CV across source countries on import unit values). While the issue of the relative variance of import and export unit values across countries is of interest, and a topic for future research, in this paper we focus on explaining bilateral import and export unit values (as opposed to the variance of these values); on this topic, the Armington model has little to say.

The literature on pricing-to-market, in the form of international price discrimination, going back to Krugman (1987), suggests that a country's average import unit values (and bilateral export unit values to that country) will be a function of per-capita income (though working through price elasticities of demand), but not of supply-based factors in the exporting country. Recent empirical papers by Co (2007) and Alessandria and Kaboski (2007) are consistent with such a relationship. The finding of a relationship between importers' per-capita income and unit values suggests an important explanation for income-based deviations from purchasing-power parity (PPP) in addition to the often-invoked Balassa-Samuelson effect (Balassa (1964), Samuelson (1964)), which attributes such deviations to the prices of non-tradable inputs into traded goods as delivered further down the supply chain. Deviations measured directly on export or import (f.o.b. or c.i.f. prices) do not include non-traded wholesale and retail margins, and are unlikely to be caused by embodied non-tradables in the importing country.

Co (2007), explaining patterns of variation across destination markets in U.S. exporter pricing (between 1989 and 2001), finds evidence consistent with several

mechanisms supporting price discrimination – these include quality variation, transaction costs (as proxied by language of the importing country), and incomplete responses to currency fluctuations. Alessandria and Kaboski (2007) also document price discrimination by U.S. exporters; however, they motivate this behavior through a consumer search model. They assume (and provide some evidence suggesting) that low-income importing-country consumers are more productive in search and for this reason are more price sensitive than are consumers in higher-income destination markets.

Quality-based differentiation in internationally traded goods has been explained using a variety of theoretical frameworks. Grossman and Helpmann (1991) describes a situation in which R&D leads to improvements in products, so that higher-quality and lower-quality varieties of the product coexist in equilibrium. Melitz (2003) models producers as being heterogeneous in terms of productivity, which can be readily generalized to the case of hedonic differences in quality.³⁴ Regardless of the particular theoretical construct used as motivation, one would expect that higher per-capita incomes in an exporting country allow for both higher average quality of exports and a greater range of quality by that country's exporters. This leads in turn to the prediction that higher income is associated with higher average export unit values, both in total and to particular destinations.

³ The Melitz framework is exploited in a recent paper by Baldwin and Ito (2008), with a somewhat similar empirical strategy as the present paper but a different focus. They differentiate between the standard productivity-based interpretation of the Melitz model as a model of heterogeneous firm trade (HFT), and the quality-based interpretation (QHFT). Under the HFT interpretation, price-based competition between firms implies that low-priced goods travel the furthest distance, while under the QHFT interpretation, the highest-price goods should travel the longest distance. This leads to an empirical strategy focusing on the distance coefficient in a regression with FOB prices as the dependent variable, in which goods with positive distance coefficients are interpreted as quality-competition goods while goods with negative distance coefficients are interpreted as price-competition goods. By contrast, our strategy is to identify goods with a high correlation between exporters' per capita income and price as goods for which quality-based competition holds.

Schott (2008) looks at 10-digit US import data from both China and the OECD countries and finds considerable overlap in terms of quantities, but much less so in terms of export prices, suggesting that Chinese exporters are lower on the “quality ladder” than are those in more-developed economies. Fontagné, Gaulier and Zignagno (2008), while acknowledging demand-side forces determining unit values, focuses primarily on the supply-side influences and generally supports the Schott results – of higher unit values within product categories as the level of development increases -- across a large sample of bilateral unit values over a ten year period, though at a more aggregate product definition (6-digit HS).

To formalize these relationships, consider a monopolistically competitive export sector, where quality (R) is a function of local per-capita income (Y_j), but higher quality products can only be produced at a higher marginal cost.⁵ For a simple specification (with i indicating importer country, and j the exporter country), let $MC_j = R^a$, $R = Y_j^b$, (both $a, b > 0$) implying $MC_j = Y_j^{ab}$. In determining export price to a particular destination market, that market’s import demand elasticity for a particular product is of course relevant, and we assume that the absolute value of the elasticity, $|\eta|$, is inversely related to importing-country per-capita income (Y_i);⁶ for purposes of exposition, let $1 - (1/|\eta|) = Y_i^{-d}$ ($d > 0$).

⁵ An alternate motivation for this specification can be generated from the quality-ladder model in Grossman and Helpman (1991), ch. 4. Higher-quality products are innovated using costly R&D, and produce more utility for the consumer. The association of R&D with quality and higher prices thus comes on the demand side rather than the supply side, but the stylized fact that high-income countries are more R&D intensive continues to provide the motivation for an association between per capita income and product price.

⁶ There are several explanations for why import demand elasticity and per-capita income are inversely related. For one, a positive income shock leading to a parallel shift of import demand will always lead to a reduced price elasticity of demand. An alternative mechanism is the higher search cost in high-wage economies leading to reduced price search by consumers and a resulting more inelastic demand (as discussed by Alessandria and Kaboski (2007)).

In terms of bilateral import prices (or unit values), the profit maximizing price markup (or Lerner Index) is $[P - MC_j] / P = 1 / |\eta|$, which after some manipulation yields $P_{ij} = Y_j^{ab} / Y_i^{-d}$ or $\ln P_{ij} = ab \ln Y_j + d \ln Y_i$, with all estimated parameters expected to be positive, both reflecting heterogeneous exporter quality and pricing-to-market. Of course, transportation and other trade costs need to be considered as well in explaining bilateral unit values derived from importer data. Also, consistent with the discussion above, an empirical finding that $d > 0$ may be motivated by other factors than price discrimination or search; it may also represent evidence of product differentiation along another dimension.

In addition, the residual in the estimated version of the above equation captures variation in import unit values not explained by either demand variation in import markets (pricing-to-market) or quality/productivity variation in export markets (producer heterogeneity). While one source of the remaining variation can be the inclusion in the HS6 product categories of widely disparate products, another can be the presence of non-tariff measures affecting trade. In future work we hope to attempt to disentangle these two influences; however, as a start, we present below some evidence on the products and importing countries in which the largest residuals are present.

Data and Specification

The data analyzed are from a single year, 2005. The data are obtained from the COMTRADE system maintained by UNCTAD. The initial dataset represents all bilateral trade flows for all importing partners for all HS-6 subheadings (hereinafter “products”),

as reported by the importing countries using the HS-2002 classification.⁷ Unit values are generated as the observed ratio of values to quantities. A number of procedures are used to trim and clean the data. This is necessary in part because anomalous and extreme unit values can be generated for a number of reasons, and it is not always easy to distinguish spurious from authentic extreme values. Thus, the following procedures are adopted:

- HS-6 products are deleted from the dataset if:
 - There is no unit of quantity associated with them;
 - Less than 80 percent of global trade is measured in a consistent unit of quantity (e.g. number of units, or kilograms);
 - The subheading label is “other”⁸; or
 - There are fewer than 100 bilateral observations for the product (after individual observations have been deleted as described below).
- Individual observations are deleted if:
 - The available units of quantity were estimated by UNCTAD rather than directly reported by the importing country;
 - The observations record a country as importing from itself;
 - The observed value of bilateral imports is less than U.S. \$25;
 - The calculated unit values are among the 5 percent of extreme observations for a given product (2.5 percent in each tail), after the first three exclusions are made; or

⁷ In order to avoid potential issues involving the reconciliation of exporters’ and importers’ data, it was decided to begin with importers’ data based on the long-standing, if not always true, folk wisdom among empirical trade economists that importers’ data are better because of duty collection and other interests of the customs authorities.

⁸ This is a fairly broad and somewhat arbitrary criterion. We include products for which “other” appears elsewhere in the product name, categories described as “parts and components”, and categories described as “nesi” or “nesoi” (not elsewhere specified or indicated).

- They do not have matching data for per-capita income or distance (see below) for one or both trading partners

The joint effect of these exclusions is to reduce the number of observations from approximately 6.02 million to 2.28 million, the number of usable HS-6 subheadings from 5,222 to 3,626 and the coverage of world imports to about 40 percent of the total.

Approximately half (as measured by trade value) of the data that are dropped include UNCTAD estimates for the quantity of the good. In order to control for any potential selection bias in our data that may result from the exclusion of observations from countries with poor data collection, we estimate a two-step Heckman selection model. In the first step, a probit model to predict the probability of an observation being included in our cleaned dataset is estimated, using the per capita (PPP) GDP's of the importing and exporting countries, as well as several governance indicators⁹ as explanatory variables in the probit model.

In the second step, the specification estimated for each product is

$$(1) \ln P_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \beta_4 C_{ij} + \beta_5 L_i + \beta_6 L_j + \beta_7 M + \varepsilon_{ij}$$

in which the subscripts i and j indicate the importing and exporting countries, P is the unit value of imports of country i from country j, Y is purchasing-power parity per capita income in 2005, D is bilateral distance, C is a dummy variable indicating contiguous countries, L is a dummy variable indicating landlocked countries, and M is the inverse Mill's ratio computed using the results of the 1st stage regression. Since the equation is estimated separately for each product, the estimated coefficients vary across products,

⁹ These governance indicators include Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption as taken from the World Bank Governance Indicators located at <http://www.govindicators.org> (Accessed January 14, 2009).

and the subscript for products is omitted for convenience. The coefficients in the second stage are estimated with heteroskedasticity-consistent standard errors.

In exploratory work, we estimated a specification using only β_0 , β_1 , and β_2 . The additional variables, which give the estimated equation the appearance of a price dual to the gravity equation, were added because the prices are c.i.f. (importers') prices, and thus presumably have different insurance and freight margins for different country pairs. The addition of the distance-related variables was originally intended to account for transportation costs; however, their impact is generally stronger than one would expect based on transport costs alone.¹⁰ As it turns out, the results on per capita income are broadly robust to whether or not the additional variables are included, but we end up learning something extra from including the additional variables, as discussed below.¹¹

The measure of GDP per capita used is current 2005 GDP per capita on a PPP basis as reported in the International Comparison Program.¹² The various distance measures are available from CEPII and documented in Mayer and Zignagno (2006).¹³

¹⁰ Since we already know that matched-partner f.o.b./c.i.f. ratios from the COMTRADE data yield little in terms of credible transport margins (Hummels and Lugovskyy (2006)), it is not surprising that using simply c.i.f. prices and a regression framework does not yield results that look like actual margins.

¹¹ Other specifications including higher order and interaction terms, were also estimated as were sets of regressions pooling products at higher levels of aggregation; the results of these specifications were largely similar to those reported below. Additionally, a Maximum Likelihood Estimator (MLE) was computed to simultaneously estimate the 1st and 2nd stage regressions for each product. These estimates also proved to be qualitatively similar to those produced by the two step approach. The two-step approach was chosen as the base specification due to the programming convenience of allowing for heteroskedasticity-robust standard errors under this model.

¹² These data are available at http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT/0..contentMDK:20134839~menuPK:303406~pagePK:60002244~piPK:62002388~theSitePK:270065_00.html (accessed February 25, 2009).

¹³ The measures themselves may be found at <http://www.cepii.fr/anglaisgraph/bdd/distances.htm> (accessed May 30, 2008).

The Governance Indicators are taken from the World Bank Governance Indicator dataset.¹⁴

Econometric Results

Table 2 provides the distribution of estimated coefficients for the 3,626 product categories, and the broad differences observed between agricultural (HS 1-24) and non-agricultural goods (HS 25-97). Agriculture contains a higher proportion of goods which may be homogeneous in the pure physical sense, while non-agricultural goods are more likely to be differentiated based on technological sophistication induced by R&D, consistent with the concept of a “quality ladder”. Thus, this split provides useful initial information about the variation among products.

For each of the six variables, the estimated sign is as expected for a majority of products. By far the strongest results are those for the relationship between unit values and exporters’ per capita income, suggesting that quality ladders are pervasive. 95.6 percent of the 3,626 HS-6 products examined show a positive relationship between unit values and exporters’ per capita income, and 80.9 percent of the products show a positive relationship which is also statistically significant at .01 or better (one-tail). The proportion of statistically significant positive results at this level is higher for non-agricultural than for agricultural products (82.5 percent vs. 71.6 percent), as is the estimated coefficient for the mean product (.296 vs. .178).¹⁵ This is consistent with the

¹⁴ These indicators can be found at <http://info.worldbank.org/governance/wgi/index.asp> (accessed February 25, 2009).

¹⁵ Means and medians are used interchangeably as measures of central tendency in this paper, for different expositional purposes. For the distributions we are looking at, the characterizations of the distribution are robust to this choice, i.e. they tend to be symmetric rather than skewed distributions.

idea that non-agricultural products tend to be more improvable by research, and higher-income countries tend to be more research-intensive.¹⁶

The second finding is that the quality-ladder effect tends to be more important than the pricing-to-market effect. While a large majority of products (77.7 percent) show a positive estimate for importers' per capita income and a majority (50.2 percent) a statistically significant relationship at .01 or better, these percentages are both less than for the quality-ladder effect. Also, the estimated coefficients are, on average, less than half the size of those for exporters' per capita income (.131 vs. .278), and they do not show systematic variation between agricultural and non-agricultural products.

The estimated coefficients for the four distance variables show a larger percentage of unexpected signs and low-significance values than for the income variables. The effect of adding additional kilometers of distance is greater on average for agricultural products (spoilage?), as is the price premium associated with of landlocked importers, while the price premium associated with landlocked exporters is greater on average for non-agricultural products.

The considerable variation in the estimated effects of exporters' and importers' income (elasticities of observed price with respect to income) is exhibited in Table 3 and Figures 1 and 2, which portray variation according to the 21 sections of the Harmonized System.¹⁷ Table 3 provides the minimum, maximum, and quartile distribution of each of the estimated coefficients, while Figures 1 and 2 portray the interquartile range for importers' per capita income and exporters' per capita income respectively.

¹⁶ This is not to deny the importance of agricultural R&D. Such R&D may be broadly more focused on lowering production costs than improving product quality, as compared to manufacturing R&D, though this may change in the future with the increasing importance of GMOs.

¹⁷ An HS section is a standardized grouping of one or more two-digit HS chapters. See http://www.usitc.gov/tata/hts/bychapter/_0802.htm for the relationship between HS sections and chapters.

First, we can see what kinds of products typically have the highest association between either importers' or exporters' per capita income and observed importers' prices. These are summarized by sorting the estimated coefficients within each HS section, for each variable, and taking the median value for each variable.¹⁸ Pricing-to-market effects are strongest for art and antiques (.665 at the median); footwear, headgear, and other accessories (.325); and hides, leather and skins (.296). These cases seem less explainable in terms of search than in terms of demand-side product differentiation. All of these categories contain consumer luxury products which may be very different in demand without being very different in terms of production costs or research intensity. The strongest quality-ladder effects for the median product in each section are for instruments, clocks, etc. (.427); machinery and equipment (.397), which includes capital equipment, electronics and computers; and arms and ammunition (.382). These are all cases for which the role of R&D in producing advanced products is self-evident.

Next, we can see where the exceptions to the rule of prices increasing with both partners' income are concentrated. As noted above, these are more widespread for importers' per capita income, the pricing-to-market effect. For mineral products, which include fossil fuels, fewer than half of the 106 HS-6 products exhibit positive pricing-to-market effects. At least one quarter of all products in the "chemicals and products" section, as well as those made of wood, cork, and straw do not exhibit positive pricing-to-market effects. This result also holds for metals and metal products. Interpreting these cases according to the search model, it may be that the products which are exceptions to the rule are those for which product attributes are facially obvious; or, if they represent

¹⁸ The median product for one variable is generally not the same as the median product for another; the distributions are sorted separately.

additional product differentiation, one could say that the differentiation within HS-6 subheadings is minimal. These cases all represent industrial intermediate goods, some of which are traded on commodity exchanges. The only category for which over 25 percent of goods fail to exhibit quality-ladder effects is gems and jewelry. While there is certainly skill involved in making these products, it is as much a matter of tradition and custom as of formal R&D, and the relevant skills are often present to a high degree in low-income countries, for example India.

Since the interpretation of an elasticity of c.i.f. prices with respect to per capita income is not intuitive, Table 4 illustrates the economic importance of the estimates by means of a simple simulation. Considering the median product and the 75th percentile (high effect) product in each HS section, Table 4 presents the estimated difference in product price for an importer (exporter) with the per capita income of the United States in 2005, as compared with the per capita income of China, in the form of a price premium. This reduces the price variation observed in the example of watches in Table 1 to a stylized fact, and illustrates in a different way the variation across categories of products. A 40 percent price premium, for example, indicates that when the unit value in a country with the per capita income of China is \$1.00, the comparable unit value is \$1.40 in the United States. Note that these are not actual comparisons between China and the United States, but stylized comparisons between countries at comparable stages of development. Also, because China is a lower-middle income and not a low-income country, these price premia are not the largest that could reasonably be obtained by considering countries at extreme opposite stages of development.

The estimated price differences in Table 4 illustrate that very broad amounts of price dispersion associated with levels of development are not at all unusual. Median unit values for products produced by “United States” are at least double those for products produced by “China” in six HS sections (instruments and clocks; machinery and equipment; arms and ammunition; stone, ceramics and glass; miscellaneous manufactures; and art and antiques), and unit values for products at the 75th percentile are at least doubled in an additional 8 sections. Taking Tables 3 and 4 together, and considering the 75th percentile alone, we find that in the two “high-tech” sections 16 and 18 alone (machinery and equipment, and instruments and clocks) there must be at least 140 products for which the typical “United States” export unit value is at least triple that of the typical “Chinese” export unit value. Similarly, large pricing-to-market effects are evident for many product categories, though not as widespread, and are extremely high for art and antiques.

Similarly, Tables 5 and 6 illustrate the effects of the various distance variables both for a median product in each HS section and for a 75th percentile product. In the case of geographic distance, the variable represents the price markup associated with moving the product the mean distance for an observation in the overall dataset (about 3,200 km) as opposed to not having to move it at all. For the median product overall, the distance effect corresponds to a price markup of 49.9 percent. This is much larger than one would expect for a c.i.f. margin. Available data for New Zealand and U.S. imports, which allow the margin to be separated from the total unit value, suggest typical values for transport and insurance costs on the order of 4 to 11 percent of the c.i.f. value (Hummels (2007)). It is unclear whether the estimated distance effects reflect some costs

of trading not included in c.i.f. margins, some inefficiency in market information, or something else. In any case, normal distance-related effects on price appear to be very high for certain products, including mineral products; stone, ceramics, and glass; and some gems and jewelry products. They are the lowest and in fact usually absent, for arts and antiques, and are also absent for most textiles, apparel, footwear, and headgear.¹⁹ The estimated effects of contiguity and landlocked status are assessed for the case in which the status is present or absent, i.e. they are the effects observed when the associated dummy variable equals 1 rather than zero.

If high estimated values of β_2 really do indicate products that are quality-differentiated by research intensity, then these estimates could be used as potential indicators of what products involve the biggest technology gaps; that is, products for which innovation and production of the most advanced varieties is most difficult both to perform and to imitate. Table 7 lists the thirty products with the highest estimated quality ladder effects. These products involve price ratios on the simulated “U.S.-China” scale of between 7:1 and 31:1 for the high-quality and low-quality versions.

The list of high-quality-ladder products is instructive, and dominated by specialized machinery and instruments. These include five categories of metal working machinery, cathode ray tubes and television camera tubes, cameras, and several kinds of agricultural machinery. There are also some categories of elements, compounds and alloys (furfaldehyde, carbon disulphide, and rare-earth metals) which may be homogeneous chemically but which may vary importantly in purity or other attributes that may be expensive to produce.

¹⁹ The sector-specific results do not show any obvious relationship between the distance coefficient and *a priori* notions of goods for which quality competition should be important. This appears to run counter to the interpretation of distance and quality in Baldwin and Ito (2008).

Similarly, if pricing-to-market really reflects further differentiation of goods valued by high-income consumers as much as or more than search, then this should be even more apparent when looking at the thirty products with the highest pricing-to-market effects, as we do in Table 8. This impression is in fact confirmed. The products involved include gold waste and scrap (with an over 12,000:1 price ratio on the “U.S.-China” simulated scale), pleasure boats; postage stamps; mink, fox, and other furskins; wigs and the hair used to make them; silk handkerchiefs; clocks and parts thereof; and two different kinds of watches. There are also certain high-technology intermediate goods on this list, such as flat knitting machines and chemicals doped for use in electronics. These disaggregated results effectively undermine the search explanation in Alessandra and Kaboski(2007) for an association between importers’ income and unit values. It is less likely that the poor, having a low opportunity cost of time, are more efficient searchers for truffles and silk handkerchiefs, than that these come in different qualities and the rich get the best ones. The possibility that price discrimination, as described above, could play a role for some of these products cannot be ruled out.

Residuals and non-tariff measures

As alluded to earlier, there is a substantial amount of variation in unit values that is not readily explained by either difference in importers’ or exporters’ per capita income or by distance effects. As a simple measure of this, the unadjusted R^2 is less than 0.2 for over 77 percent of the 3,626 products studied, and less than 0.4 for over 99 percent of the products. The tariff-equivalent effects of non-tariff measures are often estimated by a “price gap” that captures the difference between the price paid by a particular importer

suspected of having a non-tariff barrier, and a “world market” price taking into account appropriate transport and distribution margins. The product-specific information required to estimate these price gaps often requires specific knowledge of individual products, and it is challenging to come up with a convincing method of estimating price gaps for many products at once (Ferrantino (2006)).

The residuals for the specification estimated here can potentially be used to look at cases for which countries appear to pay “too much” or “too little” for their imports, on a quality-adjusted basis. Using both of the income effects to capture two different aspects of quality handles one problem which often plagues the estimation of price gaps. Since the residuals from our 3,626 regressions are available, we use them to generate summary measures of country- and product-category-specific deviation in c.i.f. import prices, and ask whether the resulting patterns resemble those which might reasonably be associated with non-tariff measures.²⁰

Accordingly, we construct a summary index for the purpose of comparing each importing country’s c.i.f. prices actually paid with the prices expected according to equation (1), for the products it actually imports, from the trading partners it imports from, as follows:

Let V_{ijk} be the reported value of exports from country i to country j of product k . First, define $V_{i^*k} = \sum_j V_{ijk}$. Second, assign weights to each exporter-product pair

$\theta_{ik} = \frac{V_{i^*k}}{\sum_{i,k} V_{i^*k}}$. Then, extract from the regressions on each of the k products the residuals

²⁰ For this purpose, estimating a specification with exporter fixed effects might have produced better results, as it would have captured differences in exporter-specific quality unassociated with a simple log-log function of per capita income. We intend to explore this option in future research.

ϵ_{ijk} . Finally, construct, for each of the j importers, the index $\eta_j = \frac{\sum_{i,k} \theta_{ik} \epsilon_{ijk}}{\sum_{i,k;V_{ijk} \neq 0} \theta_{ik}}$, where

the weights in the denominator include only those values of (i,k) observed for a particular importer j . The resulting indices should provide an indicator of whether each importer is paying “too much” or “too little” for the products it is importing from the sources it is importing from. The weights serve the purpose of removing from the index effects arising purely from the fact that different importers import different bundles of goods, or that they trade with different partners for geographic reasons.

The results of this index are reported in Table 9, in alphabetical order. The index is calculated for all products and then partitioned for agricultural and non-agricultural products.²¹ While we have yet to do any formal analysis of these scores, they do not immediately show any obvious pattern either by level of development or by our impressionistic notions of the incidence of non-tariff barriers. The countries with the highest import prices, *ceteris paribus*, are the Maldives, Belarus, Iceland, and Estonia, while those with the lowest import prices are Suriname, Pakistan, Togo, and Lithuania. The results do have one unusual feature. Even though the index numbers are aggregates of OLS residuals which have mean zero in each regression, the index numbers themselves are asymmetric, taking a larger number of negative than positive values (for total trade, the negative index values outnumber the positive ones by 90 to 23). This feature of the results is deserving of a good explanation, which as yet we are lacking.

In an attempt to provide at least one *ad hoc* test of whether the residuals in aggregate might contain some information on the prevalence of price-increasing non-

²¹ The data for one importer, Israel, was included in the regressions but not in the rankings in Table 9, since it is represented by too few products with good data to yield a meaningful score.

tariff measures, we compared the agriculture scores for members of the G-10²² and Cairns Group countries²³ with sufficient data to calculate the score. This was based on the idea that the G-10, who work within the current WTO negotiations to maintain their agricultural import restraints, are likely to have higher-than-average non-tariff barriers on agricultural products, while the Cairns Group, who seek to lower agricultural barriers, are likely to have lower-than-average non-tariff barriers themselves. The results are portrayed in Figure 3. As it turns out, the G-10 countries do pay above-average import prices for agricultural goods, *ceteris paribus*, than the Cairns Group, with a mean index value of .026 for the seven members of the G-10 we can score, and a similar value of -.083 for the seventeen members of the Cairns Group. For this number of countries, the standard difference-of-means test has a p-value of almost exactly .03, that is, the difference is of statistical significance (at the 5% level) when the countries are treated as observations. This result, however, while suggestive that there may be some policy-related information in our residuals, should not be given excessive weight.

²² The WTO identifies 10 countries vulnerable to agricultural imports as members of the G-10: Switzerland, Japan, South Korea, Chinese Taipei, Liechtenstein, Israel, Bulgaria, Norway, Iceland and Mauritius.

²³ The Cairns Group is composed of 19 agriculture exporting countries: Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Guatemala, Indonesia, Malaysia, New Zealand, Pakistan, Paraguay, Peru, the Philippines, South Africa, Thailand, and Uruguay.

Conclusions

We have combined different strands in the recent literature on unit values, the “quality ladder” strand representing income-based variation by exporter and the “pricing-to-market” strand focusing on income-based variation by importer. By examining the prevalence of these effects on disaggregated products, and for multilateral trade data, we have shown that both quality-ladder and pricing-to-market effects are widely prevalent in international trade.

Quality-ladder effects, in particular, are more universally prevalent and stronger, and our estimates of these effects may provide useful information about international technology gaps. Pricing-to-market effects seem less likely to reflect a comparative advantage in search than some aspect either of product differentiation or price discrimination as experienced by consumers. In some cases they also appear to capture aspects of technology along a different dimension than the quality-ladder effects, as yet to be defined. The possibility that a refinement of this approach could yield higher-quality residuals for the “mass-produced” estimation of NTM price gaps is a topic for future research, which we have sketched here but not fully explored.

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Table 1
 Significant Trade Flows for HS 910191
 Watches (excluding wristwatches) with cases of or clad with precious metal,
 electrically operated
Bold italics indicates World Bank high-income country

Exporter	Importer	Quantity	Unit Value
Switzerland	Great Britain	5,091	\$1,001.68
Switzerland	Netherlands	4,301	\$301.18
Switzerland	Singapore	10,431	\$117.03
Great Britain	Ireland	40,115	\$56.62
Malaysia	Ireland	4,527	\$32.86
Hong Kong	South Africa	5,775	\$14.12
Hong Kong	Slovakia	8,355	\$14.07
China	Great Britain	22,080	\$11.85
France	Mauritius	9,550	\$10.55
China	New Zealand	4,839	\$9.81
Japan	United States	15,974	\$8.99
Indonesia	Singapore	171,390	\$7.86
Hong Kong	Australia	18,924	\$6.22
China	Saudi Arabia	15,220	\$6.20
Hong Kong	Bulgaria	8,093	\$5.82
Hong Kong	Netherlands	6,323	\$5.31
Hong Kong	Spain	7,715	\$4.78
China	Hong Kong	444,728	\$3.98
Hong Kong	Saudi Arabia	6,954	\$3.68
China	Netherlands	26,407	\$3.48
Hong Kong	Malaysia	68,619	\$3.27
China	Spain	58,343	\$3.25
Hong Kong	United States	150,039	\$2.63
China	United States	819,453	\$2.13
China	Australia	16,840	\$1.62
Germany	Bulgaria	22,274	\$1.24
China	South Africa	15,278	\$0.92
China	Mexico	54,159	\$0.90
Hong Kong	Mexico	47,607	\$0.59
China	Japan	248,020	\$0.56

Table 2
Distribution of Estimated Coefficients at HS-6 (subheading) level

	Total HS 1-97	Agriculture HS 1-24	Non-Agriculture HS 25-97
Number of HS-6 subheadings	3,626	543	3,083
Number of observations	2,274,199	286,972	1,987,227
Log GDP_Importer			
Mean	.131	.124	.132
Percentage of estimates positive	77.7	84.2	76.6
And significant at .1 (one-tail)	63.2	71.6	61.7
And significant at .01 (one-tail)	50.2	58.4	48.8
Log GDP_Exporter			
Mean	.278	.178	.296
Percentage of estimates positive	95.6	93.7	96.0
And significant at .1 (one-tail)	89.2	84.9	89.9
And significant at .01 (one-tail)	80.9	71.6	82.5
Log GDP_Distance			
Mean	.059	.076	.056
Percentage of estimates positive	70.6	73.3	70.1
And significant at .1 (one-tail)	47.0	55.1	45.6
And significant at .01 (one-tail)	30.3	39.8	28.6
Contiguity			
Mean	-.140	-.145	-.139
Percentage of estimates negative	76.9	79.4	76.5
And significant at .1 (one-tail)	37.3	42.4	36.5
And significant at .01 (one-tail)	12.4	15.1	11.9
Landlocked Importer			
Mean	.126	.188	.115
Percentage of estimates positive	73.8	85.1	71.8
And significant at .1 (one-tail)	39.2	51.9	36.9
And significant at .01 (one-tail)	15.9	26.0	14.1
Landlocked Exporter			
Mean	.149	.067	.164
Percentage of estimates positive	70.2	58.0	72.4
And significant at .1 (one-tail)	41.4	29.5	43.5
And significant at .01 (one-tail)	22.2	13.4	23.7

Table 3 Distribution of income coefficients by HS Section

HS Section Name	Number of products	Log(Importers' per capita GDP)					Log (Exporters' per capita GDP)				
		min	p25	p50	p75	max	min	p25	p50	p75	max
1. Animals and animal products	146	-0.292	0.074	0.150	0.256	0.727	-0.168	0.073	0.149	0.234	0.595
2. Vegetable products	217	-0.512	0.034	0.117	0.208	0.978	-0.240	0.098	0.171	0.258	0.756
3. Fats and oils	29	-0.139	0.045	0.086	0.176	0.424	-0.071	0.071	0.136	0.222	0.433
4. Prepared food, beverages, and tobacco	151	-0.462	0.034	0.098	0.151	0.534	-0.314	0.127	0.194	0.262	0.860
5. Mineral products	106	-0.448	-0.144	-0.043	0.054	0.377	-0.140	0.132	0.217	0.361	0.941
6. Chemicals and chemical products	553	-0.575	-0.054	0.023	0.122	0.757	-0.289	0.109	0.208	0.328	1.241
7. Rubber and plastics	163	-0.166	0.018	0.069	0.128	0.378	-0.366	0.147	0.261	0.387	0.730
8. Hides, leather, and skins	49	-0.132	0.155	0.296	0.416	0.879	-0.179	0.111	0.182	0.238	0.536
9. Wood, cork, and straw	42	-0.513	-0.020	0.049	0.120	0.265	-0.002	0.125	0.202	0.295	0.535
10. Paper, pulp, and printing	120	-0.104	0.017	0.094	0.173	0.524	-0.210	0.053	0.126	0.220	0.622
11. Textiles and apparel	716	-0.186	0.128	0.239	0.354	0.765	-0.194	0.222	0.297	0.358	0.659
12. Footwear, headgear, etc	41	0.063	0.211	0.325	0.451	0.906	-0.070	0.212	0.271	0.332	0.599
13. Stone, ceramics, and glass	95	-0.222	0.024	0.087	0.196	0.482	0.121	0.268	0.359	0.507	0.885
14. Gems and jewelry	18	-0.157	0.091	0.279	0.412	4.054	-0.230	-0.060	0.078	0.326	0.661
15. Metals and metal products	445	-0.271	-0.003	0.069	0.153	0.509	-0.168	0.167	0.286	0.419	0.803
16. Machinery and equipment	440	-0.750	-0.007	0.103	0.212	1.948	-0.200	0.274	0.397	0.523	1.480
17. Transport equipment	71	-0.305	0.069	0.154	0.255	1.128	-0.205	0.102	0.245	0.466	0.771
18. Instruments, clocks, etc	124	-0.632	0.010	0.184	0.294	1.220	-0.024	0.315	0.427	0.557	1.102
19. Arms and ammunition	9	0.007	0.085	0.208	0.222	0.565	0.108	0.294	0.382	0.528	0.648
20. Miscellaneous manufactures	89	-0.161	0.070	0.197	0.270	0.617	-0.048	0.223	0.309	0.383	0.714
21. Art and antiques	2	0.472	0.472	0.665	0.858	0.858	0.262	0.262	0.299	0.336	0.336

Figure 1
Search Effects by HS Section
(Interquartile range of estimated elasticity of observed price with respect to Log Importers' Per Capita Income)

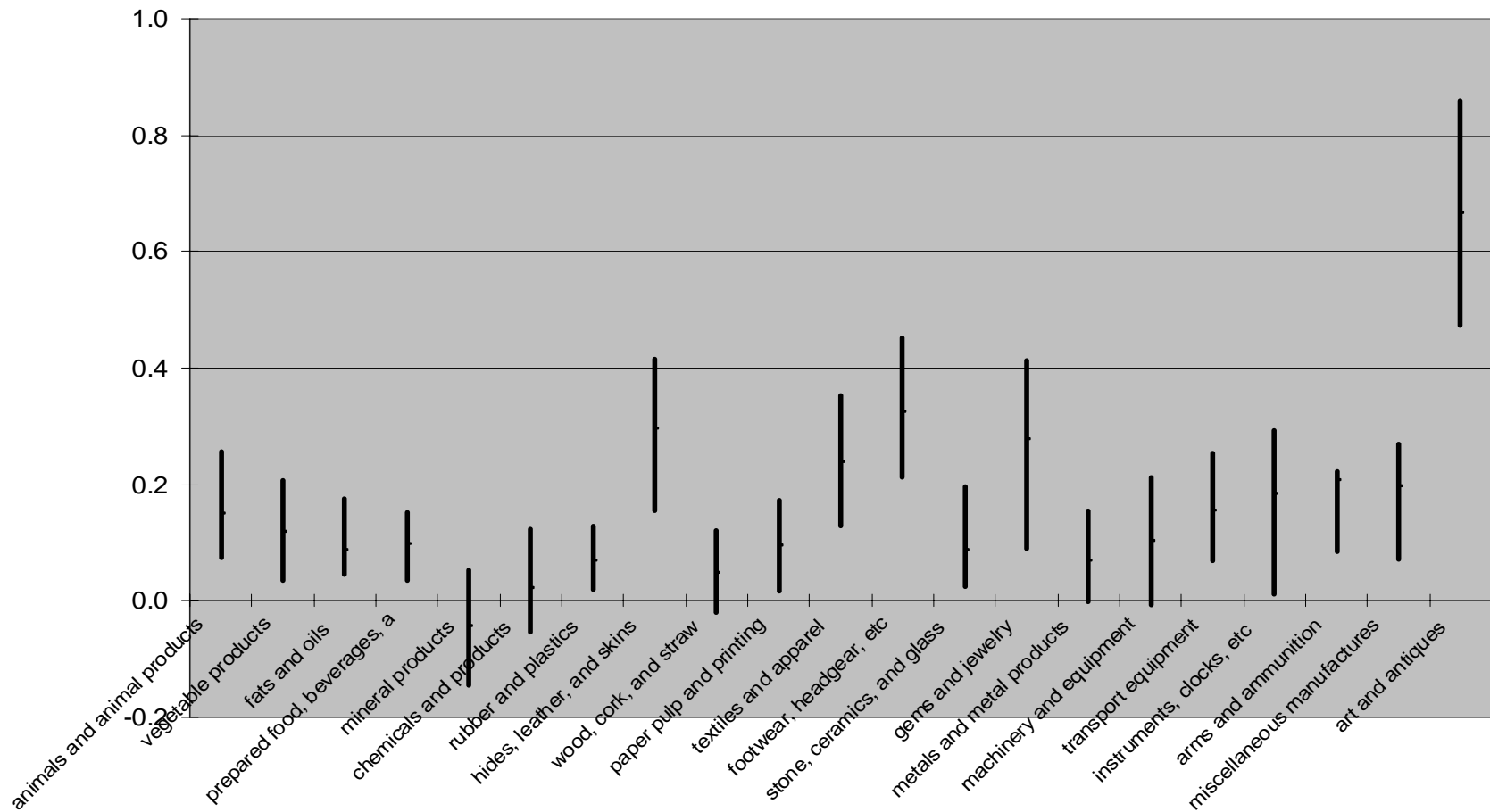


Figure 2
Search Effects by HS Section
(Interquartile range of estimated elasticity of observed price with respect to Log Exporters' Per Capita Income)

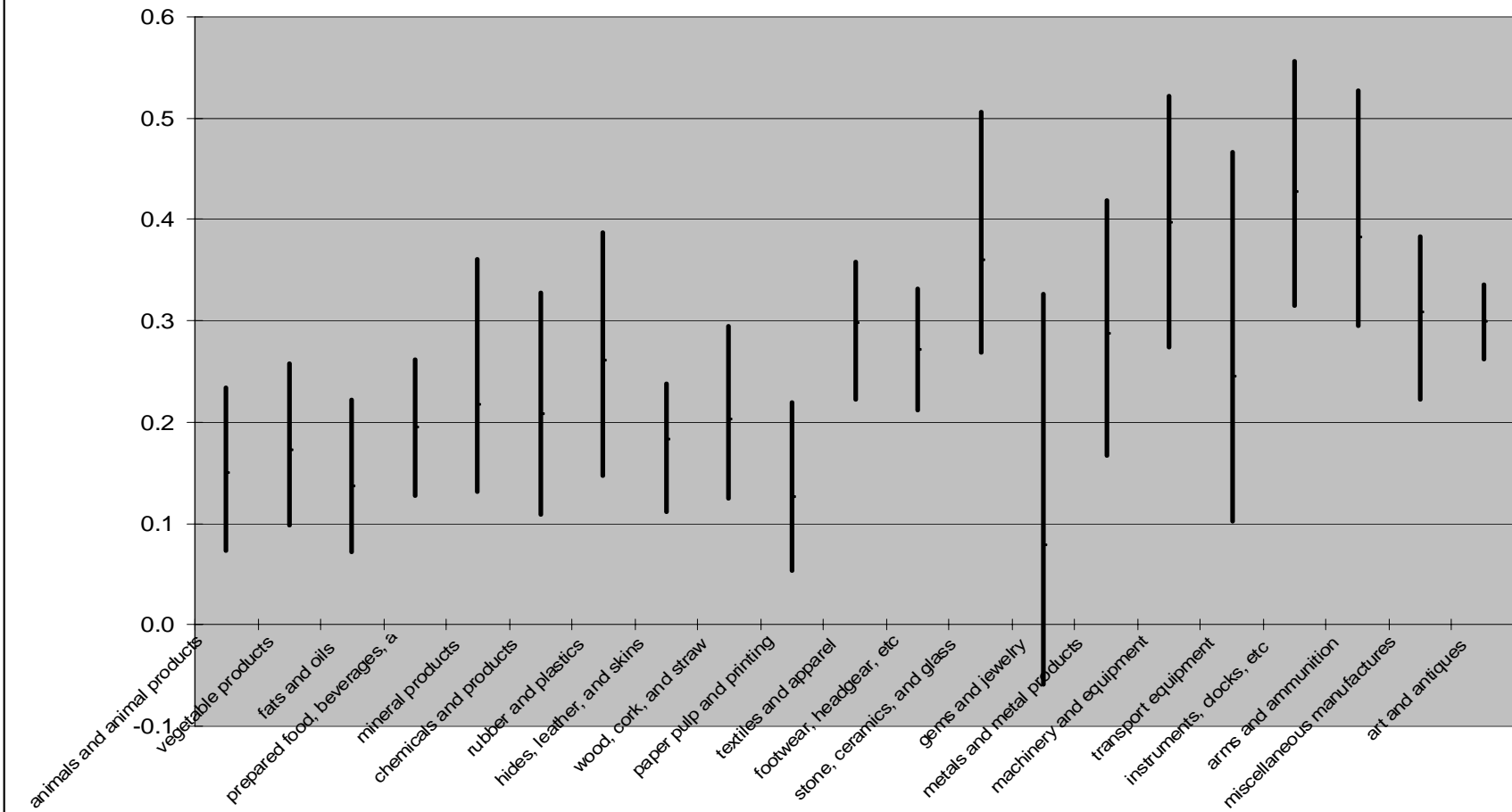


Table 4

Estimated price differences for median and 75th percentile products at a difference in per capita income corresponding to the difference between the United States and China

HS section	Name	Importers' Price (median)	Importers' price (75 th percentile)	Exporters' price (median)	Exporters' price (75 th percentile)
1	animals and animal products	41.7%	81.2%	41.3%	72.3%
2	vegetable products	31.3%	61.9%	48.9%	81.9%
3	fats and oils	22.2%	50.5%	37.2%	67.4%
4	prepared food, beverages, and tobacco	25.6%	41.9%	56.9%	83.8%
5	mineral products	-9.5%	13.4%	65.3%	131.4%
6	chemicals and products	5.4%	32.8%	62.0%	114.0%
7	rubber and plastics	17.5%	34.7%	83.2%	145.7%
8	hides, leather, and skins	99.0%	162.5%	52.6%	73.9%
9	wood, cork, and straw	11.9%	32.1%	59.8%	98.2%
10	paper pulp and printing	24.4%	49.6%	33.9%	66.7%
11	textiles and apparel	74.1%	127.5%	99.5%	129.5%
12	footwear, headgear, etc	112.4%	184.9%	87.6%	116.3%
13	stone, ceramics, and glass	22.4%	57.5%	130.2%	224.0%
14	gems and jewelry	90.9%	160.1%	19.9%	113.4%
15	metals and metal products	17.3%	42.8%	94.4%	164.6%
16	machinery and equipment	27.0%	63.7%	151.2%	236.4%
17	transport equipment	42.8%	80.7%	76.6%	195.2%
18	instruments, clocks, etc	53.2%	97.9%	169.2%	264.1%
19	arms and ammunition	62.1%	67.5%	143.0%	240.4%
20	miscellaneous manufactures	57.8%	87.3%	104.6%	143.5%
21	art and antiques	368.5%	633.3%	100.1%	118.3%

Memo: 2005 PPP per capita income, United States - \$41,674
China - \$4,091

Table 5

Estimated price differences for median and 75th percentile products associated with distance effects, evaluated at global mean distance, and with contiguity, for contiguous countries

HS section	Name	Distance 50 th percentile	Distance 75 th percentile	Contiguity 50 th percentile	Contiguity 75 th percentile
1	animals and animal products	44.7%	199.1%	-7.2%	-14.9%
2	vegetable products	105.4%	252.9%	-11.1%	-22.7%
3	fats and oils	60.1%	174.7%	-17.9%	-32.3%
4	prepared food, beverages, a	45.0%	128.6%	-14.3%	-21.8%
5	mineral products	202.2%	1000.0%	-22.2%	-34.9%
6	chemicals and products	79.2%	267.0%	-14.5%	-27.1%
7	rubber and plastics	86.0%	189.7%	-12.0%	-19.8%
8	hides, leather, and skins	19.6%	125.5%	-15.8%	-25.7%
9	wood, cork, and straw	85.8%	187.0%	-14.1%	-29.0%
10	paper pulp and printing	99.0%	272.4%	-14.4%	-23.4%
11	textiles and apparel	5.1%	55.2%	-13.1%	-21.9%
12	footwear, headgear, etc	-3.7%	29.1%	-14.3%	-25.6%
13	stone, ceramics, and glass	124.9%	384.9%	-19.1%	-32.1%
14	gems and jewelry	30.9%	680.0%	2.4%	-21.6%
15	metals and metal products	78.7%	186.0%	-9.2%	-18.4%
16	machinery and equipment	62.6%	244.1%	-9.9%	-22.9%
17	transport equipment	39.7%	130.5%	-2.1%	-14.8%
18	instruments, clocks, etc	21.7%	138.4%	-13.6%	-33.7%
19	arms and ammunition	108.2%	176.8%	0.4%	-6.9%
20	miscellaneous manufactures	24.1%	145.0%	-10.4%	-22.9%
21	art and antiques	-29.1%	20.7%	-21.5%	-44.0%
	Aggregate median	49.9%		-12.2%	

Memo: Global mean distance for all products (not trade-weighted): approximately 3,200 kilometers. Contiguity is evaluated as the effect of being contiguous vs. non-contiguous.

Table 6

Estimated price differences for median and 75th percentile products associated with landlocked status

HS section	Name	Importer landlocked 50 th percentile	Importer landlocked 75 th percentile	Exporter landlocked 50 th percentile	Exporter landlocked 75 th percentile
1	animals and animal products	20.5%	42.6%	1.6%	21.3%
2	vegetable products	19.8%	37.2%	4.4%	22.7%
3	fats and oils	13.6%	40.7%	7.4%	47.4%
4	prepared food, beverages, a	9.5%	18.9%	13.2%	30.4%
5	mineral products	20.5%	40.4%	4.8%	20.7%
6	chemicals and products	12.6%	31.4%	31.5%	66.0%
7	rubber and plastics	11.5%	24.3%	14.8%	31.1%
8	hides, leather, and skins	10.3%	27.9%	12.4%	41.3%
9	wood, cork, and straw	12.5%	26.8%	-0.4%	17.7%
10	paper pulp and printing	12.1%	25.1%	6.6%	27.2%
11	textiles and apparel	9.0%	23.2%	17.8%	35.2%
12	footwear, headgear, etc	11.6%	33.2%	16.9%	29.3%
13	stone, ceramics, and glass	14.0%	27.8%	17.0%	44.8%
14	gems and jewelry	5.2%	69.0%	50.8%	106.9%
15	metals and metal products	12.4%	24.5%	12.4%	34.7%
16	machinery and equipment	6.1%	26.2%	21.3%	45.0%
17	transport equipment	7.1%	17.9%	7.0%	31.2%
18	instruments, clocks, etc	8.3%	31.1%	39.5%	86.8%
19	arms and ammunition	7.5%	20.3%	23.1%	43.4%
20	miscellaneous manufactures	5.6%	17.5%	17.1%	37.1%
21	art and antiques	42.6%	56.4%	56.1%	56.3%
	Aggregate median	11.5%		16.1%	

Evaluated as the effect of landlocked vs. non-landlocked status.

Table 7
Thirty Products With The Highest Income-Related Quality-Ladder Effects

Product	Product Name	Estimated elasticity of price with respect to exporters' per capita income	Simulated price ratio for per capita income of U.S. and China
843353	Root or tuber harvesting machines	1.480	31.04
846310	Drawbenches for bars, tubes, profiles, wire or the like, for working metal or cermets, without removing material	1.309	20.87
845891	Lathes (including turning centers), for removing metal, numerically controlled	1.291	20.02
293212	2-Furaldehyde (furfuraldehyde)	1.241	17.82
854060	Cathode ray tubes, other	1.154	14.55
846241	Punch/notch machines (incl. presses), incl. combined punch & shearing machines, numerically controlled for working metal or metal carbides	1.145	14.25
846140	Gear cutting, gear grinding or gear finishing machines for working by removing metal or cermets	1.120	13.46
900630	Cameras specially designed for underwater, aerial, medical, surgical, forensic or criminological purposes, not cinematographic	1.102	12.91
846021	Other grinding machines for metal or cermets, w/positioning accuracy in any one axis of at least 0.01 mm, numerically controlled	1.088	12.51
843041	Selfpropelled boring or sinking machinery	1.082	12.31
845620	Machine tools operated by ultrasonic processes	1.076	12.15
901510	Rangefinders	1.063	11.79
843850	Machinery for the preparation of meat or poultry, other	1.042	11.22
843680	Agricultural, horticultural, forestry or bee-keeping machinery, other	1.041	11.20
900580	Optical telescopes and other optical astronomical instruments	1.019	10.64
281310	Carbon disulphide	1.018	10.63
902229	Apparatus based on the use of alpha, beta, or gamma radiations, not for medical, surgical, or veterinary uses	0.978	9.69
845150	Machines for reeling, unreeling, folding, cutting or pinking textile fabrics	0.976	9.64
846040	Honing or lapping machines for working metal or cermets	0.955	9.18
251020	Natural calcium phosphates, natural aluminium calcium phosphates and phosphatic chalk, ground	0.941	8.89
854071	Magnetrons	0.936	8.79
844230	Machinery, apparatus and equipment for preparing or making plates, cylinders, or other printing components	0.927	8.59
851511	Brazing or soldering machines and apparatus	0.920	8.45
854020	Television camera tubes; image converters and intensifiers; other photocathode tubes	0.908	8.23
280530	Rareearth metals, scandium and yttrium, whether or not mixed or alloyed	0.899	8.06
910191	Watches (excl. wristwatches) with cases of or clad with precious metal, electrically operated	0.891	7.90
700231	Glass tubes of fused quartz or other fused silica, unworked	0.885	7.80
902750	Instruments and apparatus using optical radiations (ultraviolet, visible, infrared), other (e.g. exposure meters)	0.867	7.49
841920	Medical, surgical or laboratory sterilizers	0.862	7.39
200320	Truffles, prepared or preserved otherwise than by vinegar or acetic acid	0.860	7.36

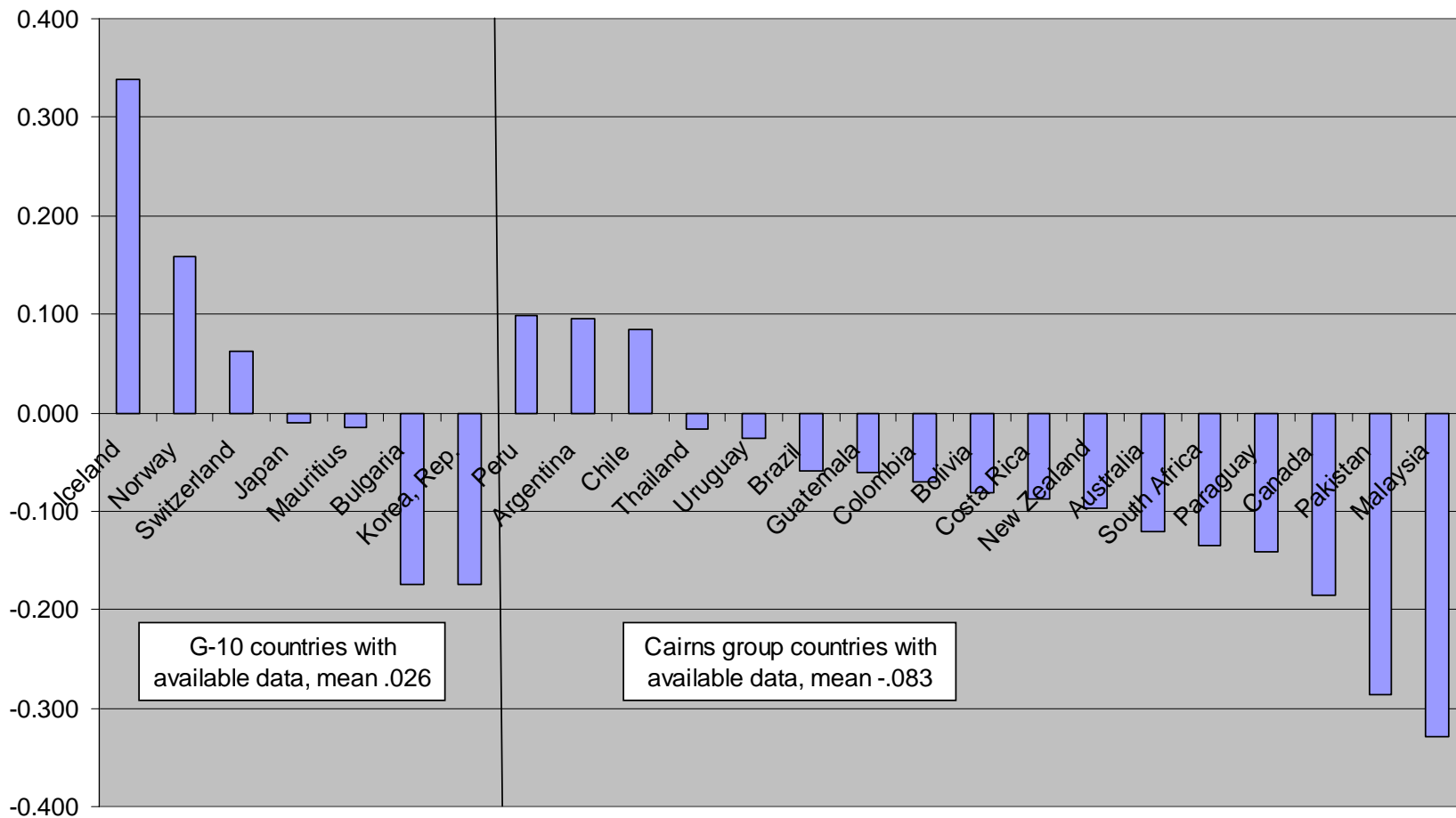
Table 8
Thirty Products With The Highest Pricing-To-Market Effects

Product	Product Name	Estimated elasticity of price with respect to importers' per capita income	Simulated price ratio for per capita income of U.S. and China
711291	Gold waste and scrap, including metal clad with gold but excluding sweepings containing other precious metals	4.054	12,222.14
841181	Gas turbines other than turbojets or turbopropellers, of a power not exceeding 5,000 kW, aircraft and other	1.948	91.96
910111	Wrist watches with cases of or clad with precious metal, electrically operated, with mechanical display only	1.220	16.99
890392	Motorboats, other than outboard motorboats	1.128	13.71
890391	Sailboats, with or without auxiliary motor	1.105	13.00
70952	Truffles	0.978	9.68
844720	Flat knitting machines; stitchbonding machines; V-bed flat knitting machines	0.943	8.93
670420	Wigs, false beards, eyebrows and eyelashes, switches and the like, other, of human hair	0.906	8.20
430110	Raw furskins of mink, whole, with or without head, tail or paws	0.879	7.69
430180	Raw furskins, whole, with or without head, tail or paws, not of mink, lamb or fox	0.861	7.37
970400	Postage or revenue stamps, stamp-postmarks, first-day covers, postal stationery, and the like, used or unused, other than heading 4907	0.858	7.33
843221	Disc harrows for soil preparation or cultivation	0.791	6.27
430220	Heads, tails, paws, other pieces or cuttings of dressed or tanned furskins, not assembled	0.783	6.16
580500	Handwoven tapestries of the type Gobelins, Flanders, Aubusson, Beauvais and the like, and needle-worked tapestries	0.765	5.91
911190	Parts of watch cases	0.761	5.85
320730	Liquid lustres and similar preparations, of a kind used in the ceramic, enameling or glass industry	0.757	5.80
670300	Human or animal hair prepared for making wigs and the like	0.754	5.75
621310	Handkerchiefs, of silk or silk waste	0.747	5.66
381800	Chemical elements doped for use in electronics, in the form of discs, wafers, etc., chemical compounds doped for electric use	0.745	5.64
10110	Purebred live horses, asses, mules and hinnies for breeding	0.727	5.40
711810	Coin (other than gold coin), not being legal tender	0.717	5.29
611490	Other garments, knitted or crocheted, of other textile materials (mostly wool and silk)	0.711	5.21
910911	Electrically operated clock movements, complete and assembled, of alarm clocks	0.710	5.20
910191	Watches (excl. wrist watches) with cases of or clad with precious metal, electrically operated	0.689	4.95
711100	Base metals, silver or gold, clad with platinum, not further worked than semimanufactured	0.684	4.90
430160	Raw furskins of fox, whole, with or without head, tail or paws	0.676	4.80
871310	Carriages for disables persons, not mechanically propelled	0.675	4.79
650692	Headgear of furskin, whether or not lined or trimmed (excl. toy and carnival headgear)	0.661	4.64
611190	Babies' garments and clothing accessories, knitted or crocheted, of other textile materials	0.646	4.48
293491	Aminorex (INN), brotizolam (INN), clotiazepam (INN), cloxazolam (INN), dextromoramide (INN), haloxazolam (INN), ketazolam (INN), mesocarb (INN), oxazolam (INN), pemoline (INN), phendimetrazine (INN), phenmetrazine (INN) and sufentanil (INN); salts thereof	0.644	4.45

Table 9
Index of Residual Ln Import Price For All Products

Importer	Total	Agriculture	Non- Agriculture	Importer	Total	Agriculture	Non- Agriculture
Albania	-0.345	-0.248	-0.357	Korea, Rep.	-0.078	-0.175	-0.066
Algeria	0.048	-0.338	0.089	Kyrgyz Republic	-0.270	0.093	-0.313
Argentina	0.025	0.096	0.018	Latvia	-0.046	-0.139	-0.026
Armenia	-0.070	-0.199	-0.052	Lithuania	-0.497	-0.212	-0.585
Australia	-0.209	-0.121	-0.228	Luxembourg	0.113	0.261	0.091
Austria	-0.128	-0.058	-0.142	Macedonia, FYR	-0.058	-0.053	-0.058
Azerbaijan	-0.033	-0.490	0.025	Madagascar	0.065	0.142	0.057
Bahrain	-0.083	0.062	-0.103	Malawi	-0.060	-0.012	-0.064
Barbados	-0.015	0.047	-0.034	Malaysia	-0.324	-0.330	-0.323
Belarus	0.228	0.151	0.240	Maldives	0.351	0.247	0.712
Belgium	-0.148	-0.105	-0.154	Malta	-0.161	0.012	-0.182
Belize	-0.355	-0.139	-0.389	Mauritius	-0.037	-0.015	-0.042
Benin	-0.376	-0.342	-0.380	Mexico	-0.133	-0.121	-0.136
Bolivia	-0.253	-0.081	-0.268	Moldova	0.085	0.039	0.096
Bosnia and Herzegovina	-0.059	-0.138	-0.045	Mongolia	-0.174	-0.333	-0.118
Brazil	-0.161	-0.059	-0.169	Morocco	-0.040	-0.101	-0.031
Bulgaria	-0.160	-0.174	-0.159	Mozambique	-0.169	0.196	-0.198
Cameroon	-0.330	0.091	-0.384	Namibia	-0.026	-0.007	-0.027
Canada	-0.150	-0.185	-0.144	Netherlands	-0.161	-0.215	-0.152
Chile	-0.035	0.084	-0.061	New Zealand	-0.044	-0.097	-0.037
China	-0.023	-0.139	-0.013	Nicaragua	-0.259	0.117	-0.304
Colombia	-0.040	-0.070	-0.037	Niger	0.014	0.128	-0.010
Costa Rica	-0.243	-0.088	-0.261	Norway	0.089	0.158	0.076
Cote d'Ivoire	-0.021	0.277	-0.067	Oman	-0.223	-0.212	-0.225
Croatia	0.069	-0.011	0.083	Pakistan	-0.593	-0.286	-0.620
Cyprus	-0.049	0.029	-0.060	Panama	-0.357	-0.181	-0.379
Czech Republic	-0.158	-0.193	-0.153	Paraguay	-0.244	-0.142	-0.259
Denmark	-0.014	-0.165	0.017	Peru	0.012	0.099	0.005
Dominica	-0.357	-0.112	-0.390	Poland	-0.076	-0.088	-0.073
Ecuador	-0.143	-0.001	-0.164	Portugal	-0.155	-0.165	-0.153
El Salvador	-0.231	0.038	-0.262	Qatar	-0.370	-0.327	-0.377
Estonia	0.116	0.021	0.130	Romania	0.041	-0.129	0.087
Ethiopia(excl. Eritrea)	0.025	0.206	0.014	Saudi Arabia	-0.228	-0.223	-0.229
Fiji	-0.047	0.119	-0.068	Senegal	-0.218	0.095	-0.271
Finland	0.044	0.049	0.043	Singapore	-0.115	-0.087	-0.121
France	-0.107	-0.112	-0.106	Slovak Republic	-0.066	-0.135	-0.057
Gabon	-0.070	-0.118	-0.064	Slovenia	-0.085	-0.160	-0.046
Germany	-0.192	-0.151	-0.203	South Africa	-0.153	-0.134	-0.155
Ghana	-0.045	0.135	-0.067	Spain	-0.186	-0.193	-0.186
Greece	-0.134	-0.146	-0.131	Sri Lanka	-0.097	-0.177	-0.073
Guatemala	-0.014	-0.060	-0.004	Suriname	-0.633	-0.457	-0.671
Guyana	-0.402	0.006	-0.457	Sweden	-0.002	-0.004	-0.001
Honduras	-0.372	-0.349	-0.375	Switzerland	0.010	0.062	0.003
Hong Kong, China	-0.161	-0.173	-0.159	Syrian Arab Republic	-0.392	-0.392	-0.392
Hungary	-0.254	-0.211	-0.260	Tanzania	-0.390	-0.074	-0.425
Iceland	0.201	0.338	0.173	Thailand	-0.081	-0.017	-0.089
India	-0.010	0.181	-0.025	Togo	-0.526	-0.399	-0.545
Iran, Islamic Rep.	-0.178	-0.393	-0.161	Trinidad and Tobago	-0.192	-0.194	-0.191
Ireland	-0.082	0.044	-0.098	Tunisia	0.100	-0.064	0.112
Israel	-1.766		-1.766	Turkey	0.035	-0.153	0.050
Italy	-0.146	-0.154	-0.145	Uganda	-0.091	-0.166	-0.086
Jamaica	0.022	0.072	0.013	United Arab Emirates	-0.244	-0.253	-0.243
Japan	0.018	-0.011	0.023	United Kingdom	-0.184	-0.114	-0.195
Jordan	-0.189	-0.102	-0.200	United States	-0.181	-0.102	-0.196
Kazakhstan	-0.003	0.012	-0.005	Uruguay	0.005	-0.027	0.009
Kenya	0.109	0.347	0.092	Zambia	-0.109	0.196	-0.127
Kiribati	-0.081	-0.032	-0.189	Zimbabwe	-0.145	-0.204	-0.141

Figure 3
Agricultural price residuals for (WTO) G-10 and Cairns group countries
(equal means rejected at c. $p = 0.05$)



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