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# How Much Do Agricultural Policies Restrict Trade? Comparing Trade Restrictiveness Indexes

Kym Anderson and Johanna Croser[1]

*Recently the Bank has provided new indicators for monitoring the extent to which agricultural policies restrict international trade in farm goods. They come from two studies with differing methodologies and data sources, and each provides less-than-perfect estimates. This note shows how and explains why the two indexes differ for some countries.*

Policy makers and analysts are often keen to know the extent to which agricultural policies reduce international trade flows, as an aid to prioritizing negotiating efforts and unilateral reform agendas. There are various indicators used for that purpose. The most common are nominal rates of assistance to farmers and related consumer tax equivalents affecting the prices that domestic consumers pay for farm products. These measure the extent to which domestic prices exceed those at a country's border. An alternative indicator is to use scalar index numbers from the Anderson and Neary (1994, 2005) family of trade restrictiveness indexes. These measures provide a single theoretically sound indicator of the trade effects of different policy measures that is directly comparable across time and countries.

Drawing on the seminal theoretical work of Anderson and Neary, two recent World Bank studies have attempted to answer the question of how much agricultural policies restrict trade nationally, regionally and globally. Kee, Nicita, and Olerreaga (2009) estimate, among other indices, a single trade reduction index (called an Overall Trade Restrictiveness Index or OTRI in their paper) for 78 developed and developing countries for a snapshot in time (a single year in the early or mid-2000s). Updates of these have been reported regularly in the World Bank's *Global Monitoring Report*.

Anderson and Croser (2009) provide alternative annual estimates of a similar index (called a trade reduction index, or TRI) for the agricultural sector of 75 developed and developing countries for the period 1955 to 2007, using a methodology set out in Lloyd, Croser, and Anderson (2010). This is based on sectoral estimates of the nominal rate of assistance to farmers and the consumer tax equivalent (NRA and CTE) of domestic and border policy measures that affect each country's agricultural trade. Those NRAs and CTEs, provided by Anderson and Valenzuela (2008) are derived by comparing domestic prices with prices of like products at a country's border.[2]

In this paper, we compare the estimates of indices from the Anderson and Croser (2009) country-level TRI estimates (AC), and the Kee, Nicita, and Olerreaga (2008) OTRI estimates, both available on the World Bank website (KNO).[3] We explore how the two series complement each other, why they differ, and how estimation of the trade restrictiveness of agricultural policy can be improved in the future.

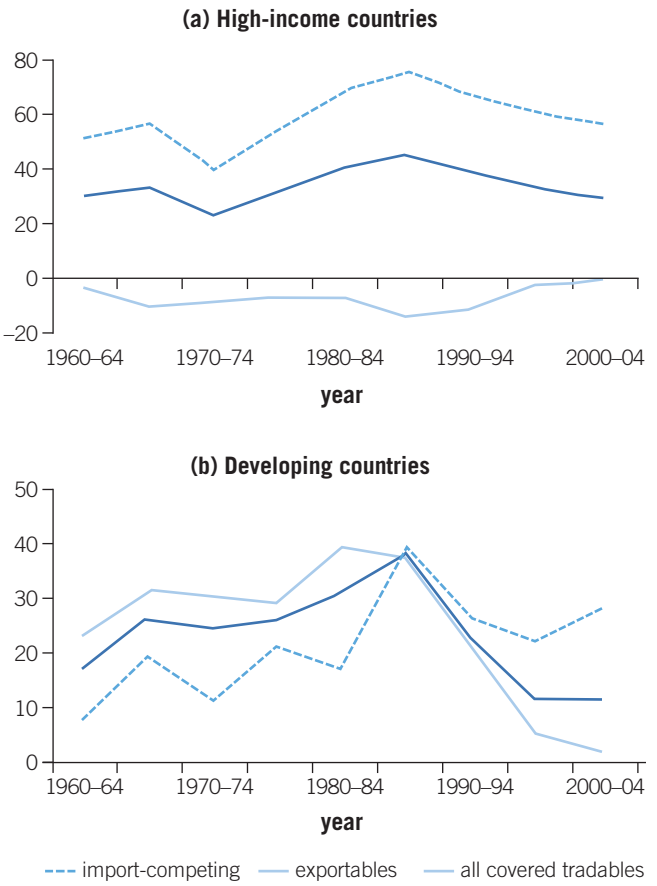
## Complementary Estimates of Agricultural Trade Restrictiveness Indexes

Figure 1 presents the TRI aggregate estimates by AC for the import-competing and exportables subsectors and the overall agricultural sector from 1960 to 2004. For developing countries as a group, the trade restrictiveness of agricultural policy was slightly increasing until the 1990s. Thereafter, it declined, mostly due to reductions in Africa and Asia. For high-income countries, the TRI time path was similar but the causes differ. The aggregate results for developing countries are driven by the exportables subsector, which has

been taxed, and the import-competing subsector, which is being protected but by less than in high-income countries. Policies in high-income countries, by contrast, support both exporting and import-competing agricultural products and, even though they favor the latter much more heavily, the assistance to exporters somewhat offsets the antitrade bias from the protection of import-competing products in terms of impacts on those countries' aggregate volume of trade in farm products. This is reflected in figure 1a in a much smaller TRI for high-income countries overall for agriculture as compared with that for just the import-competing subsector.

Figure 2 presents the country-level detail from the two studies for 2000–04 (for which there are 49 countries in common), showing the KNO estimates for the agricultural sector OTRI based on import tariffs and NTMs alongside the AC estimates of the TRI for the import-competing agricultural subsector, with countries ranked according to the AC estimates. In both studies there is considerable diversity in the country-level index estimates. In line with the results in figure 1, all high-income and transition economies have positive index estimates, indicating unsurprisingly that farm policies in the import-competing sectors of these economies were trade-reducing in that period. There is a high degree of correlation between the estimated series in the two studies for many countries, especially the European Union (EU) countries and most of Central and Eastern Europe's transition economies. (Note that the common KNO estimate of the OTRI for member countries of the EU as a whole—49 percent—is allocated to each member country in figure 2.)

**Figure 1. Trade Reduction Indexes for the Agricultural Sector's Import-Competing and Exportables Subsector and Overall, All Covered Tradable Farm Products, 1960–2007**




*Source:* Anderson and Croser 2009.
*Note:* Regional aggregates are weighted using the average of the value of production and consumption at undistorted prices.

The differences between the two sets of estimates are most noticeable at the top and bottom of figure 2(a). For the EFTA countries (Switzerland, Iceland, and Norway) and Japan—countries with a strong comparative disadvantage in agricultural products—the AC estimates are much higher than the KNO estimates; while for Australia, the United States, and New Zealand—countries with a strong comparative advantage in farm products—the AC estimates are much smaller than the KNO estimates.

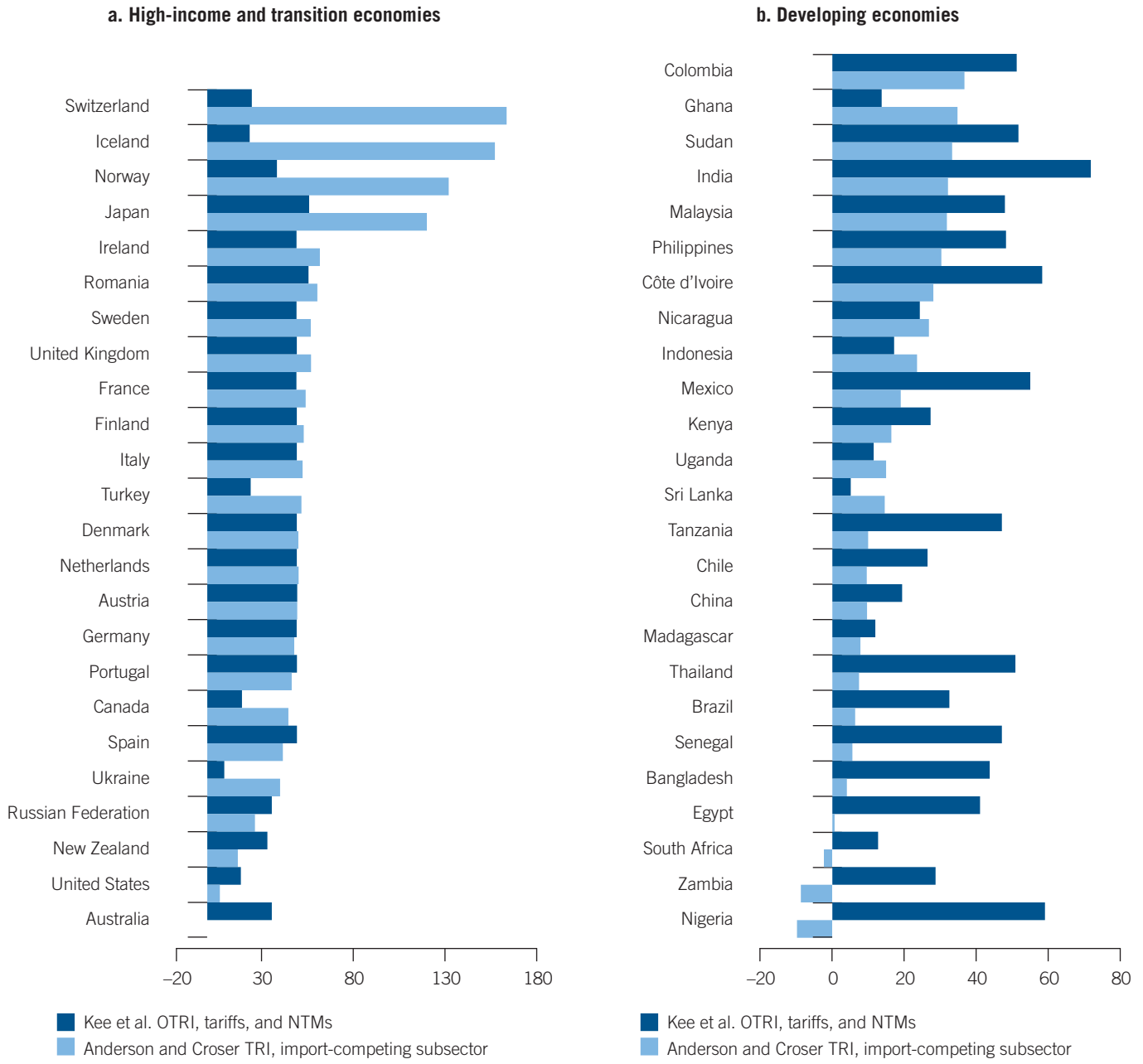
Figure 2(b) presents the estimates for those developing countries present in both data sets. Most countries had policies that were overall trade-reducing in the time period shown. For a few developing countries, the TRI estimate by AC is negative, indicating that their agricultural policies in aggregate were implicitly subsidizing imports slightly. The AC estimates for developing countries are generally smaller than the KNO estimates. This tendency holds across the three main developing country regions (Africa, Asia, and Latin America). There are only a few developing countries for which the KNO estimate is lower than the AC estimate, most noticeably Ghana and Sri Lanka.

These results are complementary. The AC estimates, based on historical data, enable greater insights into the restrictiveness of policy over time. Also, the AC estimates for import-competing and exportable subsectors give a stronger indication of the antitrade policy stance in many countries, especially in previous decades, than is obtainable by examining indexes for just the import-competing industries. However, the KNO series has the benefit that it can be readily updated from published secondary data.

## Why the Two Studies' Estimates Differ

There are at least five reasons why the KNO and AC estimates could differ. The most obvious empirical reason for the series to differ is that distortions data are drawn from different sources. In the KNO study, the main source is the WTO Integrated Data Base and UNCTAD's TRAINS database, supplemented by WTO national *Trade Policy Review* reports.

**Figure 2. Trade Reduction Indexes for the Agricultural Sector's Import-Competing Subsector, Selected Focus Countries, 2000–04 (percent)**




*Sources:* Anderson and Croser 2009; Kee, Nicita and Olarreaga 2008.
*Note:* The Kee, Nicita, and Olarreaga estimate for each country is for a single year in the mid-2000s for which the most recent data are available.

Agricultural domestic support data (which are included in the KNO NTM estimate) are based on WTO members' notifications during the period 1995–98. By contrast, the data used in the AC estimates are obtained from the World Bank's new Distortions to Agricultural Incentives database, which provides price-equivalent distortion estimates for the production and consumption sides of each commodity market based on direct price comparisons. By calculating domestic-to-border price ratios, the estimates include the price effects of all tariff and NTMs plus any domestic price support measures (positive or negative), plus an adjustment for the output-price equivalent of direct interventions in farm input markets. Where multiple exchange rates operate, an estimate of the import or export tax equivalents of that distortion are included as well. The domestic-to-border price ratio is an appropriate measure for the TRI analysis since it captures agricultural price and trade policies by comparing like products at the same point in the value chain, namely, the farm-gate level.

The different sources of data (and their different years), and the way they are used, can potentially explain some of the dif-

ference in the estimates. The KNO estimates of their OTRI are higher than the TRI estimates by AC for agricultural-exporting countries potentially because of the methodology used by KNO to capture the effects of NTMs. The KNO method involves (1) estimating the restrictiveness of NTMs on import volumes by product and country, and (2) using import demand elasticities to transform the estimated import quantity to an ad valorem tariff equivalent measure. The former step includes in the estimating equation a dummy variable for each NTM regardless of the extent of restrictiveness of that measure. For countries such as Australia, the United States, and New Zealand, almost half of the OTRI estimates by KNO are due to NTMs.

The AC method of domestic-to-border price comparisons for like products at the farm-gate level of the value chain, by contrast, provides an ad valorem equivalent directly. While such measures based on price comparisons are likely to be more accurate for covered products, there are many food products imported for consumers that are not covered in the study because they were not important in domestic production (see below). Also, generating such measures can be computationally intensive, and updates are not yet as mainstreamed as the annual updates of UNCTAD's TRAINS database.

The second reason to expect differences between the two series is that the AC estimates are computed with the simplifying assumption within each country that domestic price elasticities of supply are equal across commodities, and the same for domestic price elasticities of demand. That assumption allows the AC estimates to be constructed by aggregating distortions using as weights just the sectoral share of each commodity's domestic value of consumption or production at undistorted prices. The OTRI estimates, calculated with a full set of country- and commodity-specified import demand elasticities, has the benefit of capturing precisely the differential responses of various commodity trades to a given policy distortion.

The third reason to expect differences between the two series is that the KNO estimates are generated from a very disaggregated data set (at the HS six-digit tariff line level, which has more than 4,000 tariff lines) whereas the AC estimates are based on a sample that averages just 15 farm products per high-income country and 9 per developing country (so as to cover around 70 percent of the gross value of each country's farm production). If the level of disaggregation had been the only difference between the two series, the greater level of disaggregation in the KNO study would result in more accurate TRI estimates. This is because the KNO estimates correctly aggregate distortions from the more disaggregated base, and the estimates reflect the full diversity of distortions across industries within the agricultural subsector under study. The OTRI for industries distorted by import restrictions alone (the KNO approach) would give a higher estimate than a comparable TRI estimate by AC because the former would be based on data that contain a fuller diversity of distortions across the import-competing subsector.[4]

The fourth reason why the two series could differ is the difference in the products included in the two studies. The KNO estimates are based on a methodology where distortions to import-competing products are weighted by observed import values (multiplied by import demand elasticities, as per the Anderson/Neary formulation of the index). That is, the KNO estimates will only include products for which there are nonzero imports at the HS six-digit level, regardless of their importance to domestic production or consumption. By contrast, the AC estimates are computed using a methodology where the weights are production and consumption based. Anderson and Valenzuela (2008) select agricultural products for inclusion in the database because they are important contributors to the gross value of national production at undistorted prices, thereby minimizing the number of products needed to achieve the target coverage of 70 percent of that total value. The AC estimates are based on policy distortions to those 70 percent of products, including both import-competing and exportable subsectors. The TRIs are computed for the subsectors separately as well as together; and they can be extended to include the nontradables subsector as well.

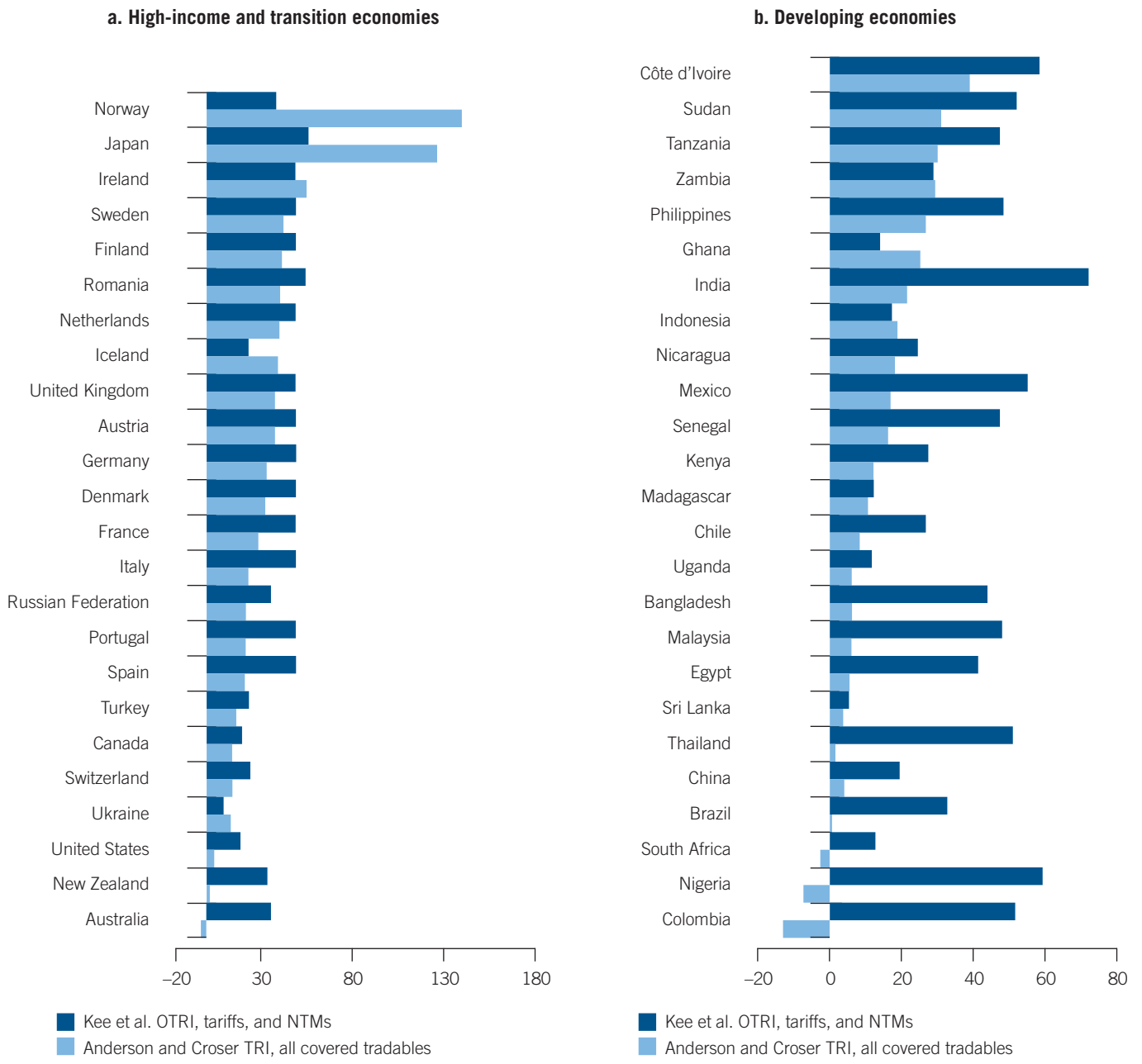
If the only difference between the two series was that KNO limit their sample to products facing actual import competition, the AC estimates would give a more accurate indication of distortions to the domestic agricultural markets of a country because they include both import-competing and export subsectors. However, the AC estimates could be improved by including more coverage of production and consumption beyond the current 70 percent level. At the same time the KNO methodology and OTRI estimates could be improved by including exportable products.

The fifth and related reason for the difference between the two series is that the KNO estimates include only import-restricting policy distortions, whereas the AC estimates are based on all distortions (positive and negative) to import-competing and exportable industries. That set includes import and export taxes and subsidies and ad valorem equivalents of nonprice border measures such as quantitative trade restrictions or technical standards, the implicit trade taxes associated with multiple exchange rates, as well as domestic production or consumption taxes and subsidies and the output subsidy equivalent of farm input subsidies net of input taxes.[5]

Differences in the estimated TRI series due to differing extents of product disaggregation, product coverage, and instrument coverage are evident from a comparison of the

KNO estimates with two alternative sets of AC estimates. The first comparison is between the KNO estimates and the TRI estimates by AC for import-competing products in each country (figure 3). Given the five differences between the two series analyzed above, it is not possible to say a priori whether the TRI estimates by AC should be larger or smaller than the KNO counterparts. For example, while the latter will include many more products—including ones involving little or no restriction because there is no local industry demanding protection from import competition—it will only include import restrictions and hence only a subset of distortions to agricultural trade (albeit probably the most distortive subset). For high-income and transitional economies, where almost all import distortions are protective, the AC estimates (with fewer sectors) are higher than KNO estimates, most likely because the effect of including more lightly protected products dominates. This could be partly why temperate-climate countries such as Japan, Switzer-

**Figure 3. Trade Reduction Indexes for the Agricultural Import-Competing Subsector and for All Covered Tradable Farm Products, Selected Focus Countries, 2000–04 (percent)**




*Source:* Anderson and Croser 2009.
*Note:* The Kee, Nicita, and Olarreaga estimate for each country is for a single year in the mid-2000s for which the most recent data are available.

land, Norway, and Iceland, despite having highly protected import-competing agricultural sectors, have low OTRIs: many of their imports from tropical countries would face few if any restrictions (figure 3a). In African countries such as Zambia, where there have been import subsidies for staple foods, the TRI estimate is lower than the OTRI, suggesting that the effect of including more policy instruments dominates the explanation for the difference between estimates (figure 3b).

The second comparison is between the KNO estimates and AC's TRI estimates for *all* covered tradables (both exportable and import-competing sectors). This brings the two series closer together in terms of product coverage, but the AC estimates also include distortions to exportable industries. Once again it is not possible to say a priori whether the AC estimates should be larger or smaller than the KNO estimates. The extent to which the increased product coverage in the AC estimates brings them closer to the KNO estimates will depend on the type and extent of distortions to exportable versus import-competing subsectors. A comparison and figures 2 and 3 reveal that when exportable subsectors are included to generate a TRI for all agricultural tradables, the TRI estimates generally are lower in 2000–04 than those involving just import-competing subsectors. This is because the exportable subsector tends to be less trade restricted than the import-competing subsector. For example, Switzerland and Iceland have large export subsidies in 2000–04 for several agricultural products (Josling 2009). These trade-expanding subsidies reduce the TRI estimate quite significantly when the exportable subsector is included. In contrast, Norway provides much lower assistance to its exportable subsector than to its import-competing farmers, so the inclusion of exporting industries has a less significant effect on that country's TRI estimate (compare the grey shaded bar for Norway in figures 2 and 3). As for developing countries, Côte d'Ivoire, Tanzania, and Zambia each have trade-reducing policies in their exportable subsector, which leads to a higher TRI estimate for them in figure 3 than in figure 2.

## Conclusion

In recent years very considerable progress has been made in answering the question: how much do agricultural policies restrict trade? The two World Bank studies surveyed here have approached the question from different angles, each producing complementary results as to the restrictiveness of import-competing agriculture in developed and developing countries in the 2000s. The Anderson and Croser (2009) estimates have the benefit of being part of a longer time-series of estimates, giving historical context to the current policy position. The import-competing subsector estimates can be compared to estimates for the other subsectors of agriculture (exportables and nontradables), thereby offering further insight into the antitrade bias in different countries' policies. The Kee, Nicita, and Olarreaga (2008) indexes, constructed from a somewhat different methodology and data set, have the benefit of allowing for a comparison between the trade restrictiveness of agricultural and manufacturing import-competing policies, offering insight into the extent of the sectoral bias in protectionist national trade policies (usually favoring agriculture). The KNO estimates are more theoretically precise than the AC estimates because they are based on a more disaggregated data set and they capture the differential responses of various commodity trades to a given policy distortion through the inclusion of elasticity data. Because the KNO estimates are based on a routinely published data source, they can be regularly updated at low cost.

The level of disaggregation, the proportion of the sector included in the aggregation, and the types of policy instruments included in the analysis are all important determinants of indices of agricultural trade restrictiveness. The more prevalent are NTMs, the more difficult it will be to avoid domestic-to-border price comparisons to get an accurate measure. But such price comparison studies need to include not only products important in domestic production but also those important in domestic consumption but not be produced domestically (such as tropical products in temperate countries, and conversely). Such price comparison studies are laborious and therefore expensive. Nonetheless, they are being undertaken regularly by the OECD for gradually more and more countries, including for a large sample of African countries under a new joint project with the FAO and national governments funded by the Bill and Melinda Gates Foundation. Adding TRIs to the list of calculated indicators by the OECD would enrich the policy analysis that will be possible with those estimates, without requiring any more information that is currently needed to estimate NRAs/CTEs or PSE/CSEs if one is willing to adopt some restrictive assumptions about price elasticities.

One final point: the TRI, with its inclusion of export subsectors, will be especially useful when assessing the restrictiveness of policy responses to spikes in international food prices, as in 2008 when many developing countries placed restrictions on exports of food. Efforts are currently under way to update the Anderson and Valenzuela (2008) and Anderson and Croser (2009) databases to include that year.

## Notes

1. Correspondence: kym.anderson@adelaide.edu.au. This note is a product of a World Bank research project on Distortions to Agricultural Incentives (see www.worldbank.org/agdistortions). The authors are grateful for the distortion es-

timates provided by the authors of the various country case studies, for funding from Trust Funds provided by the governments of the Netherlands (BNPP), the United Kingdom (DfID), and Ireland, as well as from the Australian Research Council.

2. See also Anderson (2009) for a summary. The Anderson and Croser (2009) database also contains estimates of a TRI for the market of individual commodities, based on the methodology of Croser, Lloyd, and Anderson (2010). These measures are novel because all previous work has focused on constructing index numbers from the perspective of a single country.

3. The Kee et al. (2008) estimates are slightly different to those in Kee et al. (2009), but we use the former because they include a disaggregation of the OTRI into manufacturing and agricultural subsectors of each national economy.

4. Another index reported in both the KNO paper and the AC database is a welfare reduction index, for which the variance of sectoral distortions is a component of the index. Space constraints preclude a discussion of welfare impact estimates.

5. As noted, the AC methodology can be extended to include domestic distortions to the nontradables subsector of agriculture (Croser and Anderson 2010). By definition this subsector involves no trade distortions, so its inclusion in the set of products necessarily will lower the sectoral TRI estimates.

## About the Authors

Kym Anderson *is the George Gollin Professor of Economics and formerly foundation Executive Director of the Centre for International Economic Studies at the University of Adelaide, Australia. He is also a consultant and the leader of Agricultural Distortions Research Project (www.worldbank.org/agdistortions) at the World Bank.* Johanna Croser *is a PhD candidate in the School of Economics at the University of Adelaide, Australia.*

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