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31 March 2009

Online at <https://mpra.ub.uni-muenchen.de/21316/>
MPRA Paper No. 21316, posted 16 Mar 2010 12:55 UTC

Background Paper on the IMF's Trade Restrictiveness Index

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March 31, 2009

Summary

This paper reviews the Fund's Trade Restrictiveness Index (IMF-TRI). It has three parts.

The first part describes what the IMF-TRI is and the data needed to compute it. This part also traces the history of usage and the debate on the use of the IMF-TRI within the fund. It draws on internal Fund documentation as well as interviews conducted by Ms. Tan at IEO and the consultant. It also includes a discussion of the key documents produced internally and commissioned from external sources by the Fund.

The second part asks what a good measure should be. There is no one size fits all measure as trade restrictiveness is multi dimensional. However, there is no reason to rely on a single measure of trade restrictiveness to capture all these dimensions. Depending on how comprehensive a measure is needed, one or a variety of measures may be deemed appropriate to look at. The strengths and weaknesses of the IMF-TRI are highlighted and existing measures briefly surveyed.

The third part suggests that an approach based on work by James Anderson, Peter Neary, and Robert Feenstra (ANF-TRI), together with other indicators, be used by the IMF in the future. The approach is relatively flexible and can be used to construct a basic measure of trade restrictiveness or a variety of more comprehensive ones as described in this section.

This approach has been implemented by a group of economists at or formerly at the World Bank(H.L. Kee, M. Olarrelanga, A. Nicata). The relevant indices are available online. The averages of some of these indices are being reported in the Global Monitoring Report (GMR) which is put out under the joint auspices of the Bank, Fund, WTO and UNCTAD, and has presumably been vetted by all of the above. This provides additional legitimacy for the Fund's use of the index. Moreover, the Bank is committed to updating these indices annually for the GMR.

1. Introduction

There have been many measures of trade restrictiveness proposed in the literature. The IMF uses one such measure in its policy work. This paper will serve as a background paper on the IMF's Trade Restrictiveness Index (IMF-TRI) and the case for and feasibility of the TRI or alternative frameworks for guiding the IMF's advice in its work on trade.

1.1. The IMF-TRI

The IMF-TRI is a 10-point-scale overall trade restrictiveness index (10 = most restrictive, 1 = most open) used by the IMF. It was created in 1997 for use with the Board paper, "Trade Liberalization in Fund-Supported Programs" (EBS/97/163), to evaluate trade reform within 27 program countries from 1990-1997. The base TRI was 1990 and its evolution until 1997 was thus tracked. Subsequently, it has continued to be calculated annually for 178 IMF member countries (latest being 2007 figures). Overall, the development of this index was viewed positively as it was seen as a valuable tool for classifying the relative restrictiveness of trade regimes. However, even in 1997, its limitations were noted and some Directors cautioned against placing undue emphasis on it. However, others felt that it should be used as an input in designing and monitoring trade liberalization components ongoing fund supported programs.

The IMF-TRI originated, in the first place, from an older IMF index created by Kirmani et al (1994a, b) that studied trade reforms in IMF-supported programs. Kirmani's index was a 3-category index (Open, Moderate, Restrictive) as opposed to a 10-point index like the IMF-TRI. The IMF-TRI sub-divided tariff regimes into 5 categories instead of 3, and also incorporated tariff dispersion or exemptions into the classification. The IMF-TRI also sought to additionally link changes in overall restrictiveness to the policy content of the Fund-supported programs (SM/94/192, Supplement 2).

1.1.1. Construction of the IMF-TRI

The computation of the 10-point IMF-TRI (10 = most restrictive, 1 = least restrictive) is via the following formula:

$$TRI = 1 + (t - 1) + 3(N - 1),$$

where t is the Tariff Index and takes integral values from $\{1, 2, \dots, 5\}$, depending on the level of a simple unweighted average of MFN applied tariff rates for that country, plus any additional surcharges/fees applied only to imports. Average tariffs below 10 were assigned a value of 1, average tariffs of 10 to 15% were assigned a value of 2, while those between 15 to 20% were assigned a 3, and those between 20 and 25% were assigned a 4. Average tariffs above 25% were assigned a 5.) N is the NTB Index which takes integral values from $\{1, 2, 3\}$ depending on the extent of NTBs. A country's use of non tariff barriers such as quotas, restrictive licensing requirements, bans, state trading or exchange restrictions is considered in this classification, with a value of value of 2 being assigned if the coverage of NTBs in trade or production is between 1% and 25%. The resultant combination of tariffs and NTB into a single measure via the aforementioned formula yields the ten point classification scheme. (See Annex 1 of "Trade Liberalization in Fund Supported Programs" EBS/97/163.) Note that the dispersion of tariffs does not play any role in this index. This is unfortunate as greater dispersion increases the adverse impact of trade policy on welfare. Small tariffs have very small adverse effects when the equilibrium is close to first best as the welfare function has its peak at the first best tariff so is relatively flat in this neighborhood, while larger tariffs result in disproportionately larger welfare losses.

1.2. History of the Usage of the IMF-TRI

From 2 Apr. 1998, Management authorized its use in staff reports on new medium-term (≥ 2 year) adjustment programs (Memo from Jack Boorman to Heads of Area Departments, April 2, 1998). It was meant to be used for the purposes of evaluation of a country's trade restrictiveness over time. However, IMF staff had begun using it regularly for surveillance, and it thus also appeared regularly in Article IV Staff Reports and Selected Issues Papers. The TRI was not to be published in public documents to avoid confusion by external parties.

In 2003, the Trade Policy Division in the IMF conducted a review of the TRI. William Cline was hired to produce a review of the IMF's TRI. The review was to outline the state of knowledge, highlighting the methodology and its pros and cons, as well as providing at least two alternatives that were operationally viable. The paper was completed in 2003 and was entitled "Enhancing the IMF's Index of Trade Restrictiveness". It contains a number of important observations. First, it points out that the TRI does not capture tariffs in agriculture effectively. It points out that tariff rate quotas (with over quota tariffs being quite high) replaced phys-

ical quotas as a consequence of Uruguay Round negotiations. These are classified as NTBs and as the intensity of NTBs he argues, is not well differentiated in the Fund TRI, this tends to underestimate agricultural protection levels. Nor does the Fund's TRI account for subsidies.¹ This point is also made in Subramaniam (2000) in the context of African trade policies.

The Cline paper also has a nice discussion of some recent alternative indices. The indices covered include the CEPII or MACMaps (Market Access maps) measure, the Heritage Foundation-Wall Street Journal index which is a part of their overall index of economic freedom measure, the OXFAM index of double standards which focuses on developed country protection against developing countries, and the CGD (Center for Global Development) Aggregate Measure of Protection which is meant to do the same thing. Cline points out the well known problems involved with using trade shares as weights in aggregating tariffs: namely that tariffs reduce trade and so that doing so tend to understate protection. He also points out that tariff equivalents of NTBs are hard to come by and suggests some rules of thumb for converting various NTBs into tariff equivalents. He also recognizes the fact that both the average and the variance of tariffs matter in terms of calculating the welfare costs and suggests using a formula that assumes the world price is given and there is no domestic production.

Cline also discusses the Anderson Neary Trade Restrictiveness Index (AN-TRI). He argues that their index needs intensive data and modeling inputs and has less success in incorporating NTBs. His paper summarizes: "It seems unlikely that any of the recent indices reviewed above could (or in some cases should) replace the IMF's index of trade restrictiveness any time soon." He then summarizes the objections to each measure. He seems to suggest that a measure he calls the Total Tariff Equivalent (TTE) be used. This involves calculating an average tariff, a tariff equivalent of NTBs and summing them. The weights to be used at each stage are not clearly defined and the procedure seems a bit ad-hoc.

This review was widely circulated for comments to experts inside and outside the fund including Will Martin (World Bank), James Anderson and Peter Neary. The views of the experts are documented in a series of memos. The comments by Anderson and Neary, in particular, respond to Cline's view that the data requirements for implementing the AN-TRI are excessive. They point out that their

¹In general equilibrium, a tariff on the imported good (which encourages production and discourages the consumption) is equivalent to production subsidy and a consumption tax on the imported good. Thus, a subsidy on production does what a tariff would do on the production side. As a result, the protective effects of subsidies may need to be considered.

indices can be implemented at less detailed levels and so could have basically the same data requirements as Cline's proposed TTE index. Moreover, that making the kind of assumptions Cline suggests (for example conversion of NTBs into tariffs at some fixed rate) would reduce the information needs for their indices as well. The points seem well thought out and fair. However, Cline's paper never came out as an IMF Working Paper.

A June 2003 memo (6/26/2003) from Timothy Geithner to FDMD Anne Krueger asked for feedback on the Cline paper. In response, Ms. Krueger wrote that she favored developing an index with other multilateral institutions.

In 2004, in response to complaints from Nigeria that their TRI number was higher than that of South Africa which, they claimed, had a more restrictive trade regime (see the 12/17/2004 memo from Hans Peter Lankes to Mark Allen) the FDMD Anne Krueger asked staff to work on a price wedge based alternative and propose a remedy within 3 weeks. Meanwhile, the TRI was to be removed from country staff reports. An inter-departmental working group (RES, PDR, AFTR and STA) was constituted and provided a report. In the report the group advised against a price wedge approach as other factors than trade policy affect price gaps and there was no way to purge the data of these effects. Moreover, the paucity of internationally comparable price data was cited as making this impractical. (See also 3/31/2005 memo from Rajan to Krueger.) The working group was clearly aware of work by World Bank Researchers Kee, Nicita and Olarreaga (2004a, 2004b and 2005) that computes trade restrictiveness indices. The report first summarizes the work, noting that it is implemented in three stages. The authors first carefully estimate import demand elasticities at a very disaggregated level (6 digit harmonized system level) for 117 countries using data from 1998-2002.. Then they estimate ad-valorem equivalents of NTBs by estimating the extent to which the NTBs reduce import values and using these estimates together with the elasticities in the first stage to do so. In the third stage they use a partial equilibrium version of the AN-TRI proposed by Robert Feenstra (called the ANF-TRI below) to obtain their estimated TRI. Their index is discussed in more detail below.

The report goes on to say "This work represents a clear advance towards the calculation of trade restrictiveness indices,.." and then goes on to outline the shortcomings of the approach. These include the fact that subsidies (both export and production) are not incorporated, and that the NTB data used for most of the countries is out of date. This is a very thoughtful and useful report.

At an Executive Board Meeting on 28 Feb. 2005 (EBM/05/19-1), the Exec-

utive Board discussed the paper, “Review of Fund Work on Trade” (SM/05/47), which included a discussion of “Review of the IMF’s Trade Restrictiveness Index” (SM/05/57) prepared by the Fund’s Policy Development and Review Department. This was an overall discussion of the IMF’s approach to trade and also discussed the usefulness of TRI, given increasing criticism of the Staff’s over reliance on TRI for policy advice and in their approach. Staff paper SM/05/57 recommended that undue emphasis and reliance on TRI be ceased, especially for policy advice and cross-country comparisons. The Board reaffirmed that “while not a fully comprehensive indicator of a country’s trade policy stance, the TRI remains a useful tool for the Fund’s work, as it balances reasonably well the requirements of accuracy, country coverage, timeliness, and methodological soundness. Directors agreed with the staff’s recommendation that, in order to avoid a false sense of precision, including with respect to cross-country comparisons—for which the IMF-TRI is not suited—the index should henceforth be used mainly as a starting point in discussions with national authorities, and not be included in individual country staff reports” (EBM/05/19-1). The Directors also agreed to continue to adhere to the policy of not publicizing the IMF-TRI, keeping it instead only for internal use and in starting discussions with governments. In addition, the Staff were to consider ways to improve IMF-TRI as an index and to explore the development of alternative indices.

Following the 2005 Board Meeting, the IMF-TRI has continued to be compiled (latest data runs till 2007), but it is unclear under which auspices it is currently being used and how much staff rely on this index. For example, it has not shown up on any 2006 Article IV, selected issues and country report documents that IEO’s trade team has reviewed, showing the adherence to the Board’s recommendations. It is still being computed by PDR. It is not known if IMF-TRI is used by Staff outside the context of these reports.

It is also unclear whether subsequent follow-ups have been enacted following the Board’s recommendation to improve IMF-TRI methodology or explore alternative indices. It seems as if this has already been done to some extent: ITC’s Market Access Maps (which measure tariffs in-depth) have been incorporated to produce several summary country reports. However, there is no indication of further follow-ups with development of the TRI or incorporation of other alternative indices.

2. A Good TRI?

Trade restrictiveness (or its opposite, trade openness) sounds like it should be easy enough to define and measure. Yet, how it should be defined is far from uncontroversial. A good index should be conceptually based, implementable and comparable. That is, it should be objectively defined in terms of what it is measuring via a model, even if the model is relatively simple. Thus, if what it is measuring is continuous, it should be continuous as well or it loses information content.² It should be relatively easy to calculate using available information. It should permit comparability over time and space.

The existing literature contains many definitions of trade restrictiveness, and their meaning and relationships to one another are not clear to the uninitiated. As shown in Pritchett (1991), the existing measures of trade openness are by and large uncorrelated. This should come as no surprise for two reasons. First, none of the definitions he considers are conceptually well based, so that it is not quite clear what they are measuring. Second, as different measures are trying to capture different aspects of trade restrictiveness, and this is loosely represented by these measures, there is no reason to expect these different measures to be highly correlated. This may well be why different studies reach different conclusions about the relationship between openness and performance of an economy.³

It is also far from clear how to calculate such an index, especially when the time and resources available are limited as they are in practice. First, assuming the objective is to measure barriers to trade, how can/should these be measured? Here there are two broad approaches that can be taken. One can opt for an indirect, i.e., outcome based approach. (This is analogous to the output approach in R&D

²Attempts to dichotomize the continuum into black and white are counterproductive for two more reasons. First, it leads to the permeation of ideology into analysis. Outward orientation is perceived as good and inward orientation as bad on a priori grounds while both (or neither) may be universally so. Second, it prevents researchers from trying to develop conceptual measures and permits reliance on ad hoc definitions.

³Some, such as Dollar (1992), and Edwards (1992) (1993), and Frankel and Romer (1999) conclude that openness or trade is good for growth, while others, like Rodrik and Rodriguez (2000) cast doubt on this conclusion. In much of this work, trade restrictiveness is measured by the value of trade relative to national income. There may be good reason to expect a link between growth and trade value. For example, greater trade may allow greater specialization and lower costs in industries with dynamic scale effects. If this is the motivation, the value of trade in these industries should be considered, not the total value of trade. Alternatively, greater trade may help fill the "foreign exchange gap," thereby relieving growth-retarding bottlenecks as suggested in Krueger (1983) among others.

where innovation is measured in terms of patents.) This takes the position that restrictive trade policy should be reflected in terms of outcomes like the country's trade flows, or in terms of deviations of domestic prices of tradeables from world prices. Thus, a quota on shoes, for example, should reduce the import value (at world prices) and raise the domestic price of shoes relative to what it would have been without the quota. Or one can take a more direct, i.e., an input based approach. (This is analogous to the input approach in R&D where innovation is measured in terms of R&D expenditures). This takes the view that trade policy can be measured directly in terms of what goes into it, namely tariffs, quotas and other NTBs. This is clearly easier with tariffs (though even here the question of appropriate weights for the tariffs is an issue) than quotas since quotas need to be identified and transformed into their ad-valorem equivalents, which is not trivial.

Both approaches have problems associated with them. Estimating trade flow gaps or price gaps is problematic as trade flows are not well explained by trade models. The most empirically successful model, the gravity model, is loosely based on theories that explain trade flows. As a result, taking the view that deviations from predicted trade flows, must be due to trade policy, is a bold step.⁴ Nevertheless, it may be the only viable option in some cases as explained below. Using price gap measures is also problematic as differences in prices can occur without trade restrictions being in place. The most obvious issue is that the quality of imports could differ across countries and this could result in NTBs being mistakenly inferred.

The input based approach has equally vexing problems. For example, as is well known, in general equilibrium all taxes and subsidies need to be considered. In particular, one of the results in international trade is that trade policies in competitive markets are equivalent to a combination of domestic policies as in the Lerner Symmetry Theorem. Thus, even if one could aggregate in a meaningful way over tariffs on different commodities, trade restrictiveness cannot be defined solely in terms of trade policy. For example, if a good is imported, a production subsidy on a good is equivalent to an import tariff and a consumption subsidy at the same rate. Thus, Japan's production subsidies on rice can be thought of as an import tariff on rice combined with a consumption subsidy. *The treatment of subsidies in calculating trade barriers could completely change the estimated levels and rankings*

⁴If imports falls short of that predicted in a sector, the extent of the shortfall, together with the import demand elasticity, yeilds an implicit tariff that would result in the observed import level. Horeover, this is usually a one sided exercise. If a country imports more than predicted by the regression, the implicit tariff is set to be zero.

of trade restrictiveness across countries. An agricultural developing country might for this reason take exception to leaving out agricultural subsidies (such as those of the US, EU and Japan) in such calculations. While this is certainly a valid point, it is worth pointing out that if we take this stand, then other *domestic* policies may also become candidates for inclusion into trade policy measures. Subsidies have traditionally not been included in most TRI's, though they clearly could be.⁵

An additional complication arises due to the prevalence of Non Tariff barriers, or NTBs and the recent proliferation of preferential trading areas. Over the many rounds of negotiations, tariff barriers have fallen considerably, but NTBs remain, often disguised in creative ways and creating measurement issues.⁶ It is hard to come up with a tariff equivalent of NTBs as detailed knowledge and modelling is needed to do so. See Deardorff (1985) for more on this.

PTAs also complicate measurement of NTBs. Tariffs between PTA members are not really zero as restrictive rules of origin may have to be met to obtain preferential status, see Krishna and Krueger (1995), Krishna (2006). These rules raise the cost of production and have real costs associated with them. Moreover, as PTAs raise trade from PTA partners while reducing it from others, so that coming up with a tariff equivalent when PTAs exist is hard to do. Finally, preferences given to the least developed countries (such as free access for everything but arms (EBA) in the EU) would reduce the tariffs levied on trade. However, to the extent that they are conditional on costly rules of origin being met they both restrict and distort trade patterns. As a result, outcome based approaches may be the only option, especially when NTBs, PTAs and preferences are prevalent.

Even assuming we can measure the component parts of trade barriers, how do we put these together in a meaningful way? How should trade barriers be weighed? Is only their level relevant or are higher moments important as well? This is where the need for a model is most striking. A simple or trade weighted average of (or variance of) trade barriers is relatively easy to construct but it is far from clear what it means without a model. Suppose, for example, that the tariff is a prohibitive one. A trade weighted average will clearly underestimate

⁵More on this issue below.

⁶Cline (2005) for example, points out that if we replace quotas with tariff rate quotas, (a tariff rate quota has a penalty tariff for imports above the quota level) then the out of quota penalty tariff (converted into ad-valorem terms) should be used as the tariff equivalent if there are imports out of quota. But if there are no such imports then the tariff equivalent is harder to pin down. Martin, in commenting on Cline's work, (see his e mail August 6th, 2006 in internal documentation) also points out that it is important to ensure that specific tariffs are converted to ad-valorem ones and not overlooked.

the extent of protection in this case.

In this context, the strengths and weaknesses of the IMF-TRI are obvious.

Strengths: The IMF-TRI is easily computed because it has low data requirements, allowing classification of a wide range of countries frequently. It is also deceptively simplistic and requires a minimum level of work in its creation.

Weaknesses: The IMF-TRI's simplicity, a strength, has also subjected it to a range of criticisms. Its most profound criticism is that it is ad-hoc. As it is not conceptually well based it is not clear what it is measuring. The uninformed user is lulled into thinking that he/she "understands" it but only because the underlying lack of logic is not immediately apparent to those who have not thought through it rigorously. It has a narrow policy coverage⁷, does not weight the data appropriately⁸, does not accurately reflect the policies of countries in RTAs or PTAs. The TRI is also said to be biased against LDCs, which tend to use more tariff barriers rather than the opaque technical or phytosanitary barriers that more developed countries use.⁹

Furthermore, the NTB index is insufficient in differentiation of intensity between ratings (eg. 108 of 183 countries are currently assigned "2" NTB rating) (This is also pointed out in Cline (2003)). This is largely due to the overall reduction in protection that has occurred over time which has reduced the dispersion in the index: when originally constructed, an equal share of countries fell in each category.

The IMF's TRI seems to have served its purpose for general evaluation of program countries' trade policies over time, but its limitations of use have become more of an issue as data availability and technology have improved. It is clear that it (and this would be true for any measure as no one measure can capture all the elements of country's trade policy) must be used in conjunction with qualitative analysis and supplemental indicators allowing a more detailed analysis of a country's trade policies, and should not be used alone for policy advice. However, while no index will be perfect and comprehensive, better approaches are now feasible.

⁷It does not account for subsidies of any form and so cannot capture the implicit protective effect of agricultural production subsidies.

⁸Average tariffs tend to under estimate the extent of protection as explained above and no attention is paid to the dispersion of tariffs.

⁹However, the incorporation of such barriers is not without controversy. Australia, for example, has very strict requirements for agricultural imports to prevent pests from entering. This can translate into very high implicit trade policies.

2.1. Alternatives?

What then, are the alternatives to the IMF-TRI? How do they fare on the three criteria above? There is little point in making an exhaustive list of measures and shooting them down. The interested reader can find comprehensive discussions of older measures in Edwards (1989), Baldwin (1989), and Deardorff and Stern (1985) and in Krishna (1990). More recently, the commissioned paper by Cline (2003) contains a discussion of the main recent alternatives being considered and their operational potential. These include the MAcMaps (Market Access maps) system,¹⁰ the Heritage Foundation-Wall Street Journal index of economic freedom which has a trade policy component,¹¹ the OXFAM index of double standards that tries to capture the protection of developed countries against developing ones,¹² and the Center for Global Development (CGD) index which tries to calculate an broader measure of trade policy.¹³ The only conceptually well based measures available are the original index proposed by Anderson (1990), Anderson and Neary (1990, 2003, 2005), and its implementation in a CGE model or the simplified partial equilibrium analogue proposed by Feenstra (1996), and implemented by Kee, Nicita and Olarreaga (2006).

2.1.1. A Conceptually Well Based Measure

Anderson and Neary develop a distance function based measure of openness that can be used for both tariffs and quotas, separately and together and which allows for difference in rent retention. This is termed the AN-TRI. Rent retention is an issue both because of the current practice of not selling quotas and because of evidence in Krishna et al.(1991) that not all the rent goes to exporters even

¹⁰The Geneva-Based International Trade Centre's (ITC) Market Access Maps is very detailed on tariffs but does not include nontariff information. PDR has worked with ITC to produce several summary country reports based on the Market Access Maps system. See Cline (2004).

¹¹This is not conceptually well based and overly simplistic.

¹²It focuses on one thing: how developed countries protect themselves against competition from developing ones. It does this in an ad hoc manner by looking at ten factors that it sees as important. These include the average tariffs, the tariffs on textiles and agriculture (which tend to be important for developing countries), and restrictions on imports from the least developed countries.

¹³This is not very well based conceptually being a mix of a trade weighted tariff average, where trade weights are adjusted to account for their dependence on trade policies (recall that trade restrictions reduce trade and trade weights so this adjustment raises these trade weights), and a measure of revealed openness (a country is revealed to be less open if it trades less than predicted). It is also not calculated for a wide range of countries.

when they get all the licenses. The Anderson-Neary measure is quite analytically complex, but the basic idea is to calculate how much all tariffs have to be increased and quotas decreased to keep utility at the original level. This equation is then totally differentiated to get new and interesting results for piecemeal policy reform. The relevant comparative statics terms turn out to be quite easy to sign and calculate if further technical assumptions on the trade balance function are made¹⁴.

Note first that as their index is derived by taking derivatives, it is reliable only for assessing small changes in trade policies.

Second, and much more severe, inter-temporal and cross country comparison are hard to make using their index. A given percentage change in their index does not correspond to the same percentage change in welfare across time or space when the economies are different. As same nation has different economies over time and different nations have different economies, their index number has some serious comparability problems. Of course, this is much less of a problem for a given economy than across economies as a given economy is likely to change only slowly over time. Anderson (1990) argues that using average tariffs or even trade weighted ones gives very different rankings over time from their index and so be misleading.

3. A Simpler Version: The ANF-TRI

The partial equilibrium version of the AN-TRI index, suggested by Feenstra (1996) and implemented by Kee, Nicita and Olarreaga (2004), which we will call the ANF-TRI, is easier to calculate, more transparent, and comparable than their original index and requires less information. It calculates the uniform tariff, that if applied to imports, would leave the welfare of the importing country unaffected, assuming that world prices are fixed. It seem like this could be a possible successor to the IMF-TRI.

3.1. The ANF-TRI

The ANF-TRI takes as a first step the welfare loss for a small country in partial equilibrium of a given set of tariffs. This consists of the difference in welfare (which is the sum of consumer surplus, producer surplus and net tariff revenue) at the given tariffs relative to that at free trade. Consider Figure 1 where supply and

¹⁴Tokarick (2007) looks at the sensitivity of the the AN-TRI to alternative model structures.

demand are linear. The world price is P^* . At this price the good is imported as domestic demand, D^d , exceeds domestic supply, S^d as depicted in Figure 1. $M(\cdot)$ denotes imports and equals domestic demand less domestic supply. A specific tariff of t (or an ad-valorem one of T where $P^*T = t$, raises the domestic price to $P^* + t$. Imports fall from CH to DF . Also producer surplus rises by area $ABCD$ and net government revenue rises by area $DEFG$, while consumer surplus is reduced by the area $ABFH$. The net effect is a loss of area DCE and FGH , the two triangles of dead weight loss in Figure 1.¹⁵

Now consider these two triangles. For FGH , the base is just the absolute value of slope of demand times t , while the height is t . Similarly for DCE , the base is just the absolute value of slope of supply times t , while the height is t . Thus the area of the two triangles is just

$$\begin{aligned} DCE + FGH &= -\frac{1}{2} \left(t \frac{d(D^d(P^*) - S^d(P^*))}{dP} \right) t \\ &= -\frac{1}{2} \left(\frac{dM(P^*)}{dP} \frac{P^*}{M(P^*)} \right) \left(\frac{M(P^*)}{P^*} \right) (TP^*)^2 \\ &= \frac{1}{2} (\epsilon) (M(P^*)P^*)T^2 \end{aligned}$$

where ϵ is the import demand elasticity defined as a positive number.

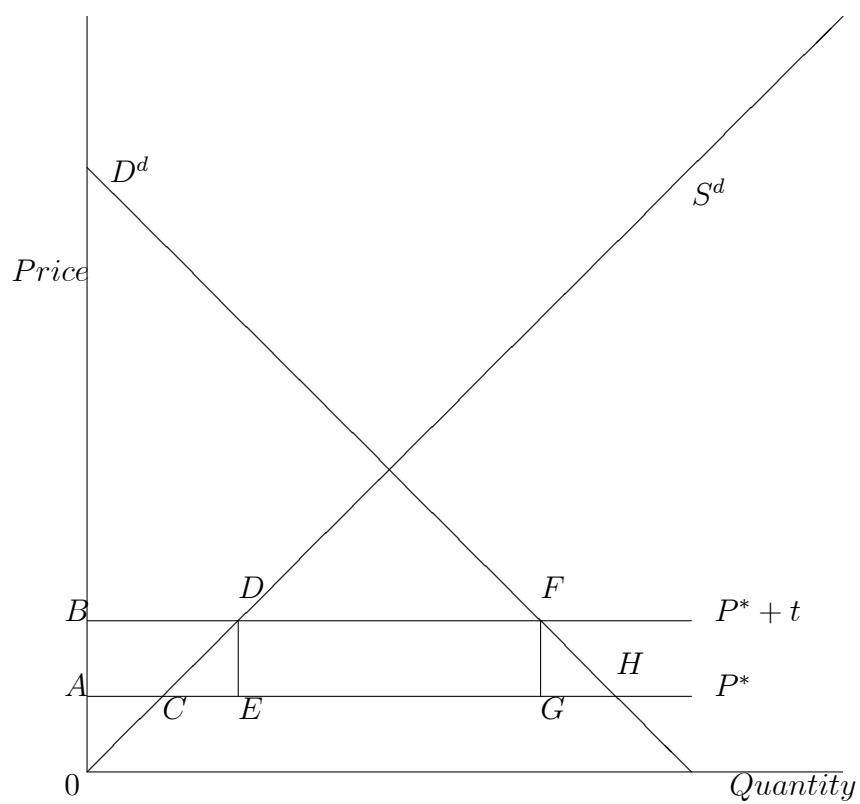
Now doing this across sectors gives the welfare loss of the tariffs to be

$$\frac{1}{2} \sum_{i=1}^N (\epsilon^i) M^i(P^{*i})P^{*i} (T^i)^2 \quad (3.1)$$

where T^i is the ad valorem tariff in sector i . Now suppose there was a uniform tariff T . Then, by the same reasoning, the welfare loss from that uniform tariff

¹⁵Note also that the tariff is equivalent to a production subsidy and a consumption tax at the same rate. A production subsidy of t would raise the price facing producers to $P^* + t$ but leave the price facing consumers unaffected. The result would be that producer surplus rises by $ABDC$, while government revenue falls by $ABDE$ with a net loss of CDE . A consumption tax would raise the price facing consumers to $P^* + t$ but leave the price facing producers unaffected. It would reduce consumer surplus by $ABFH$ and raise government revenue by $AGFB$ with a net loss of FGH . Note that together, the production subsidy and consumption tax have the same effect as a tariff! Similarly, a production subsidy is equivalent to a tariff and a consumption subsidy at the same rate.

Figure 3.1: Tariffs in a Small Country



would be

$$\frac{1}{2} \sum_{i=1}^N (\epsilon^i) M^i(P^{*i})P^{*i}T^2 \quad (3.2)$$

Setting (3.1) equal to (3.2) gives:

$$\begin{aligned} T &= \left[\sum_{i=1}^N \left(\frac{(\epsilon^i) M^i(P^{*i})P^{*i}}{\sum_{i=1}^N (\epsilon^i) M^i(P^{*i})P^{*i}} \right) (T^i)^2 \right]^{1/2} \\ &= \left[\sum_{i=1}^N (s^i) (T^i)^2 \right]^{1/2} \end{aligned}$$

where $s^i = \frac{(\epsilon^i)M^i(P^{*i})P^{*i}}{\sum_{i=1}^N (\epsilon^i)M^i(P^{*i})P^{*i}}$ is the elasticity adjusted import value share of sector i . By definition, T , is the ANF-TRI and as shown, equals the square root of the weighted sum of the square of ad valorem tariffs. Note that both higher tariffs and more variance result in a higher index. It is easy to see, that for a given mean tariff, T is minimized when $s^i T^i$ is constant for all i . In other words, in this setting, greater generalized variance, given the mean, reduces welfare as does increasing all tariffs proportionally. This makes intuitive sense as free trade is first best here so welfare is maximized at zero tariffs. Small tariffs hence do not change welfare much, while large ones do, making greater dispersion alone bad for welfare.

3.2. Calculating the Index

To calculate the index, first all Non Tariff Barriers (NTBs) need to be transformed into Ad Valorem Tariff Equivalentents (AVEs). This is done by assuming that all differences (not due to existing tariffs) between domestic and international prices are due to some unaccounted for trade policies which we can lump together and call non tariff barriers. This is quite a heroic assumption to make given the existence of substantial unexplained price differentials in freely traded goods. Once these unexplained price differences are inferred, the tariffs that would have induced them, given estimated values of import demand elasticities can be backed out. These elasticities are estimates across countries and products (at the 6-digit level of the Harmonized System of product classification).¹⁶

¹⁶For details on how these elasticities were estimated, see Kee et. al. (2004).

Second, when tariffs are specific, namely set to be t dollars per unit, they need to be converted to their AVEs. (It is important to be careful about this as ad valorem and specific tariffs are often reported separately, especially in agriculture, and can easily be missed. Will Martin, in his memo to Mary Jo Marquez, August 6, 2003, commenting on the paper by Cline, suggests that this is a good part of the reason for unrealistically low estimates for Japan's agricultural protection.) Then a weighted sum of these (the weights are the elasticity adjusted import value shares denoted by s_i above) is taken at the tariff line level. Note that the weights are increasing in the import shares and elasticities of import demand. These weights properly account for the importance that restrictions on these good would have on the overall restrictiveness.

Thus, information on tariff levels, AVEs of NTMs, import share data as well as elasticities of import demand are needed for implementation. It is important to use the weights s_i on the ad valorem tariffs, rather than just take a simple average. Anderson and Neary (1998) show that trade weighted average tariffs are close to uncorrelated with and are about 50% lower than their index in their data¹⁷.

3.3. Related Indices

A similar index, the Mercantilist Trade Restrictiveness Index (MTRI), is calculated by Kee, Nicita and Olarreaga (2004). It computes the equivalent uniform tariff of country M that would keep *imports* of country M at their observed levels. This is (somewhat confusingly) referred to as the OTRI by Kee et al (2004) and in World Bank publications and so as not to muddy the waters further, I will use their nomenclature. Finally, the MA-OTRI looks at the uniform tariff that if imposed by all of country M's trading partners would keep its *exports* constant. These are discussed in more detail below.

3.3.1. The OTRI

The approach here follows the same lines. Consider the reduction in imports from the specific tariff t . Imports fall from CH to D or by the sum of the bases of the two dead weight loss triangles. For FGH , the base is just the absolute value of slope of demand times t . Similarly for DCE , the base is just the absolute value

¹⁷If data are not available, simplifying assumptions can be made.

of slope of supply times t . Thus the fall in the value of imports due to t is

$$\begin{aligned}
M &= - \left(t \frac{d(D^d(P^*) - S^d(P^*))}{dP} \right) P^* \\
&= - \left(\frac{dM(P^*)}{dP} \frac{P^*}{M(P^*)} \right) \left(\frac{M(P^*)}{P^*} \right) (TP^*) \\
&= (\epsilon) M(P^*) P^* T
\end{aligned}$$

Thus, summing over sectors gives the import decrease due to the existing set of tariffs to be

$$\sum_{i=1}^N (\epsilon^i) M^i(P^{*i}) P^{*i} T^i. \quad (3.3)$$

The import decline from a uniform tariff T would then be

$$T \sum_{i=1}^N (\epsilon^i) M^i(P^{*i}) P^{*i}. \quad (3.4)$$

Hence, the uniform tariff that would result in the same decrease in import value, denoted by T^o , is obtained by setting these two equal and is

$$\begin{aligned}
T^o &= \left[\frac{\sum_{i=1}^N (\epsilon^i) M^i(P^{*i}) P^{*i}}{\sum (\epsilon^i) M^i(P^{*i}) P^{*i}} T^i \right] \\
&= \sum_{i=1}^N s^i T^i.
\end{aligned}$$

This is just the elasticity adjusted import share weighted average tariff. Note that the OTRI thus does not depend on the variance of tariffs. This makes sense as it is targeting imports, which vary at a constant rate with tariffs, not welfare.

3.3.2. The MA-OTRI

This looks at the fall in a county's exports due to the tariffs imposed by its trading partners. Consider a single good i exported by a country k that has the specific tariff t^{ijk} imposed on it by a trading partner j . The approach here follows the same lines as that above. Consider the reduction in the value of k 's exports of i

from the specific tariff t^{ijk} . The fall in the value of imports from country k due to t^{ijk} is

$$\begin{aligned}
&= - \left(t^{ijk} \frac{d(M^{ij}(P^{i*}))}{dP} \right) P^{i*} \\
&= - \left(\frac{dM^{ij}(P^{i*})}{dP^i} \frac{P^{i*}}{M^{ij}(P^{i*})} \right) \left(\frac{M^{ij}(P^{i*})}{P^{i*}} \right) (T^{ijk} P^{i*}) \\
&= (\epsilon^{ij}) M^{ij}(P^{i*}) P^{i*} T^i
\end{aligned}$$

Thus, summing over countries and sectors gives the import decrease due to the existing set of tariffs to be

$$\sum_{i=1}^N \sum_{j \neq k}^K (\epsilon^{ij}) M^{ij}(P^{i*}) P^{i*} T^{ijk}. \quad (3.5)$$

The import decline from a uniform tariff T^m would then be

$$T^m \sum_{i=1}^N \sum_{j \neq k}^K (\epsilon^{ij}) M^{ij}(P^{i*}) P^{i*}. \quad (3.6)$$

Hence, the uniform tariff that would result in the same decrease in import value is obtained by setting these two equal and is

$$\begin{aligned}
T^m &= \left[\sum_{i=1}^N \sum_{j \neq k}^K \left(\frac{(\epsilon^{ijk}) M^{ij}(P^{i*}) P^{i*}}{\sum_{i=1}^N \sum_{j \neq k}^K (\epsilon^{ijk}) M^{ij}(P^{i*}) P^{i*}} T^{ijk} \right) \right] \\
&= \sum_{i=1}^N \sum_{j \neq k}^K s^{ijk} T^{ijk}.
\end{aligned}$$

This is just the elasticity adjusted export share weighted average tariff. Note that the OTRI thus does not depend on the variance of tariffs. This makes sense as it is targeting imports, which vary at a constant rate with tariffs.

3.4. Implementation

The website at <http://info.worldbank.org/etools/wti2008/1a.asp> has the world trade indicators. These websites maintained by the World Bank¹⁸ have the country level estimates for the OTRI and MA-OTRI calculated by the Bank and which

¹⁸In the World Trade Indicators website see for TRIs:

are the basis for the aggregate numbers reported in the Global Monitoring Report (GMR). They are also shown separately for agriculture and manufacturing, and both with and without NTBs (which are the weakest part of the procedure) included. The ANF-TRI index, as well as the OTRI and MA-OTRI are reported in Kee et al (2004) for 91 countries. many, mostly smaller countries do not have TRIs calculated for them, presumably as their data was poor. Obtaining better data and more comprehensive coverage is an area where cooperation between the Bank, Fund, WTO and other bodies would be very useful.

The index is model based and comparable across time and space. In addition, while not as simple as the IMF-TRI, it is reasonable simple to calculate and there is a commitment by the Bank to update it annually.

3.5. Deficiencies

As with all measures, the ANF-TRI, as well as the related indices discussed above, have some clear deficiencies. First, it is worth pointing out that these indices are all targeted at different things. Thus, the ANF-TRI for example, as defined above, does not account for subsidies. To the extent that subsidies encourage production (as does a tariff on the good) and that this information is what is needed, this is a drawback. However, if one wanted to develop an index that measured the extent to which domestic production was being distorted by trade and domestic policies like subsidies, the appropriate “index of domestic subsidization” could be defined and estimated using the approach above. This seems like the appropriate way to deal with subsidies if the concern is production. If the concern is imports, one could include *subsidies and tariffs* at given levels and ask what *uniform tariff* combined with *zero subsidies*, would lead to the existing level of imports. As should be evident, there are a large number of such variations possible and there is no one size fits all index possible.

Second, the NTB equivalent estimation (which is a component of the above measures) is not very reliable as price differences in a country need not be due to protection. In addition, this data tends to not to be updated annually. This makes the index as a whole less useful for Fund operational work. For this reason, it is important that the indices be reported both with and without NTBs as is done

<http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:21085342~pagePK:210058~pagePK:210058~pagePK:210058~pagePK:210058~pagePK:210058>
and for country briefs see
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/TRADE/0,,contentMDK:21393040~pagePK:210058~pagePK:210058~pagePK:210058~pagePK:210058~pagePK:210058>

by the Bank. Of course, ideally one would like to handle NTBs differently. With detailed information on which sectors had NTBs and what they were, one could model their effect and estimate the advalorem equivalents sector by sector and case by case. However, this is at present not likely to be practical. Nevertheless, better information on NTBs will help construct some simple cross checks. For example, it would be worth checking if sectors where we suspect NTBs exist and are restrictive tend to have high imputed ad-valorem tariffs..

Third, the index could be criticized on the basis that it assumes perfect competition. This is much less of a concern for two reasons. First, the best should not stand in the way of the good. The proposed index is so much better than what the IMF has at present that this dictum is very apt here. Second, why would one want to add imperfect competition? In welfare based measures like the ANF-TRI one would want to do so as the welfare loss from tariffs in already distorted settings could be much higher than in undistorted ones. For example, limited competition in the domestic market could allow import quotas to facilitate collusion and result in large welfare losses. This would be the case for adding imperfect competition. However, there is only one way to have perfect competition and an infinite number of ways to have imperfect competition. Which way should it be added? No clean answer exists here. Thus, while market imperfections should be noted, adding this complication to an index would not be advisable.

Fourth, the proliferation of PTAs and a complex of overlapping preferences and Rules of Origin needed to obtain them have made things even more complicated in the real world. Here there is not much that can be done in terms of creating an index that incorporates this feature of the real world. One could, of course, infer tariffs in the same manner as the tariff equivalents of NTBs are inferred, which would in a way account for all of this, but given the difficulties associated with this method discussed above, this would be ill advised.

Finally, these indices are essentially partial equilibrium constructs. They ignore any general equilibrium interactions, both between final goods and between final and intermediates as captured by measures like the effective rate of protection.

Are the limitations of the above, or in fact any index of trade restrictiveness, going to be important enough to mean that using it without substantial other analysis of trade policies (bear in mind that Fund staff expertise and resources for the analysis of trade policy are limited) is going to create more problems than it is worth in terms of accurately portraying the relative restrictiveness or change over time of a country's trade policy? The answer to this is no. While there will

always be criticisms, using these kinds of indices will in fact insulate the Fund from criticism for two reasons. First, the indices, and the approach they are based on, are vetted, at least implicitly by other multilateral organizations as they are part of the GMR. Second, critics would have to make the case that the index leaves out something important, what this is, and how it should be included. This would at least allow a common language for dialogue and would be preferable to loose arguments that the number given to a country is too high.

As long as the limitations of these indices are kept in mind, they represent a useful advance over the status quo.

4. Conclusion and Recommendations

The recommendations below are also based on numerous interviews with Fund staff including some of who have left the Fund (Anne Krueger, Hans Peter Lankes, Shang Jin Wei, Arvind Subramaniam) as well as those who remain at the Fund. A unifying concern in these interviews was that the Fund is not well placed (given its macro focus) in terms of trade expertise, and in terms of institutional constraints, to developing and keeping up a TRI that approaches the best available practice in the area. While the former Trade Policy Department (TPD) was well placed to do certain aspects of the IMF's work on trade—maybe not research work, but the practical work of keeping track of policy changes and coordinating the IMF's role in the global institutional dialogue that is one important component of keeping the IMF current on trade policy issues, it was not well placed to creating and keeping up a TRI that incorporated the best available practice in the area. The current IMF-TRI was developed and is maintained in PDR (now SPR). This is not the ideal arrangement and that responsibility for deciding and keeping under review how the IMF monitors trade policy (whether it is by using the Bank's measures or developing its own) should be moved to RES. Since the departure of Anne Krueger, the Trade Division in Research has been phased out. The other group in the Fund, the Trade Policy Division/PDR (now SPR), is more operationally oriented and not well suited to do this work either.

In light of all of this, it makes even more sense for the Fund to use an existing vetted index. Even if the concept it needs to implement differs from that of any existing index, much can be incorporated using extensions of the approach described above to develop and implement an index directed to these needs.

The fund thus has two options. The first option is to improve the existing index. The existing index could be significantly improved by doing two things.

First, the ranges of the index need to be redefined as most countries today fall in the lower part of the index. Second, the NTB coverage could be improved significantly using existing work by Kee et al. Such improvements would however not address the central problem with the index which is that it is not conceptually well based. Use of such an index would leave the Fund open to the kinds of criticisms that initially made Ms. Krueger ask for reform of the index. For this reason, this route is not advisable.

Second, it could go with an existing index. Here, given its advantages, the resources the Bank has devoted to the ANF-TRI and its commitment to update it annually, the obvious suspect is the ANF-TRI. The data requirements are very similar for all three indices outlined above. If additional dimensions are deemed advisable, the Fund could use information on other indices like the cost of doing business indicators developed by the World Bank. The relevant indices are available online. The averages of some of these indices are being reported in the Global Monitoring Report (GMR) which is put out under the joint auspices of the Bank, Fund, WTO and UNCTAD, and has presumably been vetted by all of the above. This provides additional legitimacy for the Fund's use of the index. Moreover, the Bank is said to be committed to updating these indices annually for the GMR.

In this context, one suspects that while the Fund might be reasonably satisfied with a measure of protection based on the size of the welfare/utility loss that results from tariffs, quotas, and subsidies under perfect competition, many of the IMF's stakeholders, especially the newly developing countries, may not. In these circles, the concern is that developed country subsidies (certainly those to agriculture) raise domestic production and reduce imports. They are naturally quite likely to be suspicious of a measure based solely on the welfare loss to the protecting country. In the interests of being even handed and incorporating these concerns, it would be well worth extending the index to include subsidies as discussed above. This could also be of use in trade negotiations and other discussion of trade policy on the impact of trade protection on producers' competitiveness. One might ask whether the IMF should be doing this alone, or with other multilateral institutions. Here, one suspects that the latter would be preferable in order to have the implicit approval of as many of these multilateral bodies as possible.

Greater cooperation with the Bank, the WTO and UNCTAD should allow the needed indices to be generated annually for use by the IMF and other agencies. Such cooperation would also help improve the poor quality of data on NTBs, which researchers blame for poor measurement of NTBs. A working group which involves these agencies and leading researchers (including Alan Deardorff and

Anne Krueger) has been directed with coming up with ways to better measure NTBs and is at present working on these issues. This push is unlikely to produce much that is of use in the near future.

To conclude, one might also ask whether, given the generalized reduction in tariffs, a TRI is vital to the Fund's work? Similarly, should trade protectionism kick up in the next few years, would having a good TRI be a substantial (though obviously not fail-safe) tool for allowing the IMF to play a role in identifying and combating it? The answer to both these is a definite yes. Though tariffs have fallen, more creative ways are continually being found to limit trade.¹⁹ Thus, a TRI that has a hope of identifying such creative barriers (as the NTB part of the above indices does) is potentially very valuable both in measuring the level and the changes (should such protectionism occur) in protection. All multilateral institutions should be continually working on research that will help to improve the detection and measurement of such hidden restrictions. Clearly the Fund cannot do this alone, but nor can any other body. This has to be done multilaterally. However, interviews with Anne Krueger and others made clear the fact that the costs of coordination across institutions are large and should not be underestimated.

¹⁹Note the Voluntary Export Restraints (VERs) and Orderly Marketing Arrangements (OMAs) in the 80's which substituted for quotas which are technically illegal. More recently, the possibility of using complex phyto sanitary requirements (to shut out less sophisticated exporters from developing countries who may have a hard time meeting them) to limit imports has been a subject of discussion.

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