

**The Importance of Technical Barriers to Agri-Food Trade:
Evidence from the TBT Specific Trade Concerns Raised at the WTO**

Caesar Cororaton and David Orden*

First Version
June 15, 2019

Keywords: Agriculture, Food, Specific Trade Concerns (STCs), Technical Barriers to Trade (TBTs), World Trade Organization (WTO), Developed Countries, Developing Countries

Abstract

This Working Paper distinguishes between 212 specific trade concerns (STCs) related to regulatory measures affecting trade of agri-food products and 336 concerning other products. These STCs were discussed at the WTO during 1995-2017 with respect to members' rights and obligations under the *Agreement on Technical Barriers to Trade*. The paper has three broad components. First, we document an increase not decline in the relative importance of STCs concerning agri-food products in a recent (2006-2017) compared to early (1995-2005) sub-period. Second, we assess the frequencies and correlations among objectives of members whose regulatory measures STCs have been directed toward and the issues raised by members with concerns about those measures. We find a number of broad similarities between the STCs concerning agri-food and other product but also some important differences. Third, our analysis addresses participation of 73 members in these STCs, distinguishing at an aggregated level between developed and developing members and disaggregating into eight groups based on WTO self-designation and World Bank income criteria. Developed members raising STCs directed toward developing members dominates participation concerning both agri-food and other products, followed by developing members raising STCs directed toward developed members. Disaggregation into the eight groups provides additional insights.

* Caesar Cororaton (ccaesar@vt.edu) is Senior Research Fellow and David Orden (orden@vt.edu) is professor and Director, Global Issues Initiative, Institute for Society, Culture and Environment (ISCE), Virginia Polytechnic Institute and State University (Virginia Tech), Arlington Virginia, USA. Analysis and conclusions expressed in this working paper are those of the authors and do not purport to reflect those of the WTO or its members. Financial support through the competitively-funded research project "Effects of Contested Regulatory Measures on U.S. and Global Agricultural Trade" (USDA/NIFA/AFRI 2018-67023-27686) is gratefully acknowledge.

We thank Lee Ann Jackson, Erik Wijkström and Devin McDaniels at the WTO Secretariat for facilitating this research, including by providing a database on the TBT specific trade concerns. Assistance from Khadija Rouchdi, Department of Agricultural and Applied Economics at Virginia Tech, is also appreciated.

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The Importance of Technical Barriers to Agri-Food Trade: Evidence from the TBT Specific Trade Concerns Raised at the WTO

Introduction

International trade is vital to the well-being of nations. Through the General Agreement on Tariffs and Trade (GATT), the World Trade Organization (WTO), regional trade agreements (RTAs), and unilateral decisions, the levels of tariffs impeding trade have been reduced on a persistent and widespread basis for more than half a century. Although recent conflicts in which new and retaliatory tariffs between the United States and some of its major trade partners have jarred the global trading system, renewed negotiations and agreements may hold the promise of further progress if economic and political costs of the new tariffs bring these parties to the negotiating table. Negotiation and implementation of agreements to open trade opportunities among many other nations has continued without new tariffs being imposed.

It is also widely recognized that non-tariff measures (NTMs) are a substantial impediment to trade. This is reflected both in the experience of firms engaged in trade and in economic modeling of trade policy reforms. In models of potential impacts of trade agreements, a substantial component of the economic gains from lowering barriers to trade arise from the prospect that such agreements reduce the costs to trade from NTMs. What is often left unspecified is just how these costs can be brought down, particularly around regulatory measures that have legitimate policy objectives in their own right, but about which nations may disagree on their substance or implementation.

One forum in which countries have sought to provide transparency and resolve differences about regulatory measures has been the WTO, both through discussions in the regular committees and through its dispute settlement process. Formal disputes involving regulations are limited in number. Accompanying these formal legal proceedings, several committees of the WTO provide an ongoing venue for discussion of a larger and more diverse set of regulations. Members with concerns about whether measures being considered or adopted by their trade partners are compliant with the stipulations of the WTO agreements related to NTMs can raise their concerns for discussion within these committees.

In this paper we provide a review and evaluation of the regulatory measures raised for discussion within the WTO Committee on Technical Barriers to Trade (TBT Committee). We are interested in particular in trade of agricultural products, food and beverages. Throughout the

paper, we distinguish between the measures discussed in the Committee meetings concerning agri-food trade and those concerning other products. The analysis demonstrates the importance of TBTs to agri-food sectors and provides a characterization of the measures discussed and the involvement of developed and developing members of the WTO in these discussions.

Under the *Agreement on Technical Barriers to Trade* (TBT Agreement, WTO 1995) concerns of members, denoted within the WTO as *specific trade concerns* (STCs), have been raised in the tri-annual meetings of the TBT Committee in increasing numbers since 1995. The STCs are tracked within the WTO's Integrated Management System (IMS) database (www.tbtime.wto.org). This provides a summary of key aspects of each STC, including the measure under discussion, the member imposing the measure, the legitimate objectives of the measure, products affected, members raising concerns about the measure, the issues of concern that members raise, and links to the minutes at which the STC was discussed and to related notifications and other relevant documents. We draw on the IMS database to characterize the discussion of TBT measures subject to STCs at the WTO during the twenty-three years 1995-2017. Annual and tri-annual reports of the TBT Committee, prepared by the WTO Secretariat, provide initial summaries of members' participation in the STCs, objectives and issues raised, and other descriptive aggregate statistics. Our analysis complements these reports (e.g., WTO 2018a, b) and other previous studies (e.g., Horn, Mavroidis and Wijkström 2013; Holzer 2018).

During 1995-2017 there were 548 STCs discussed in the TBT Committee. We identify 212 (38.7%) of these as concerns about agri-food products, which is a higher proportion than agri-food's share of world trade. Distinguishing the agri-food STCs, and comparison to the 336 STCs (61.3%) concerning regulatory measures for other products, is a unique dimension of our analysis. The concerns raised about regulatory measures in the TBT Committee arise in addition to concerns that are addressed in the WTO's Committee on Sanitary and Phytosanitary Measures (SPS Committee). The SPS measures primarily concern agri-food products and have been widely assessed. Our analysis demonstrates that concerns over agri-food regulatory measures that fall under the remit of the TBT Committee are also a vital area of discussion of agri-food trade among WTO members.

The paper is organized as follows. Section 2 reviews the commitments members have made under the TBT Agreement and the corresponding categories of objectives of regulatory measures and issues of concern arising in the STCs. Section 3 presents our review and analysis.

The differentiations we construct between agri-food and other products and among eight groups of developed and developing members are described. We then review and assess the STCs as follows. First, we provide a chronology of the involvement of members both in terms of having STCs directed toward them and by raising STCs directed towards their trade partners concerning agri-food and other products. Second, we assess the objectives stated by members for regulatory measures toward which STCs are directed and the issues articulated by members raising these STCs, reporting about the frequency at which individual objectives and issues are raised and describing correlations when multiple objectives or issues are articulated within an STC. Third, we assess the intensity of STCs as reflected by the number of members that raise the STCs and the number of times they are discussed in Committee meetings. We also examine in additional depth which members have raised STCs toward which other members and the partnerships that have occurred in raising the STCs. In Section 4, we summarize our findings and draw conclusions from the analysis in terms of the scope of discussion of regulatory measures and the participation of members in STCs within the TBT Committee.

To preview the structure and results of the analysis, we find a number of broad similarities between the STCs concerning agri-food and other products, but also some important differences. For both agri-food and other products, many of the STCs are raised by only one or a few members and often only at one or a few Committee meetings, while others are more intense as reflected in the number of member raising the concern and duration of the discussions. We include all 548 of the STCs discussed during 1995-2017 in our analysis; 73 members have been involved in these STCs, with one or more STCs directed toward 48 members and 67 members having raised one or more concerns. Comparing a more recent sub-period (2006-2017) to an earlier sub-period (1995-2005), the number of new STCs concerning agri-food products directed toward members initiated per year and the number of members raising these STCs show larger percentage increases compared to other products. Thus, the relative importance of the agri-food STCs has increased not decreased. An increase in the share of STCs directed toward developing members (nearly two-thirds overall) and a shift by developing members toward raising STCs concerning agri-food products (more than half of their concerns overall) are other noteworthy changes over time.

Protection of human health or safety is an objective of nearly half of the measures subject to STCs concerning both agri-food and other products. This objective is stated relatively more

often by developing members, particularly for agri-food products, while protection of the environment (an objective of the regulatory measures in about one-quarter of the STCs) is relatively more frequently articulated by developed members and concerning other products. The two most often articulated market performance objectives (providing consumer information/labeling and prevention of deceptive practices/consumer protection) are relatively more frequently stated for measures concerning agri-food products than concerning other products by both developed and developing members. Correlations among the objectives articulated suggest that very often when a market performance objective is given, that objective is a means toward achieving a health, safety or environmental protection purpose. Issue raised in the STCs concerning agri-food and other products also exhibit similarities. Requests for further information arise in two-thirds of the STCs concerning both agri-food and other products and concerns about transparency of the regulatory process in more than half of the STCs. The issue of a possible unnecessary barrier to trade is raised in three-fifths of the STCs, with the highest relative frequency (70.1%) in STCs concerning agri-food products directed toward developed members. When other substantive issues are raised, often the arguments is pushed to the point of raising concern about an unnecessary barriers to trade.

Our assessment of participation in the STCs is summarized in Figure 1 differentiating between agri-food and other products and between developed and developing members at an aggregated level. Similar shares of the 212 STCs concerning agri-food and the 336 STCs concerning other products are directed toward developed and developing members—about one-third and two-thirds, respectively. More than one member can raise an STC. We refer to each case of a member raising an STC as a bilateral member-STC “pairing.” The agri-food STCs (38.7% of the STCs concerning all products) account for a more than proportionate share (48.3%) of the 1,546 bilateral pairings of members raising STCs. Developed members account for half of the pairings of a member raising the STCs concerning agri-food products, compared to around 60 percent of the pairings concerning other products.

The lower part of Figure 1 utilizes the bilateral pairings to assess which members have raised STCs toward which other members. The overall pattern is broadly similar across agri-food and other products. Developed members raising STCs directed toward developing members are the dominant pairings (35.4% of the 746 agri-food pairings and a higher 47.3% of the 800 other product pairings). Developing members raising STCs directed toward developed members is the

second largest share of pairings (29.2% for agri-food and 26.6% for other products). The third largest share of pairings is developing members raising STCs directed toward other developing members. A larger percent of the pairings concerning agri-food (20.9%) compared to other products (13.6%) occur in these STCs; this offsets the lower percent of pairings in which developed members raise STCs directed toward developing members concerning agri-food compared to other products. Finally, pairings of developed members raising STCs directed toward other developed members account for the smallest percent of the pairings of members raising the STCs concerning both agri-food (14.5%) and other products (12.5%). Overall, these results suggest there has been multi-dimensional involvement in the STCs with developed members raising STCs directed toward developing members relatively more frequently concerning other products and developing members raising STCs directed toward other developing members relatively more frequent concerning agri-food products. Disaggregation among eight groups of developed and developing members (not shown in Figure 1) adds further insights about concentration and dispersion of the concerns. STCs directed toward the European Union (EU) and BRIC members (Brazil, Russia, India and China) account together for 88 (41.5%) of the 212 STCs directed toward all members concerning agri-food products and 167 (49.7%) of the 336 STCs directed toward all members concerning other products.

Before turning to the analysis in further depth, one point of additional context is in order. The STCs examined herein provide only a glimpse at the international dialogue around TBTs affecting agri-food and other product trade. The WTO Committee undertakes numerous activities to promote dialogue and integration around TBTs across all sectors. More broadly, in addition to the discussions through the TBT Committee WTO members engage in dialogue about TBT measures through many channels: informally and formally, bilaterally and regionally, directly through industry and its associations, in standard-setting bodies, in national capitals and in Geneva, and so on. All the while, domestic dialogue and decision-making is also a dynamic process internally within the political and regulatory governance systems of members. The interface of the international and domestic dialogues is facilitated by the WTO committees. The resources the WTO makes publicly available about STCs provide a basis for assessing multilaterally and with comparable data among members the issues that arise around TBTs and how they are discussed.

Figure 1. Member Participation in TBT Specific Trade Concerns, Introductory Summary, Agri-Food and Other Products, 1995-2017



The Agreement on Technical Barriers to Trade

The TBT Agreement seeks to strike a balance between the right of WTO members to take measures to achieve legitimate policy objectives and the need to discipline this right in order to avoid the creation of unnecessary obstacles to international trade (WTO, 1995). Among the legitimate objectives for which measures may be developed the Agreement lists “inter alia, national security requirements; the prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or the environment.” Broadly, factors to be considered in assessing risks related to these objectives include “inter alia: available scientific and technical information, related processing technology or intended end-uses of products.”

The Agreement then sets out key principles for adherence by WTO members, both in terms of the substance of measures and transparency in their promulgation and implementation. In substantive terms, the Agreement stipulates that measures must not discriminate among like products, must “not be prepared, adopted or applied with a view to or the effect of creating unnecessary obstacles to trade,” and in this context “must not be more trade-restrictive than necessary to fulfill a legitimate objective, taking into account the risks non-fulfilment would create.” The Agreement does not impose common policies on members, but measures are to be based on international standards where they exist, in which case such measures are rebuttably presumed not to create unnecessary trade barriers. Members are not expected to use international standards when “such standards or relevant parts would be an ineffective or inappropriate means for achieving the legitimate objective pursued.” Members are encouraged to give positive consideration to equivalency of other members’ measures and where appropriate to base measures on product performance requirements rather than design or descriptive characteristics. Members are required to monitor and review their measures to adopt to changed circumstances and objectives. In addition, the Agreement provides specific disciplines applying to conformity assessment procedures, and promotes co-operation between members to facilitate the acceptance of conformity assessment results. Provision is made for technical assistance to members and for special and differential treatment of developing and least-developed countries.

To provide transparency about TBT measures and to facilitate their implementation, the Agreement also sets additional procedural requirements and guidelines. Where relevant international standards do not exist, or a proposed measure is not in accordance with the technical content of relevant international standards, and the proposed measure may have a

significant effect on trade, members are required to publish notice of the measure, to notify the measure to other members through the WTO Secretariat, and to allow reasonable time for other members to make comments. Members are also to allow a reasonable interval between publication of a measure and its entry into force in order to give exporters an opportunity to adapt their products or methods of production to the requirements of adopted measures. Members are to establish national enquiry points to serve as a facilitator for information exchange on TBT measures that affect trade.

The scope of measures covered by the TBT Agreement is wide. It applies to regulatory non-tariff measures: these measures include technical regulations and standards, including packaging, marking and labeling requirements, and procedures for assessment of conformity with technical regulations and standards. An annex to the Agreement sets out a Code of Good Practices for standard-setting bodies, which includes adherence to most of the enumerated principles in the Agreement itself. Members are required to ensure that their central government standards bodies adhere to the Code and to take reasonable measures to ensure that other standards organizations within their territories also accept and comply with the Code.

Both agricultural and other products fall within the scope of the TBT Agreement. However, an important exception to its coverage is made for a set of specific risks that international trade brings to human, animal and plant life or health. Measures related to these risks are covered by the *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS Agreement; WTO 1995). More specifically, the SPS Agreement covers measures applied to protect animal or plant life or health within the territory of the member from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms; to protect human or animal life or health from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs; and to protect human life or health from risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests; or to prevent or limit other damage within the territory of the Member from the entry, establishment or spread of pests. The SPS Agreement covers both agricultural and other products, but is particularly important for agri-food trade. There is no overlap between the TBT and SPS Agreements with regard to scope, i.e., in principle, a given measure cannot be covered by both. However, regulatory measures

adopted by members often include multiple provisions and can be raised as STCs or face formal dispute challenge under the provisions of both the agreements.¹

TBT measures are also subject to general provisions of GATT 1994. Other WTO agreements may also be relevant to the discussion of TBT measures, such as the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) addressing trademarks, signs, and geographical indicators for commercial identification, or the Agreement on Rules of Origin.

The implementation of the TBT Agreement is supervised by the TBT Committee, which was formally established with the purpose of “...affording Members the opportunity of consulting on any matters relating to the operation of this Agreement or the furtherance of its objectives, and shall carry out such responsibilities as assigned to it under this Agreement or by the Members.” As described by Horn, Mavroidis and Wijkström (2013), the discussion of STCs evolved over time and the Committee formalized the procedure for discussion of STCs in 2009, essentially in an effort to cope with a growing agenda. At that point delegates in the TBT Committee, noting the “accelerated growth” in the number of specific trade concerns raised, as well as the number of members engaging in the discussion, agreed on a set of guidelines (e.g., sequencing and time limits) to streamline the process so as to make it efficient and to secure more prompt responses to concerns raised. In short, based on the mandates within the TBT Agreement, over time the Committee has developed pragmatic procedures that enable delegations to use the WTO as a platform for the multilateral review of both draft and existing measures of a regulatory nature (Horn, Mavroidis and Wijkström 2013).

Legitimate Objectives and Issues Raised in TBT Specific Trade Concerns

Corresponding to the procedural and substantive stipulations of the TBT Agreement, legitimate objectives of notified measures are tracked in 13 categories (Table 1) and issues raised as concerns in the STCs are tracked in 11 categories (Table 2) in the WTO’s IMS database. While not separated as follows in the database or WTO reports, in our assessment the 13 categories of objectives can be distinguished between four that are stated in terms of achieving

¹ Grant and Arita (2017) provides a thorough discussion of the SPS Agreement and the STCs that have been raised in the SPS Committee. See also Josling, Roberts and Orden (2004) for discussion of the WTO agreements bearing on food regulation and trade.

legitimate risk-related goals (national security, protection of human health or safety, protection of animal or plant health or life, and protection of the environment); four stated in terms of achieving legitimate market performance objectives (prevention of deceptive practices, consumer information/labeling, quality requirements, and harmonization); and, more recently, four seeking increased efficiency of international trade (lowering or removing of trade barriers, adoption of domestic law, cost savings and increasing productivity, and trade facilitation). Finally, there is a residual category for other objectives members articulate in text specific to the measure under discussion.

Among the issues raised as concerns, five categories are related, in our assessment, to guidelines and stipulations in the Agreement in terms of the regulatory process and implementation of measures. First, members may simply seek further information or clarification about the substance or state of play of a measure under discussion. This category highlights the Committee meetings as a venue for information exchange. Second, members may raise concerns about the transparency of the regulatory process for a measure under STC discussion. In this case, members are concerned with such issues as lack of notification of a measure, insufficient opportunity to comment, or lack of response to enquiries. The remaining three procedural categories relate to concerns about the implementation of measures. Concerns arise over whether a reasonable interval was allowed for industry to adapt, provision of technical assistance, and granting of special and differential treatment. These considerations may have substantial effects on market access and trade, but are concerns about the process of implementation, not the substance of the measure *per se*.

The next five categories of issues of concern are related to the substance of measures under STC discussion, and there is as a residual category of other concerns, either about process or substance, that are spelled out as text specific to the measure. First, members may raise substantive concerns about whether there is a legitimate objective or rationale for a measure. Either the stated objective of a measure could be viewed as not legitimate in terms of the purposes for which regulations are envisioned under the Agreement, or it might be viewed that the objective is legitimate but the measure under discussion does not bear sufficient impact on achieving the legitimate objective to be justified. Second, concerns arise about international standards as the basis for measures. While measures based on international standards are rebuttably presumed to comply with a member's obligations, members may not agree whether a

relevant international standard exists, about the interpretation of the guidelines in an international standard, or about whether international standard are sufficient for achieving the legitimate objective of a measure. Stipulations of the TBT Agreement also require that measures not discriminate among like products, which is tracked as a third category of substantive issues. Measures are to be based on product performance requirements wherever appropriate, thus discussions of issues about measures that address non-product-related process or production methods (npr-PPM) are tracked as a fourth category of concerns.

The final category of concern about the substance of the regulations addressed in STCs is whether the measure creates an unnecessary obstacle to international trade. It is the effects on international trade that the TBT Agreement seeks to balance with legitimate objectives of regulatory measures, thus measures only fall under its scope if there are plausible trade effects. Each of the four substantive concerns described above can be the basis on its own for raising an STC. In addition, these four substantive concerns might be argued to cause a measure to create an unnecessary barrier to trade. For example, inconsistency with an international standard can be raised as a concern in its own right. The argument might also be extended to asserting that the inconsistency causes an unnecessary barrier to trade, without adequate justification existing for the deviation as necessary to achieve a legitimate objective. The Agreement specifies an additional consideration as well. A measure must not be more trade-restrictive than necessary to achieve the legitimate objective. Thus, the five categories of substantive concerns, although tracked separately in the IMS, are better perceived as pieces of an interlocking puzzle than as completely distinct and separable.

This inter-connectedness of the issues raised in the STCs is reflected in the “necessity tests” that are referred to and assessed in WTO dispute settlement. As summarized by Boza, Polanco and Espinoza (2018), TBT panels often utilize four steps to test necessity: 1) identify the objective of the measure, 2) determine if the objective is legitimate, 3) evaluate the degree to which the measure fulfills the legitimate objective, and 4) determine if the measure is more trade restrictive than necessary, particularly by making a comparison of the measure with possible alternatives. Boza, Polanco and Espinoza (2018) make the observation that to date no WTO member has been found to be acting in a manner inconsistent with the TBT Agreement’s stipulation that a measure not cause an unnecessary obstacle to international trade. They note that the fact that a measure is trade restrictive does not make it inconsistent with this stipulation.

Table 1. Legitimate Objectives of TBT Measures

Objective	Description
<i>Risk-Related</i>	
National Security Requirements	The measure is aimed at the protection of national security from threats such as nuclear radiation, potential explosions, terrorism, or public disorder caused as a result of use of the product or as a result of related production processes and methods
Protection of Human Health or Safety	The measure is aimed at preventing possible harm to human health, and risks to human safety from the product or related production processes or methods
Protection of Animal or Plant Life or Health	The measure is aimed at preventing damage or harm to animal or plant life or health from the product or related production processes or methods
Protection of the Environment	The measure is aimed at preventing damage to the environment from the product or related production processes or methods
<i>Market Performance</i>	
Consumer Information, Labelling	The measure is aimed at informing the consumer of the impact, risk, quality or other characteristics of the product or related production processes or methods
Quality Requirements	The measure is aimed at ensuring that quality requirements for the product are met
Prevention of Deceptive Practices and Consumer Protection	The measure aims to prevent deceptive practices by producers and sellers of the product
Harmonization	The measure seeks to harmonize standards or technical regulations between national systems
<i>Other</i>	
Other, text	Specific objectives of an STC related to or not covered by the objectives above

Source: Adapted from McDaniels (STC Coding Rules, 7 February 2012). Differentiation between risk-related and market performance objectives is a construct of the authors.

Note: Subsequently four additional categories have been articulated: Lowering or Removing of Trade Barriers, Adoption of Domestic Law, Cost Saving and Increasing Productivity, and Trade Facilitation. These latter categories are not mentioned in the STCs through 2017 included in the analysis of this paper.

Table 2. Issues of Concern about Measures Subject to STCs

Issue (Agreement Reference)	Description
<i>Regulatory Process and Implementation</i>	
Further Information, Clarification	Requests for information or update on state of play of the measure. Need for additional information or details on the regulation, the timing or the procedure, or clarifications on the contents therein
Transparency (Articles 2.9.1 – 2.9.4; Articles 5.6.1 – 5.6.4)	International Transparency: meeting TBT obligations; such issues as not notified, should have been notified, comments not responded to, no opportunity for comments. The notification of the new regulation is expected to be during the draft stages of the regulation, before it is adopted. The period for allowing comments on the draft shall be at least 60 days, and the notification of the agreement must take place no later than the start of this comment period National Transparency: such issues as public consultation, regulatory impact assessment
Time to Adapt, “reasonable interval” (Article 2.12; Article 5.9)	Members were not afforded a reasonable interval of time, as required by the TBT Agreement to allow them to adapt their processes and production methods to the measure or the new regulation therein
Technical Assistance (Article 11)	Maintaining Member should consider providing technical assistance to developing countries; requests for technical assistance
Special and Differential Treatment (Article 12.3)	Does not provide special and differential treatment to developing countries; Explicit mention of special and differential treatment
<i>Substance of the Measure</i>	
Rationale, Legitimacy (Article 2.2 – 2.5; Article 2.9.2, 2.10.1.; Article 5.2.4, 5.6.2, 5.7.1)	Lack of sufficient justification of the legitimacy of the objective. The legitimate objective pursued by the measure cannot justify the need for the measure itself
International Standard (Article 2.4; Article 2.5)	Mention of international bodies, sources of guidance, standards, principles. Inconsistency with international standard, non-use, non-existence of international standard
Discrimination (Article 2.1)	Not providing most favoured nation treatment or national treatment
NPR-PPM (Annex 1)	Measure based on a non-product-related process or production method
Unnecessary Barrier to Trade (Article 2.2)	Measure acts as a barrier to trade, and cannot be justified adequately as necessary to pursue a legitimate objective. Not the least trade restrictive approach to achieve a legitimate objective. Includes conformity assessment procedures which pose unnecessary barriers
<i>Other</i>	
Other, Text	Issues raised by Members that are related to or not covered by any of the above categories

Source: Adapted from McDaniels (STC Coding Rules, 7 February 2012). Differentiation between Regulatory Process and Implementation issues and Substance of the Measure issues is a construct of the authors.

Review and Assessment of TBT Specific Trade Concerns

This section presents our review and assessment of the STCs that have been discussed in the TBT Committee. First, the differentiations are described that we construct between agri-food and other products and among members that have self-designated as developed and developing in the WTO. The analysis of the STCs is then presented as follows. First, we provide a chronological breakdown of the numbers of new agri-food and other product STCs initiated per year and the involvement of members both in terms of STCs being directed toward their regulatory measures and by raising STCs directed toward their trade partners. Second, we assess the objectives stated by members for regulatory measures toward which STCs are directed and the issues articulated by members raising these STCs, reporting about individual objectives and issues and describing correlations when multiple objectives or issues are articulated within an STC. Third, we assess the intensity of STCs as reflected by the number of members that raise the STCs and the number of times they are discussed in Committee meetings. We also examine in additional depth which members have raised STCs toward which other members and the partnerships that occur among members raising the STCs. Because of the number of tables and figures utilized to present the results, for convenience all of these figures and tables are placed at the end of the paper instead of being interspersed within the text of the results sections.

Product and Membership Differentiations

In examining the STCs discussed in the TBT Committee, we make a basic differentiation between agri-food and other products. The agri-food category includes HS-2 codes 01-24 and certain other products such as raw and processed cotton (HS 5201, 5202, 5203) and unprocessed forest products (HS 4401, 4403). Broadly, the agri-food category includes primary agricultural products such as cereals, fruits and vegetables, meats and dairy products. It also includes processed food products for human ingestion. We include beverages, both alcoholic and non-alcoholic, and tobacco and tobacco products—again these are products for human intake. Thus, the key characteristic of the agri-food category is that the product either be an agriculturally-produced product (including forestry) or be utilized for digestive or inhaled human consumption. On this basis, while processed foods, beverages and tobacco products are included in the agri-food category, other manufactured products such as cosmetics, textiles, leather goods, and wood products are classified as other products, even though they may contain or be manufactured from

products classified as agri-food. Our agri-food category also excludes chemical and manufactured inputs into agricultural production.²

There is a differentiation within the WTO between members self-designating as developed and developing, and the WTO recognizes a designation of least-developed members.³ At an aggregated level, we distinguish between the developed and developing members. Seven least-developed members have been involved in the STCs and we include these members with the developing members in our developed/developing aggregations.

To assess members' involvement and other aspects of the STCs with greater disaggregation among members, we also present results based on an integration of the self-designations between developed and developing members in the WTO with a differentiation among members based on World Bank income categories. This results in eight groups among the 73 members that have been involved in one or more of the STCs during 1995-2017. The number of STCs these members have been subject to and raised toward other members are presented in Table 3 differentiating between agri-food and other products.

The first three groups are comprised of 12 developed members in the WTO that are categorized as high-income economies by the World Bank (denoted DDHI). Among the 12 DDHI members, we separate out the United States (U.S.) and European Union (EU) because of the size and importance of these economies and their high level of participation in the STCs. Among the 10 other DDHI members, the largest number of STCs have been directed toward Canada and Japan and these two members have also raised the most STCs directed toward other members. Australia, New Zealand and Switzerland have also been relatively active raising STCs.

The next four groups include all developing members and a few members that designate as developed within the WTO but have income levels lower than the World Bank high-income economies. Among these members, we include the BRIC (Brazil, Russia, India and China) as a distinct group. This differentiation reflects the emphasis accorded to these large, often referred to as leading emerging economies, and the relatively high number of STCs in which these four members have been involved. India and Brazil are founding members of the WTO, while China

² In future analysis we will utilize a more detailed mapping to assess the 212 STCs related to agri-food products at the HS 4-digit and 6-digit levels, including relating the STCs to trade flows between the members STCs are directed toward and those members raising the STCs.

³ Almost all WTO members are individual countries. An exception is the European Union which represents its 28 countries.

acceded to the WTO in 2001 and Russia in 2012. Brazil, China and Russia are World Bank upper-middle income economies, while India is lower-middle income. Each of the BRIC members has been subject to a substantial number of STCs. Brazil and China have also raised substantial numbers of STCs, while India and Russia have been less active as members raising concerns.

Among the remaining WTO developing members, we distinguish between those categorized into the World Bank high-income, upper-middle-income and lower-middle-income economies. Of the 16 developing high-income members (DGHI), South Korea (Korea, Republic) has been subject to by far the most STCs, followed by Argentina, Saudi Arabia and Taiwan (Taiwan, China). The largest number of STCs have been raised by South Korea and Chile. Among the 19 developing upper-middle-income members (DGUM), those subject to the most STCs include Ecuador, Mexico, Colombia and Thailand. Eight of the DGUM members have not had any STC directed toward them. Mexico has raised by far the most STCs, followed by Guatemala, Columbia, Cuba, South Africa, the Dominican Republic, and Malaysia. Among the 15 developing lower-middle-income members (DGLM), the largest number of STCs have been directed toward Indonesia, followed by Egypt and Viet Nam. Five of the DGLM members have not been subject to any STC. Indonesia has raised the most STCs, followed by Ukraine, Egypt and Zimbabwe.

The final group we differentiate includes seven WTO least-developed members, all of which except Zambia are World Bank low-income economies (LDLI). Among the LDLI members, only Nepal has had an STC directed toward it. The LDLI members have raised an STC 19 times.

Looking across the eight groups of members defined based on WTO and World Bank criteria, of the 73 members involved in the 548 STCs, one or more STCs have been directed toward 48 members, while 67 members have raised one or more STCs. A larger number of developing members with upper-middle income or less are involved by raising one or more STCs than by having one or more STCs directed toward them. Each STCs can be raised by more than one member. In the 548 STCs, 1,546 bilateral pairings occur in which a member has raised an STC toward another member. To provide a sense of the regulatory measures that have been subject to recent STCs, illustrative examples are summarized in Table 4.

Table 3. Participation in TBT Specific Trade Concerns, Agri-Food and Other Products, Seventy-Three Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

		Participation in STCs					
		STC Directed Toward Member			STC Raised By Member		
		Other		All Products	Other		All Products
		Agri-Food	Products		Agri-Food	Products	
All Members (total)		212	336	548	746	800	1.546
WTO Developed/WB High Income (12) (DDHI)		77	121	198	372	478	850
EU	European Union ⁽¹⁾	48	68	116	99	157	256
USA	United States	14	35	49	99	142	241
Other DDHI (not including EU and USA)							
Aus	Australia	1	1	2	41	21	62
Can	Canada	7	4	11	63	54	117
Hrv	Croatia		1	1	1		1
Isl	Iceland				2		2
Jpn	Japan	3	9	12	9	74	83
Nor	Norway	1	2	3	9	3	12
Nzl	New Zealand	3		3	32	6	38
Pol	Poland				1		1
Svn	Slovenia					1	1
Swl	Switzerland		1	1	16	20	36
BRIC (4) ⁽²⁾		40	99	139	48	82	130
Bra	Brazil	11	13	24	34	19	53
Chn	China	12	57	69	9	50	59
Ind	India	7	20	27	3	9	12
Rus	Russia ⁽³⁾	10	9	19	2	4	6
WTO Developing/WB High Income (16) (DGHI)		30	49	79	63	107	170
Arg	Argentina	5	3	8	23	11	34
Bhr	Bahrain		1	1			
Brb	Barbados				2	1	3
Chl	Chile	2	2	4	24	12	36
Hkg	Hong Kong SAR, China		2	2	1	3	4
Isr	Israel	2	4	6		9	9
Kor	Korea, Republic	9	24	33	2	57	59
Kwt	Kuwait		1	1		1	1
Pan	Panama				1		1
Qat	Qatar		1	1		1	1
Sau	Saudi Arabia ⁽⁴⁾	3	5	8	1	2	3
Sgp	Singapore	1		1	1	2	3
Twn	Taiwan, China	5	3	8	1	5	6
Tto	Trinidad and Tobago				2		2
Are	United Arab Emirates	2	3	5			
Ury	Uruguay	1		1	5	3	8

Table 3. Participation in TBT Specific Trade Concerns (continued)

		Participation in STCs					
		STC Directed Toward Member			STC Raised By Member		
		Other			Other		
		Agri-Food	Products	All Products	Agri-Food	Products	All Products
WTO Developing/WB Upper-Middle Income (19) (DGUM)		35	48	83	158	101	259
(not including Brazil, China and India)							
Bwa	Botswana					2	2
Col	Colombia	4	9	13	8	10	18
Cri	Costa Rica				3	4	7
Cub	Cuba				14	4	18
Dom	Dominican republic	1	1	2	13	2	15
Ecu	Ecuador	5	15	20	9	3	12
Gtm	Guatemala				22	1	23
Jam	Jamaica				2		2
Jor	Jordan		1	1	2	4	6
Mkd	Macedonia				2		2
Mys	Malaysia	1	2	3	5	10	15
Mus	Mauritius					1	1
Mex	Mexico	8	7	15	47	34	81
Pry	Paraguay				3	1	4
Per	Peru	4	2	6	7	1	8
Tha	Thailand	5	5	10	1	13	14
Tur	Turkey	2	4	6	6	3	9
Ven	Venezuela		1	1	2	3	5
Zaf	South Africa	5	1	6	12	5	17
WTO Developing/WB Lower-Middle Income (15) (DGLM)		29	19	48	86	32	118
(not including India)							
Bol	Bolivia	2		2	2	4	6
Slv	El Salvador	1		1	2	1	3
Egy	Egypt	3	4	7	4	8	12
Hnd	Hondoras				8		8
Idn	Indonesia	9	12	21	24	5	29
Ken	Kenya ⁽⁵⁾	3		3	3		3
Mda	Maldova ⁽⁶⁾	3		3			
Nic	Nicaragua				7		7
Nga	Nigeria				7		7
Pak	Pakistan					2	2
Phl	Philippines		1	1	5	3	8
Tun	Tunisia	1		1			
Ukr	Ukraine ⁽⁶⁾	2		2	15	8	23
Vnm	Viet Nam	5	2	7			
Zwe	Zimbabwe ⁽⁷⁾				9	1	10
WTO Least Developed/WB Low Income (7) (LDLI)		1		1	19		19
Bdi	Burundi				1		1
Mwi	Malawi				7		7
Moz	Mozambique				3		3
Npl	Nepal	1		1			
Tza	Tanzania				2		2
Uga	Uganda				1		1
Zmb	Zambia ⁽⁸⁾				5		5

Notes:

¹ Includes some STCs raised toward specific EU member countries

² Brazil, China, India are WTO developing members, Russia WTO developed; Brazil, China and Russia are World Bank upper-middle-income economies, India lower-middle-income

³ Includes 2 STCs raised toward Eurasian Economic Union (EEU). In addition to Russia, EEU countries are Kazakhstan (Kaz) and Kyrgyzstan (KgZ)

⁴ Includes 4 STCs raised toward Gulf Cooperation Council (GCC). In addition to Saudi Arabia the GCC countries are Bahrain (Bhr), Kuwait, (Kwt), Oman (Omn), Qatar (Qat), United Arab Emirates (Are) and Yemen (Yem)

⁵ Includes 2 STCs raised toward East African Community (EAC). In addition to Kenya, EAC countries are Burundi (Bdi), Rowanda (Rwa), Tanzania (Tza) and Uganda (Uga)

⁶ WTO developed member

⁷ WTO developing, World Bank low-income economy

⁸ WTO least developed member, WB lower-middle-income economy

Table 4. Illustrative Examples of TBT Specific Trade Concerns, Agri-Food and Other Products

STC Number	Title	Raised By	First Raised	Last Raised (as of March 2019)
Agri-Food Products				
Directed Toward Developed Members				
91	United States - Country of Origin Labelling	Argentina; Australia; Brazil; Canada; China; Mexico; New Zealand	21-Jun-2002	5-Nov-2009
304	Australia - Tobacco Plain Packaging Bill 2011	Chile; China; Colombia; Cuba; Dominican Republic; El Salvador; European Union; Guatemala; Honduras; Hong Kong, China; Indonesia; Japan; Mexico; Nicaragua; Nigeria; Philippines; Russian Federation; Switzerland; Turkey; Ukraine; Zambia; Zimbabwe	15-Jun-2011	5-Nov-2014
512	European Union - Quality Schemes for Agricultural Products and Foodstuffs	Argentina; Kenya; New Zealand; United States of America; Uruguay	15-Jun-2016	8-Nov-2017
Directed Toward Developing Members				
370	Chile - Proposed amendment to the Food Health Regulations, Supreme Decree No. 977/96	Argentina; Australia; Brazil; Canada; Colombia; Costa Rica; European Union; Guatemala; Mexico; Peru; Switzerland; United States of America	6-Mar-2013	10-Nov-2016
413	India - Labelling Regulations for Canola Oil	Australia; Canada	19-Mar-2014	15-Jun-2016
421	Egypt - Bottled water	Turkey	19-Mar-2014	18-Mar-2015
470	Brazil - Draft Ordinance Act Nº. 374, 27 November 2014 (Portaria SDA/MAPA 374/2014) Establishes quality requirements for wine and derivatives of grape and wine	United States of America; European Union	17-Jun-2015	21-Mar-2018
493	China - Formula Registration Regulation for Infant and Follow-up Formula	European Union; Japan; Korea, Republic of; New Zealand; Switzerland; United States of America	9-Mar-2016	6-Mar-2019
502	Indonesia - Halal Product Assurance Law No. 33 of 2014	Australia; Brazil; Canada; European Union; New Zealand; United States of America	9-Mar-2016	6-Mar-2019
518	Korea - Amendment of the Notifications on Warning Messages on Smoking and Drinking	Australia; Canada; Chile; European Union; Japan; Mexico; New Zealand; United States of America	10-Nov-2016	21-Mar-2018
Other Products				
Directed Toward Developed Members				
178	Norway - Proposed regulation concerning specific hazardous substances in consumer products	Israel; Japan; Jordan; Korea, Republic of; United States of America	9-Nov-2007	20-Mar-2012
262	United States - Hazardous Materials: Transportation of Lithium Batteries	China; European Union; Israel; Japan; Korea, Republic of	24-Mar-2010	6-Mar-2013
525	European Union - Radio Equipment Directive	China; United States of America	29-Mar-2017	21-Mar-2018
Directed Toward Developing Members				
406	Mexico - Draft Mexican Official Standard PROY-NOM-032-ENER-2013: Maximum electrical power limits for equipment and appliances requiring standby power. Test methods and labelling	Korea, Republic of; United States of America	30-Oct-2013	19-Mar-2014
419	Ecuador - Certification of Ceramic Tiles II	Brazil; European Union	19-Mar-2014	17-Jun-2015
491	Korea - Standards and Specifications for Wood Products	Canada; United States of America	4-Nov-2015	10-Nov-2016
496	United Arab Emirates - Control scheme to restrict the use of hazardous materials in electronic and electrical devices	European Union; Japan; Switzerland; United States of America	9-Mar-2016	8-Nov-2017
515	India - E-waste (Management) Rules, 2016	Japan; Korea, Republic of; United States of America	10-Nov-2016	29-Mar-2017
521	Russian Federation, Kazakhstan, Kyrgyz Republic - Pharmaceutical products Resolution 1314 of the Government of the Russian Federation on determining compliance of medicinal products' manufacturers with the requirements of Good Manufacturing Practice (non-notified); draft decisions of the Board of the Eurasian Economic Union	European Union; Ukraine; United States of America	10-Nov-2016	6-Mar-2019
527	China - Tentative Administrative Rules on Enterprises Average Fuel Consumption and New Energy Vehicle Credits and Administration Regulation on the Access of New Energy Vehicle Manufactures and Products	European Union; Japan; United States of America	29-Mar-2017	21-Mar-2018

Products and Members STCs Directed Toward

The number of new STCs brought to the Committee each year from 1995 to 2017 is shown in Figure 2 differentiating between agri-food and other products (all results figures and tables are placed at the end of the paper). Of the 548 STCs initiated during these 23 years, 212 (38.7%) concern agri-food products and 336 (61.3%) concern other products. The number of new STCs initiated per year has increased noticeably. Overall, the average number of new STCs increases from 11.6 per year during 1995-2005 (11 years, roughly the first decade after inauguration of the WTO and the TBT Agreement) to 35.0 per year during 2006-2017 (12 years, roughly the second decade after inauguration). The average number of new STCs concerning agri-food products increases from 4.3 per year to 13.7 per year, while the average number of new STCs concerning other products increases from 7.4 per year to 21.2 per year. From this, there is a somewhat larger increase in percentage terms in the average number of new STCs initiated per year concerning agri-food products (219%) versus other products (186%).

Bringing STCs to the TBT Committee requires resource commitments by members. Thus, the increasing number of STCs discussed in the Committee is indicative of the usefulness members ascribe to the information exchange, vetting of concerns, and resolution of trade frictions arising around regulatory measures that occur through this venue. The increased number of new STCs per year parallels an increase in TBT regulatory measures notified to the WTO by members (WTO 2018a, b). It reflects both increased numbers of STCs directed toward founding members of the WTO and STCs directed toward members that have acceded to the WTO since 1995. Increased levels of world trade also contribute to the rising number of new STCs per year.

Table 5 breaks down the number of STC directed toward members along three lines: between agri-food and other products as shown in Figure 2, between developed and developing members, and for all years 1995-2017 with comparisons to the early 11 years (sub-period 1995-2005) and the more recent 12 years (sub-period 2006-2017).

For the full time period, 198 (36.1%) of the 548 STCs have been directed toward developed members and 350 (63.9%) toward developing members.⁴ Of the 212 STCs concerning

⁴ For consistency with our tables that will show disaggregation of the developed and developing members, we include as developed in the aggregated tables only those 12 members self-designated as such in the WTO and categorized as high-income economies by the World Bank. This excludes Russia and five other members self-designating as developed in the WTO (see Table 3). For this reason, the tabulations we present for developed and developing members will differ from similar tabulations by the TBT Committee in its annual and tri-annual reports, while our totals for all members will match.

agri-food products, 77 (14.1% of the 548 STCs) have been directed toward developed members and 135 (24.6% of all STCs) toward developing members. Of the 336 STCs concerning other products, 121 (22.1% of all STCs) have been directed toward developed members, while 215 (39.2% of all STCs) have been directed toward developing members. Thus, similar percentages of the 212 agri-food and 336 other product STCs have been directed toward developed and developing members—about one-third and two-thirds, respectively. Looked at from a different angle (the gray shaded rows in Table 5), similar shares of the 198 STC directed toward developed members and the 350 STCs directed toward developing members concern agri-food products (38.9% and 38.6%, respectively) and other products (61.1% and 61.4%, respectively).

Differentiating along the three dimensions provides additional insight about the shifting patterns among members that have been subject to STCs. Of the 548 STCs concerning all products, 128 were initiated during the early sub-period 1995-2005 and 420 during the recent sub-period 2006-2017. The shares across products shift somewhat between the two sub-periods, with agri-food products accounting for 36.7% of the STCs initiated during 1995-2005, increasing to 39.3% of those initiated in more recent years. The share of STCs concerning all products directed toward developing members increases by a greater percentage from 53.9% in 1995-2005 to 66.9% more recently.

While the absolute number of STCs rises from the early sub-period to recent sub-period in all cases, there is a particularly large increase in the number of STCs concerning other products directed toward developing members. These STCs account for 32.8% of the 128 STCs initiated during 1995-2005, rising to 41.2% of the 420 STCs initiated during the more recent sub-period. Conversely, there is a relative decline in the share of STCs concerning other products that are directed toward developed members. This share drops from 30.5% to 19.5% of the total number of STCs initiated during the respective sub-periods. The shift of shares between the two sub-periods are less pronounced for the STCs concerning agri-food products. The share of STCs concerning agri-food products directed toward developing members increase from 21.1% of the STCs initiated during 1995-2005 to 25.7% of those initiated during 2006-2017. Those directed toward developed members falls from 15.6% to 13.6% of the STCs initiated when comparing the early to recent sub-period. Of the STCs directed toward developed members (gray shaded rows), the share concerning agri-food products increases from 33.9% during 1995-2005 to 41.0% during 2006-2017, with a corresponding decline in the share concerning other products from

66.1% to 59.0%. The share of STCs concerning agri-food products versus other products directed toward developing members is relatively stable between the two sub-periods.

Table 6 displays the distribution of STCs concerning all products, agri-food and other products disaggregated among the eight groups of members for the full time period and the early and recent sub-periods. The European Union accounts for 116 (58.6%) of the 198 STCs concerning all products directed toward developed members during 1995-2017, with fewer STCs directed toward the U.S. and other DDHI members. Percent increases between the sub-periods in the number of STCs concerning all products directed toward developed members range from 176% for the U.S. and 151% for the EU down to 54% for the other DDHI. Agri-food products account for around 30% of the STCs directed toward the U.S. in both time sub-periods, as shown in the lower part of Table 6. Agri-food products account for a larger share of the STCs directed toward the EU in both sub-periods and for the EU and other DDHI members this share increases to 43.4% and 55.0%, respectively, in the sub-period 2006-2017.

Of the 350 STCs concerning all products directed toward developing members over the full time period, 139 (39.7%) are directed toward the BRIC members. The number of STCs directed toward the BRIC members increases 495% (from 20 to 119) from the early to recent sub-period, reflecting the accession of China in particular and concerns of other members about its regulatory measures. Comparing the numbers of STCs shown in Table 6 to the corresponding totals show in Table 5, the share of STCs directed toward developing members that are directed toward the BRIC during 1995-2005 is 29.0%, rising to 42.3% during 2006-2017 (these percentages are not shown in either table). The increased BRIC share occurs as a result of STCs concerning other products (rising from 26.2% to 50.9% of the other product STCs directed toward developing members). The share of agri-food STCs directed toward developing members that are directed toward the BRIC members declines between the two sub-periods (from 33.3% to 28.7%). Correspondingly, the share of STCs directed toward the BRIC that concern agri-food products declines from 45.0% of the STCs directed toward the BRIC members during 1995-2005 to 26.1% during 2006-2017 (shown in the lower part of Table 6). The share of STCs directed toward DGHI members that concern agri-food products also falls during the recent sub-period, while this share increases for the DGUM and DGLM members. The only STC directed toward a LDLI member (Nepal) concerns an agri-food product.

Members Raising STCs

Figure 3 and Tables 7 and 8 present a parallel analysis about the members that have raised the STCs toward their trade partners. These members are exporters raising STCs about regulations affecting certain products toward specific individual members to which they export or potentially export. The 1,546 pairings of a member raising an STC toward another member indicates that the 548 STCs have been raised on average by 2.8 members. This includes members which raise the new STCs initiated each year and members which later join in raising that STC as it continues to be discussed in the TBT Committee.

The number of pairings of members that have raised the STCs is illustrated in Figure 3, again differentiating between agri-food and other products. Of the 1,546 pairings of members raising an STC during these 23 years, 746 (48.3%) were in the 212 STCs concerning agri-food products and 800 (51.7%) in the 336 STC concerning other products. A higher average number of members raise the STCs concerning agri-food products (3.5 members) compared to the average number of members raising STCs concerning other products (2.4 members).

The number of the pairings of members raising the STCs shown in Figure 3 has increased noticeably in conjunction with the increased number of STCs initiated per year shown in Figure 2. Overall, the average number of pairings of a member raising the STCs increases from 31.0 per year during sub-period 1995-2005 to 100.4 per year during sub-period 2006-2017. The average number of pairings of a member raising STCs concerning agri-food products increases from 13.0 per year to 50.2 per year; while the average number concerning other products increases from 18.0 per year to 50.2 per year. Thus, there is a larger increase in percentage terms in the sub-period average number of pairings of members raising the STCs concerning agri-food products (286%) versus other products (179%).

Table 7 breaks down the pairings of members raising STCs along the same three lines as in Table 5. For the full time period 1995-2017, developed members account for 850 (55.0%) of the pairings of a member raising an STC concerning all products and developing members for 696 (45.0%). Thus, the developed members account for a higher percentage of pairings raising STCs than the percentage of STCs that are directed toward them, with the opposite situation for developing members. Of the 746 pairings concerning agri-food products, similar numbers are raised by developed and developing members (372 and 374, respectively, each about 24% of all pairings). Developed member pairings account for a larger share of those concerning other

products. There are 478 pairings in which a developed member raises an STC concerning other products (30.9% of all pairings) compared to 322 pairings (20.8% of all pairings) in which a developing member raised an STC concerning other products. Developed members account for 49.9% of the pairings of members raising agri-food STCs but for 59.7% of the pairings of members raising STCS concerning other products. From the angle displayed in the gray shaded rows of Table 7, of the pairings raised by developed members 43.8% concern agri-food products and 56.2% concern other products. For developing members a higher share (53.7%) concern agri-food products, while 46.3% concern other products.

Comparing the early and recent time sub-periods, 341 of the pairings of a member raising an STC concerning all products occur during 1995-2005 and 1,205 during 2006-2017. The share of the pairings concerning agri-food products increases from 41.9% of all pairings during 1995-2005 to 50.0% during more recent years, with a corresponding decrease from 58.1% to 50.0% for other products. The share in which a developing member raises an STC concerning all products increases from 42.5% of all pairings during the sub-period 1995-2005 to 45.7% during recent years. Thus, developing members have not increased their relative participation in raising STCs to the same extent that they have become relatively more likely to be subject to an STC in the more recent sub-period compared to the early sub-period.

While the number of pairings of members raising STCs increases along with the number of STCs in all cases, there is a particularly large increase in the number by developing members raising STCs concerning agri-food products. These pairings account for 56 (16.4%) of the 341 pairings during the early sub-period rising to 318 (26.4%) of the 1,205 pairings during 2006-2017. This increase parallels the smaller increase that occurs in the share of STCs concerning agri-food products directed toward developing members (Table 5). The share of all pairings during the sub-period raised by developing members that concern agri-food products (gray shaded rows in Table 7) increases noticeably (from 38.6% in 1995-2005 to 57.7% from 2006-2017), with a corresponding decline in the share of pairings of an STC raised by developing members concerning other products (from 61.4% to 42.3%).

Conversely, there is a relative decline between the early and recent sub-periods of all other pairings raised by developed and developing members. The share of pairings raised by developing members concerning other products drops from 26.1% to 19.3% of the total number of pairings during the respective sub-periods. This shift runs opposite to the increased share of

STCs concerning other products directed toward developing members during 2006-2017 compared to the early sub-period. The share of all pairings during the sub-period accounted for by developed members falls slightly in the more recent sub-period compared to the earlier period both for agri-food and other products (from 25.5% during 1995-2005 to 23.6% during 2006-2017 for agri-food and from 32.0% to 30.6% for other products). The shares of pairings of a developed member raising STCs concerning agri-food and other products (gray shaded rows) remain essentially constant between the two periods.

Table 8 displays the distribution of pairings of members raising STCs concerning all products, agri-food and other products for the full time period and two sub-periods disaggregated among the eight groups of members. Among developed members, the U.S. and EU raise similar numbers of STCs concerning all products (241 and 256, respectively) during 1995-2017, with other DDHI members accounting for a larger number (353) of the pairings raising STCs. For individual members the number of STCs raised and number of pairings of that member raising STCs are identical. However, since more than one member in a multi-member group can raise an STC, the number of distinct STCs raised by the group and number of pairings raising those STCs will differ to the extent that more than one member of the group raises any STC. Thus, we also display in Table 8 the number of distinct STCs that the members of each group were involved in raising.

The 353 pairings in STCs concerning all products raised by the 10 other DDHI members occurred in 213 STCs, indicating an average of 1.6 other DDHI members raising each STC. Among the five developing member groups, the size of each group plays a role, along with levels of involvement by the members, in determining the number of pairings to the number of distinct STCs in which that group raised concerns. The four BRIC members raise concerns 130 times related to 115 distinct STCs concerning all products (an average of 1.1 BRIC members raising each STC). The average number of members raising each STC ranges among the other groups of developing members from 1.3 for the 16 DGHI members raising 128 distinct STCs, to 2.0 for the 19 DGUM members raising 132 distinct STCs, to 1.9 for the 15 DGLM members raising 62 distinct STCs. An average of 2.4 members raised each of the eight STCs raised by the seven LDLI members.

It is also of informative to compare the number of distinct STCs raised by each group of members to the number of STCs directed toward that group shown in Table 6. The U.S., EU and

other DDHI members raise many more STCs than are directed toward them, with the ratio lowest for the EU ($256/116=2.2$) and highest for the other DDHI group which raised 213 distinct STCs compared to only 33 STCs directed toward its members (these ratios are not shown in either table). In contrast, the BRIC members have raised fewer distinct STCs (115) than directed toward them (139). The ratios of distinct STCs concerning all products raised by groups of members to STCs directed toward those members is greater than one for the other developing member groups, but the ratios are lower than for the developed members, with the exception of a high ratio for the small numbers in which LDLI members are involved (raising eight STCs but subject to only one).

Turning back to assessment based on the 1,546 pairings of members raising the STCs, among developed members the percentage increases concerning all products between the early and recent sub-periods range from 263% for the U.S. to 241% for the EU and 210% for other DDHI members (last row in top part of Table 8). Agri-food products account for between about 35%-50% of the pairings raised by the U.S., EU and other DDHI members, with no discernable change between the early and more recent sub-periods, as shown in the lower part of Table 8.

Among the developing members, there are sharp increases in the number of pairings of DGLM and LDLI members raising STCs which together account for 115 of the 1,205 pairings of all members concerning all products in the recent sub-period. Percent increases from the early to recent sub-period in pairings of a member raising an STC concerning all products range among other groups of developing members between 233% for the BRIC, 247% for DGHI and 271% for DGUM. Thus, the BRIC members have only a proportionate role in the increase of pairings of members raising STCs, in contrast to the disproportionate increase in STCs directed toward BRIC members (Table 6). The BRIC members account for about 8% of the pairings in STCs concerning all products raised in each period by all members (as can be computed from Tables 7 and 8), with a shift toward relatively fewer of the pairings of the BRIC in STCs concerning agri-food products in the recent sub-period (shown in the lower part of Table 8). About one-third of the pairings raised by DGHI members concern agri-food products in both sub-periods. Less than half of the of the pairings of DGUM and DGLM members raising STCs concern agri-food products during 1995-2006 but these shares increase to 66.7% and 82.3%, respectively, during the more recent years. The increased number of pairings in STCs raised concerning agri-food products by the DGUM and DGLM members largely account for the increased percent shown in

Table 7 of all pairings in the recent sub-period that are raised by developing members concerning agri-food products.

Objectives of the Measures STCs Directed Toward

Figure 4 presents the objectives stated by members for their regulatory measures that have been subject to STCs. The number of members that articulate each objective are shown for all products and disaggregated between agri-food and other products. The four objectives we characterize as risk-related are grouped together followed by the four that are characterized as market performance objectives. Among the 548 STCs raised toward members during 1995-2017, there were 887 objectives articulated. This includes 107 objectives stated as “Other” and described in text phrases and 77 STCs for which no objective was specified, resulting in 810 stated objectives, as reported also by the TBT Committee (WTO 2018a). An average of 1.6 objectives have been articulated by members for the measures subject to the 548 STCs.⁵

Of the objectives stated concerning all products, 432 (48.7%) are risk-related, while 271 (30.6%) are related to market performance, and the remaining 184 (20.7%) are other or not specified. The two most widely articulated objectives are risk-related—protection of human health or safety, followed by protection of the environment. Conversely, objectives related to national security and protection of animal or plant life or health are given relatively few times. Prevention of deceptive practices/consumer protection and provision of consumer information/labeling are more frequently stated market performance objectives than quality requirements or harmonization.

Since multiple objectives are often stated for a measure subject to an STC, correlations among the objectives articulated by members are also informative. In Table 9, the main diagonal elements (gray shaded) show the number of times each objective given in the corresponding row and column headings was articulated for measures subject to the 548 STCs. The number of times other objectives were stated together with this objective are shown symmetrically above and below the main diagonal. These correlations are converted into percentages in Table 10. The percent below the main diagonal show the proportion of times the row objective was stated when

⁵ Alternatively, one can drop the 77 STCs with no objective specified, resulting in 810 objectives articulated over 471 STCs, an average of 1.7 objectives per STC. For consistency throughout the paper, we retain the full set of 548 STCs in the presentation.

the main diagonal objective above it was given. Correspondingly, the percent above the main diagonal show how often the two objectives were stated together as a proportion of the times the main diagonal objective below it was given. While Table 10 is no longer symmetric, the ratios of the corresponding percents above and below the main diagonal are equal to the inverse ratios of the number of times the objectives were stated.

Among the risk-related objectives, in 68 (25.5%) of the 267 STCs where protection of human health or safety is articulated as an objective of the measure, protection of the environment is also articulated (correspondingly, these two objectives are articulated jointly in 51.9% of the 131 STCs in which protection of the environment is an objective). Among the market performance objectives, in 31 (30.1%) of the 103 STCs where prevention of deceptive practices/consumer protection is articulated as an objective, consumer information/labeling is also articulated (correspondingly, these two objectives are articulated jointly in 32.0% of the 97 STCs in which consumer information/labeling is an objective). Other correlations within each block of objectives are not as high, with exception of the frequent statement of human health or safety and environmental objectives for the 16 measures subject to an STC for which protection of animal or plant life or health is an objective.

There are also several strong correlations across the risk-related and market performance objectives. Of the 103 times that prevention of deceptive practices/consumer protection is articulated as an objective, one of the two most widely articulated risk-related objectives is also articulated 77 times (together 74.8% as often), while of the 97 times where consumer information/labeling is articulated as an objective, one of these two risk-related objectives is also articulated 58 times (together 59.8% as often). Likewise, the two most often stated risk-related objectives are frequently articulated when the other two market performance objectives are given for a measure (together 82.3% as often when quality requirements is stated as an objective and 65.4% as often when harmonization is an objective).

Looked at the opposite way, the two most frequently stated market performance objectives taken together are articulated 102 times in conjunction with 267 times protection of human health or safety is given as an objective (together 38.2% as often). These two market performance objectives are articulated fewer times (together 33 times, 25.2% as often) in conjunction with the 131 times protection of the environment is an objective.

What these correlations suggest, is that very often when a market performance objective is given, that objective is a means toward achieving a risk-related purpose—a means to a broader end, so to speak. Conversely, somewhat less frequently, but still often, to achieve a risk-related objective the means is through a measure related to market performance. The first correlation is stronger for other products than for agri-food products, while the second is stronger for agri-food products.⁶

The number of STCs in which each objective is articulated as shown in Figure 4 is further assessed in Table 11. It displays for all products, agri-food products and other products the percent of STCs during 1995-2017 directed toward developed and developing members for which those members have stated each objective for the measures subject to concern.

Protection of human health or safety, the most frequently articulated objective, is relatively more frequently an objective of developing members than developed members, particularly concerning agri-food products (55.6% versus 35.1%) but also concerning other products (51.2% versus 45.5%). This objective is articulated at similar relative frequency (nearly 50%) concerning agri-food and other products. Different results hold for protection of the environment which is relatively more frequently articulated by developed members than developing members (31.8% versus 19.4% concerning all products) and is relatively more often articulated (as evident also in Figure 3) for measures concerning other products compared to agri-food (33.9% across developed and developing members versus 8.0%). The relatively few times national security is articulated as an objective are concentrated among developing

⁶ The disaggregated correlations of objectives concerning agri-food and other products are not shown separately in Tables 9 and 10 but are available from the authors upon request. These results show that of the 48 times that prevention of deceptive practices is the objective of measures concerning other products that an STC is directed toward, the two most widely articulated risk-related objectives are stated 44 times (together 91.7% as often). For agri-food products this correlation falls to 33 times the two risk-related objectives are stated in 55 STCs for which prevention of deceptive practices is an objective (together 60.0% as often). Likewise, for other products, the two risk-related objectives are stated 22 times in the 30 STCs for which consumer information/labeling is an objective (together 73.3% as often), but only 36 times in the 67 agri-food STCs with this market performance objective (together 53.7% as often).

Conversely, the correlation of market performance objectives with risk-related objectives is stronger for agri-food products than for other products. The two most frequently given market performance objectives are articulated 63 times in the 102 agri-food STCs for which protection of human health or safety is a stated goal (together 61.8% as often). For the four market performance objectives this rises to 79 times (together 77.4% as often), but for other products it is only 66 out of 165 (together 40.0% as often) for the four market performance objectives together. Likewise, although protection of the environment is stated as an objective relatively infrequently for agri-food measures STCs are directed toward, the four market performance objectives together are stated 53.0% as often, whereas for other products this falls to the market performance objectives being stated only 30.7% as often in conjunction with the 114 times protection of the environment is an objective.

countries for other products, while the relatively few times protection of animal or plant health or life is articulated as an objective are dispersed across members and products.

Three of the market performance objectives—the prevention of deceptive practices/consumer protection, consumer information/labeling and quality requirements—are relatively more often articulated concerning all products by developing members than developed members (24.3% versus 9.1%, 18.6% versus 16.2% and 10.3% versus 4.5%, respectively). Prevention of deceptive practices/consumer protection is relatively more often an objective of measures concerning agri-food products (25.9%) compared to other products (14.3%). Consumer information/labeling is articulated relatively more frequently for measures concerning agri-food products (31.6% versus 8.9%) and at similar relative frequencies for the agri-food measures among developed and developing members (31.2% and 31.9%, respectively). Quality requirements are articulated as an objective at similar relative frequency concerning agri-food and other products (about 8%) with greater relative frequency concerning all products among developing members compared to developed members arising from measures concerning other products (11.6% versus 2.5%). In contrast, developed members articulate harmonization as an objective of their measures relatively more often than developing members and this objective is again articulated relatively more frequently concerning agri-food products than concerning other products.

Tables 12 and 13 provide further disaggregation of objectives among the eight groups of members concerning agri-food and other products. An overall observation is the general similarity across the disaggregated results to those at the aggregated level, with some variance as expected but few clearly discernable patterns of differences across objectives and groups of members. For the STCs concerning agri-food products (Table 12), among the developed members, protection of human health is particularly prominent as an objective of other DDHI members (46.7% of the measures subject to STCs), while protection of the environment is relatively less frequently an objective of the other DDHI compared to the U.S. and EU (6.7% versus 14.3% and 16.7%, respectively). Protection from deceptive practices and consumer information/labeling are relatively more prominent for the EU (18.8% and 35.4%, respectively) than for other developed members, while the few national security objectives, but none of the harmonization objectives, are articulated by the U.S. Among developing members (leaving aside the one STC directed toward an LDLI member), DGUM members articulate protection of human

health and consumer information/labeling relatively most often as an objective of their measures (in 62.9% and 45.7% of the STCs directed toward them), while BRIC members articulate protection of human health and prevention of deceptive practices relatively often (55.0% and 40.0%, respectively). DGLM members articulate quality requirements relatively most often, but only in 13.8% of the STCs to which they are subject. DGHI members articulate harmonization relatively most often as an objective (in 16.7% of the STCs directed toward these members).

For other products (Table 13), among developed members protection of human health is articulated relatively most often as an objective of the measures subject to an STC by the EU (in 51.5% of the STC directed toward the EU) but protection of the environment relatively most often by the other DDHI members (in 66.7% of the STCs directed toward them). The U.S. articulates protection from deceptive practices and consumer information/labeling relatively more often than other developed members. (in 11.4% and 8.6% of the STCs directed toward the U.S., respectively). Harmonization is articulated as an objective only by the EU. Among the developing members, BRIC members articulate protection of human health, national security and protection of animal or plant health as objectives of their measures relatively most often compared to other groups of members (in 60.6%, 12.1% and 6.1%, respectively, of the STCs directed toward BRIC members). DGHI members articulate consumer information/labeling relatively most often (20.4%), DGUM members articulate protection of the environment and prevention of deceptive practices relatively most often (37.5% and 41.7%, respectively) and DGLM members articulate the quality objective relatively most often (in 31.6% of the STCs directed toward these members).

Issues of Concern Raised about Measures STCs Directed Toward

Figure 5 presents the issues raised in the STCs directed toward members. The number of times an issue was raised in an STC is shown, again concerning all products, agri-food and other products. The five issues concerning regulatory process and implementation are grouped together followed by the five issues concerning the substance of the regulatory measures toward which the STCs are directed. Among the 548 STCs directed toward members during 1995-2017, 2,090 issues were raised, as reported also by the TBT Committee (WTO 2018a). This includes 254 issues given as “Other” and described in text phrases. On average, 3.7 issues have been raised in each of the 548 STCs.

Of the issues raised, 846 (40.5%) are related to regulatory process and implementation, while 994 (47.5%) are related to substance of the regulatory measures and the remaining 250 (12.0%) are other. The issues raised most often for all products concerning regulatory process and implementation are requests for further information/clarification about a measure and concerns about transparency. Issues are raised somewhat less frequently about reasonable time for exporters to adapt to a regulation, while issues about special and differential treatment and technical assistance are infrequent. In terms of the substance of measures toward which STCs are directed, potentially creating a unnecessary barrier to trade is the most frequently raised issue, and the second most frequently raised overall, followed by issues about the rationale/legitimacy of a measure and relation of measures to international standards. Concern that a measure is discriminatory toward exporters is also often raised as an issue. Concerns with npr-PPMs are less frequently raised.

The correlations among issue raised in the 548 STCs concerning all products are shown in Tables 14 and Table 15. Among the regulatory process and implementation issues, in 227 (61.2%) of the 371 STCs in which further information is raised as an issue, transparency is also raised as an issue, while concerns about reasonable time to adapt are raised with further information 107 times (28.8%) and with transparency 103 times (33.4% of the times transparency is raised). Looked at correspondingly, further information is sought in over 70% of the STCs in which transparency or reasonable time to adapt are raised as an issue (73.7% and 78.7%, respectively). Transparency is also raised as an issue in 75.7% of the STCs in which reasonable time to adapt is raised. That is, and not surprisingly, further information is sought frequently when other process and implementation issues are raised and transparency is frequently an issue when there are concerns about reasonable time to adapt. Issues about special and differential treatment and technical assistance are raised fewer times. In 6 of the 8 times that technical assistance is an issue, special and differential treatment is an issue, while special and differential treatment is an issue 17 out of 23 times without technical assistance being an issue (whereas of the 23 times that special and differential treatment is an issue, further information and transparency also are raised as an issue 19 and 18 times, respectively).

Among the issues concerning substance of the regulatory measures toward which the STCs are directed, of the 333 times that unnecessary barrier to trade is raised as an issue, rationale/legitimacy is raised 169 times (50.8.1%), international standards is raised 141 times

(42.3%) and discrimination 125 times (37.5%). Looked at correspondingly, unnecessary barrier to trade is raised as an issue more than 70% of the times that rationale/legitimacy or discrimination is raised (72.8% and 73.5%, respectively) and 65.3% of the time that international standards is raised. An interpretation of these correlations is that each of the other substantive issues arises as a driving factor in a subset of those STCs in which unnecessary barrier to trade is raised as an issue, while at relatively higher frequencies when one of the other substantive issues is raised the argument is pushed through to raising the issue of unnecessary barrier. Other correlations among substantive issues raised are symmetrically lower across the STCs. International standards is raised 48.7% of the times that rationale/legitimacy is an issue, while rationale/legitimacy is raised 52.3% of the times that international standards is raised. Rationale/legitimacy is raised as an issue in 52.4% of the STCs in which discrimination is an issue, but international standards in only 42.4% of the STCs in which discrimination is raised. Similarly, discrimination is raised in less than 40% of the STCs that rationale/legitimacy or international standards are an issue. When issues about npr-PPMs are raised they are relatively uncorrelated with other issues also being raised. The highest correlation is that unnecessary barrier to trade is raised as an issue 60.5% of the times that npr-PPMs is raised.

There are also several strong correlations of regulatory process and implementation issues raised together with substantive issues. Again, this is not surprising. Requests for further information arise 69.7% to 75.0% of the times that one of the substantive issues is raised, while unnecessary barrier to trade is raised as an issue between 62.3% and 100% of the times that one of the process and implementation issues is raised. Likewise, transparency is raised as an issue between 48.8% and 69.4% of the times one of the substantive issues is raised, while rationale/legitimacy, international standards and discrimination are raised as an issue between 34.2% and 65.2% of the times that one of the process and implementation issues is raised. Correlations are lower across the remaining procedural and substantive issues that are raised only infrequently. The broad conclusions from the correlations between process and implementation issues and substance of the measure issues is that often the STCs involve both information gathering and expressions of concerns on a substantive basis and that unnecessary barrier to trade is a generic focal point of argument when other substantive issues are raised. Disaggregated

results concerning agri-food and other products are similar to the results shown for all products in Tables 14 and 15.⁷

The number of STCs in which each issue is raised shown in Figure 5 is further assessed in Table 16. It shows for all products, agri-food products and other products the percent of STCs during 1995-2017 directed toward developed and developing members for which the member(s) raising the STC brought up each issue.

Among issues about regulatory process and implementation, further information/clarification, transparency and reasonable time to adapt are each raised (total by all members) at similar relative frequencies concerning agri-food and other products (in about two-thirds, over one-half and one-quarter, respectively, of the STCs concerning both agri-food and other products) by all members together. These three process and implementation issues are raised relatively more frequently in STCs directed toward developing than developed members, particularly concerning agri-food products. Issues about special and differential treatment and technical assistance are directed primarily toward developed members, and arise relatively more frequently concerning agri-food than other products.

The relative frequencies with which issues about substance of the measures are raised are more diverse across members and products. The issues of an unnecessary barrier to trade and rationale/legitimacy are raised with similar relative frequency toward developed and developing members in STCs concerning all products (in around 60% and 42%, of the STCs, respectively). For unnecessary barrier to trade, the similar relative frequencies among developed and developing members concerning all products arise from a higher relative frequency in which this issue is raised toward developed members concerning agri-food products (70.1% versus 55.6%) offset by a lower relative frequency in which this issue is raised toward developed members concerning other products (57.9% versus 62.3%). For rationale/legitimacy, the relative frequencies toward developed and developing members are similar (around 47% concerning agri-food and 39% concerning other products). Issues are raised about international standards relatively more frequently toward developing members concerning both agri-food and other products. Issues about discrimination are raised toward developed and developing members at similar relative frequencies concerning all products (around 30%). These issues, like issues about

⁷ Correlation results for issues raised in the STCs concerning agri-food and other products are available from the authors on request.

rationale/legitimacy, arise relatively more frequently in STCs concerning agri-food products compared to other products (36.3% versus 27.7%). But similar to the relative frequencies about unnecessary barriers to trade, concerns about discrimination are raised relatively more frequently toward developed members concerning agri-food products (46.8% versus 30.4%), but relatively less frequently toward developed members concerning other products (24.0% versus 29.8%). Concerns about npr-PPMs are raised relatively more frequently in STCs concerning agri-food than other products (16.5% versus 2.4%) and are raised relatively more frequently toward developed members.

Tables 17 and 18 provides further disaggregation of the issues raised in the STCs directed toward the eight groups of members concerning agri-food and other products. Again, an overall observation is the general similarity across the disaggregated results to those at the aggregated level, with some variance as would be expected.

For agri-food (Table 17), among developed members the process and implementation issues except technical assistance are raised at slightly higher percentages in STCs directed toward the EU than toward the U.S. or other DDHI members. Unnecessary barrier to trade is raised as an issue in 83.3% of the STCs directed toward the EU, while rationale/legitimacy is relatively most frequently raised toward other DDHI (60.0%) and discrimination relatively most frequently toward the EU (50.0%). Issues about international standards are relatively most often raised toward the U.S. (35.7%). Among developing members (leaving aside the one STC directed toward an LDLI member), further information/clarification and reasonable time to adapt are relatively most frequently raised toward DGUM members (77.1% and 37.1%, respectively) and transparency toward BRIC members (75.0%). Unnecessary barrier to trade and npr-PPM are raised as issues relatively most frequently in STCs directed toward DGHI members (60.0% and 20.0%, respectively), rationale/legitimacy and discrimination relatively most frequently in STC directed toward DGLM members (55.2% and 48.3%, respectively) and international standards relatively most frequently in STCs directed toward BRIC (52.5%).

For other products (Table 18), among the developed members further information and transparency are relatively most frequently raised, but reasonable time to adapt relatively least frequently raised, in STCs directed toward the EU, while none of the issues of special and differential treatment or technical assistance are raised toward the U.S. Unnecessary barrier to trade is relatively most frequently raised in STCs directed toward other DDHI members (66.7%),

rationale/legitimacy relatively most frequently toward the EU (51.5%) and international standards again relatively most frequently toward the U.S. (40.0%). Among the developing members, noteworthy observations are again the general similarity of the frequencies in which further information/clarification, transparency and reasonable time to adapt are raised in STCs directed toward the BRIC, DGHI, DGUM and DGLM members (an exception is the low frequency at which reasonable time to adapt is raised as an issue toward DGHI members). Unnecessary barrier to trade is raised as an issue in 84.2% of the STCs directed toward DGLM members. Rationale/legitimacy is raised as an issue relatively most frequently in STCs directed toward DGUM members (47.9%), while international standards and discrimination have been raised relatively most frequently in STCs directed toward BRIC members (52.5% and 36.4% respectively).

Distribution of STCs by Number of Members Raising and Duration

From the analysis so far, we know that on average 2.8 members have raised each of the 548 STCs. The distribution of STCs in terms of number of members that raise each one and their duration from when an STC is initially raised through the final time it is discussed in the TBT Committee have not been assessed. Table 19 provides a cross-tabulation of these two dimensions for the STCs concerning all products. Duration is indicted by the number of Committee meetings at which an STC has been raised through 2017. With three meetings per year, this measure of duration can be translated into a continuous period in years during which an STC was discussed if the discussions occur at sequential meetings. There can also be gaps between meetings at which an STC is raised, in which case the duration can be longer in terms of of years. In addition, many of the recently initiated STCs remain under discussion during 2018 and 2019. This will add to the eventual full duration of these STCs.

The results in Table 19 indicate a skewed distribution in terms of number of members raising the STCs and duration through 2017. A large number of the STCs have been raised by only one or a few members and only one or a few times, while a smaller subset are raised by larger numbers of members and more persistently.

Specifically, 144 (26.3%) of the 548 STCs have been raised by only one member at only one Committee meeting. These STCs can be considered specific to the trade between a single exporter and the importer. They are also transitory, with the exporter, having raised the concern

once, not persisting to pursue the STC in subsequent meetings. An additional 109 STCs (19.9%) have been raised by only a single member at more than one meeting. These STCs are all of relatively short duration, with 233 (92.1% of the 253 STCs raised by only one member) raised in three or fewer Committee meetings and none of these STCs raised in more than 10 meetings. Extending to a larger set of STCs raised by up to three members accounts for 422 (77%) of the STCs, with 344 (81.5% of these 422 STCs) raised in three or fewer meetings and only one raised in more than 12 meetings.

The distribution is somewhat different for STCs that are raised by four or more members. These STCs address the concerns of wider groups of exporters. There have been 117 STCs (21.4%) raised by between four and 12 members and these STCs tend to be of longer duration than those raised by three or fewer members. Of these 117 STCs, 37 (31.6%) have been raised three or fewer times, while 67 (57.3% of these STCs) had been raised in 4-12 meetings. A few of the STCs raised by 4-12 members also have longer durations, with 13 raised in more than 12 Committee meetings. Finally, there is a small set of outliers raised by a large number of members (from 13 to 34). All of these STCs have been raised in four or more meetings with the longest duration of 38 meetings covering a period of more than a decade. The cross-tabulations concerning agri-food and other products (not shown) exhibit similar patterns to the distributions concerning all products.⁸

The cross-tabulation in Table 19 is informative about the skewed distribution of STCs with a large share raised by only a few members and of relatively limited duration, while a smaller set are of more general concern among exporters and tend to be of longer duration. This characterizes the STCs and points toward, but does not provide information about, the question of what drives the involvement of members or persistence in raising an STC. Interviews conducted by the authors during April 2018 with a small group of delegates to the TBT Committee (including the chairperson of the Committee) provide some insights in this regard. These interviews centered on three topics: the STC as a signal of concern about a regulatory measure, outcomes implied when an STC concludes, and how well the WTO's database, minutes of Committee meetings and related notifications and documents reflect the associated issues.

Respondents indicated that concerns expressed by the exporting industry of a member generally play a key role in the initiation and duration of an STC. While the committee minutes

⁸ Again, these results are available from the authors on request.

do not reflect all of the discussion in informal and formal negotiations, respondents indicated the meetings and minutes serve an important and correlated role in calling attention to the issues of concern.⁹ Respondents indicated that industries no longer expressing concern about an issue often plays a role in conclusion of an STC. Various reasons were given for why an industry ceases to express concerns: clarification of a regulation or conclusion that the regulation is justified, modification or withdrawal of the regulation at issue, adjustment of the industry to meet the requirements of the new regulation, conclusion by the industry that it cannot affect the outcome and must either adapt or find other markets for its products, and other reasons. Respondents indicated that in their experience it can be uncertain to Geneva-based delegates what the outcome had been that led their government to bring an STC to closure. Finally, the respondents expressed the view that the committee minutes reflect the discussion in the committee quite accurately (with members often asked to validate the minutes before they are finalized). When asked for recommendations to improve the STC process, respondents expressed that they thought the process worked well and the Committee meetings served an important role as a forum for multilateral discussion. Overall, a broad conclusion from the interviews with the delegates is that STCs are a credible signal that the measure or policy at issue, whether in draft form or already implemented, is impacting or has the potential to impact trade.

Directional Patterns and Partnerships among Members STCs Directed Toward and Raised By

The figures and tables above provide information about the STCs directed toward and raised by members. They mostly do not address the question of which members have raised STCs toward which trade partners. Tables 20-23 address this question based on the 1,546 pairings of members raising the STCs.

For developed and developing members as aggregated groups, the 198 STCs concerning all products directed toward developed members involve 639 pairings of members raising the

⁹ The minutes of the Committee meetings and related notifications and other documents are a second publicly-available resource about the dialogue around STCs. The minutes include the statements made by members raising each concern and responses from the members considering or imposing the measure. Participation in the STCs can be assessed on a meeting-by-meeting basis using the minutes. The relative weight of discussion among the issues raised can be evaluated and assessment can be made, at least in some cases, of how the dialogue evolved from the initial expression of concern through the final meeting at which the STC is raised. In a companion paper (Orden et al., 2019) we utilize the Committee minutes, notifications and related documents to characterize the discussion in a sample of 31 recent STCs concerning agri-food products that are relatively intense as reflected in having been raised by one or more member in four or more Committee meetings through November 2017.

STCs, as shown in the first column of Table 20. By comparison, there are 850 pairings in which a developed member raised an STC toward either a developed or developing member (second row of Table 20, also shown in Table 7). The 350 STCs concerning all products directed toward developing members involve 907 pairings of members raising the STCs, compared to 696 pairings in which a developing member raised an STC. Thus, developed members are involved in more pairings raising STCs than they are subject to pairings in STCs directed toward them. The opposite holds for developing members: they are involved in fewer pairings raising STCs than they are subject to pairings in STCs raised toward them. This is consistent with earlier results (Tables 5 and 7) that developed and developing members, respectively, are subject to 36.1% and 63.9% of the 548 STCs while they account for 55.0% and 45.0% of the 1,526 pairings of members raising an STC.

The 77 STCs concerning agri-food products directed toward developed members involve 326 pairings of members raising the STCs, compared to 372 pairings in which a developed member raised an agri-food STC. The 135 STCs concerning agri-food products directed toward developing members involve 420 pairings of members raising the STCs, compared to 374 pairings in which a developing member raised an agri-food STC. The contrast is sharper concerning other products. The 121 STCs concerning other products directed toward developed members involve 313 pairings of members raising the STCs, compared to 478 pairings in which a developed member raised an STC concerning other products. The 215 STCs concerning other products directed toward developing members involve 487 pairings of members raising the STCs, compared to 322 pairings in which a developing member raised an STC concerning other products. Again, these results are consistent with and shed additional light on the earlier findings. For example, developing members are subject to 63.7% of the STCs concerning agri-food products, while 56.3% of the pairings of members raising the agri-food STCs are in STCs directed toward developing members.

Looked at from another angle, the dominant pairings concerning all products is developed members raising STCs directed toward developing members, accounting for 642 (41.5%) of the 1,546 pairings. The second largest pattern of pairing concerning all products is developing members raising STCs directed toward developed members, accounting for 431 (27.9%) of pairings. Developing members raising STCs toward other developing member are the third largest group of pairings, accounting for 265 (17.1%). Pairings of developed members

raising STCs directed toward other developed members account for the smallest number (208) and percent (13.5%) of the pairings of members raising the STCs concerning all products.

Across agri-food and other products, the patterns of which members have raised STCs toward which other members are broadly similar to those concerning all products when expressed as percentages. Developed members raising STCs directed toward developing members is the dominant pairing concerning both agri-food and other products (35.4% of the 746 agri-food pairings and a higher 47.3% of the 800 other product pairings). Developing members raising STCs directed toward developed members is the second largest pairing pattern concerning both categories of products (29.2% for agri-food and 26.6% for other products). A larger percent of the agri-food pairings (20.9%) compared to other product pairings (13.6%) arise from developing members raising STCs directed toward other developing members. This difference offsets the lower percent concerning agri-food compared to other products of pairings in which developed members raise STCs directed toward developing members. Pairings of developed members raising STCs directed toward other developed member account for the smallest percent of the pairings of members raising the STCs concerning both agri-food (14.5%) and other products (12.5%).

The lower part of Table 20 extends the analysis of pairings of members raising the STCs. The number of pairing of developed and developing members raising the STCs are shown separately for those in which the STC is raised only by developed or developing members—including by just one member—and those pairings that are jointly raised by one or more developed and one or more developing members.

Of the 850 pairings in which a developed member raises an STC concerning all products toward either a developed or developing member, 411 (48.4%) occur in STCs raised only by one or more developed members, while 439 (51.6%) occur in STCs also raised by one or more developing members. Developing members are relatively less likely to be involved in STCs that are raised only by developing members (234 (33.6%) of their total of 696 pairings raising STCs) and relatively more likely to have raised STCs that are also raised by one or more developed members (462 (66.4%) of the pairings raised by developing members).

Looking further at the distributions of pairings shown in the lower part of Table 20, among the 642 developed member pairings in the 350 STCs concerning all products directed toward developing members 334 (52.0%) are pairings in which developed members are raising

these STCs on their own or only with other developed members. The percent is only 40.2% for the 135 agri-food STCs compared to 60.3% for the 215 other products STCs directed toward developing members, thus developed members are less likely to be raising STCs without developing members concerning agri-food than concerning other products. Among the 431 pairings of developing members raising the 198 STCs concerning all products directed toward developed members 179 (41.5%) are raised on their own or only with other developing members. The percentages are 48.2% for the 77 agri-food STCs compared to 34.7% for the 121 other products STCs, thus developing members are more likely concerning agri-food than concerning other products to raise STCs toward developed members without other developed members also raising those STCs.

Pairings of a member raising an STC that is raised by both developing and developed members is relatively most likely to occur when developing members raise STCs toward other developing member. Of these 265 pairings concerning all products, 55 (20.8%) occur in STCs raised only by developing members (17.3% for agri-food and 25.7% for other products), while 79.2% occur in STCs also raised by one or more developed members (82.7% for agri-food and 74.3% for other products). Finally, of the 208 pairings in which developed members raise STCs directed toward other developed members, 37.0% concerning both both agri-food and other products occur in STCs that are raised only by developed members, while 63.0% of the pairings of developed members raising STCs directed toward other developed members occur in STCs that are also raised by one or more developing members.

One cannot discern from the results in Table 20 whether developed or developing members or a combination of members from both groups take a leading role in those STCs raised jointly by developed and developing members. Nonetheless, it is noteworthy how relatively infrequent it is for an STC concerning agri-food or other products to be raised only by developing members directed toward other developing members. To a lesser extent this also applies to developed members raising an STC directed toward other developed members. Conversely, to summarize, when developed members are raising STCs concerning other products directed toward developing members it is relatively most likely that the developed members are raising the STC without any developing members raising it jointly, while for agri-food products these STCs are more often raised jointly. When developing members are raising an STC directed toward developed members it is about equally likely that the developing

members are raising the STCs concerning agri-food products with and without one or more developed members raising it jointly, while when developing members are raising STCs concerning other products directed toward developed members relatively more often other developed members are also raising the STC.

Tables 21 extends the upper part of Table 20 by disaggregating into the eight groups of members for the STCs concerning all products. There are some differences among the groups of members compared to the developed/developing aggregated results. Among the developed members, the U.S. and the other DDHI members are involved in more pairings raising STCs (241 and 353, respectively, shown in the last column of Table 21 and earlier in Table 8) than there are pairings of members raising STCs directed toward them (84 and 119, respectively, new results shown in the last row of Table 21). This is consistent with the U.S. and the other DDHI members raising more STCs than have been directed toward them, as discussed earlier (see Tables 6 and 8). In contrast, although the EU also raises more STCs than are directed toward it, the STCs directed toward the EU involve far more pairings of members raising those STC than the number of pairings in which the EU is raising an STC (436 versus 256). Among the developing members, there is a similar contrast between pairings for the BRIC members (380 pairings in STCs directed toward the BRIC compared to 130 pairings in which the BRIC raise an STC). This is consistent with the BRIC members having been subject to more STCs than the distinct STCs they have raised. For the other developing member groups, the comparisons are closer, with somewhat more pairings in STCs directed toward DGHI and DGLM members than pairings in which they are raising STCs (173 versus 170 and 139 versus 118, respectively). The opposite holds for DGUM members (212 pairings of members raising STCs directed toward DGUM versus 259 pairings in which they are raising an STC). Only one STC has been directed toward an LDLI member by three developed members, while the LDLI members have been involved in 19 pairings raising STCs.

Looking across the eight disaggregated developed/developing groups some additional differences are noted. Using the data in Table 21, each row of Table 22 shows the percent of pairings by each group of members directed toward the groups of members shown in the column headings as a percent of the total number of pairing raised by that row group (row sums equal 100%).

Among the developed members, more than 20% of the pairings raised by the U.S. and the other DDHI members are directed toward the EU, while less than 10% of the STCs raised by the EU are directed toward other developed members. Relatively high percentages of the pairings by the U.S., EU and other DDHI members are directed toward the BRIC members (31.1%, 38.3% and 28.9%, respectively). The percent of pairings by developed members directed toward other groups of developing members generally decline slightly as income levels are lower among those groups of developing members.

Among the developing members, pairings by the BRIC raising an STC are concentrated toward developed members, particularly the EU (51.5%) followed by the U.S. (17.7%). Pairings in STCs raised by other developing members that are directed toward the EU are also relatively high as percentages of their total pairings. For DGHI members, relatively high percent of their pairings are directed toward BRIC and DGUM members (20.0% and 15.9%, respectively), while a relatively high percent of pairings of DGUM members are directed among themselves (16.6%). Half of the pairings of DGLM members raising STCs are directed toward the EU and about one-fifth toward both the other DDHI members and BRIC members. Of the small number of pairings raised by LDLI members nearly half are directed toward the other DDHI members and the rest toward the EU and BRIC members.

Table 23 presents a different perspective on the pairings of which members raise STCs toward which other members. It shows the percent of the pairings directed toward each member group in the column heading that occur from each row group (column sums equal 100%). Of the pairings directed toward developed members, pairings of other developed members raising the STCs account for 32.2% toward the U.S., 30.9% toward the EU and 38.7% toward other DDHI (sums of first three rows in Table 23). The developed members account for 61.3% of the pairings directed toward DGUM members up to 79.7% of those directed toward DGHI members and for all pairings in the one STC directed toward an LDLI member. BRIC members account for 27.4% of the pairings directed toward the U.S. but only 15.4% of the pairings directed toward the EU (despite over half of the pairings by the BRIC being toward the EU). The BRIC account for only 6.7% or less of the pairings directed toward other groups of members. Excluding the one STC directed toward an LDLI member, the DGHI, DGUM and DGLM members account for between 0.5% (DGLM toward other DGUM) and 24.3% (DGUM toward EU) of the pairings directed toward the various member groups.

Tables 21-23 disaggregate the directional pattern for all products of pairings directed toward and raised by developed and developing members among the eight groups of members, expanding on the aggregated results shown in the top part of Table 20. While not included in the paper, corresponding disaggregated tables differentiating between the directional patterns of pairings concerning agri-food and other products shown also in the top part of Table 20 at an aggregated level add two additional insights about which members raise STCs directed toward which trade partners.¹⁰ Specifically, these agri-food and other product tables show that of the 35.4% of agri-food pairings raised by developed members toward developing members, 9.1% are toward the BRIC members and 26.3% are toward the other four groups of developing members. Of the 47.3% of other product pairings raised by developed members toward developing members, 25.9% are toward the BRIC members and 21.4% are toward the other four groups of developing members. Thus, the higher share of pairings of developed members raising STCs directed toward developing members concerning other products versus agri-food products arises from the pairings directed toward the BRIC members; the share of pairings of developed members raising STCs directed toward the other four groups of developing members is higher for agri-food products than for other products. The disaggregated tables for agri-food and other products also show that the higher share of agri-food compared to other product pairings of developing members raising STCs directed toward developing members (20.9% versus 13.6%) is due primarily to the number of pairings of DDUM members raising these concerns (10.7% of all agri-food pairings are DDUM directed toward developing members, versus 6.1% of all other product pairings).

The tables and discussion above addresses pairings in terms of members raising STCs directed toward other members. For a final perspective we also assess the partnerships formed among the eight groups of members in their pairings as they raise STCs. This extends the analysis of STCs raised only by developed members, only by developing members or by both developed and developing members shown in the lower part of Table 20.

In assessing the partnerships that occur in raising STCs, a new question comes up about the most informative way to count the number of times members have joined together. One approach is to count each directional bilateral match, so if the U.S. and the EU together raise a single STC, then two partnerships are counted: the U.S. has one partner (the EU) and the EU has

¹⁰ The six additional tables for agri-food and other products are available on request.

one partner (the U.S.). This allows the partnerships to be expressed from the perspective of each member, but leads to a very large number of partnerships being counted. If N members raise an STC, then counting directional bilateral matches leads to $N-1$ partnerships for each member raising the STC, and a total of $N*(N-1)$ partnerships. This multiplicative count puts heavy weight on STCs raised by larger numbers of members. It also puts heavy weight on larger groups of members.

To avoid some of the effect of such weighting, we assess partnerships among the eight groups of members as they have raised STCs in an alternative way. For each distinct STC raised by the groups of members, we report how many times one or more members of the other seven groups joined in raising that STC. Each of these matches is counted as a directional partnership between the two groups.

The results of this count of partnerships raising STCs are shown in Tables 24 and 25, structured similarly to the earlier tables about correlations of objectives and issues. The number of distinct STCs raised by each group of members are shown on the main diagonal of Table 24 (also shown earlier in Table 8). The off-diagonal numbers in Table 24 show how many times other groups of members joined in raising these STCs. The table is symmetric: for example the U.S. and EU joined in raising 136 STCs, out of 241 raised by the U.S. and 256 raised by the EU. The U.S. was joined in the 241 STCs it raised a total of 489 times (sum of the off-diagonal numbers in the U.S. column) by one or more members of the other seven groups. Overall, counting directional matches this way, in the 548 STCs there are 2,372 directional partnerships among the eight groups of members. If each partnership is only counted one time (e.g. the U.S. and EU partnering in raising a single STC is only counted as one partnership), then there are 1,186 such (non-directional) partnerships.

The partnership results are expressed in percent terms in Table 25. The numbers above and below the main diagonal show the percent of the distinct STCs raised by the group in each column heading that were also raised by one or more members of each row group. The table is no longer symmetric; for example, the 136 STCs raised jointly by the U.S. and EU are 53.1% of the 256 STCs raised by the EU, while the same 136 STCs raised jointly are 56.4% of the 241 STCs raised by the U.S.

The results in Table 25 show that not only have developed members raised a large number of STCs but there are also high levels of partnerships among developed members. The

percentages of partnerships among the U.S., EU and the other DDHI groups range from 43.0% (other DDHI of the STCs raised by the EU) to 64.3% (U.S. of the distinct STCs raised by the other DDHI members). With the high numbers of STCs raised by the developed members, they could also have high percentages of partnerships with the groups of developing members. These percent are generally lower indicating more independence between STCs raised by developed and developing members than among developed members.

The partnerships measured by percentages of the distinct STCs raised by developed members that are also raised by one or more members of the developing groups are constrained by the lower total numbers of distinct STCs the developing groups have raised. The BRIC, DGHI and DGUM groups have raised similar numbers of distinct STCs, so potentially partnership percentages could be high again, but they are mostly relatively low, again indicating relative independence between the STCs raised by these groups. The DGLM and LDLI members have raised relatively few STCs. The LDLI group has been in partnerships with other developing member groups on higher percentage terms than with developed members, with results somewhat mixed for DGLM. With their low levels of involvement raising STCs the partnerships the DGLM and LDLI have with other groups are low as a percent of the STCs raised by these other groups.

It is also interesting to compare the partnerships members form in raising STCs to the contestation between those same members as they raise STCs directed toward each other. While 20.3% of the STCs raised by the U.S. have been directed toward the EU (Table 22), for a different 56.4% raised by the U.S. the EU has been a partner in bringing an STC toward a third member. The difference is more pronounced in terms of the EU raising an STC directed toward the U.S. versus being a partner of the U.S. (5.1% versus 53.1%). Comparisons cannot be made so directly for the groups with more than one member between the percent of bilateral pairings of the group of members in raising STCs directed toward members shown in Table 22 and the percent of distinct STCs which groups of members have been partners raising shown in Table 25. Nevertheless, the point to be made is that perspectives of members shift as different STCs arise. Members who are at odds on one concern are often partners on other concerns. Providing a common forum for the multilateral discussion and interface around differing alignments about specific regulatory measures is a useful dimension of the STC process through the WTO.

Summary and Conclusions

This section provides a summary of our review and evaluation of the STCs that have been raised about TBT regulatory measures affecting trade of agri-food and other products, and we draw together conclusions from the analysis. Among the 548 STCs raised during 1995-2017 we distinguish between 212 (38.7%) that concern measures related to agri-food products and 336 (61.3%) that concern measures related to other products. The TBT Agreement seeks to strike a balance for all products between the rights of WTO members to enact regulatory measures to achieve legitimate policy objectives and the need to discipline these rights in order to avoid the creation of unnecessary obstacles to international trade. The Agreement describes legitimate objectives of TBT measures and key principles for adherence that members have agreed upon concerning both the regulatory process and implementation of measures and their substance.

In the context of the intent of the TBT Agreement, it makes sense to begin the summary with the objectives of the measures that have been subject to STCs and the issues of concern stated by members raising these STCs. We find it informative to differentiate the categories of objectives that have been articulated in the STCs between four that can be considered, in our assessment, as legitimate risk-related objectives (protection of human health or safety, protection of the environment, protection of animal or plant health or life, and national security) and four stated in terms of achieving legitimate market performance objectives (consumer information/labeling, prevention of deceptive practices/consumer protection, quality requirements, and harmonization). The issues raised in the STCs can be distinguished between five categories related to guidelines and stipulations in the Agreement in terms of the regulatory process and implementation of measures (further information/clarification, transparency, reasonable time to adapt, technical assistance, and special and differential treatment) and five related to the substance of the measures (unnecessary barrier to trade, rationale/legitimacy, international standards, discrimination, and npr-PPMs).

Throughout our analysis we find a number of broad similarities between the STCs concerning agri-food and other products, but also some important differences. The two most frequently stated objectives of measures subject to STCs concerning all products are risk-related protection of human health or safety and protection of the environment. The next two most frequently stated are the two market performance objectives of consumer information/labeling

and prevention of deceptive practices/consumer protection. The other four categories of objectives are relatively infrequently given as the purpose of the measures.

Protection of human health or safety is stated as an objective in nearly half of the STCs concerning both agri-food and other product and is stated relatively more frequently by developing members, especially concerning agri-food products. In contrast, protection of the environment is stated in about one-quarter of the STCs and is relatively more frequently stated by developed members and concerning other products. The two most frequently articulated market performance objectives are stated in one-quarter or more of the agri-food STCs but in less than 15% of the other product STCs. Developing members state these two objectives relatively more frequently than developed member concerning both agri-food and other products. There is general similarity to the aggregated results when the developed and developing members are disaggregated into eight groups. There are also interesting correlations among the objectives stated by members for their TBT measures. These correlations suggest that very often when a market performance objective is given, that objective is a means toward achieving a risk-related ends. Conversely, somewhat less frequently, but still often, to achieve a risk-related objective the means is through a measure related to market performance.

Among the issues members raise about compliance of the measures STCs are directed toward with the principles of the TBT Agreement the most frequently raised issue is queries about further information/clarification. This issue is brought up in two-thirds of the STCs concerning both agri-food and other products. Transparency is raised as an issue in over half of the STCs, and reasonable time to adapt in about one-quarter of the STCs, again concerning both agri-food and other products. These three process and implementation issues are raised relatively more frequently in STCs directed toward developing members than directed toward developed members, particularly concerning agri-food products. Only a very few members raise special and differential treatment or technical assistance as issues, and these few cases are primarily in STCs directed toward developed members.

The second most frequently raise issue overall concerns the possibility of a measure creating an unnecessary barrier to trade. This issue about the substance of measures is raised in nearly three-fifths of the STCs concerning both agri-food and other products. Unnecessary barrier to trade is raised as an issue relatively more frequently in STCs concerning agri-food products among those directed toward developed members, but relatively more frequently in

STCs concerning other products among those directed toward developing members. Three other substantive issues (rationale/legitimacy, international standards and discrimination) are raised in about 30%-40% of the STCs concerning all products and two of these (rationale/legitimacy and discrimination) at somewhat higher relative frequencies in the STCs concerning agri-food compared to other products. There is again general similarity to the aggregated results when the developed and developing members are disaggregated into eight groups to assess the issues raised in the STCs.

There are also interesting correlations among the issues of concern raised in the STCs. Further information/clarification is raised in two-thirds or more of the STCs concerning all products in which any other issue is raised, and transparency in half or more. Similarly, unnecessary barrier to trade is raised in three-fifths or more of the STCs concerning all products in which any other issue is raised. The other process/implementation and substantive issues are raised in less than half of the STCs in which other issues are also raised. One interpretation of these correlations is that each of the other substantive issues arises as a driving concern in a subset of those STCs in which unnecessary barrier to trade is raised as an issue, while at higher relative frequencies when one of the other substantive issues is raised the argument is pushed through to raising the issue of unnecessary barrier. A second broad conclusion from the correlations among the issues raised is that often the STCs involve both information gathering and expressions of concerns on a substantive basis.

The second thrust of our analysis addresses participation in the STCs. Seventy-three members have been involved in the STCs concerning all products, with one or more STCs directed toward 48 members and 67 members having raised one or more concerns. We assess participation of the 73 members at the aggregated level of developed and developing members and by disaggregating into eight groups based on WTO self-designation and World Bank income criteria. The U.S., EU and BRIC are distinguished among the eight groups based on the size of these economies and their high levels of participation in the STCs. We measure participation using numbers of STCs directed toward members and numbers of bilateral pairings of members raising STCs toward their trade partners. For the six groups with more than one member, we sometimes also discuss the number of distinct STCs that group has raised, which is less than the number of bilateral pairings by members of that group to the extent that more than one member of the group raised any of the STCs.

Two initial findings merit summarizing. First, the number of STCs directed toward members, and the number of members involved in raising STCs, have both increased markedly in recent years. This reflects the value members place on meetings of the TBT Committee as a forum for discussion and resolution of regulatory issues. Comparing a recent sub-period (2006-2017) to an early sub-period (1995-2005), percentage increases are higher concerning agri-food products compared to other products both for the average number of new STCs initiated per year and the number of members raising the STCs. The percent of STCs initiated that concern agri-food products increases from 36.7% in the early sub-period to 39.3% in the more recent sub-period, while the percent of pairings raising agri-food STCs increases from 41.9% to 50.0%. Thus, the relative importance of STCs concerning agri-food products has increased not decreased. Second, member participation raising STCs and their duration show a skewed distribution. The majority of STCs are raised by only one or a few members and only one or a few times, while a smaller set of STCs are raised by larger numbers of members and/or have longer duration. We include all of the STCs in the analysis in this paper, but focus in a companion paper (Orden et al. 2019) on an in-depth assessment of a subset of 31 recent agri-food STCs that have been raised four or more times and thus represent the set of more intense discussions.

Our assessment of participation in the STCs during 1995-2017 at the aggregated level of developed and developing members is summarized in Figure 6, which extends the introductory summary provided earlier. Of the 548 STCs during the twenty-three years, 212 (38.7%) concern agri-food products, while 336 (61.3%) concern other products. A higher percent of the 1,546 bilateral pairings of a member raising an STC occur in the STCs concerning agri-food products: 746 (48.3%) compared to 800 (51.7%) concerning other products. This reflects that on average larger numbers of members raise the agri-food STCs.

When STCs and the pairings of members raising the STCs are broken down between developed and developing members some interesting similarities and differences are noted. As shown in the top part of Figure 6, about 36% of the STCs concerning both agri-food and other products during the twenty-three years 1995-2017 are directed toward developed members and about 64% are directed toward developing members. Correspondingly, 36.1% of the STCs concerning all products are directed toward developed members and 63.9% are directed toward developing members (as can be computed from the agri-food and other products results shown in

Figure 6). The share of STCs concerning all products directed toward developing members increases from 53.9% in the early sub-period 1995-2005 to 66.9% in the recent sub-period 2006-2017 (sub-period results developed in the paper are not shown in Figure 6). The share of the STCs directed toward developed members that concern agri-food products increases in the recent sub-period compared to the early sub-period, while the share concerning agri-food products drops slightly among the STCs directed toward developing members.

Developed members account for 55.0% of the pairings raising the STCs concerning all products and developing members for 45.0% during 1995-2017 (as can be computed from Figure 6). There has been only a slight increase between the early and recent sub-periods in the share of the pairings accounted for by developing members. Thus, developing members have not increased their relative participation in raising STCs to the same extent that they have become relatively more likely to be subject to an STC in the recent sub-period compared to the early sub-period. The share of pairings of developing members raising STCs concerning agri-food products out of the total pairings raising STCs concerning all products increases from the early to recent sub-period, while other pairings of developed and developing members decline as shares of all of the pairings in each sub-period. Over the twenty-three years, STCs concerning agri-food products account for 53.7% of the developing member pairings, versus 43.8% for developed members (again this can be computed from Figure 6).

Disaggregation among eight groups of members (not shown in Figure 6) provides some additional insights about the STCs concerning agri-food and other products directed toward developed and developing members. Among developed members, the EU is subject to more STCs than the U.S. or other developed-high income members. The share of these STCs concerning agri-food products is higher for the EU and the other developed-high income members than for the U.S. A substantial share of the increased number of STCs directed toward developing members in recent years are toward the BRIC members, reflecting the accession of China in particular and concerns of other members about its regulatory measures, particularly concerning other products. Only 28.8% of the STCs directed toward the BRIC members during 1995-2017 concern agri-food products, while this share increases from over one-third to 100% as income levels decline among other groups of developing members.

The lower part of Figure 6 utilizes the bilateral pairings to assess which members have raised STCs toward which other members. The results presented in the earlier summary Figure 1

are elaborated to include our findings on pairings in which only developed or developing members raise STCs versus pairings that occur in STCs raised by at least one developed and one developing member.

Overall, developed members are involved in more pairings raising STCs (shown in the top part of Figure 6) than they are subject to pairings directed toward them (summed in the third from bottom row of Figure 6). The opposite holds for developing members: they are involved in fewer pairings raising STCs than they are subject to pairings directed toward them. These results are consistent with the developing members being subject to 63.9% of the 548 STCs concerning all products while they account for only 45.0% of the 1,526 pairings of members raising the STCs.

The patterns of developed and developing member pairings in raising STCs and being subject to pairings in STCs directed toward them are broadly similar concerning agri-food and other products. Developed members raising STCs directed toward developing members are the dominant pairings concerning both agri-food and other products (35.4% of the 746 agri-food pairings and a higher 47.3% of the 800 other product pairings, with the difference in these shares due to the large number STCs concerning other products directed toward the BRIC members by developed members). Developing members raising STCs directed toward developed members is the second largest share of pairings (29.2% for agri-food and 26.6% for other products). A larger percent of the agri-food pairings (20.9%) compared to other product pairings (13.6%) arise from developing members raising STCs directed toward other developing members—this difference arises primarily from a large number of STCs concerning agri-food products raised by upper-middle-income developing members toward developing members, and this difference offsets the lower percent of pairings in which developed members raise STCs directed toward developing members concerning agri-food compared to other products. Finally, pairings of developed members raising STCs directed toward other developed members account for the smallest percent of the pairings of members raising the STCs concerning both agri-food (14.5%) and other products (12.5%). Thus, there has been multi-dimensional involvement in the STCs with developed members raising STCs directed toward developing members relatively more frequently concerning other products and developing members raising STCs directed toward other developing members relatively more frequent concerning agri-food products.

Considering whether an STC is raised by at least one developed member and at least one developing member adds additional insights. Only 40.2% of the pairings of developed members raising STCs concerning agri-food products directed toward developing members occur without any developing member having also raised the STC; this increases to 60.3% for other products. Nearly half of the pairings of developing members raising STCs concerning agri-food products directed toward developed members, but only about one-third concerning other products, occur without any developed member also raising the STC. In contrast, nearly three-quarters or more of the pairing of developing members raising STCs concerning both agri-food and other products directed toward other developing member occur in STCs that are also raised by at least one developed member. Similarly, for both agri-food and other products almost two-thirds of the pairings of developed members raising STCs toward other developed member occur in STCs also raised by at least one developing member. One cannot discern whether developed or developing members or a combination of members from both groups take a leading role in those STCs raised jointly by developed and developing members. Nonetheless, it is noteworthy that it is relatively least likely for STCs concerning either agri-food or other products to be raised only by developing members directed toward other developing members.

Disaggregating into the eight groups of members adds some further insights about the pairings in STCs concerning all products directed toward developed and developing members compared to the pairings in STCs they raise (again, disaggregated results are not shown in Figure 6). The U.S. and the group of other developed-high income members are involved in more pairings raising STCs, and the other developed-high income members also raise more distinct STCs with their pairings, than the number of STCs directed toward the group. Although the EU raises more STCs than are raised toward it, there are more pairings of members raising the STCs directed toward the EU. There are also more STCs raised towards the BRIC members, and many more pairings of members raising these STCs, than the number of distinct STCs or pairings raising STCs by the BRIC members. STCs directed toward the EU and BRIC members together account for 46.6% of the STCs directed toward all members, and for 52.8% of all pairings raising STCs. For the groups of developing members other than the BRIC members, the pairings and number of distinct STCs they raise generally exceeds the pairings and number of STCs directed toward the group. Substantial increases from the early to recent sub-period in the number of pairings in which developing members with upper-middle and lower-middle incomes

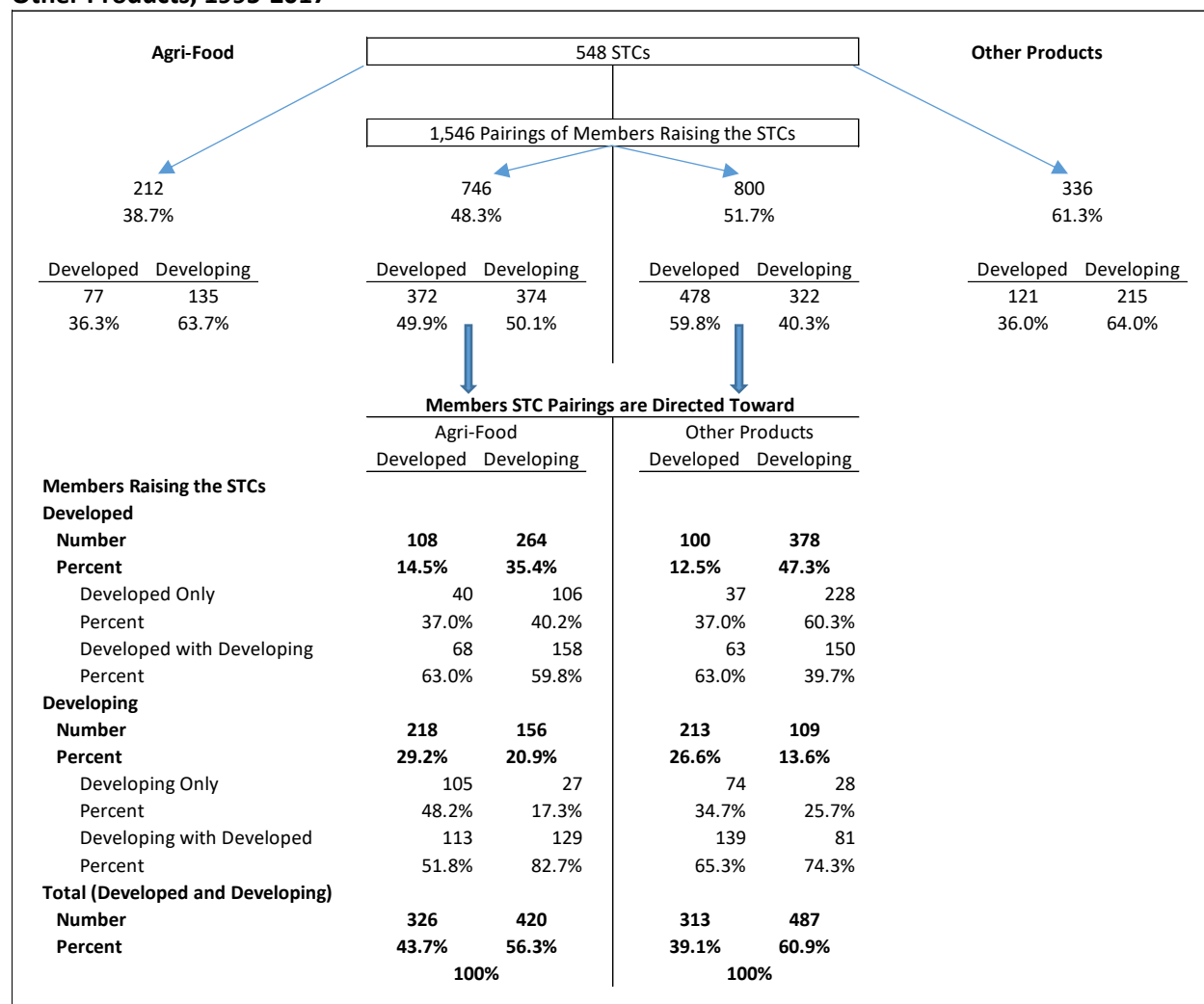
raise STCs concerning agri-food products account for a large part of the overall increase in pairings in which developing members raise agri-food STCs.

At the disaggregated level in terms more specifically of which members raise STCs toward which other members, of the pairings by the U.S., EU and other developed members raising STCs concerning all products, the highest shares (25%-50%) are in STCs directed toward the BRIC members. Less than 10% of the pairings raised by the EU are directed toward the U.S. or the other developed-high income members. The shares of pairings of developed members directed toward the developing member groups generally decline slightly as income levels are lower among those developing members. Pairings of the five groups of developing members are concentrated in STCs raised toward the EU. These STCs account for 30%-50% of the pairings by developing members, with additional concentration of their pairings in STCs directed toward the BRIC members.

Finally, we evaluate the partnerships formed among members in raising STCs. To do this we assess the correlations among the eight groups of members in raising the distinct STCs in which each group is involved. The results show that not only have developed members raised a large number of STCs but there are also high levels of partnerships among developed members. The correlation percentages are lower between developed and developing members, indicating more independence between STCs raised by developed and developing members than among developed members. Partnership percentages are mostly relatively low among groups of developing members, again indicating relative independence between the STCs raised by these groups.

It is also interesting to compare the partnerships members form in raising STCs to the contestation between those same members as they raise STCs directed toward each other. Results we present make the point that perspectives of members shift as different STCs arise. Members who are at odds on one concern are often partners on other concerns. Thus, a principal inference from the analysis is that providing a common forum for the multilateral discussion and interface around differing alignments about specific regulatory measures is a useful dimension of the STC process through the WTO.

Figure 6. Member Participation in TBT Specific Trade Concerns, Concluding Summary, Agri-Food and Other Products, 1995-2017



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Compilation of Results: Figures 2-5 and Tables 5-25

Figure 2. New STCs Initiated per Year, Agri-Food and Other Products, 1995-2017

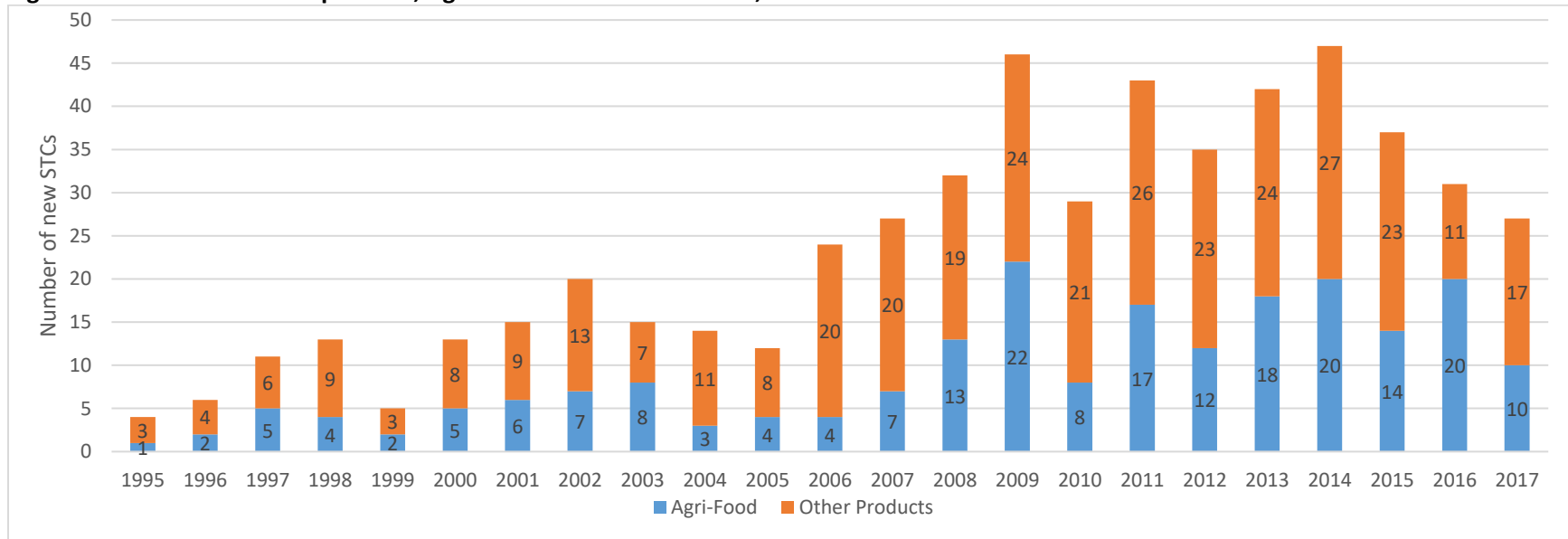


Table 5. STCs Concerning All Products, Agri-Food and Other Products Directed Toward Developed and Developing Members, 1995-2017 and Sub-Periods 1995-2005 and 2006-17

		All Products			Agri-Food			Other Products		
		Developed	Developing	Total	Developed	Developing	Total	Developed	Developing	Total
Full Period 1995-2017	(23 years)									
	Number	198	350	548	77	135	212	121	215	336
	Percent of All Products Total	36.1%	63.9%	100%	14.1%	24.6%	38.7%	22.1%	39.2%	61.3%
	Percent of Agri-Food and Other Products Totals				35.3%	63.7%	100%	36.0%	63.4%	100%
	Toward Developed	100%			38.9%			61.1%		
	Toward Developing		100%			38.6%			61.4%	
Sub-Periods	(11 years)									
	1995-2005									
	Number	59	69	128	20	27	47	39	42	81
	Percent of All Products Total	46.1%	53.9%	100%	15.6%	21.1%	36.7%	30.5%	32.8%	63.3%
	Percent of Agri-Food and Other Products Totals				42.6%	57.4%	100%	48.1%	51.9%	100%
	Toward Developed	100%			33.9%			66.1%		
	Toward Developing		100%			39.1%			60.9%	
2006-2017	(12 years)									
	Number	139	281	420	57	108	165	82	173	255
	Percent of All Products Total	33.1%	66.9%	100%	13.6%	25.7%	39.3%	19.5%	41.2%	60.7%
	Percent of Agri-Food and Other Products Totals				34.6%	65.4%	100%	32.2%	67.8%	100%
	Toward Developed	100%			41.0%			59.0%		
	Toward Developing		100%			38.4%			61.6%	

Table 6. STCs Concerning All Products, Agri-Food and Other Products Directed Toward Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017 and Sub-Periods 1995-2005 and 2006-17

	United States		European Union		Other Developed/High Income (DDHI)		BRIC		Developing/High Income (DGHI)		Developing/Upper-Middle Income (DGUM)		Developing/Lower-Middle Income (DGLM)		WTO Least Developed/Low Income (LDLI)	
	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products
Number of STCs																
Full Period																
1995-2017	14	35	48	68	15	18	40	99	30	49	35	48	29	19	1	0
All Products		49		116		33		139		79		83		48		1
Sub-Periods																
1995-2005	4	9	12	21	4	9	9	11	10	11	6	15	2	5	0	0
All Products		13		33		13		20		21		21		7		0
2006-2017	10	26	36	47	11	9	31	88	20	38	29	33	27	14	1	0
All Products		36		83		20		119		58		62		41		1
Percent Increase		176%		151%		54%		495%		176%		195%		486%		—
Percentages for each Group of Members (Agri-Food and Other Products sum each period = 100%)																
Full Period																
1995-2017	28.6	71.4	41.4	58.6	45.5	54.5	28.8	71.2	38.0	62.0	42.2	57.8	60.4	39.6	100	0
Sub-Periods																
1995-2005	30.8	69.2	36.4	63.6	30.8	69.2	45.0	55.0	47.6	52.4	28.6	71.4	28.6	71.4	0	0
2006-2017	27.8	72.2	43.4	56.6	55.0	45.0	26.1	73.9	34.5	65.5	46.8	53.2	65.9	34.1	100	0

Figure 3. Members Raising the STCs Initiated each Year, Agri-Food and Other Products, 1995-2017

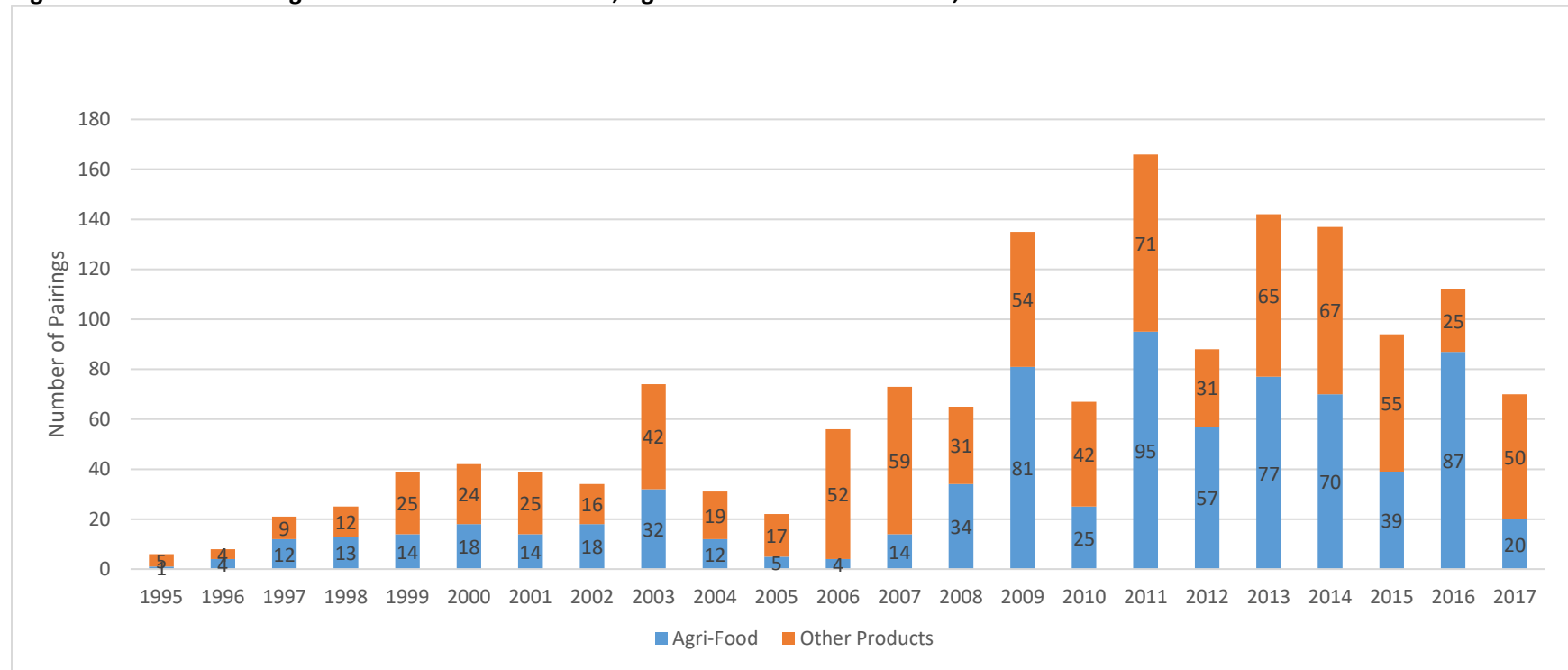


Table 7. Bilateral Pairings of Developed and Developing Members Raising STCs Concerning All Products, Agri-Food and Other Products, 1995-2017 and Sub-Periods 1995-2005 and 2006-17

		All Products			Agri-Food			Other Products		
		Developed	Developing	Total	Developed	Developing	Total	Developed	Developing	Total
Full Period 1995-2017	(23 years)									
	Number	850	696	1,546	372	374	746	478	322	800
	Percent of All Products Total	55.0%	45.0%	100%	24.1%	24.2%	48.3%	30.9%	20.8%	51.7%
	Percent of Agri-Food and Other Products Totals				49.9%	50.1%	100%	59.7%	40.3%	100%
	Raised by Developed	100%			43.8%			56.2%		
	Raised by Developing		100%			53.7%			46.3%	
Sub-Periods										
	1995-2005	(11 years)								
	Number	196	145	341	87	56	143	109	89	198
	Percent of All Products Total	57.5%	42.5%	100%	25.5%	16.4%	41.9%	32.0%	26.1%	58.1%
	Percent of Agri-Food and Other Products Totals				60.8%	39.2%	100%	55.1%	49.9%	100%
	Raised by Developed	100%			44.4%			55.6%		
	Raised by Developing		100%			38.6%			61.4%	
2006-2017	(12 years)									
	Number	654	551	1,205	285	318	603	369	233	602
	Percent of All Products Total	54.3%	45.7%	100%	23.6%	26.4%	50.0%	30.6%	19.3%	50.0%
	Percent of Agri-Food and Other Products Totals				47.3%	52.7%	100.0%	61.3%	38.7%	100%
	Raised by Developed	100%			43.6%			56.4%		
	Raised by Developing		100%			57.7%			42.3%	

Table 8. Bilateral Pairings Raising STCs Concerning All Products, Agri-Food and Other Products, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017 and Sub-Periods 1995-2005 and 2006-17

	United States		European Union		Other Developed/High Income (DDHI)		BRIC		Developing/High Income (DGHI)		Developing/Upper-Middle Income (DGUM)		Developing/Lower-Middle Income (DGLM)		WTO Least Developed/Low Income (LDLI)	
	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products	Agri-Food	Other Products
Full Period Number of Members Raising the STCs 1995-2017 All Products Number of Distinct STCs 1995-2017 All Products Average Raising each STC Sub-Periods Number of Members Raising the STCs 1995-2005 All Products 2006-2017 All Products Percent Increase																
	99	142	99	157	174	179	48	82	63	107	158	101	86	32	19	0
	241		256		353		130		170		259		118		19	
	99	142	99	157	90	123	44	71	50	78	74	58	40	22	8	0
	241		256		213		115		128		132		62		8	
	1.0		1.0		1.6		1.1		1.3		2.0		1.9		2.4	
	23	29	21	37	43	43	14	16	13	25	22	33	7	15	0	0
	52		58		86		30		38		55		22		0	
	76	113	78	120	131	136	34	66	50	82	136	68	79	17	19	0
189		198		267		100		132		204		96		19		
263%		241%		210%		233%		247%		271%		336%		–		
Percentages of Pairings for each Group of Members (Agri-food and Other Product sum each period = 100%)																
Full Period 1995-2017	41.1	58.9	38.7	61.3	49.3	50.7	36.9	63.1	37.1	62.9	61.0	39.0	72.9	27.1	100	0
Sub-Periods 1995-2005	44.2	55.8	36.2	63.8	50.0	50.0	46.7	53.3	34.2	65.8	40.0	60.0	31.8	68.2	0	0
2006-2017	40.2	59.8	39.4	60.6	49.1	50.9	34.0	66.0	37.9	62.1	66.7	33.3	82.3	17.7	100	0

Figure 4. Objectives of the Measures STCs Directed Toward Concerning All Products, Agri-Food and Other Products, 1995-2017

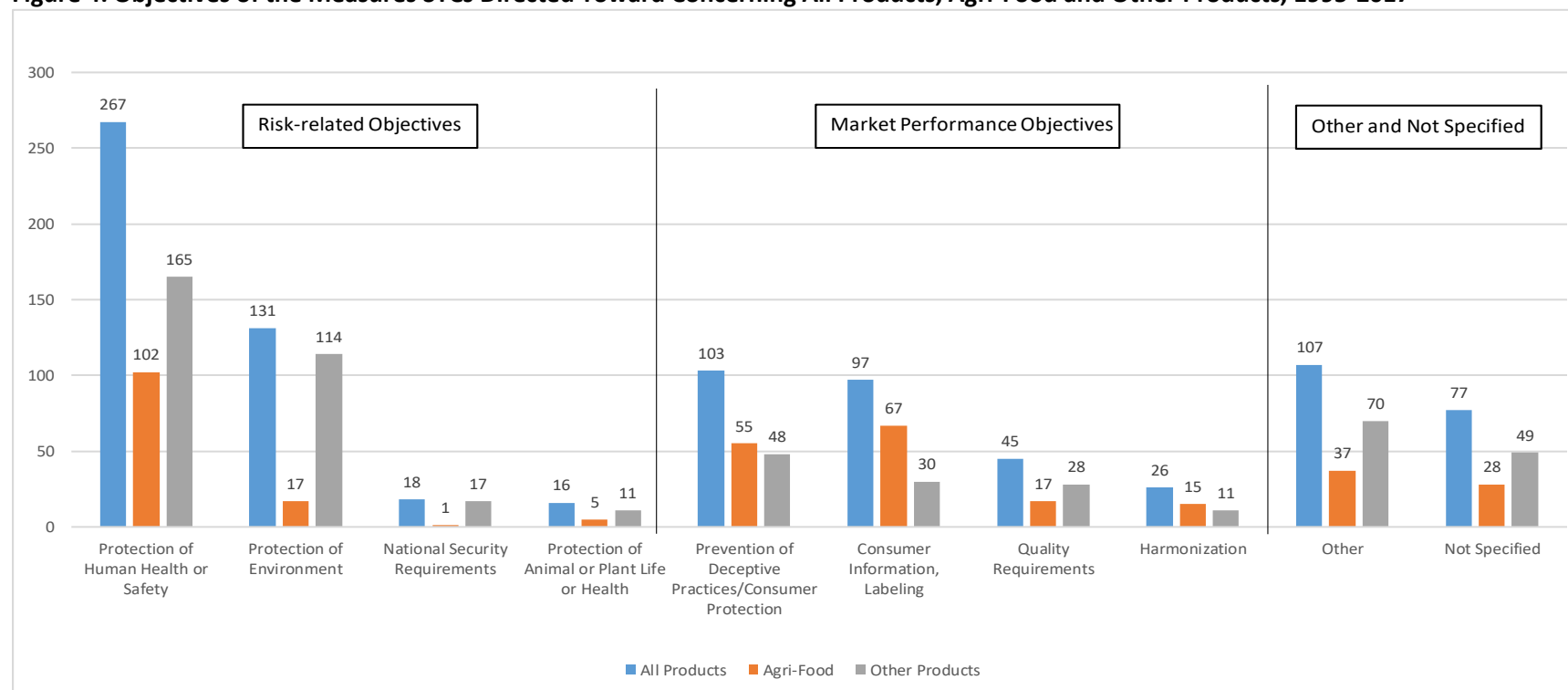


Table 9. Correlations among Objectives of Measures STCs Directed Toward, All Products and Members, 1995-2017

	Protection of Human Health or Safety	Protection of the Environment	National Security Requirements	Protection of Animal or Plant Life or Health	Prevention of Deceptive Practices/Consumer Protection	Consumer Information/ Labelling	Quality Requirements	Harmonization	Other
Risk-Related									
Human Health or Safety	267	68	4	12	55	47	30	13	43
Environment	68	131	4	10	22	11	7	4	27
National Security Requirements	4	4	18	2	3	0	1	0	5
Animal or Plant Health	12	10	2	16	4	0	2	1	3
Market Performance									
Prevention of Deceptive Practices	55	22	3	4	103	31	10	2	14
Consumer Information/Labelling	47	11	0	0	31	97	5	4	11
Quality Requirements	30	7	1	2	10	5	45	2	12
Harmonization	13	4	0	1	2	4	2	26	4
Other	43	27	5	3	14	11	12	4	107

Table 10. Percent Correlations among Objectives of Measures STCs Directed Toward, All Products and Members, 1995-2017

	Protection of Human Health or Safety	Protection of the Environment	National Security Requirements	Protection of Animal or Plant Life or Health	Prevention of Deceptive Practices/Consumer Protection	Consumer Information/ Labelling	Quality Requirements	Harmonization	Other
Risk-Related									
Human Health or Safety	100.0	51.9	22.2	75.0	53.4	48.5	66.7	50.0	40.2
Environment	25.5	100.0	22.2	62.5	21.4	11.3	15.6	15.4	25.2
National Security Requirements	1.5	3.1	100.0	12.5	2.9	0.0	2.2	0.0	4.7
Animal or Plant Health	4.5	7.6	11.1	100.0	3.9	0.0	4.4	3.8	2.8
Market Performance									
Prevention of Deceptive Practices	20.6	16.8	16.7	25.0	100.0	32.0	22.2	7.7	13.1
Consumer Information/Labelling	17.6	8.4	0.0	0.0	30.1	100.0	11.1	15.4	10.3
Quality Requirements	11.2	5.3	5.6	12.5	9.7	5.2	100.0	7.7	11.2
Harmonization	4.9	3.1	0.0	6.3	1.9	4.1	4.4	100.0	3.7
Other	16.1	20.6	27.8	18.8	13.6	11.3	26.7	15.4	100.0

Table 11. Objectives of the Measures STCs Directed Toward Concerning All Products, Developed and Developing Members, 1995-2017

	All Products			Agri-Food			Other Products		
	Developed	Developing	Total	Developed	Developing	Total	Developed	Developing	Total
Number of STCs	198	350	548	77	135	212	121	215	336
Number of Objectives	291	596	887	118	226	344	173	370	543
Average Number	1.5	1.7	1.6	1.5	1.7	1.6	1.4	1.7	1.6
Percent of STCs Directed Toward Members in which Each Objective is Articulated									
Risk-Related Objectives									
Protection of Human Health or Safety	41.4	52.9	48.7	35.1	55.6	48.1	45.5	51.2	49.1
Protection of the Environment	31.8	19.4	23.9	14.3	4.4	8.0	43.0	28.8	33.9
National Security Requirements	1.5	4.3	3.3	1.3	0.0	0.5	1.7	7.0	5.1
Protection of Animal or Plant Life or Health	2.5	3.1	2.9	2.6	2.2	2.4	2.5	3.7	3.3
Market Performance Objectives									
Prevention of Deceptive Practices/Consumer Protection	9.1	24.3	18.8	15.6	31.9	25.9	5.0	19.5	14.3
Consumer Information, Labelling	16.2	18.6	17.7	31.2	31.9	31.6	6.6	10.2	8.9
Quality Requirements	4.5	10.3	8.2	7.8	8.1	8.0	2.5	11.6	8.3
Harmonization	8.6	2.6	4.7	11.7	4.4	7.1	6.6	1.4	3.3
Other and Not Specified									
Other (1)	17.2	20.9	19.5	19.5	16.3	17.5	15.7	15.7	23.7
Not Specified	14.1	14.0	14.1	14.3	12.6	13.2	14.0	14.0	14.9

(1) Does not account for more than one other objective being raised in a single STC

Note: An additional set of objectives now tracked includes Lowering or Removing of Trade Barriers, Adoption of Domestic Law, Cost Saving and Increasing Productivity, and Trade Facilitation.

Table 12. Objectives of Agri-Food Measures STCs Directed Toward, Members Grouped by WTO Development and World Bank Income Categories, 1995-2017

	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGH)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	All Members
Number of STCs	14	48	15	40	30	35	29	1	212
Number of Objectives Stated	20	77	21	66	43	65	50	2	344
Average Number	1.4	1.6	1.4	1.7	1.4	1.9	1.7	2.0	1.6
Percent of STCs Directed Toward Members in which Each Objective is Articulated									
Risk-Related									
Human Health	35.7	31.3	46.7	55.0	40.0	62.9	62.1	100.0	48.1
Environment	14.3	16.7	6.7	2.5	3.3	2.9	10.3	0.0	8.0
National Security	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Animal or Plant Health	0.0	4.2	0.0	0.0	6.7	0.0	3.4	0.0	2.4
Market Performance									
Prevention of Deceptive Practices	7.1	18.8	13.3	40.0	30.0	34.3	20.7	0.0	25.9
Consumer Information/Labeling	28.6	35.4	20.0	30.0	23.3	45.7	24.1	100.0	31.6
Quality Requirements	14.3	8.3	0.0	10.0	6.7	2.9	13.8	0.0	8.0
Harmonization	0.0	14.6	13.3	0.0	16.7	0.0	3.4	0.0	7.1
Other and Not Specified									
Other (1)	21.4	20.8	13.3	12.5	10.0	25.7	17.2	0.0	17.5
Not specified	14.3	10.4	26.7	15.0	6.7	11.4	17.2	0.0	13.2

(1) Does not account for more than one other objective being raised in a single STC

Table 13. Objectives of Other Product Measures STCs Directed Toward, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGHI)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	All Members
Number of STCs	35	68	18	99	49	48	19	0	336
Number of Objectives Stated	44	102	27	169	76	91	34	0	543
Average Number	1.3	1.5	1.5	1.7	1.6	1.9	1.8	—	1.6
Percent of STCs Directed Toward Members in which Each Objective is Articulated									
Risk-Related									
Human Health	37.1	51.5	38.9	60.6	36.7	52.1	36.8	0.0	49.1
Environment	40.0	38.2	66.7	26.3	30.6	39.6	10.5	0.0	33.9
National Security	2.9	1.5	0.0	12.1	2.0	2.1	5.3	0.0	5.1
Animal or Plant Health	0.0	4.4	0.0	6.1	0.0	4.2	0.0	0.0	3.3
Market Performance									
Prevention of Deceptive Practices	11.4	1.5	5.6	14.1	14.3	41.7	5.3	0.0	14.3
Consumer Information/Labeling	8.6	5.9	5.6	5.1	20.4	10.4	10.5	0.0	8.9
Quality Requirements	0.0	2.9	5.6	9.1	8.2	12.5	31.6	0.0	8.3
Harmonization	0.0	11.8	0.0	1.0	4.1	0.0	0.0	0.0	3.3
Other and Not Specified									
Other (1)	11.4	19.1	11.1	27.3	16.3	12.5	52.6	0.0	20.8
Not specified	14.3	13.2	16.7	9.1	22.4	14.6	26.3	0.0	14.6

(1) Does not account for more than one other objective being raised in a single STC

Figure 5. Issues Raised about Measures STCs Directed Toward Concerning All Products, Agri-Food and Other Products, 1995-2017

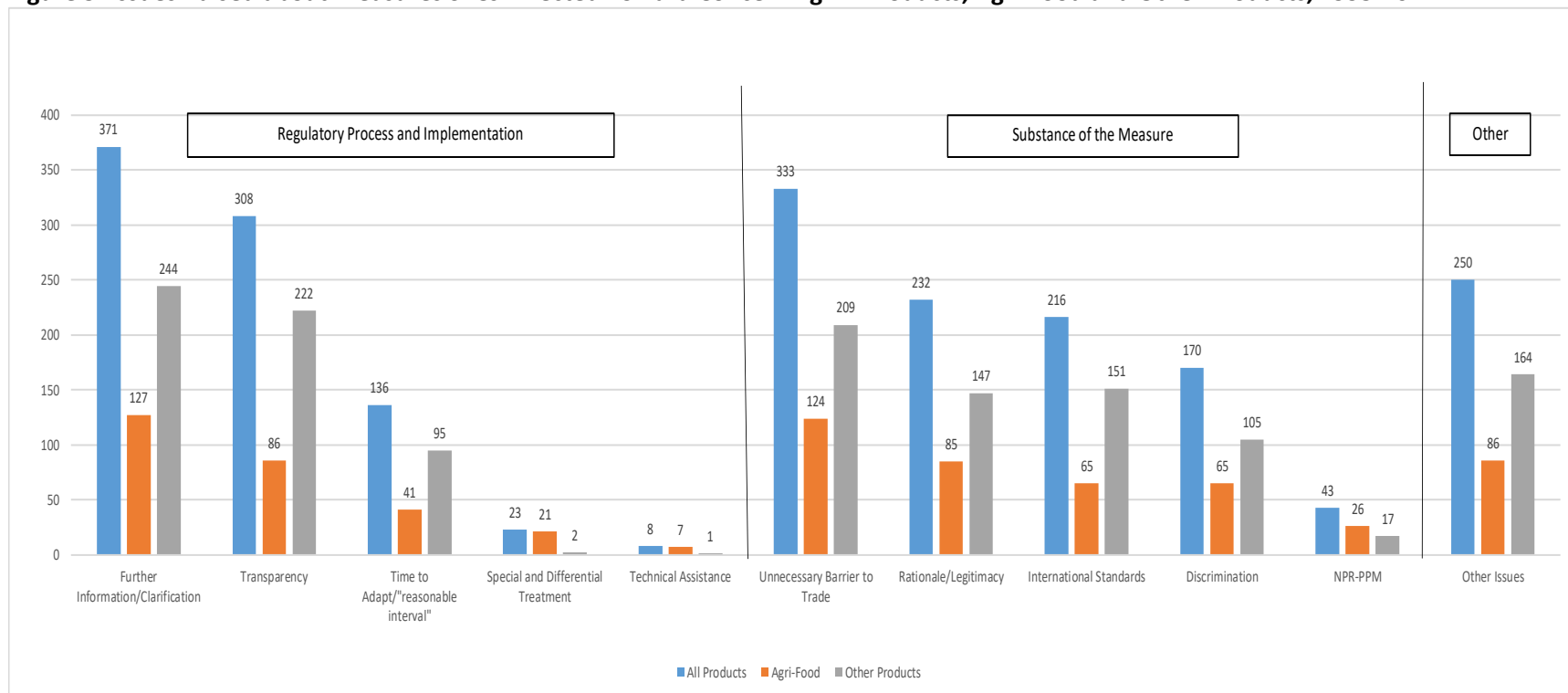


Table 14. Correlations among Issues Raised about Measures STCs Directed Toward, All Products and Members, 1995-2017

	Further Information/ Clarification	Transparency	Time to Adapt, "Reasonable Interval"	Special and Differential Treatment	Technical Assistance	Unnecessary Barrier to Trade	Rationale/Legitimacy	International Standards	Discrimination	NPR-PPM	Other
Regulatory Process and Implementation											
Further Information/Clarification	371	227	107	19	6	232	172	162	127	32	185
Transparency	227	308	103	18	6	192	136	132	118	21	152
Time to Adapt/"Reasonable Interval"	107	103	136	11	7	101	68	63	57	5	85
Special and Differential Treatment	19	18	11	23	6	22	14	14	15	3	16
Technical Assistance	6	6	7	6	8	8	4	3	3	1	5
Substance of the Measure											
Unnecessary Barrier to Trade	232	192	101	22	8	333	169	141	125	26	175
Rationale/Legitimacy	172	136	68	14	4	169	232	113	89	19	133
International Standards	162	132	63	14	3	141	113	216	72	8	113
Discrimination	127	118	57	15	3	125	89	72	170	16	91
NPR-PPM	32	21	5	3	1	26	19	8	16	43	21
Other Issues	185	152	85	16	5	175	133	113	91	21	250

Table 15. Percent Correlations among Issues Raised about Measures STCs Directed Toward, All Products and Members, 1995-2017

	Further Information/ Clarification	Transparency	Time to Adapt, "Reasonable Interval"	Special and Differential Treatment	Technical Assistance	Unnecessary Barrier to Trade	Rationale/Legitimacy	International Standards	Discrimination	NPR-PPM	Other
Regulatory Process and Implementation											
Further Information/Clarification	100.0	73.7	78.7	82.6	75.0	69.7	74.1	75.0	74.7	74.4	74.0
Transparency	61.2	100.0	75.7	78.3	75.0	57.7	58.6	61.1	69.4	48.8	60.8
Time to Adapt/"Reasonable Interval"	28.8	33.4	100.0	47.8	87.5	30.3	29.3	29.2	33.5	11.6	34.0
Special and Differential Treatment	5.1	5.8	8.1	100.0	75.0	6.6	6.0	6.5	8.8	7.0	6.4
Technical Assistance	1.6	1.9	5.1	26.1	100.0	2.4	1.7	1.4	1.8	2.3	2.0
Substance of the Measure											
Unnecessary Barrier to Trade	62.5	62.3	74.3	95.7	100.0	100.0	72.8	65.3	73.5	60.5	70.0
Rationale/Legitimacy	46.4	44.2	50.0	60.9	50.0	50.8	100.0	52.3	52.4	44.2	53.2
International Standards	43.7	42.9	46.3	60.9	37.5	42.3	48.7	100.0	42.4	18.6	45.2
Discrimination	34.2	38.3	41.9	65.2	37.5	37.5	38.4	33.3	100.0	37.2	36.4
NPR-PPM	8.6	6.8	3.7	13.0	12.5	7.8	8.2	3.7	9.4	100.0	8.4
Other Issues	49.9	49.4	62.5	69.6	62.5	52.6	57.3	52.3	53.5	48.8	100.0

Table 16. Issues Raised about Measures STCs Directed Toward Concerning All Products, Agri-Food and Other Products, Developed and Developing Members, 1995-2017

	All Products			Agri-Food			Other Products		
	Developed	Developing	Total	Developed	Developing	Total	Developed	Developing	Total
Number of STCs	198	350	548	77	135	212	121	215	336
Number of Issues	733	1,357	2,090	307	533	840	426	824	1,250
Average Number	3.7	3.9	3.8	4.0	3.9	4.0	3.5	3.8	3.7
Percent of STCs Directed Toward Members in which Each Issue is Raised									
Regulatory Process and Implementation									
Further Information/Clarification	64.1	69.7	67.7	62.3	71.9	68.4	65.3	68.4	67.3
Transparency	43.4	63.4	56.2	36.4	68.1	56.6	47.9	60.5	56.0
Time to Adapt/"Reasonable Interval"	20.7	27.1	24.8	14.3	26.7	22.2	24.8	27.4	26.5
Special and Differential Treatment	10.6	0.6	4.2	14.3	0.7	5.7	8.3	0.5	3.3
Technical Assistance	3.5	0.3	1.5	3.9	0.7	1.9	3.3	0.0	1.2
Substance of the Measure									
Unnecessary Barrier to Trade	62.6	59.7	60.8	70.1	55.6	60.8	57.9	62.3	60.7
Rationale/Legitimacy	42.9	42.0	42.3	48.1	46.7	47.2	39.7	39.1	39.3
International Standards	32.8	43.1	39.4	31.2	39.3	36.3	33.9	45.6	41.4
Discrimination	32.8	30.0	31.0	46.8	30.4	36.3	24.0	29.8	27.7
NPR-PPM	13.1	4.9	7.8	28.6	9.6	16.5	3.3	1.9	2.4
Other Issues (1)	43.4	46.9	45.6	42.9	45.2	44.3	43.8	47.9	46.4

(1) Does not account for more than one other issue being raised in a single STC

Table 17. Issues Raised about Agri-Food Measures STCs Directed Toward, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGH)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	All Members
Number of STCs	14	48	15	40	30	35	29	1	212
Number of Issues Raised	44	207	56	159	116	137	118	3	840
Average Number	3.1	4.3	3.7	4.0	3.9	3.9	4.1	3.0	4.0
Percent of STCs Directed Toward Members in which Each Issue is Raised									
Regulatory Process and Implementation									
Further Information/Clarification	57.1	64.6	60.0	65.0	70.0	77.1	75.9	100.0	68.4
Transparency	28.6	39.6	33.3	75.0	60.0	65.7	69.0	100.0	56.6
Time to Adapt/"Reasonable Interval"	14.3	14.6	13.3	22.5	30.0	37.1	17.2	0.0	22.2
Special and Differential Treatment	7.1	16.7	13.3	2.5	0.0	0.0	0.0	0.0	5.7
Technical Assistance	7.1	4.2	0.0	0.0	0.0	2.9	0.0	0.0	1.9
Substance of the Measure									
Unnecessary Barrier to Trade	42.9	83.3	53.3	57.5	60.0	48.6	55.2	100.0	60.8
Rationale/Legitimacy	28.6	50.0	60.0	42.5	43.3	48.6	55.2	0.0	47.2
International Standards	35.7	31.3	26.7	52.5	23.3	42.9	34.5	0.0	36.3
Discrimination	35.7	50.0	46.7	32.5	26.7	17.1	48.3	0.0	36.3
NPR-PPM	28.6	31.3	20.0	7.5	20.0	5.7	6.9	0.0	16.5
Other Issues (1)	28.6	45.8	46.7	40.0	53.3	45.7	44.8	0.0	44.3

(1) Does not account for more than one other issue being raised in a single STC

Table 18. Issues Raised about Other Product Measures STCs Directed Toward, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGH)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	All Members
Number of STCs	35	68	18	99	49	48	19	0	336
Number of Issues Raised	101	269	56	418	153	183	70	–	1,250
Average Number	2.9	4.0	3.1	4.2	3.1	3.8	3.7	–	3.7
Percent of STCs Directed Toward Members in which Each Issue is Raised									
Regulatory Process and Implementation									
Further Information/Clarification	60.0	70.6	55.6	71.7	63.3	66.7	68.4	–	67.3
Transparency	45.7	52.9	33.3	63.6	49.0	64.6	63.2	–	56.0
Time to Adapt/"Reasonable Interval"	25.7	19.1	44.4	32.3	16.3	27.1	31.6	–	26.5
Special and Differential Treatment	0.0	13.2	5.6	1.0	0.0	0.0	0.0	–	3.3
Technical Assistance	0.0	2.9	11.1	0.0	0.0	0.0	0.0	–	1.2
Substance of the Measure									
Unnecessary Barrier to Trade	51.4	58.8	66.7	65.7	49.0	60.4	84.2	–	60.7
Rationale/Legitimacy	20.0	51.5	33.3	43.4	30.6	47.9	15.8	–	39.3
International Standards	40.0	35.3	16.7	52.5	40.8	37.5	42.1	–	41.4
Discrimination	17.1	27.9	22.2	36.4	24.5	29.2	10.5	–	27.7
NPR-PPM	0.0	5.9	0.0	1.0	4.1	2.1	0.0	–	2.4
Other Issues (1)	28.6	57.4	22.2	54.5	34.7	45.8	52.6	0.0	46.4

(1) Does not account for more than one other issue being raised in a single STC

Table 19. Number of Members Raising STCs and Times Raised, All Products and Members, 1995-2017

	Number of Members Raising																						Total	Percent
	1	2	3	Sum 1-3	4	5	6	7	8	9	10	11	12	13	14	... 16	... 21	... 23	... 27	... 29	... 34			
Times Raised																								
1	144	34	12	190	4	6	1		1													202	36.9	
2	66	21	11	98	4	2	2		4	1	1											112	20.4	
3	23	24	9	56	5	1	4	1														67	12.2	
Sum 1-3	233	79	32	344																		381	69.5	
4	7	13	7		3	4	2		2		1	1	1		1							42	7.7	
5	6	7	8		4	1	1	1	1				1				1	1		1		33	6.0	
6	3	1	5		5	3	1	1	1	1	2											23	4.2	
7	2	3	4		4	1	2		1	1												18	3.3	
8	1	3			2	2		1														9	1.6	
9			1			3		2														6	1.1	
10	1		3			2																6	1.1	
11		1				1	1		1	1	1											6	1.1	
12			1			1			1			1	1									5	0.9	
13						1													1			2	0.4	
14											1					1						2	0.4	
15					1			1														2	0.4	
16								1														1	0.2	
17						1																1	0.2	
18						1	1			1												3	0.5	
... 20			1																			1	0.2	
21							1															1	0.2	
22					1	1																2	0.4	
... 28															1							1	0.2	
29														1								1	0.2	
... 34					1																	1	0.2	
... 38																					1	1	0.2	
Total	253	107	62		34	31	16	8	12	5	6	2	3	1	2	1	1	1	1	1	1	548	100.0	
Percent	46.2	19.5	11.3		6.2	5.7	2.9	1.5	2.2	0.9	1.1	0.4	0.5	0.2	0.4	0.2	0.2	0.2	0.2	0.2	0.2	100.0		

Table 20. Directed Toward/Raised By Directional Patterns of STC Bilateral Pairings Concerning All Products, Developed and Developing Members, 1995-2017

	Members STCs are Directed Toward								
	All Products			Agri-Food			Other Products		
	Developed	Developing	Total	Developed	Developing	Total	Developed	Developing	Total
Number of STCs	198	350	548	77	135	212	121	215	336
Members Raising the STCs									
Developed									
Number	208	642	850	108	264	372	100	378	478
Percent	13.5%	41.5%	55.0%	14.5%	35.4%	49.9%	12.5%	47.3%	59.8%
Developing									
Number	431	265	696	218	156	374	213	109	322
Percent	27.9%	17.1%	45.0%	29.2%	20.9%	50.1%	26.6%	13.6%	40.3%
Total (Developed and Developing)									
Number	639	907	1,546	326	420	746	313	487	800
Percent	41.3%	58.7%	100%	43.7%	56.3%	100%	39.10%	60.90%	100%
Members Raising the STCs (separating STCs raised only by developed or developing members from STCs raised by both)									
Developed									
Developed Only									
Number	77	334	411	40	106	146	37	228	265
Percent	37.0%	52.0%	48.4%	37.0%	40.2%	39.2%	37.0%	60.3%	55.4%
Developed with Developing									
Number	131	308	439	68	158	226	63	150	213
Percent	63.0%	48.0%	51.6%	63.0%	59.8%	60.8%	63.0%	39.7%	44.6%
Developed Total (percent)	100%	100%	100%	100%	100%	100%	100%	100%	100%
Developing									
Developing Only									
Number	179	55	234	105	27	132	74	28	102
Percent	41.5%	20.8%	33.6%	48.2%	17.3%	35.3%	34.7%	25.7%	31.7%
Developing with Developed									
Number	252	210	462	113	129	242	139	81	220
Percent	58.5%	79.2%	66.4%	51.8%	82.7%	64.7%	65.3%	74.3%	68.3%
Developing Total (percent)	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 21. Directed Toward/Raised By Directional Patterns of STC Bilateral Pairings Concerning All Products, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

	Members STCs Directed Toward									
	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGHI)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	Totals	Percent of Total Pairings
Number of STCs	49	116	33	139	79	83	48	1	548	
Percent of STCs	8.9%	21.2%	6.0%	25.4%	14.4%	15.1%	8.8%	0.2%	100.0%	
Members Raising the STCs										
US	0	49	10	75	37	45	24	1	241	15.6%
EU	13	0	12	98	53	44	35	1	256	16.6%
Other DDHI	14	86	24	102	48	41	37	1	353	22.8%
BRIC	23	67	8	9	5	11	7	0	130	8.4%
DGHI	15	63	10	34	9	27	12	0	170	11.0%
DGUM	14	106	22	33	20	43	21	0	259	16.8%
DGLM	5	59	24	25	1	1	3	0	118	7.6%
LDLI	0	6	9	4	0	0	0	0	19	1.2%
Total Pairings of Members Raising STCs	84	436	119	380	173	212	139	3	1,546	100%
Percent of Total Pairings	5.4%	28.2%	7.7%	24.6%	11.2%	13.7%	9.0%	0.2%	100%	

Table 22. Percent Directed Toward/Raised By Directional Patterns of STC Bilateral Pairings Concerning All Products, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

	Members STCs Directed Toward								Total Pairings of Members Raising STCs
	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGHI)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	
Members Raising the STCs									
US	0.0%	20.3%	4.1%	31.1%	15.4%	18.7%	10.0%	0.4%	241
EU	5.1%	0.0%	4.7%	38.3%	20.7%	17.2%	13.7%	0.4%	256
Other DDHI	4.0%	24.4%	6.8%	28.9%	13.6%	11.6%	10.5%	0.3%	353
BRIC	17.7%	51.5%	6.2%	6.9%	3.8%	8.5%	5.4%	0.0%	130
DGHI	8.8%	37.1%	5.9%	20.0%	5.3%	15.9%	7.1%	0.0%	170
DGUM	5.4%	40.9%	8.5%	12.7%	7.7%	16.6%	8.1%	0.0%	259
DGLM	4.2%	50.0%	20.3%	21.2%	0.8%	0.8%	2.5%	0.0%	118
LDLI	0.0%	31.6%	47.4%	21.1%	0.0%	0.0%	0.0%	0.0%	19

Note: Each row shows percent of concerns raised by members in that row group toward members in each column group (row sums = 100%).

Table 23. Percent Raised By/Directed Toward Directional Patterns of STC Bilateral Pairings Concerning All Products, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

Members STCs Directed Toward									
	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGHI)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	
Members Raising the STCs									
US	0.0%	11.2%	8.4%	19.7%	21.4%	21.2%	17.3%	33.3%	
EU	15.5%	0.0%	10.1%	25.8%	30.6%	20.8%	25.2%	33.3%	
Other DDHI	16.7%	19.7%	20.2%	26.8%	27.7%	19.3%	26.6%	33.3%	
BRIC	27.4%	15.4%	6.7%	2.4%	2.9%	5.2%	5.0%	0.0%	
DGHI	17.9%	14.4%	8.4%	8.9%	5.2%	12.7%	8.6%	0.0%	
DGUM	16.7%	24.3%	18.5%	8.7%	11.6%	20.3%	15.1%	0.0%	
DGLM	6.0%	13.5%	20.2%	6.6%	0.6%	0.5%	2.2%	0.0%	
LDLI	0.0%	1.4%	7.6%	1.1%	0.0%	0.0%	0.0%	0.0%	
Total Pairings of									
Members Raising STCs	84	436	119	380	173	212	139	3	1,546

Note: Each column shows percent of concerns toward members in that column raised by each row group (column sums = 100%).

Table 24. Partnerships Raising STCs Concerning All Products, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

Partners	Number of Pairings Raising STCs (main diagonal) and Jointly among Groups of Members (off-diagonal)								Total Partnerships
	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGHI)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)	
US	241	136	137	46	73	72	24	1	489
EU	136	256	110	30	57	50	11	3	397
Other DDHI	137	110	213	48	73	66	23	2	459
BRIC	46	30	48	115	34	39	21	3	221
DGHI	73	57	73	34	128	57	17	3	314
DGUM	72	50	66	39	57	132	34	8	326
DGLM	24	11	23	21	17	34	62	8	138
LDLI	1	3	2	3	3	8	8	8	28
Total Partnerships	489	397	459	221	314	326	138	28	2,372

Note: Total partnerships of each group of members are row/column sums excluding main diagonal number of STCs raised by that group of members.

Table 25. Percent Partnerships Raising STCs Concerning All Products, Members Grouped by WTO Development and World Bank Income Criteria, 1995-2017

Partners	Percent of STCs Raised by Members on Main Diagonal Raised Jointly by Other Groups of Members (off-diagonal)							
	United States	European Union	Other Developed/High Income (DDHI)	BRIC	Developing/High Income (DGHI)	Developing/Upper-Middle Income (DGUM)	Developing/Lower-Middle Income (DGLM)	WTO Least Developed/Low Income (LDLI)
US	100.0	53.1	64.3	40.0	57.0	54.5	38.7	12.5
EU	56.4	100.0	51.6	26.1	44.5	37.9	17.7	37.5
Other DDHI	56.8	43.0	100.0	41.7	57.0	50.0	37.1	25.0
BRIC	19.1	11.7	22.5	100.0	26.6	29.5	33.9	37.5
DGHI	30.3	22.3	34.3	29.6	100.0	43.2	27.4	37.5
DGUM	29.9	19.5	31.0	33.9	44.5	100.0	54.8	100.0
DGLM	10.0	4.3	10.8	18.3	13.3	25.8	100.0	100.0
LDLI	0.4	1.2	0.9	2.6	2.3	6.1	12.9	100.0

Note: Off-diagonal percents are shares of STCs raised by member group on main diagonal that were raised jointly by other groups of members.