B. An economic perspective on the use of non-tariff measures

Governments use non-tariff measures and services measures for a growing number of reasons. This section examines what these are and how they may affect trade. It also analyses the choices available to governments among a variety of policy instruments, from a theoretical and an empirical perspective. The section ends with case studies on non-tariff measures in the context of the recent financial crisis, climate change and food safety.

Contents

Some key facts and findings

- Non-tariff measures (NTMs) are often first-best policies to correct market failures. However, as the same NTM used to pursue a public policy objective may also be employed to distort international trade, it can be difficult to distinguish "legitimate" from protectionist motivations for NTMs.

- Neither the declared aim of a non-tariff measure nor its effect on trade provides conclusive evidence of whether it is innocuous from a trade perspective. However, analysing the nature of these measures – their opaqueness, efficiency and effect on various groups in society – and their political and economic context can provide important insights.

- Non-tariff measures, including behind-the-border measures, may take the place of tariffs and border NTMs that are disciplined in trade agreements. This raises important questions regarding the regulation of NTMs at international level.

- Similar issues arise in relation to services measures, which have become increasingly significant in light of the international fragmentation of production processes.

- Developments such as the recent financial crisis, current debates on climate change and heightened concerns about food safety have led to the increased use of NTMs and services measures in the 21st century, illustrating the difficulties involved in dealing with public policy measures and their impact on international trade.

Trade agreements are meant to discipline policies that distort trade without constraining governments in their pursuit of other legitimate public policy objectives, such as consumer health and safety protection – even if these happen to affect trade. Thus, while certain non-tariff measures (NTMs) entail trade costs, these costs can be justified for other reasons. This section seeks to shed light on the importance of making this distinction and on how it can be made, a key question from the perspective of the WTO.

Section B.1 introduces different types of non-tariff measures and discusses how they are employed to achieve a range of policy objectives. In analysing the welfare and trade effects of NTMs in more detail, it becomes clear that usually more than one measure can be used to pursue a given policy goal, in a more or less efficient manner. While a specific NTM can represent the first-best policy to pursue a legitimate public policy objective, the same measure can also be used for protectionist purposes or create unnecessary trade costs. Making this distinction is not always easy and represents a major challenge for trade agreements that target the latter, while seeking not to interfere with the former.

Section B.2 identifies situations in which governments may be prone to employ non-tariff measures for trade competitiveness reasons, even if the stated policy rationale is a different one, or implement an inefficient instrument that may affect trade more than necessary to achieve a given objective. From this analysis, a number of factors relating to the choice of NTMs and the sectors and political context in which they are applied can help distinguish between "legitimate" and "protectionist" (or excessively trade-restrictive) use. Another reason why governments may turn to NTMs relates to "policy substitution" – that is, the use of certain NTMs when tariffs or other NTMs are effectively regulated in international trade agreements.

The special characteristics of services trade, notably the intangibility of services and the different modes of trade, make it necessary to ask, in Section B.3, to what extent the previous analysis applies to services as well.

The penultimate part (Section B.4) examines case studies on the rise of non-tariff measures during the recent financial crisis, in the context of climate change and in relation to food safety. The objective of this sub-section is to illustrate how recent developments have led to an increased use of NTMs and to what extent the measures taken may pose a challenge for international trade. Finally, the main results are summarized in Section B.5.

1. Reasons for government intervention and types of measures

(a) Classifying NTMs and government motives

There are various ways to categorize both non-tariff measures and the reasons why governments use them. The classifications discussed in this section provide a useful way to consider many of the issues raised in this report.

The trade literature typically distinguishes between interventions aimed at increasing national welfare and those motivated by "political economy" goals. The former includes interventions to correct market failures and to exploit a country's or a firm's market power (by manipulating the terms of trade and shifting profits). One key point is that interventions to exploit market power come at the expense of one's trade partners (beggar-thy-neighbour practices), whereas those focused on correcting market failures have trade effects that are unintended consequences of the policy.

Political economy motives reflect the response of political incumbents to special interest groups, usually assumed to be organized producer groups. Although the economic literature generally assumes consumers are too numerous and diverse to coordinate effectively, they can put effective pressure on politicians on issues that involve consumer health and safety. In addition, civil society and non-governmental organizations have become powerful advocates for issues such as the environment. Political economy motives are likely to lead to policies that shelter favoured producers and reduce trade flows at the expense of national welfare. This suggests a further distinction between non-tariff measures motivated by public policy objectives and those motivated by competitiveness concerns. This does not mean that public policy and competitiveness concerns cannot overlap – for example, when protecting an infant industry whose expansion can increase national welfare. However, there are likely to be many more instances where promoting a domestic producer's interests comes at the expense of the social good. Lastly, motives can be distinguished according to their intended distributional effects – specifically, whether they benefit consumers or producers.

So far, the discussion has focused on the economic motives of governments for employing non-tariff measures. However, national welfare and public policy objectives may embrace far more than purely economic issues. Governments are responsible for safeguarding national security. Governments may wish to firmly uphold certain moral and religious tenets. Where a society is made up of different ethnic or religious groups, a high value will be placed upon the

preservation of social cohesion. These goals may be compromised if certain goods are freely available in the country, requiring governments to use NTMs so as to restrict their supply via international trade.

The classification and quantification of non-tariff measures is a long-standing area of research (a partial listing includes Baldwin, 1970; Laird and Yeats, 1990; Deardorff and Stern, 1997; Dee and Ferrantino, 2005). This research has provided the conceptual framework for the various NTM databases – including the WTO's – that will be relied on extensively in this report, especially in Section C.

Following Staiger (2012), non-tariff measures can be classified according to whether they are applied at the border, to exports (e.g. export taxes, quotas or bans) and imports (e.g. import quota, import ban), or behind the border. This latter category can be further sub-divided according to whether the NTMs are domestic taxes, other charges, and subsidies, or whether they are regulatory. The distinction between border and behind-the-border NTMs appears frequently in the economic literature. In one sense, it is a distinction based on where the measures are applied. However, in another sense, it involves a distinction between measures applied to foreign goods only (at the border) and those applied equally to domestic and foreign goods. This raises a key question about behind-the-border measures – i.e. whether, intentionally or *de facto*, they treat domestic and foreign goods differently.

What is common about the interventions collectively called non-tariff measures, irrespective of their motives, is that they have trade effects (either liberal or restrictive). Sometimes the trade effects are simply the by-product of pursuing a particular public policy objective. Other times, the trade effects are the primary goal. Since governments usually claim that their policies have laudable objectives, declared intentions may offer little insight into the motives behind interventions. Instead, motives can best be deduced from the type of NTM chosen, from the sector to which it is applied, from its design and implementation, and from its impact – i.e. whether consumers or producers benefit and whether foreign goods are discriminated against or not.

For the purpose of later analysis of the trade and welfare effects of non-tariff measures, a distinction will also be made between NTMs that are price, quantity or "quality" focused. A price measure (such as a subsidy) operates by changing relative prices while a quantity measure (such as a quota) works by directly limiting the quantity of some activity. Quality measures (such as a technical barrier to trade measure or a sanitary and phytosanitary measure) change some features of a product or the process by which it is produced. This categorization helps to simplify the analysis of the trade and welfare effects of NTMs by using examples taken from each category rather than by examining exhaustively all NTMs.

Another important theme in the literature – and in this report – is the transparency of non-tariff measures. Although there is no agreed definition of what constitutes a transparent NTM, Box B.1 discusses how the issue might be approached and conceptualized.

Box B.1: Defining transparency in non-tariff measures

Criteria for assessing the transparency of non-tariff measures are not readily available in the trade literature, so the following analysis draws on several papers that address public policy transparency more broadly. These include Geraats (2002) which defines transparency in central banking and in the conduct of monetary policy, Wolfe (2003) which discusses transparency requirements found in WTO agreements, Collins-Williams and Wolfe (2010) which develops what the authors describe as an "analytic framework" for thinking about WTO transparency provisions and Helble et al. (2009) which discusses the transparency of the trading environment and concludes that it exerts an independent impact on trade flows.[1] None provide a definition of transparency that can be taken "off-the-shelf" and applied directly to NTMs. However, the papers do provide a number of useful ideas for approaching the task of assessing the transparency of NTMs.

First, at a conceptual level, transparency can be defined as the absence of information asymmetry, a situation where policy makers and relevant economic agents have the same information (Geraats, 2002). Information asymmetry generates uncertainty for the agents with less information. Those with access to private information may try to manipulate the beliefs of others and thereby indirectly alter economic behaviour. Thus, economic efficiency requires information be made publicly available. In the case of non-tariff measures, it may be important to distinguish between different economic agents – the private sector and other governments – because each is likely to be concerned with different aspects of information. Governments are likely to want information that allows them to better evaluate whether their trade partners are abiding by international commitments. The private sector is likely to be more concerned with information asymmetry that hampers its ability to take advantage of commercially profitable opportunities.

Secondly, given the range and diversity of non-tariff measures, removing information asymmetry may require devoting more effort to some measures than others.

Regulations involving human health, food safety or the environment usually require specialized knowledge and will be intrinsically more complex than an *ad valorem* tariff. As Collins-Williams and Wolfe (2010) put it, trading partners cannot see what is going on "behind the border" without help. This means that mechanisms to achieve regulatory transparency may have to be designed or structured differently than other types of non-tariff measures given their greater complexity.

Thirdly, a more systemic view of transparency is needed which takes into account the policy-making process as a whole. One of the key difficulties is distinguishing whether a non-tariff measure is put in place because of public policy concerns or a desire to protect domestic producers. It is much easier to resolve this question if one has knowledge of the decision- or policy-making process as a whole, and is not limited to drawing inferences solely from the NTM's design or its implementation.

Fourthly, in this connection, it may be possible to take the stages of policy-making identified in Geraats (2002) and adapt them to a trade or NTM context. The paper distinguishes between different stages of the policy-making process – political, economic, procedural, policy and operational – and makes the point that transparency will need to apply to each of these stages and that it may call for different requirements at each stage.[2] In the NTM context, political transparency refers to openness about policy objectives and the importance assigned to them. Scientific or technical transparency means making available the information used as the basis for implementing a measure, including the underlying data, expert opinion and risk assessment. Procedural transparency describes the way policy decisions are taken, including the scope for public consultations and access to independent adjudication. It also includes the publication and notification of measures and the establishment of enquiry points. Operational transparency concerns the design and implementation of the NTM. By comparing the transparency of NTMs in this "systemic" way, the whole policy-making process could be taken into account, or just one particular stage of it.

Fifthly, the papers by Helble et al. (2009) and Wolfe (2003) associate transparency with predictability and simplicity. Predictability reduces the cost stemming from policy uncertainty while simplification reduces the information costs from an overly complex trading environment that may hinder economic agents. A "bound" import tariff is more transparent than an unbound tariff because the tariff binding creates greater predictability for exporters to that country. These papers suggest that predictability and simplicity are important dimensions of transparency and provide another way of comparing the transparency of different non-tariff measures. At the operational stage for example, the transparency of an NTM may be judged by whether traders find its design or implementation to be simple and predictable.

Finally, an unstated assumption in all these papers is that aggregate welfare should increase with enhanced transparency. While this is likely to be the case, not everyone would necessarily be better off if trade partners become more transparent with one another. Some import-competing firms may lose out if, as a result of greater transparency of the home country's non-tariff measures, foreign competitors export more because of the reduction in uncertainty. As will be explained in Section B.2, some policy-makers may have no interest in transparency because opaqueness allows them to reward political backers without paying a political price. This may explain why introducing more transparency in NTMs is likely to be a difficult undertaking, not necessarily because of the technical challenges involved, but because there are interests that will be opposed to it.

Any discussion of the motives and impacts of non-tariff measures needs to take into account the increasing fragmentation and offshoring of production. Unfortunately, there is very little literature about how fragmentation affects government motives to employ NTMs so what can be said is rather limited and conjectural.

The international fragmentation of production across many parts of the world is well documented in recent empirical research. Hanson et al. (2005) illustrate the extent of US multinationals' trade in intermediate inputs between parent firms and their foreign affiliates. Hummels et al. (2001) demonstrate the degree of vertical specialization among ten OECD and four emerging countries. Kimura and Ando (2005) show

the extent of international production/distribution networks in East Asia. Theoretical research into the fragmentation of production has also grown in tandem with this expanding empirical work (see the recent survey by Baldwin and Robert-Nicoud, 2007).

The economic theory of fragmentation (Jones and Kierzkowski, 1990; 2000) contends that increased market size makes it profitable to split up the process of production and allow specialization to reduce per unit cost.[3] This division of labour can take place within a country, but if countries differ in their comparative advantages, greater cost savings from specialization can be obtained by offshoring production. This process of fragmentation requires firms to be able to coordinate between production locations and to move parts and

components across national borders. This underscores the crucial role of services, particularly telecommunications and transport, in connecting fragmented production blocks.

Production fragmentation has an impact on why governments use non-tariff measures and how they influence trade. First, where global supply chains are prevalent, it is not possible to disentangle merchandise trade from services trade and foreign direct investment (FDI). This means that NTMs, which affect merchandise trade, are also likely to have an impact on services and FDI flows. Conversely, services and investment regulations are likely to impact merchandise trade as well. Secondly, while governments' usual motives for employing NTMs remain – i.e. to address market failures, to exploit market power or to respond to political economy pressures – production fragmentation makes some motives more pressing than others. For instance, governments may see information asymmetry as more critical given that products are now made from parts and components coming from distant and multiple sources (see the case study of food supply chains in Section B.4). Clearly, the role of NTMs in a world of increasingly fragmented production is a fertile area for future research.

(b) How do non-tariff measures achieve policy objectives?

The discussion here illustrates how non-tariff measures can be used to achieve public policy as well as political economy objectives. Although it is not an exhaustive discussion of all possible government motives for using NTMs, two broader observations can be made. First, more than one NTM can frequently be used to pursue the same policy objective. From the

standpoint of economic efficiency, governments should use the NTM that maximizes national welfare – i.e. the first-best NTM (see Box B.2 which discusses how this decision-making process is akin to cost-benefit analysis). Secondly, NTMs used to pursue legitimate policy objectives can also be used for protectionist purposes, underlining the difficulty of distinguishing "legitimate" from "protectionist" government motives. This section begins with several cases of market failures, looks at instances of beggar-thy-neighbour policies, touches on equity motivations, and ends with political economy examples.

(i) Correcting market failures

Health and safety of consumers and consumer choice

As discussed in Box B.1, information asymmetry refers to a situation where one set of agents involved in an economic transaction or exchange has an informational advantage over other parties. An example is the seller of a used car who has better information about the state of the car than the potential buyer (Akerlof, 1970). Another example is the job seeker who has better information about his productivity and aptitude for work than the potential employer (Spence, 1973). A third example is the case of a producer who sells a sub-standard product which can compromise the health and safety of unwitting consumers.

The existence of information asymmetry can lead to a number of inefficiencies in the market. In the used car example, since buyers know that they are at an information disadvantage they will only be willing to bid a low price – with the result that owners of good-quality used cars do not bother to put their cars up for sale, and the used car market ends up being

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Box B.2: Choice of NTMs and cost-benefit analysis

There are a number of methods that governments can follow in choosing non-tariff measures. Trachtman (2008) provides a relatively comprehensive listing of these methods (e.g. balancing, means-ends rationality, proportionality). The economically coherent way to think about government intervention and the choice of NTMs is in the context of a cost-benefit analysis (Bown and Trachtman, 2009). In broad terms, a cost-benefit analysis involves calculating the net gains to national welfare by implementing one measure relative to an alternative. (Note that the Bown and Trachtman paper goes one step further than this by including the change in the welfare of the trade partner as well because they are concerned with global and not just national welfare.)

The presumption is that non-tariff measures will vary in their ability to achieve the policy goal and that they will also differ in their costs. Governments will therefore need to evaluate the benefit from achieving a given policy objective (e.g. the welfare gain from reducing pollution), the contribution that a particular NTM can make to achieving the policy goal, and the cost incurred in applying the NTM. The outcome of the cost-benefit analysis determines not only whether government intervention is called for in the first place (the benefit must exceed the cost) but also provides a ranking of the NTMs. In particular, the method should be able to identify the first-best measure – that which produces the largest differential in benefit over cost. It is likely that a cost-benefit analysis would be more information-intensive and technically challenging to apply than some of the simpler methods mentioned above. Benefits and costs need to be quantified and monetary values assigned to them. Informational and resource constraints may explain, at least partly, why some governments do not make more extensive use of cost-benefit analysis in decision-making on NTMs.

overwhelmed by low-quality cars, i.e. there is adverse selection. In the job-seeking example, information asymmetry may lead the job seeker to expend resources to "signal" his productivity to the potential employer (e.g. attend a more expensive school) even though that decision will not necessarily increase his productivity. In the case of the sub-standard product, sale of the product can cause injuries or even fatalities. As these examples show, markets will not necessarily deliver the most efficient outcomes, and this failure provides a rationale for public action. This explains, for example, why a wide range of consumer goods – food, drugs, vehicles, electrical appliances, safety equipment – face many types of requirements, from design (e.g. toys) to ingredients (e.g. chemicals) to the process of manufacture or production (e.g. pasteurization of milk) and to performance (e.g. helmets) (World Trade Organization (WTO), 2005a). What these measures are designed to do is to weed out those products, whether domestic or foreign, that will compromise the health or safety of consumers.

Information asymmetry is also relevant to international trade. Suppose that countries differ in the safety or quality of the goods that they produce, with the home country specializing in high-quality products and the foreign country specializing in low-quality ones. Imagine that consumers in both countries differ in their preference for quality, with some willing to pay more for high-quality products, and others unwilling to pay more. In this scenario, consumers are also unable to tell the difference between high-quality and low-quality products because these goods are not distinguished by origin. Under these circumstances, Bond (1984) shows that the country with high-quality products may lose if it trades with the country producing low-quality products. This arises because trade reduces the average quality of products sold in the market of the high-quality producing country, which spills over to affect the expected welfare of all consumers in the importing country.

The first-best policy is labelling to allow consumers to distinguish between home (high-quality) and foreign (low-quality) products.[4] Consumers with a taste for high-quality goods will purchase home goods and consumers satisfied with low-quality goods will purchase foreign goods, resulting in a two-way trade in equilibrium. Each product will sell for the "right" price – high-quality goods at higher prices and low-quality goods at lower prices. The ability to distinguish between home and foreign products leaves both countries better off as a result of trade because it expands the variety of products available to consumers, and leads to a better match between consumer tastes and products. A similar result is established in Pienaar (2005) where requiring foreign goods to be labelled according to their country of origin gives the consumer all the necessary information, and unambiguously improves the welfare of the importing country.

Under certain circumstances, export subsidies can also help reduce or eliminate information asymmetry (Bagwell and Staiger, 1989). Consumers in the importing country differ in their taste for quality. Some consumers like high-quality goods and are willing to pay a higher price for them; others would rather pay a lower price for the low-quality good. Unfortunately, the groups are unable to tell the difference between high-quality and low-quality products until they make the purchase, i.e. these are "experience goods" (Nelson, 1970).[5]

Producers in the exporting country, who make the high-quality product, incur a higher cost of production than producers in the importing country, who make the low-quality good. If both goods circulate in the importing country, consumers will be unable to tell the difference and the price will reflect the average quality of these goods. At such a price, high-quality producers will not be able to export their goods since it will not cover their cost of production.[6] If the high-quality firms are aided by an export subsidy, they can sell their goods at the average price and still earn a profit. Having been introduced to the high-quality product, consumers preferring high-quality goods will be able to make repeat purchases, paying a price that reflects the quality of the good. At this later stage, the high-quality producer receives a price that covers his cost of production, and the government can withdraw the export subsidies. Consumers satisfied with low-quality goods benefit as well since they can now identify these goods and pay a lower price for them.[7]

Pollution and the environment

Another type of market failure that can justify government action is a negative externality such as pollution. Negative externalities arise when an agent's economic activity generates costs to others that the agent does not fully absorb. Hence, the scale of his activity exceeds the socially optimal amount. In recent decades, the public and policy-makers have become increasingly aware of the environmental consequences of certain economic activities. Much of the economic literature focuses on the use of taxes to correct negative externalities – the so-called Pigouvian tax. Nevertheless, many governments have chosen to pursue environmental objectives using non-price measures, such as performance standards, emission quotas, and mandated technologies.[8]

One drawback of trying to reduce pollution through government-mandated technologies is that the incentive to find less costly ways to achieve the same environmental objective is removed. Nevertheless, governments may prefer these measures for distributional or competitive reasons, because of uncertainty about the costs and benefits of abatement, or to avoid the cost of monitoring and enforcement (Bovenberg and Goulder, 2002). Regarding distributional or competitiveness concerns, for

example, governments may be sensitive to the fact that a pollution tax requires firms to pay for each unit of emission while an emission quota does not. While both instruments might lead the firm to curtail emissions by the same amount, the tax saddles the firm with an additional liability that it does not face with a quota. If policy-makers are uncertain about the true cost of mitigating environmental damage, but are certain that passing beyond a threshold level of environmental damage would be catastrophic, quantity-based measures will be preferred to price-based measures.[9]

Some of the more complicated and contentious environmental issues involve cross-border externalities. One type of cross-border externality involves countries whose economic activity pollutes or reduces a common resource, damaging all countries. A notable example of this is global warming (see the discussion in Section B.4). Another type of cross-border externality is where the activity occurs in one jurisdiction, but the adverse impacts are partly or fully felt in another jurisdiction.

Cross-border externalities are often compounded by differences in countries' income levels, or institutional and environmental capacities. Since adopting environment-friendly production methods often entails higher costs, this can lead to disagreements between countries about the distribution of the costs and benefits of correcting the externality. A number of GATT/WTO disputes − tuna-dolphin[10] and shrimp-turtle[11] − appear to fall within this category. While such differences make it difficult for countries to reach an agreement, markets could play a role in mitigating or eliminating a cross-border externality. Assuming that credible information about the environmental costs of producing a good were available, consumers might be willing to pay more for the product if it was produced without causing environmental harm. Higher prices would provide an incentive for producers to switch to more environment-friendly methods, thereby reducing pressure on the environment.

However, products made by environmentally-friendly processes may not be distinguishable from those made by less environmentally-friendly processes. Tuna caught by fishing methods which leave dolphins unharmed tastes the same as tuna caught by methods lethal to dolphins. This introduces a second market failure − information asymmetry (see discussion above) − to the original problem of a cross-border externality. Beaulieu and Gaisford (2002) analyse the effects of attempting to address these problems through various non-tariff measures − from outright bans to labelling.

Given the existence of market failures, open trade is not necessarily optimal. Depending on the strength of consumer preferences for the environment-friendly good, an outright ban of imports from countries that are the source of the environmental externality may be

even better than open trade. The rationale is that a ban improves consumer confidence in the products since they know that only environment-friendly goods can be sold. This leads to an increase in demand, i.e. a shift in the demand curve, and to greater consumer surplus. For the importing country, the drawback of an import ban is that some consumers may be indifferent to environment-friendly and environment-unfriendly products, and unwilling to pay a premium for the former. The ban adversely affects them since it limits their choice to the expensive, environment-friendly good.

While there are good reasons to question the advantages of import bans, there are notable examples of products whose trade the international community has banned for environmental reasons, including endangered species (banned under the Convention on International Trade in Endangered Species of Wild Fauna and Flora) and ozone-depleting substances (banned under the Montreal Protocol).[12] Of course, consumer confidence can also be enhanced by a labelling scheme that correctly distinguishes between goods made with little or no harm to the environment and those that impose an environmental cost. Effective labelling would be superior to a ban since it improves consumer confidence without artificially restricting imports. Consumers unwilling to pay a premium for the environment-friendly good are still able to purchase their preferred (low-price) environmentally-unfriendly good.

Infant industry protection

In some cases, an agent's economic activity generates benefits for others that the agent does not fully capture. These "positive externalities" represent an important class of market failure that can justify public intervention since the scale of activity is less than the socially optimal amount. One example is infant industry protection.

Suppose the conditions for supporting an infant industry exist.[13] The home country has a high-cost industry that finds it difficult to compete with foreign goods, but there are dynamic learning effects that are external to the firm and beneficial to the country. The experience that domestic firms accumulate by producing the good will reduce their costs over time. Furthermore, these learning effects cannot be contained within the firm but are also of benefit to other firms in the industry. This spill-over effect means that a firm does not fully internalize the gains from its learning, and so the prospect of later profit may not be sufficiently attractive to warrant absorbing losses during the initial learning period. This situation provides the necessary justification for extending temporary government support to the industry. Under these conditions, the first-best solution is for governments to use a production subsidy rather than a tariff to assist the infant industry (Bhagwati and

Ramaswami, 1963). It directly targets the source of the market failure by supporting learning in the domestic industry without penalizing consumers with a higher price for the product, the principal drawback of using a tariff.

Ideally, the support extended to the infant industry should decline as learning takes place. However, information about the pace of learning may not be known with certainty by the policy-maker. Applying a fixed subsidy rate means that the protection extended to the infant industry will be below the optimum level at the start of the leaning period and too high at the end. Under these circumstances, Melitz (2005) proposes using a quota instead of a subsidy, noting that it will allow the level of infant-industry protection to adjust automatically as the industry's costs decline.[14] Over time, the quota will become less distortive as the domestic industry's competitiveness improves.

Network effects/externalities

Certain products or services are more valuable to a buyer when more consumers use the same product or service. For example, the greater the number of subscribers to a telephone system, the more valuable that network will be to potential subscribers. Likewise, Facebook, Twitter or LinkedIn accounts are more valuable the more "friends", "followers", or professional contacts are drawn into these social networking sites. Such products or services are subject to what have been called "network effects/externalities" (Katz and Shapiro, 1985).[15]

Potentially there is a market failure associated with these networks. An individual decides to join a network because of the benefits he or she will obtain, not because of the benefits existing members will derive from him or her joining. As a result, the size of the network is smaller than the socially desirable size. If there are competing networks, each one of which is owned by a different firm, one way the problem of network size can be resolved is by making them compatible so that clients of one network are connected to the clients of all other networks (Katz and Shapiro, 1986). Given that each user's utility increases as the size of the network expands, compatibility among networks increases social welfare.

Compatibility can be achieved through adoption of common standards. The key question is whether firms have enough incentives to develop compatibility standards on their own without government intervention. One reason to be sceptical of government intervention is that governments are unlikely to have a significant informational advantage relative to private parties when emerging technologies are concerned, and so cannot be presumed to know which standard is the optimal one (Katz and Shapiro, 1994). On the other hand, because of the network effects, a product's compatibility increases its value to consumers who will

then be willing to pay more for it than for a competing but incompatible product. There may also be a market-mediated effect, as when a complementary good (spare parts, servicing, software) becomes cheaper and more readily available the greater the compatibility of markets (Farrell and Saloner, 1985). Based on evidence from the United States, these incentives appear to be sufficiently large to induce a number of private institutions – from lumber companies to Local Area Networks – to get involved in standardization activity (Farrell and Saloner, 1988). Box B.3 provides other examples of the development and use of private standards by industry groups.

Monopoly power

Imperfect competition represents another instance of market failure which occasions various forms of government intervention. Typically though, such measures are directed at the behaviour of firms and not at the products or services they produce. Competition rules will prevent a firm from colluding with others, limit its merger and acquisition activity, and guard against abuse of a dominant position.

A specific example illustrates the role of non-tariff measures in addressing this particular market failure. A small country is only able to source a specific product from a foreign monopolist because it is not produced domestically. The importing government's objective is to expand imports and reduce the artificial scarcity resulting from the foreign monopolist's control of the domestic market. Instead of NTMs being used to restrict trade, in this case NTMs will be used to try to expand trade and/or reduce the price charged by the monopolist. The optimal policy is a price ceiling on the imported product set equal to the monopolist's marginal cost of production (Helpman and Krugman, 1989). In other words, the foreign monopolist will be allowed to sell to the home country only if it caps its price at the ceiling established by the importing country. (If the monopolist had been a domestic firm, a competition authority would have adopted a similar policy of marginal-cost pricing.) More elaborate examples are discussed in Helpman and Krugman (1989) involving the use of other NTMs, such as import subsidies and minimum import volume requirements, to induce foreign firms with market power to supply more to the importing country.

(ii) Beggar-thy-neighbour policies

A country with market power in international trade can increase national welfare by improving its terms of trade (the ratio of export to import prices). If firms competing in international trade have market power – so that one firm's actions have an effect on the profits of its rival(s) – then government actions can shift profits from the foreign firm to the home firm, resulting in a gain in national welfare. In both instances, non-tariff measures can be used by the home country to

> ## Box B.3: Network effects/externalities and private standards
>
> Where network effects/externalities exist, private standard-setting is a common outcome. Indeed, compatibility and integration are paramount to exploit such externalities. The following two examples illustrate the huge incentive to develop and implement private standards in industries characterized by network externalities.
>
> One example is e-business. The Internet has become an increasingly important commercial marketplace in recent decades, thanks to mass Internet connectivity, and the expansion of web browsers and interactive web sites (Pant and Ravichandran, 2001).
>
> It is reasonable to assume that the value of an e-business information system increases with the number of people, IT products, and networks interacting through it – and in general, systems of e-business that construct global communities of customers, suppliers and business partners achieve a higher value (Pant and Ravichandran, 2001). However, in order to function and to provide customers with timely information about products, e-business systems need to be integrated with companies' internal systems and suppliers' information systems. Such integration can be effectively achieved through standardization activities (Chen, 2003). E-business standards allow a specification of business objects, data and processes involved in web-based commerce. Therefore, their adoption represents a step towards compatibility and inter-operability among companies, generating an enhanced value for the firms involved and the industry as a whole (Zhao et al., 2007).
>
> Electronic card payments (Electronic Funds Transfer at Point of Sale or "EFTPOS") provide a second example of the incentive to develop standards in contexts characterized by network externalities (Guibourg, 2001). In the last decades, the EFTPOS market has developed in many industrialized countries, evolving from paper-based instruments to debit and credit card payments. Usually, these payments are used for face-to-face transactions, and represent more efficient alternatives to cash as they allow a reduction in both costs and risks related to such payments. Network externalities are evident in this context. The usefulness to the cardholder increases as the acceptance of the card as a means of payment grows broader and the number of compatible terminals increases.
>
> In order for electronic payments to take place, and for network externalities to come to full realization, some conditions must apply. Complementarities between users need to be in place. Indeed, the utility of an individual in an EFTPOS market is zero if no retailer accepts electronic payments. However, the presence of complementarities is not a wholly sufficient condition. For network externalities to play a role, compatibility among products is also crucial. The final transfer is based on an exchange of information to authenticate and authorize the payment, and retailers need to own a terminal that allows communication with the customer's bank which in turn authorizes the transfer. This requires a telecommunications infrastructure that connects the retailer's terminal with both the retailer's and the customer's bank. Inter-operability is therefore paramount to exploit network externalities, and it can be achieved through common rules, operational standards and formats (Guibourg, 2001).

pocket terms-of-trade and profit-shifting gains. These welfare gains will come at the expense of other countries – i.e. these are beggar-thy-neighbour policies. Unlike the motives discussed before, where the trade effects may be unintended consequences of the policy, in this instance the trade effects are the intended aim of the policy. They are the means by which the country appropriates gains at the expense of its partner.

Manipulating the terms of trade with NTMs

Much of the literature on how the terms of trade can be shifted by trade policy has focused on the role of import tariffs (Johnson, 1954, Mayer, 1981; Bagwell and Staiger, 1999). An import tariff reduces the demand for imports, so for a large country this will have the effect of reducing the world price of its imports relative to the price for its exports. However,

an export tax can have a similar effect on a large country's terms of trade since the reduced availability of a country's export good in world markets should lead to a rise in its price relative to the import product.[16] It turns out that an export subsidy can also shift the terms of trade in favour of the exporting country provided that it has another good that it exports and there are differences in consumption patterns between the importing and exporting countries (Feenstra, 1986).[17]

If a country is not constrained in its use of these measures, such as by international agreements, they would be widely used to manipulate the terms of trade. Regulatory instruments, such as technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures, would be used to correct market failures and would be set at their socially optimal levels (Bagwell and Staiger, 2001; Staiger and Sykes, 2011).

However, this result may not necessarily hold in a world where production is increasingly offshored and international trade flows are dominated by intermediate inputs, many of which appear to be highly specialized to their intended use (Staiger, 2012). Section B.2 will provide a more detailed discussion of this result.

Profit-shifting non-tariff measures

Non-tariff measures can also be used to shift profits from the foreign to the home country. This is most relevant in imperfectly competitive markets where firms have market power, and can effectively use NTMs, such as subsidies, export taxes and TBT/SPS measures, to take market share and profits away from foreign rivals.

Suppose that two firms, the home and foreign firm, compete in selling to a third market. Competition between them can take many forms but for the purpose of this discussion two types of competition are examined – through their choice of output (Cournot competition) or through their choice of price (Bertrand competition).

Under Cournot competition, Brander and Spencer (1985) demonstrate that a government can use export subsidies to help the home firm expand output, thereby forcing its foreign rival to contract production and concede market share. The subsidy has the effect of committing the domestic firm to a more aggressive strategy which in turn induces the foreign firm to produce less.[18] From the point of view of the home country, even though the subsidy payment is just a transfer from the government to the home firm, the profit-shifting effect results in the firm's profit rising by more than the amount of the subsidy, creating a net gain to the home country. Note that the export subsidy creates a terms-of-trade loss for the domestic country, but this is more than made up for by the profit-shifting effect of the policy (Brander, 1995).

If firms compete in prices, Eaton and Grossman (1986) show that the optimal policy will be an export tax rather than an export subsidy. Under Bertrand competition, both firms would like to charge a higher price but if only one firm does so it will face lower export demand. However, a price hike would not prove detrimental to the home firm if its rival follows with a price increase of its own. Both firms will earn positive profits as a result. By imposing an export tax on its firm, the home government in effect commits the home firm to charge a higher price for any given price chosen by the rival. This persuades the foreign firm to follow suit – match the home firm's higher price – which benefits it and the home firm as well.[19]

Domestic subsidies in the form of research and development (R&D) subsidies can also be used to shift profits from foreign rivals to domestic firms. This policy turns out to be optimal regardless of whether firms engage in Bertrand or Cournot competition. Basically, the R&D subsidy provides an incentive to the home firm to increase its R&D investments, thereby generating cost-reducing innovation.[20] If the foreign firm is not subsidized in turn by its government, only a small level of R&D spending will be optimal with unfavourable consequences for its ability to generate cost-reducing innovation. The home government's subsidy forces a contraction in the optimal amount of R&D spending by the rival firm, thereby shifting profits from the foreign firm to the home firm.

Although such subsidies dominate discussion in the profit-shifting literature, other non-tariff measures, such as TBT/SPS measures, can play a similar role (Fischer and Serra, 2000). Consider a situation in which home and foreign firms are competing in the home market. The home government can impose a new TBT/SPS measure which raises both firms' costs. This measure also burdens consumers, as both firms try to pass on the additional cost in the form of higher prices. Despite this, the home government may find it worthwhile to impose the measure if, as a consequence, the foreign firm is forced to exit the home market, leaving the home firm free to earn monopoly profits, and if the resulting gains outweigh the loss in consumer surplus. The reason that the TBT/SPS measure weighs more heavily on the foreign firm is because it must re-organize production to conform with two different sets of regulations – one for products sold in the home market, and the other for products destined for the foreign market.

(iii) Equity

Governments are not only concerned with increasing national income but also with distributing income more equitably. This type of motive could be hard to distinguish from the protection for sale motive discussed below. First-best policies for income redistribution are not tariffs or non-tariff measures. In advanced countries, the fiscal system – both on the tax and expenditure side – is used to alter the distribution of income. Particularly in least-developed countries (LDCs), where fiscal systems are less developed and social safety nets often non-existent, governments appear to use trade policy instruments and NTMs in particular to achieve income distribution goals.[21]

Kalenga (2012) provides evidence that import and export bans and quota restrictions on commodity trade continue to make up a significant part of NTMs in sub-Saharan Africa. The use of export restrictions by a number of emerging economies when commodity prices spiked in 2008 was motivated in part to alleviate the pressure of high food prices on the most disadvantaged (Organisation for Economic Co-operation and Development (OECD), 2009a). Section B.3 and Box B.7 provide other examples of measures in the services sector whose underlying motive is equity and income redistribution.

(iv) Political economy (protection for sale)

All the motivations discussed above involve increasing social welfare by using non-tariff measures to correct market failures or to take advantage of a country's or a firm's international market power. However, political leaders may have other motivations beyond the welfare of citizens. For example, they may depend on financial contributions from special interest groups who want a say in trade policy (Grossman and Helpman, 1994).[22] In these cases, trade protection is "for sale" to the highest bidder. If policies are being influenced by special interest groups, it should be apparent from the structure of the protection being offered and the nature of the lobbying behind it. This is discussed in greater detail in Box B.4.

The original study by Grossman and Helpman only considered the use of trade taxes – tariffs, import subsidies, export taxes and export subsidies – by "captive" policy-makers under the influence of special-interest groups. The subsequent protection for sale literature extends the analysis to cover other non-tariff measures. Maggi and Rodríguez-Clare (2000), for instance, consider a situation where importers make contributions to the political incumbent. The interests of importers are opposed to those of domestic producers who benefit from import restrictions. However, if protection is to be given anyway, importers will prefer that it takes the form of import quotas rather than tariffs because they will be able to obtain the quota rents (i.e. the income generated by imports within the quota limit). Rather than being motivated by some public policy

objective, the use of quotas simply reflects the influence of importers' interests on policy-makers. Maggi and Rodríguez-Clare point out that political contributions may be made by foreign exporters as well. This could explain the use of voluntary export restraints (VERs) since the quota rents accrue to foreign exporters rather than home-country importers.

Politicians captive to special interests might also use TBT/SPS measures or customs procedures as a means of transferring profits to their benefactors (Abel-Koch, 2010). One of the "stylized" findings from the "new new" trade theory (Melitz, 2003; Helpman et al., 2004; Chaney, 2008) is that only the most productive firms in a country are engaged in exports. This stylized fact is explained by firms' widely differing productivity ("firm heterogeneity") and the existence of fixed costs to exporting. These are costs that are incurred by firms only once in order to access a foreign market, such as market information costs, the cost of setting up a distribution system, or the cost of complying with foreign technical regulations. The fixed cost of exporting turns out to be critical in determining which firms will be able to access foreign markets and which firms will fail to do so.

Suppose that the importing country requires all foreign goods to comply with its national TBT/SPS measures. Since this increases the fixed cost of exporting, less productive firms cannot generate enough revenues to cover the higher fixed costs of accessing the foreign market and therefore exit it. This reduces competition in the importing country and increases the market

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Box B.4: Is it possible to identify disguised protectionism in NTMs?

As noted at the start of this section, non-tariff measures that are used to achieve public policy goals may also be used to pursue illegitimate ends. This makes it difficult to ascertain what motivates a government to apply a particular NTM. Without underestimating the challenge this poses, the economic literature identifies a number of benchmarks that could be used to answer the question. To complement this analysis, a set of legal tools to identify disguised protectionism based on WTO jurisprudence is discussed in Section E.3.

The "protection for sale" literature predicts that organized or lobbying sectors would be favoured. Within organized groups, the import-competing members typically obtain protection while exporting members receive an export subsidy. Grossman and Helpman also predict that unorganized sectors will be penalized, with import-competing producers facing an import subsidy and exporting sectors penalized with an export tax.[23] Sectors with low elasticities of import demand (export supply) will enjoy higher levels of protection or support. The rationale for this is that the government will prefer to raise contributions from those sectors where increased protection creates the least losses to society.

Finally, sectors where import penetration is low will enjoy greater protection.[24] This is because in sectors with large domestic output, producers have much to gain from an increase in the domestic price, while the economy has relatively little to lose from protection when the volume of imports is low. Using US data, a number of empirical papers have been able to confirm that the observed pattern of protection and lobbying is consistent with the predictions of the protection for sale model (Goldberg and Maggi, 1999; Gawande and Bandyopadhyay, 2000; Facchini et al., 2005; Bombardini, 2008).

The lack of transparency of a measure may also be a tell-tale sign of lurking protectionism. Political incumbents have an interest in camouflaging the transfer of income to special interests. The less transparent the measures, the greater leeway incumbents have to serve their principals.

share and profits of domestic firms. A government captive to domestic producers can use compliance with TBT/SPS measures as a way of increasing the profits of these producers.

In the protection for sale literature, it is assumed that non-tariff measures are more widely used now because trade agreements and multilateral rules increasingly constrain the use of tariffs. However, this may not be the only reason why NTMs are used by political incumbents. As is explained in Section B.2, political leaders might prefer to use TBT/SPS measures because their greater opaqueness reduces the electoral risk posed by their use (Coate and Morris, 1995; Kono, 2006; Sturm, 2006).

(c)   What are the trade and welfare effects of NTMs?

The previous discussion established that, apart from political economy motives, governments use non-tariff measures to increase national welfare. This means that trade and welfare effects need not move in the same direction. The application of an NTM may reduce trade and yet increase the welfare of the NTM-applying country. The effects largely depend on the nature of the market failure, the type of NTM used, and other market-specific circumstances. Nevertheless, the trade effects of the specific measures are highly relevant.

The trade effects of non-tariff measures can be large in a world of deepening economic integration and shaped by complex cross-border production in the form of global supply chains. Using NTMs to pursue beggar-thy-neighbour policies – to manipulate a country's terms of trade or to steal profits from foreign enterprises – is a game that can be played by every country. A government tempted to employ such measures, but concerned about national welfare, will need to worry about the possibility of similar beggar-thy-neighbour NTMs being used against it by trade partners. The magnitude of the possible welfare losses from others' opportunistic actions is linked with the size of the trade effects. This issue, and the role that international cooperation can play in addressing it, is the focus of Section E.

Even in the absence of explicit beggar-thy-neighbour policies, and where non-tariff measures are only targeted at genuine market failures, the measures may be opaque, poorly designed, or badly implemented, thus increasing uncertainty and trade costs. Any country – whether the home country or its trading partner – can be guilty of these failings, which will end up reducing trade and the potential welfare gains that the NTMs were intended to achieve in the first place. One area that illustrates the potential problem is conformity assessment.[25]

Conformity assessment procedures are technical procedures — such as testing, verification, inspection and certification — which confirm that products fulfil the requirements laid down in regulations and standards. Generally, exporters bear the cost, if any, of these procedures. Ideally, attestation of conformity should be carried out only once in the most cost-effective manner and, subsequently, be recognized everywhere. However, in many instances, authorities in the importing country are not willing to rely on foreign manufacturers' own declarations or reports/certifications by third parties that the required specifications have been met. Whatever the TBT/SPS measure may be, assurance of compliance will be sought from domestic bodies in the importing country. This will unnecessarily raise trade costs if foreign conformity assessment bodies already possess the competence to assure them that products meet the requirements of the importing country. See Section C.2 and Section D.2 for evidence about conformity assessment procedures and estimates of the costs.

Since it is impossible to analyse the trade and welfare effect of every non-tariff measure, the following section focuses on examples regarding quantity, price and quality measures.

(i)   Quantity measures

The classic example of a quantitative restriction is an import quota which fixes trade flows at a given level. Since the trade impact of a quota is unambiguous, the interesting issue is its effects on other economic variables. Section B.1(b) highlighted instances when an import quota was an instrument used to transfer income (quota rent) to special interest groups and when a government might use an import quota to achieve a public policy goal.

If the level of infant industry protection needs to decline over time, and policy-makers lack reliable information about the required policy setting, a quota may serve better than a subsidy (Melitz, 2005). If the safety of foreign products cannot be assured and there is no way for consumers to distinguish between safe and unsafe products, an import ban might be warranted. However, a careful consideration of these latter instances suggests that extenuating circumstances in the form of high information costs were required to justify the use of import quotas. In almost all other circumstances, other non-tariff measures would be preferable to quotas. For example, in the case of infant industry protection, a subsidy is superior to an import quota. Likewise, TBT/SPS measures or labelling schemes work better than a ban in addressing all but the most extreme forms of information asymmetry. The following discussion addresses other issues related to the effects of a quota.

In principle, it is possible to calculate an *ad valorem* tariff rate that, if applied in place of a quota, will have the same trade effect. Even though import levels would

be identical, there are critical differences between tariffs and quotas that have an important bearing on welfare. If demand expands because of income or population growth, for example, imports will grow under a tariff but not under a quota. A quota also generates income (quota rent) for importers whereas tariffs generate revenues for government. In addition, the existence of quota rent can lead to an unhealthy struggle among interest groups to acquire these rents, a behaviour known as "rent-seeking" (Krueger, 1974), which can either be legal or illegal (e.g. taking the form of bribery or corruption of officials). Since competing groups expend resources to capture the quota rent, rent-seeking adds to the welfare losses or inefficiencies under quantitative restriction that do not exist under tariffs.

If domestic producers have market power, a quota also gives them greater scope to restrict imports than a tariff (Bhagwati, 1968). While total imports remain the same as under a tariff, domestic producers are able to charge consumers a price greater than the world price plus the tariff equivalent of the quota. This effect is demonstrated most clearly in the case of a monopoly. Under a tariff, the domestic monopolist cannot charge any price above the world price plus the tariff without imports flooding in. However, a quota insulates the domestic market from trade once a given threshold of imports is reached, allowing the monopolist to charge the monopoly price because there is no offsetting inflow of imports.

The case where the import-competing industry is made up of an oligopoly (i.e. a market dominated by a small number of sellers) is more complicated. If the oligopolists compete with one another, it will still be true that a quota gives the domestic firms greater scope to exercise market power. The domestic price ends up being above the world price plus the tariff equivalent of the quota but less than the monopoly price (Helpman and Krugman, 1989).[26] If the oligopolists collude, it turns out paradoxically that the cartel may charge a lower price under a quota than under a tariff (Rotemberg and Saloner, 1988) because cartels are subject to defection by members. The higher the price charged by the cartel, the greater the temptation for any single member to cheat by selling more than its allotted share of total output. This opportunistic behaviour is rational for a cartel member even if it risks breaking up the cartel, so long as the additional profit made from cheating is greater than the present value of the reduction in future profits resulting from the cartel's collapse.[27] Given the possibility of a breakdown of the cartel and the lower profits it implies, cartel members may choose to charge a lower price which is just enough to prevent defections.

(ii) Price measures

In Section B.1(b), several examples of price measures (a domestic tax, a production subsidy, and an export subsidy) were examined, as well as their use in addressing market failures (such as externalities and information asymmetry) and in shifting terms of trade and profits.

Since externalities involve a failure to incorporate the benefit or harm caused by a certain economic activity into market prices, price measures should be the preferred tool to address this type of market failure. Such measures can result in either an expansion or contraction of trade flows. If there is a legitimate case for infant industry protection, for example, a production subsidy reduces imports but also improves economic efficiency by giving domestic firms time to accumulate experience, whose learning in turn benefits the industry as a whole. In effect, there is "too much" trade since the market fails to price in domestic firms' capacity to learn and benefit other firms in the industry. A different pattern will result if a Pigouvian tax is applied to correct pollution at home and the domestic industry is import-competing. Domestic output exceeds the socially optimal amount and "too little" trade is being generated because the market fails to price in the environmental harm created by domestic producers. In this case, the Pigouvian tax results in both the imports and the welfare of the importing country rising.

By its nature, an export subsidy is intended to increase the subsidizing country's trade. Leaving aside the example discussed by Feenstra (1986), if markets are perfectly competitive, an export subsidy moves the terms of trade against the subsidizing country and reduces its welfare. Trade and welfare therefore move in opposite directions. Despite the loss in social welfare, this may well be the chosen trade policy if policy-makers are beholden to producer groups. As noted above, one of the predictions of the protection for sale literature is that organized groups in the export sector will be supported with export subsidies. If markets are oligopolistic, and firms compete in quantity, an export subsidy will move profits to the subsidizing country and increase its welfare. In this case, both trade and welfare move in the same direction. If firms compete in price, an export tax will be required to shift profits from the foreign to the home firm. Since an export tax reduces trade, trade and welfare of the country applying the non-tariff measure move in opposite directions.

Although we do not normally think of price measures when confronted with problems of information asymmetry, we saw an example of how an export subsidy could be used to overcome that market failure in Section B.1(b). Uncertainty in the importing country about the quality of foreign goods acts like a market barrier. The export subsidy allows the foreign producer with the high-quality good to introduce its product to consumers in the importing country by selling at a lower price. If enough consumers there have a taste for the high-quality good, trade expansion

will be coupled with a welfare gain for the importing country.

(iii) Quality measures

As explained above, a quality measure will require changes to the technical features of imported products which can be either an obstacle to or a catalyst for trade. Requiring exporters to comply with the importing country's TBT/SPS measures can increase trade costs and diminish their export prospects. On the other hand, if compliance with the TBT/SPS measure resolves uncertainty about the quality or safety of the imported product, greater consumer confidence can increase the demand for the item and increase trade. The trade and welfare effects of a quality measure depend on whether it addresses genuine market failures. If the measure is applied only to protect domestic producers, both trade and welfare in the importing country decrease. If, on the other hand, the measure corrects an existing market failure, welfare is likely to increase with ambiguous effects on trade.

Take the extreme case where there are no market failures but where the importing country requires all imported products to comply with a newly introduced TBT/SPS measure.[28] It is possible to distinguish two types of trade costs that would be increased by the requirement to comply with the importing country's regulation. Compliance can increase the variable cost of exporting, with each unit of export incurring an additional cost. Alternatively, compliance can require the exporting firm to revamp its production process or upgrade its technology. In this case, irrespective of the volume of exports, the firm will incur a fixed amount of expenditure if it wants to access the foreign market.

An increase in either fixed or variable costs will have two effects. First, it will decrease the volume of exports of those firms who continue to serve the export market. This is sometimes referred to as the intensive margin of trade. Secondly, the least efficient exporters will no longer be able to cover their fixed costs of exporting and so would be forced to quit exporting altogether, sometimes referred to as the extensive margin of trade.[29] Where TBT/SPS measures are imposed in the absence of a market failure, social welfare will fall in the importing country. Consumers in the importing country lose out both because the variety of goods is reduced, as some exporters exit the market, and because prices rise as the volume of trade declines. This is not to say that there will be no winners in the importing country. Domestic firms stand to gain because the withdrawal of some exporters and lower sales from remaining exporters reduces competition in the home market.

However, suppose that there is a genuine market failure involving information asymmetry. Consumers in the importing country are uncertain about the safety of the foreign good. Firms in the exporting country may be newcomers to global trade and have little or no reputation to build on. Foreign producers know if their product is safe or not, but consumers in the importing country have no reason to trust their claims. Under these circumstances, there may still be demand for the foreign product, but it is likely to be low. Requiring foreign products to comply with the importing country's TBT/SPS measures can resolve this uncertainty in the mind of consumers. Compliance, however, adds to the exporting firms' cost of production.

Under these conditions, the regulation will have two opposing effects on trade (see Box B.5). The need to conform to the new regulation raises the cost of the imported good which will tend to lower the volume of trade. However, enhanced consumer confidence in the safety of the foreign product will increase demand for it. While it is possible that the increased compliance costs will force some exporters to exit the market, others will use their compliance with the regulation as a competitive advantage and increase their market share. In the context of food safety regulations, for instance, Jaffee and Henson (2004) note that more stringent SPS measures in rich importing countries have different impacts on the competitive position of developing countries, exposing the weaknesses of some producers but accentuating the underlying supply-chain strengths of others.

Furthermore, some countries use high-quality and safety regulations to successfully position themselves in global markets. Like trade, the effect on welfare is ambiguous and depends on the relative strengths of the forces acting on consumers and domestic producers. The increased cost incurred by foreign exporters to comply with the measure should increase output and revenues for domestic producers. For consumers, there are two opposing effects – a higher price for the product which needs to be weighed against the improvement in the product's safety or quality.

Finally, while Box B.5 seems to suggest that an increase (decrease) in trade leads to an increase (decrease) in welfare, this does not necessarily hold under more general conditions. This is shown in Disdier and Marette (2010) for example, where despite a reduction in trade, welfare improves when the application of a TBT/SPS measure corrects an existing market imperfection. This result is consistent with the argument that sometimes the adverse trade effect of a non-tariff measure is a by-product of pursuing a legitimate public policy goal.

Box B.5: Effect of TBT/SPS measures on trade and welfare

Assume that a country does not produce the good X and meets all its consumption through imports. These imported goods differ widely in quality and consumers are unable to tell them apart. Because of this uncertainty, demand is low (given by the line BD in Figures B.1(a) and (b)) and price is equal to OW. Imports are equal to OA. The government of the importing country requires foreign producers to comply with a quality assurance programme; otherwise their goods will not be allowed to be sold in the country. Compliance raises the costs of foreign producers so that the price they charge rises from OW to OW'. However, consumers are now assured that only high-quality products are being sold in the market which leads to a shift in their demand to BD'. One possible outcome is that total imports rise to OA' in spite of the higher cost of imported goods (see Figure B.1(a)). Some consumer surplus is lost, given by the area labelled WW'EF, as a consequence of the cost of compliance. However, the increased confidence in the higher-quality imports results in a gain equal to the area labelled BEC. Overall, there has been an increase in consumer welfare so in this case both societal welfare and trade increase at the same time. Another possible outcome involves imports declining (see Figure B.1(b)). The increase in consumer confidence is not sufficient to overcome the higher cost of compliance. In this second example, both trade (falling from OA to OA') and societal welfare decline (the loss of WW'EF outweighs the gain of BEC).

Figure B.1(a): **Effect of TBT/SPS measures on trade and welfare: both increase**
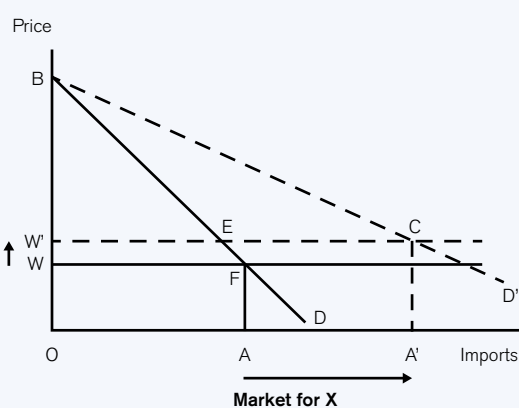
Figure B.1(b): **Effect of TBT/SPS measures on trade and welfare: both decrease**
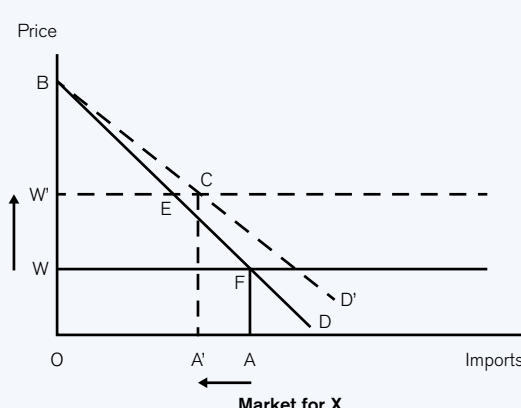
2. The choice of NTMs in light of domestic and international constraints

In the previous sub-section it was shown that in many instances, non-tariff measures, even though they affect trade, are first-best policies to address a legitimate public policy objective, such as consumer health and safety protection. However, the same measures can also be employed in a way that distorts international trade. In order to decide in such cases whether an NTM is innocuous, it is useful to determine whether the measure is likely to be pursued for competitiveness reasons rather than the stated public policy rationale or whether it may affect trade more than is necessary to achieve its policy aim.[30] Section B.2(a) explores a range of scenarios in the domestic political and economic context in which governments may be inclined to misuse NTMs in this manner. Section B.2(b) considers how far sub-optimal policy choices reflect government-imposed constraints on alternative options. The question of possible "policy substitution" may arise when international trade agreements limit the use of tariffs

and certain types of NTMs but regulate other, less efficient options less effectively.

(a) Use of NTMs and domestic policy considerations

An important reason why governments may choose to pursue trade policy objectives by applying non-tariff measures associated with other public policy goals, or, more generally, may not choose the most efficient measure for this purpose relates to the lack of transparency of certain NTMs regarding their ultimate effect and purpose. This "opaqueness" may make such measures more attractive for politically motivated interventions where beneficiaries and the size of the effects are not easily identified. Other explanations for such policy choices emphasize institutional constraints that entice politicians to choose NTMs with certain characteristics even if these measures are economically wasteful compared with alternative means.

The fact that some NTMs entail a fixed rather than variable cost is another factor that may explain why a government subject to pressure from particular groups

may favour NTMs over tariff protection. Finally, the existence of market power in a context of offshoring (and the possibility of extracting profits from exporters) may explain why trade concerns can lead both welfare- and politically oriented governments to tamper with domestic policies rather than border policies alone. Each of these explanations is discussed in turn.[31]

(i) Transparency

Although it has been argued that in competitive political systems, politicians who favour specific interest groups in an inefficient manner would be voted out of office (Stigler, 1971), the political economy literature has increasingly paid attention to the form of government intervention. One branch of the literature presumes that citizens are poorly informed as to the effects of various policies and the extent to which different politicians may be receptive to lobbying. It is not unrealistic to assume that politicians have better information than citizens about whether the conditions for a welfare-improving policy intervention are actually satisfied.[32] In addition, it may be true that citizens remain unsure after a policy is implemented whether the government has acted in the national interest or simply catered to organized interests.

In particular, as Tullock (1983) observes, policies may be chosen that benefit organized interest groups and, at the same time, are justifiable on other widely accepted grounds, such as environmental protection, and, hence, may affect positively the government's reputation with the public at large. This mismatch in information between citizens and the government about both policies and politicians' motivations can lead to the implementation of "inefficient 'sneaky' methods of redistribution over more transparent efficient methods" (Coate and Morris 1995: 1212), even when the latter are available.

In the field of trade policy, non-tariff measures may be a means to increase the income of producer lobbies while concealing the associated costs and/or the true benefits of the alleged policy objective (e.g. health, environment) to the public at large.[33] Rather than tariffs that are straightforward in their price impact and cost to consumers, an "opaque" NTM, such as an environmental regulation, may shelter an import-competing sector from foreign competition and, at the same time, be perceived as being in the public interest, even though a proper cost-benefit analysis may not show a net welfare gain. Uncertainty about the justification for, and impact of, different policies cannot explain on its own the use of opaque non-tariff measures, as competition among politicians would allow voters to sanction those politicians that pursue less efficient policies.

However, this changes when the possibility of "government failures" is taken into account. Coate and Morris (1995) describe a situation where different "types" of politicians are competing for office and voters are unsure as to the true nature of politicians' intentions. In such a case, reputation matters. "Bad" politicians, i.e. those who wish to increase the income received by special interest groups at the expense of the general public, may have an incentive to implement a "public" policy that indirectly benefits the preferred interest group, even though it is not warranted on grounds of national welfare, because open favouritism to certain groups would entail a greater reputational damage.[34]

In other words, by increasing the income of special interest groups through "opaque" rather than direct means, these politicians limit the negative reputational impact. This is because voters cannot be sure that a given public policy is being misused by "bad" politicians, as "good" politicians would pursue the same policy, albeit only if it resulted in an overall net welfare gain. As noted above, this presupposes that citizens are unable to determine the overall costs/benefits of the public policy in question with any degree of confidence both before and after it is implemented. This is a plausible assumption for policy decisions in many areas (Coate and Morris, 1995).[35]

The authors specifically cite the example of temporary infant industry production subsidies pursued to encourage learning by doing. Whether these subsidies benefit the public or not ultimately depends on the amount of learning by doing they engender, and it will be difficult for citizens to verify whether such subsidies were in their interest. Sturm (2006) cites a number of recent trade disputes over environmental or health regulations to construct a similar model, in which uncertainty about the optimal level of regulation allows politicians to provide disguised protection to the local industry and, hence, to limit possible negative consequences in future elections.[36] Like Coate and Morris (1995), Sturm (2006) characterizes such "green protectionism" (i.e. the unwarranted implementation of a product regulation in view of the limited environmental risk) as a political failure, as preferable instruments from a welfare perspective are available – in this case, direct subsidies to local producers. However, these are not chosen by "bad" politicians owing to their potentially negative impact on the politicians' re-election prospects.

In an interesting extension to the Coate and Morris (1995) set-up, Sturm (2006) also considers the political conditions in the exporting country. It is assumed that the foreign country has a comparative advantage in the product in question and that it would be more costly for foreign producers to comply with an environmental regulation than for domestic producers. Politicians in the exporting country (both "good", i.e. solely social welfare-oriented, and "bad") would therefore oppose the product regulation for its negative impact on the country's terms of trade. However, due to the same political failure described above, "bad" foreign politicians would oppose compliance with a product regulation even if the environmental risk was sufficiently high to

affect welfare of consumers in their own country. In other words, although adherence to the environmental regulation would increase welfare in the exporting country as well, bad politicians would continue to oppose it to the benefit of their constituency in the export sector, a situation the author calls "environmental dumping".

A situation where politicians in the importing country implement the product regulation, while politicians in the exporting country do not (i.e. a potential face-off on the trade impact of environmental policy), can have implications for their reputations in any one of the two countries. While voters may be unable to distinguish whether the foreign environmental policy is too lax or the domestic regulation too high, they know that such disagreement over the appropriate environmental policy implies that at least one of the two incumbent governments is of the "bad" type, i.e. prone to influence from producer lobbies.

In other words, the "politician who is distorting the environmental policy … imposes a negative reputational externality on the other incumbent" (Sturm 2006: 576), and, by implication, disagreement over the appropriate policy with a respectable politician in another country can entail a reputational damage for a domestic incumbent. In practice, this implies that transparency and the free flow of information on policies and political processes across countries can help to constrain special interest-oriented policy choices.[37] Section E discusses further the rationales for cooperation on government regulations, for example in the fields of SPS measures and TBT, and other types of NTMs and highlights the importance of transparency.

(ii) Institutional constraints

Institutional constraints can make economically less efficient non-tariff measures better for the interests of politicians or social groups that hold political power. First, governments may be limited in their ability to direct benefits to important constituents. They may lack the information necessary to target resources towards their supporters, or the credibility to maintain those policies, without an otherwise inefficient non-tariff measure.

Secondly, if the public elects a new government, the interest groups that support the incumbent may lose influence. Inconsistency problems between the government and its supporters lead politicians to try to enact policies that are difficult to reverse. Certain NTMs may be less exposed to the winds of political change. Finally, government policy is not a "monolith", but rather reflects the interests of parochial departments, bureaucrats and legislators. Intra-governmental conflict can create frictions that lead to the implementation of inefficient NTMs favouring one particular interest over another.

Targeting political supporters

Some non-tariff measures that are comparatively inefficient, such as a market-distorting regulation, can help the government to target policies towards their favoured constituency. Concretely, a government may prefer a policy that is less efficient if its outcome is more predictable. In order to illustrate why such distortionary policies persist, Mitchell and Moro (2006) describe a case in which removing an inefficient trade measure creates winners and losers in society.[38] The authors presume that the NTM in question is "informationally" efficient, as compensating those that would lose from trade opening requires knowing the extent to which foreign market competition actually causes the harm, while keeping the NTM in place requires no such additional knowledge. It is assumed that information about actual losses is private, i.e. "losers" from trade opening have the incentive to over-report their losses.

If the government worries about excessive spending on compensation policy, it may prefer to sustain the NTM rather than make decisions about how much to compensate.[39] Here, a key assumption is that the effects of an NTM are easier to verify than the effects of trade opening. This argument is less plausible if the costs of over-compensation are low or the government is equally informed (or equally ignorant) about the effects of an NTM compared with a more efficient redistributive policy.

Acemoglu and Robinson (2001) address a similar problem in the following example. If farmers hold significant political sway, the government may consider providing either a lump-sum transfer (i.e. income support) or price support in order to maintain favour with this group. Price support represents a less efficient instrument because of its effects on product markets, and from a national welfare perspective, the government should prefer a lump-sum transfer. However, despite its negative effects on consumers and trade, governments may prefer price support, which efficiently targets those who are genuinely farmers in the short-run, as farm output is a prerequisite for receiving the subsidy. Conversely, lump-sum payments might go to a larger number of beneficiaries who merely claim or pretend to be farmers (Stigler, 1971).

In addition, Acemoglu and Robinson (2001) highlight that price support increases the returns to farming and, in the long run, encourages more entry into farm activities, which further entrenches farmers' political power. Hence, for the government the distortive effects of the price support policy are potentially outweighed by the benefits of solidifying the political power of its favoured constituency.

Policy reversals

In competitive political systems, governments in power change, which can lead to policy reversals. From the

perspective of an interest group, relatively more efficient policy measures such as a one-time subsidy or a tariff may have the disadvantage of being subject to review by new legislatures or other elected officials. By contrast, certain non-tariff measures, such as product regulations, may be defined and implemented by regulatory agencies unaffected by political change and may not be subject to a regular renewal process. Rubin (1975) notes that such long-lived but inefficient policies can benefit politicians by increasing interest group support.

Politicians who are unsure about their own re-election prospects receive less from lobbyists for a short-term, reversible policy. However, politicians may nonetheless receive benefits from special interests if they put in place measures, such as product regulations and the related bureaucratic apparatus that last beyond their expected careers. Inefficient NTMs which lack regular oversight also call upon fewer resources to influence the political process and, thus, are less expensive for lobbyists with sufficiently long-term horizons.[40]

Intra-governmental conflict

Even if legislators do have regular oversight of regulatory policy measures, the bargaining necessary to pass legislation can distort policy decisions. Each legislator must decide how to allocate resources towards policies that benefit the whole country and those that primarily benefit their local constituency. Politicians may be willing to pass a policy of national interest only if, for example, a subsidy is given to an industry located in their home district. As all legislators may need to cater to special interests, inefficient policies can proliferate (Weingast et al., 1981).[41]

Further inefficiencies can arise if each legislator represents a number of constituents with conflicting interests. Dixit et al. (1997) develop a model in which interest groups spend resources on lobbying for government policy. As with the farming case above, lump-sum cash transfer policies by the government would be more efficient from a welfare perspective, but the authors demonstrate that competition between individual interest groups for more transfers can lead to an inefficient allocation of resources to lobbying. This can explain why the interest groups may seek to agree on a comparatively less efficient non-tariff measure that may not require them to lobby. While such an NTM reduces overall efficiency, it ultimately channels more resources to the groups.

The oversight problem also arises because of a lack of coordination within governments and across agencies that produce and regulate non-tariff measures. Because agency jurisdiction is often allocated according to a function, a given kind of NTM can be the responsibility of a number of overlapping departments or committees within a government. Efficient policy-making requires the contribution and cooperation of a number of agencies with different institutional interests, but these agencies may not value the overall policy goal as much as a parochial interest. As a result, intra-department miscommunication or competition can produce persistently inefficient policies. This implies that reforming NTMs that involve a range of domestic and possibly sub-national regulatory agencies may require broader attention to the potential bureaucratic frictions that prevent cooperation (Gulotty, 2011).

(iii) Firm preferences for trade measures inducing fixed costs

Recent economic research on the diverse nature of firms within a particular sector in terms of productivity and size has led to another rationale why trade protection may come in the form of "behind-the-border" non-tariff measures rather than border protection. A range of NTMs, such as TBT/SPS measures, have an important fixed cost component, as costly production adjustments have to be made, but per unit costs subsequently decline as more output is sold in the respective market.[42]

Owing to productivity and size differences among firms, fixed cost increases affect firms differently, unlike variable levies that raise costs for every firm by the same percentage.[43] Hence, although a technical product regulation affects both domestic and foreign firms, the fixed costs it entails represent a higher burden for smaller and less productive firms in both countries. As a consequence, the least efficient firms will cease to be competitive and exit the market, while the more productive and larger firms both domestically and abroad will see their profits and market shares increase. Ultimately, behind-the-border non-tariff measures of this sort only benefit the country introducing the measure as a whole if the ratio of very efficient to very inefficient firms is larger at home than in the exporting country (Rebeyrol and Vauday, 2009; Abel-Koch, 2010).[44] This is in contrast to border measures, which always penalize foreign firms to the benefit of domestic producers.

Under what circumstances, then, would a behind-the-border non-tariff measure rather than border protection be introduced? Of course, like border measures, distortionary behind-the-border measures may also have a negative impact on consumer welfare. However, as discussed in the previous sub-sections, a politically-oriented government may yield to lobby pressure from domestic producers. Assuming that only the largest and most efficient firms have the means to lobby the government,[45] they may gain more from the introduction of a behind-the-border NTM at the expense of small, less productive producers at home (even if some of the gains also go to more productive competitors abroad) than from border protection that shields all domestic firms (including those that do not lobby) from foreign competition.

Lobbying for a more demanding product regulation is more likely the less the government is concerned

about social welfare and the fewer foreign firms are active in the domestic market. The reason for the latter is that when trade is already low (e.g. due to largely inefficient foreign firms or existing border protection), an increase in behind-the-border non-tariff measures has a relatively more important effect on domestic competition. To some extent, this is counter-intuitive to the idea of policy substitution, i.e. the increase of behind-the-border NTMs when border measures are liberalized. This is further discussed in the sub-section that follows, where empirical evidence in support of policy substitution is also presented.

At higher levels of regulation, the marginal gain from behind-the-border non-tariff measures declines (and hence the political contributions lobbying firms are willing to make) and at some point becomes smaller than the marginal loss in social welfare (despite the larger weight given to organized producer interest). As a result, behind-the-border NTMs may be set at some "intermediate" level.

Conversely, for border measures targeted exclusively at foreign producers, the domestic producer lobby's marginal gain in profits (and related political contributions) do not decrease with higher levels of protection and lobbies who gain a lot from keeping foreign competition out and governments that care little for social welfare may implement a prohibitive level of border protection, or vice-versa, none at all (Abel-Koch, 2010). In sum, although the author formally does not consider lobbying for behind-the-border as opposed to border measures simultaneously, it is interesting to note that when behind-the-border NTMs are introduced, the conflict of interest between domestic producers pitting an organized lobby of productive firms against the rest may lead to less restrictive measures than if border protection were pursued.

(iv) Offshoring and bilateral bargaining

The increased role of international production networks in today's global economy and the fragmentation of the production process across borders have required a fresh look at the impact of non-tariff measures and services measures on international trade and at the incentives for government intervention. In Section B.1, it was noted that international production sharing may add to market imperfections, such as information asymmetries (Kimura and Ando, 2005) that can provoke regulatory intervention, for instance in relation to safety and quality control. In their seminal work, Jones and Kierzkowski (1990; 2000) emphasize the effects that governmental measures in "services links" connecting fragmented production blocs can have on trade in intermediates, while such measures play less of a role when the production of goods is integrated and trade takes place in final products.

In regard to political economy rationales, Grossman and Helpman (1994) mention that the protection for

sale framework can easily be extended to allow for imported intermediates, without changes to its fundamental outcomes. Protection would still be provided to politically organized final goods producers rather than producers of intermediates, as the former would lobby against protection for the latter.[46]

While the fragmentation of the supply chain affects governments' motivations to intervene and enlarge the ambit of relevant policy areas, as established in Section B.1, it may also involve new constraints and considerations in the choice of policy measures. In a recent set of papers, Staiger (2012) and Antràs and Staiger (2008) formalize a novel, explicit mechanism in relation to the international fragmentation of the supply chain that could lead to an increased use of non-tariff measures. In their framework of offshoring, the determination of international prices changes from one governed by market clearing mechanisms to one characterized by bilateral bargaining between foreign suppliers and domestic buyers. As noted in Section B.1, in such a situation, governments can be expected to use tariffs as a "first-best" instrument for extracting profits from foreign exporters.[47] However, with international offshoring, even though the government may be free to use tariffs, other policies, including behind-the-border NTMs, may also be used, resulting in a distortion of their efficient levels.

The key feature in international offshoring emphasized by the authors is the relationship-specific nature of trade between importers and their specialized suppliers abroad. Owing to the specificity of the input, foreign suppliers hold some market power over the importing producer. At the same time, once the input is produced by the exporter according to the importer's specifications and the related investment is sunk, the importer can wield its bargaining power to obtain a share of the foreign supplier's profits. As a result, international prices are determined by bilateral bargaining rather than market clearing. This phenomenon, which has become known as the "hold-up" problem in the economics literature, leads to the situation of "under-investment" by foreign suppliers and, hence, an insufficient supply of inputs to domestic producers.[48]

The domestic government now faces a tension in its objective to maximize national welfare: it must provide incentives to foreign input suppliers to produce more and, at the same time, it must help domestic producers importing these inputs to appropriate maximum profits in the bilateral bargaining with the foreign supplier.

In order to pursue these different objectives in its foreign trade relationship, the government will not only adjust its tariff policy on inputs, but also employ measures in regard to final products. It will do the former to increase the supply of foreign inputs and the latter in order to affect prices received by producers and, hence, profits all along the supply chain. Concretely, Antràs and Staiger (2008) seek to develop

a realistic scenario, where a politically motivated government (i.e. one that attaches a higher weight to producer benefits) may reduce tariffs on imported inputs (which has a positive effect on supply), but seek to increase the price of the final product, e.g. via an import tariff or an export subsidy. A disproportionate part of the costs of these distortions is borne by consumers, but a government that is sufficiently influenced by organized producer interests may be willing to allow this to happen in order to help domestic producers to increase their profits, even though some of these profits may also be dissipated along the supply chain to foreign input providers.

Building on this approach, Staiger (2012) constructs a model in which the government applies non-tariff measures on top of tariffs to the same product in order to maximize national welfare in a situation of bilateral bargaining with foreign producers.[49] In his set-up, the consumption of a good that is subject to bilateral bargaining when imported and also domestically produced entails an adverse effect on the environment. A consumption tax is imposed in order to "internalize" this environmental externality – that is, to reduce the over-consumption of the product in question owing to the lack of consideration by consumers of the environmental harm imposed on others. It can then be shown that the level of the domestic consumption tax used to address the environmental externality would be set "inefficiently", as part of the costs of the tax would be borne by the foreign input supplier.

Concretely, under certain conditions, the importing country can be made better off when import tariffs on the product are reduced and the domestic consumption tax is increased. The reason for this is that in Staiger's model, lower tariffs directly affect the pricing and production decisions of exporting firms. On the other hand, because consumers experience diminishing "utility" from higher levels of consumption of the same product, the tax does not alter consumer behaviour in a linear fashion.

While the tax partially induces consumers to cut consumption, some of the burden of the tax is imposed on the foreign producers by lowering producer prices.[50] Through this mechanism, the government is able to ensure a given supply of the good in question by lowering tariffs, while at the same time reducing foreign profits to the benefit of domestic importers. This adjustment is eventually stopped when the distortion of domestic demand, taking into account the marginal costs and benefits of containing the environmental externality, becomes too high in terms of national welfare. While the government's motivation to use non-tariff measures in such a situation is discussed in relation to a domestic consumption tax (as a targeted product-specific and detailed price instrument), Staiger (2012) briefly explains that the underlying logic could also apply to other forms of "behind-the-border" NTMs, such as TBT measures. In particular, the author asserts that in practice governments tend to apply uniform sales or value-added taxes across wide ranges of products rather than levying differentiated taxes on individual goods. He shows that where product-level domestic taxes are unavailable or difficult to implement, offshoring and bilateral bargaining can lead to a situation in which product regulations are set to be inefficiently high.

(b) Use of NTMs and international constraints

Governments can use multiple policies to achieve a given objective. In the case of a market failure, the "first-best" policy to address a single distortion is one that offsets the source of the distortion directly. For instance, if the domestic production of a certain good is associated with positive externalities for an economy, a production subsidy is the "first-best" policy – it is welfare-superior to an import tariff. What then happens in a situation where an economy faces a domestic distortion, an externality for example, but also has monopoly power in trade in that it can affect the world price of the given product? In a non-cooperative framework, a government would introduce two "first-best" or most efficient policies – a non-distortionary non-tariff measure to tackle the former and a suitable tariff for the latter (Bhagwati and Ramaswami, 1963). However, the "first-best" or most efficient measures may not always be used by governments.

The previous section showed that governments may choose to pursue trade policy objectives using non-tariff measures rather than tariffs even when the latter, more efficient, measure is available to them. It attributed this to institutional factors, the lack of transparency of certain NTMs, the fact that some NTMs entail a fixed rather than variable cost and the existence of market power in a context of offshoring. However, it may also be the case that the more efficient measures are not always available to governments. This section discusses the use of NTMs in light of constraints imposed by international trade agreements – both multilateral and regional.

(i) International constraints

Under the auspices of the GATT/WTO, the last 60 years have seen a dramatic multilateral reduction in tariff barriers owing to agreements that require members to respect the negotiated tariff bindings – ceilings on applied tariffs. If members set tariffs above that binding, they may be subject to a costly dispute initiated by another member. Similar constraints also affect other trade policy measures – for example, non-tariff measures such as import and export quotas as well as export subsidies are generally prohibited, although their use is allowed for "legitimate" reasons in specific cases. Even in preferential trade agreements (PTAs), countries agree to preferential tariffs between themselves and, in

customs unions, to set a common external tariff, whereby non-enforcement of these tariffs could generate costly retaliation by other PTA members.

Unlike border measures, disciplining behind-the-border non-tariff measures explicitly under the multilateral trading system, for instance, is more challenging for the following reasons. First, they are typically less transparent. Secondly, as alluded to in Section A, NTMs are often highly complex and country-specific. This means that the formulation of general rules to discipline them is likely to involve different authorities who are not used to coordinating with others. Thirdly, while NTMs may have adverse trade effects, some of them are associated with legitimate public policy objectives. Despite these difficulties, NTMs are not left entirely unregulated because members of a trade agreement could otherwise undo any negotiated tariff restrictions by, for instance, imposing different sales taxes for imported and domestic products (Horn, 2006). Of course, to the extent that countries can use NTMs in import-competing sectors as a means of reducing trade flows, they can undermine commitments previously made with respect to trade policy (Bajona and Ederington, 2009).

(ii) Policy substitution

It is likely that as countries sign successive rounds of trade agreements that constrain their ability to pursue trade goals through trade policy (tariffs and certain border non-tariff measures), other NTMs, including those behind the border, become attractive tools for terms-of-trade manipulation that shifts costs onto foreign exporters. In other words, there will be incentives for governments to distort their NTMs as a secondary means of protecting import-competing industries (Copeland, 1990; Ederington, 2001; Bagwell and Staiger, 2001; Bajona and Ederington, 2009). In this context, it is even argued that there is a "Law of Constant Protection" (Bhagwati, 1988).

According to Anderson and Schmitt (2003), when tariffs are constrained cooperatively, quotas would be the preferred measure among the set of border NTMs for governments looking for alternative measures. Anti-dumping policies are likely to be used only when the use of quotas is also sufficiently constrained by international agreements.[51]

Similarly, if a government cannot respond to competitive pressures abroad by unilaterally restricting market access with an increase in its tariff, it may be drawn into imposing a behind-the-border NTM. For example, it may be tempted to improve the relative cost position of a domestic firm by relaxing technical regulations in its import-competing industry, thereby restricting access to foreign suppliers. Some foreign suppliers who export to these markets may actually lower their prices to remain competitive with domestic

producers.[52] However, even such terms-of-trade movement leads to foreign producers absorbing some of the costs of the weakening of domestic technical regulations (Bagwell et al., 2002). Hence, in light of falling trade barriers, this regulatory cost shifting could result in a "race-to-the-bottom" problem where governments might be tempted to relax technical regulations that apply to import-competing industries in the name of international competitiveness – those relating to labour and the environment are prominent examples (Bagwell and Staiger, 2001; Bagwell et al., 2002).

According to Bagwell et al. (2002), the true source of the "race-to-the-bottom problem" is not that weak foreign technical regulations generate competitive pressures that induce inefficiently low domestic technical regulations. Rather, it is the imperfections in property rights over market access commitments in trade agreements – a government is not free to adjust its policy mix so long as it maintains its market access commitment. For instance, if a government increases technical requirements in its import-competing industry, this industry would be subjected to increased competitive pressure from abroad. However, because trade policy is constrained by an international agreement, the government would not be able to raise its tariff (without a penalty) and maintain its market access commitment.

It is worth noting that instead of a "race-to-the-bottom" problem, it may even be the case that increased constraints on tariff policy imposed by international agreements are accompanied by rising technical regulations. The international cost-shifting incentive described above may instead create a tendency for governments to impose more stringent domestic technical regulations if the domestic firm in an import-competing industry finds it easier to comply with them, i.e. if the technical regulation improves the relative cost position of the domestic firm (Staiger and Sykes, 2011). However, even when a technical regulation increases the costs of production more for the foreign firm than the domestic firm, the substitution of technical regulations for tariffs which are constrained by an international agreement is far from straightforward.

In a recent study, Essaji (2010) considers two scenarios. First, when tariffs are prohibitive and hence when a small tariff reduction enables minimal participation by the foreign firm, governments are likely to have an incentive to raise technical regulations. This is because the tariff cut increases the marginal benefit of the regulation – because imports become cheaper, the regulation becomes the instrument which can improve the domestic firm's relative cost position and hence its profits. At the same time, by worsening the foreign firm's production costs, and reducing imports, the technical regulation reduces tariff revenues. Hence, if the government cares about tariff

revenues, its optimal regulatory response to tariff cuts is less clear. However, prohibitive tariffs are increasingly rare.

Secondly, in the case where the foreign firm already has a significant market presence, the relationship between tariff cuts – that deepen foreign penetration even further – and rising technical regulations is more tenuous. Technical regulations reduce consumer surplus. However, a reduction in tariffs diminishes the regulation's marginal impact on consumer surplus because it lowers prices faced by consumers. Similarly, while regulations shift profits to the domestic firm, tariff cuts – by making imports cheaper – diminish the regulation's marginal effect on domestic firm profits.

Given the above, if the government only cares about consumer surplus and the domestic firm's profits, it would respond to tariff cuts by relaxing technical regulations. This suggests that because constraints on the use of tariffs weaken the effectiveness of a technical regulation as an instrument, tariffs and technical regulations are actually complements. It underscores that what matters for policy substitution is not the direct effects of measures, but how the weakening of one measure affects the marginal effectiveness of the other. The government's response is more ambiguous when it also worries about tariff revenues and negative consumption externalities.

A reduction in tariffs, bound by an international agreement, enhances the regulation's marginal effect on the consumption externality because it remains the only instrument to reduce demand in the economy. Similarly, tariff reduction enhances the regulation's marginal effect on raising tariff revenues – constraints on increasing tariffs imply that altering technical regulations is the only way in which the government can influence imports and hence tariff revenue. Hence, if the impact of the regulation on the consumption externality is large and/or if the initial tariff rate is high, the improvement in the regulation's capacity to reduce the externality and raise tariff revenues, on the margin, may offset the reduction of its marginal effects on domestic profits and the consumer surplus. In this situation, governments may respond to tariff reductions by technical requirements, i.e. policy substitution.

The findings of Essaji (2010) suggest that the proliferation of technical regulations in recent years may not be driven by a desire to protect domestic firms' profits when tariffs are constrained by an international agreement, but rather it may reflect a growing awareness of consumption externalities. Governments will have an incentive to increase technical regulations only if the net marginal benefit of the regulation increases with falling tariffs.

(iii) What does the evidence suggest?

There is an empirical literature which uses formal statistical methods to analyse whether or not constraints imposed by international or bilateral trade agreements on governments' ability to set tariffs may induce some countries to replace them with non-tariff measures. Using data from Colombia during the mid-1980s (and early 1990s), Goldberg and Pavcnik (2005) find that tariffs and NTMs were positively correlated, i.e. tariffs were reduced, not simply to be replaced by NTMs.

Analysing data for a large cross-section of countries (91) for a more recent time period (the early 2000s), Kee et al. (2009) find that the average ad valorem equivalent (AVE) of non-tariff measures appears to increase with GDP per capita. However, they also find that the overall level of protection decreases with GDP per capita, mainly driven by average tariff levels that tend to be significantly lower as countries become richer. It suggests that, in general, tariffs may be substituted by NTMs. This is reinforced by their findings at the tariff line level, where tariffs are negatively correlated with the AVEs of NTMs. Similarly, Broda et al. (2008) show that after GATT/WTO tariff commitments constrained the United States in its ability to use tariffs for the purpose of terms-of-trade manipulation, the country set significantly higher NTMs in import-competing sectors where it had greater ability to affect foreign exporter prices.

In a more recent study, using data on tariffs and non-tariff measures for about 5,000 products, Limao and Tovar (2011) exploit the variation in tariff constraints generated by the two most common commitment devices – multilateral and preferential trade agreements (PTAs). Importantly, the authors establish a causal impact of the resulting tariff constraints on the use of NTMs – not merely a correlation which may be influenced by other factors. Consider the following. Differences in the size of member states in a PTA, which is a customs union, lead to the common external tariff being determined by the tariffs of the larger partner. This can generate a large change in tariffs for the smaller partner that is likely to be "exogenous" – that is, independent of other determinants of its trade policy.

The aforementioned argument is relevant for the analysis in Limao and Tovar (2011) because they focus on a single country, Turkey, which had to adopt pre-existing EU tariffs in a large number of products. So if the common EU tariff constrained Turkey in its tariff-setting, this could have had a causal impact on protection via non-tariff measures on non-EU exporters. Limao and Tovar (2011) find evidence of policy substitution – tariff commitments imposed via the WTO and the PTA with the European Union increase the probability of Turkish NTMs. They also find that the likelihood and restrictiveness of Turkish

NTMs increase with the stringency of those tariff commitments. Furthermore, it is worth noting that the authors find imperfect policy substitution, thereby implying that tariff commitments – while partially offset by higher NTMs – may have still reduced total protection.

The studies discussed above analyse a broad set of non-tariff measures, including domestic product standards, technical regulations and voluntary export restraints. There is also a literature which analyses a possible substitution effect between tariffs and a particular class of NTMs – anti-dumping (AD) initiations. Evaluating data for 24 countries (17 developing and seven developed countries) during the period from 1996 to 2003, Feinberg and Reynolds (2007) find that trade opening commitments made in the Uruguay Round – measured by changes in bound tariffs – have a statistically significant, albeit small, positive effect on the likelihood[53] of a WTO member using AD protection. In addition, they use a simulation exercise to show that had tariffs not been reduced by the Uruguay Round, there would have been 23 per cent fewer AD cases from 1996 to 2003. When only considering the AD cases brought by the developing countries in their sample, Feinberg and Reynolds (2007) find a much larger positive effect of a promised reduction in tariffs under the Uruguay Round. This holds true both for the likelihood of a WTO member using AD protection and the total number of AD petitions filed by WTO members.

To view the above as evidence of policy substitution, however, one must be cautious. Developing countries did not reduce in the Uruguay Round the tariffs that they actually applied. Their commitments were to reduce the gap between the bound (i.e. the upper ceiling) and the applied rates (the "tariff overhang") by pledging to keep within the lower bound rates. However, what firms actually face in practice are the applied tariffs, which are very different from the bound rates, especially in developing economies.

For the developed countries in their sample, Feinberg and Reynolds (2007) find that commitments to reduce tariffs under the Uruguay Round are associated with less frequent AD activity. According to the authors, this surprising result may reflect a move towards alternative measures of protection, such as TBT and SPS measures. It may also be attributable to a host of omitted variables, such as the increasing importance of services and FDI, which could have diverted the attention of firms in these economies away from the AD instrument (Feinberg and Reynolds, 2007). Given the limitations of the study described above, it is difficult to identify a causal impact of tariff reduction commitments under the Uruguay Round on AD activity.

More recently, using data for 35 countries (29 developing and six developed countries) over the period from 1991 to 2002, Moore and Zanardi (2011) also examine the relationship between sectoral trade opening and subsequent AD initiations.[54] Unlike Feinberg and Reynolds (2007), however, the authors analyse applied rather than bound tariffs. Furthermore, they take account of additional factors that may affect AD initiations, include a larger set of importing and exporting countries. They also cover a longer time span, work with more disaggregated industrial sectors and use a more complete AD database.

In general, Moore and Zanardi (2011) find that reductions in applied tariffs do not lead to a higher probability of AD petitions. However, for a small group of developing countries that have become heavy users of AD in recent years, they do find evidence of policy substitution – a statistically significant impact of trade opening on the probability of AD filings. For this sub-sample, a one standard deviation increase in tariff liberalization results in about a 25 per cent increase in the probability of observing an AD initiation. The absence of a statistically significant "substitution effect" for other developing countries or for the six developed countries in the sample may be due to the fact that the former initiated relatively few AD petitions while the latter already had very low tariff rates over the entire period covered in the analysis.

The results of Moore and Zanardi (2011) are reinforced by the recent work by Bown and Tovar (2011) on the trade reforms undertaken by India in the 1990s. They find that taking other factors into account, products that underwent larger tariff cuts as a consequence of the trade reform were, by the early 2000s, subject to an increase in the use of safeguards and AD measures. In particular, they show that the probability of initiating an AD investigation and safeguard proceeding is 50 per cent higher as a result of a one standard deviation increase in trade opening.

The Specific Trade Concerns (STCs) databases created by the WTO Secretariat (discussed in detail in Section C.1) have been used to shed new light on whether applied tariffs and TBT/SPS measures may have been used as substitutes over the period 1995-2010.[55] Applying an analysis similar in spirit to Kee et al. (2009) – who seek to identify a "clean" correlation between tariffs and their estimated *ad valorem* equivalent of non-tariff measures,[56] rather than identifying a causal link – the results indicate some evidence that TBT measures may have been used to take the place of tariffs, but there is very limited evidence of substitution between tariffs and SPS measures (see Box B.6). This result is in line with expectations: SPS measures cover a relatively narrow area of health and safety that is often directly related to consumer protection and may offer less scope for policy substitution than the wider set of TBT measures.

Box B.6: Policy substitution – evidence from specific trade concerns

From the Specific Trade Concerns (STCs) databases, coverage ratio (the amount of trade covered by an SPS or TBT measure) and frequency ratio (the share of product lines covered) have been computed. Frequency and coverage ratios are inventory-based measures that do not necessarily capture the trade restrictiveness of a measure. However, they indicate how much trade is affected by it.[57] These measures have been computed for each combination of maintaining country (the country that maintains the measure subject to the specific trade concern), HS2 sector (a two-digit classification in the Harmonized System) and year. To analyse whether there is evidence of substitution between tariffs and SPS or TBT measures, the following econometric model has been estimated:

$$y_{ijt} = \beta_1 \ln(tar)_{ijt} + \varepsilon_{ijt}$$

where y is the (log of) the coverage ratio (or the frequency index) of the maintaining country i in HS2 sector j in year t, and tar is the (log) average applied tariff in sector j. Year, country, sector and country-sector fixed effects have then been progressively added to this baseline model.

As argued in the main text, the estimated regression does not purport to identify a causal link, but rather a "clean" correlation between tariffs and TBT or SPS measures. It is similar to the one estimated by Kee et al. (2009), who find evidence of substitution between tariffs and non-tariff measures when considering the variation within country and within sector. In contrast to Kee et al., there is also time variation in the STC databases, allowing the user to identify variation within country-sector and time using a richer set of fixed effects than Kee et al. (2009).

Table B.1 reports the results of the regressions. In columns (1) (for the coverage ratio) and (5) (for the frequency index), no fixed effect is included. In columns (2) and (6), country and time fixed effects are added. In columns (3) and (7), sector fixed effects are added. Finally, in columns (4) and (8), there are time and country-sector fixed effects.

The upper panel of the table presents results for the SPS specific trade concerns. The coefficient on the tariff is negative (as it would be if SPS measures and tariffs are substitutes) but not always significant. In particular, it is not significant for the coverage ratio in the preferred specification with the time and sector-country fixed effects (column (4)). Overall, there is little evidence that tariffs and SPS measures substitute each other.

The results of the regressions with TBT concerns, however, reveal a clearer pattern of substitution between tariffs and TBT measures (see bottom panel of Table B.1). As in Kee et al. (2009), the coefficient turns from positive to negative as more fixed effects are included. It is negative and statistically significant – both in the regression using the coverage ratio and in the regression using the frequency index as dependent variable – when time and country-sector fixed effects are included (see columns (4) and (8)).

In conclusion, the use of less efficient non-tariff measures instead of tariffs is facilitated by the fact that while bindings on import tariffs are rigid, the explicit disciplining of NTMs within the framework of international trade agreements is more difficult because they are less transparent. In addition, certain NTMs can be used to address a legitimate public policy concern (health, the environment, etc.), thereby making it possible to conceal a potentially protectionist intent behind the measure. However, is it the case that governments choose to exclude NTMs from such international agreements? And, if so, what determines this choice?

The trade literature suggests a number of possibilities. The decision to exclude may simply reflect the costs of writing and enforcing an agreement that covers a wide range of behind-the-border non-tariff measures (Horn, 2006; Horn et al., 2010). It may also be attributable to uncertainty about the circumstances that will prevail during the lifetime of the agreement, thereby making it difficult to foresee all regulatory needs that may arise (Battigalli and Maggi, 2003). There are further possible explanations.

The non-explicit regulation of non-tariff measures may represent "escape clauses" for members of the agreements – providing them with the flexibility required to maintain a self-enforcing agreement in a volatile world (Bagwell and Staiger, 1990). It may even be the case that governments can improve their bargaining power *vis-à-vis* special interest groups by committing to constrain tariffs through international agreements, and then using less efficient NTMs instead (Limao and Tovar, 2011). Finally, countries may want to retain policy space in issues they consider to be "too important" to be subject to trade rules, e.g. national security. An analysis of such factors that may explain the "endogenous determination" of the coverage of NTMs in international trade agreements is carried out in Section E.

Table B.1: **Coverage ratio and frequency index of STCs and tariffs**							
SPS							
Dependent variable	**Coverage ratio (ln)**				**Frequency index (ln)**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Tariff (ln)	-0.00847	-0.0250	-0.0911***	-0.0256	-0.0444***	-0.0125	-0.0906***	-0.0598***
	(0.00886)	(0.0159)	(0.0143)	(0.0242)	(0.00909)	(0.0155)	(0.0139)	(0.0193)
Fixed effects:								
Country	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Sector	No	No	Yes	Yes	No	No	Yes	Yes
Time	No	No	Yes	Yes	No	No	Yes	Yes
Country*sector	No	No	No	Yes	No	No	No	Yes
Observations	3,259	3,259	3,259	3,259	3,259	3,259	3,259	3,259
R-squared	0.000	0.160	0.337	0.279	0.006	0.223	0.431	0.330
Number of id				223				223
TBT								
Dependent variable	**Coverage ratio (ln)**				**Frequency index (ln)**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Tariff (ln)	0.0215***	0.00642	-0.0126***	-0.0439***	0.0234***	0.0150***	-0.00512	-0.0394***
	(0.00308)	(0.00417)	(0.00453)	(0.0113)	(0.00334)	(0.00425)	(0.00460)	(0.0123)
Fixed effects:								
Country	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Sector	No	No	Yes	Yes	No	No	Yes	Yes
Time	No	No	Yes	Yes	No	No	Yes	Yes
Country*sector	No	No	No	Yes	No	No	No	Yes
Observations	9,788	9,788	9,788	9,788	9,788	9,788	9,788	9,788
R-squared	0.005	0.084	0.170	0.107	0.005	0.100	0.185	0.108
Number of id				657				657

Notes: Robust standard errors in parentheses; *** p<0.01; columns (4) and (8): within estimation, id variable: country-sector.

Source: WTO Secretariat estimates.

3. Measures affecting trade in services

(a) Why a separate discussion?

Cross-border delivery alone does not fully capture international services transactions. The intangible and non-storable nature of many services implies that suppliers and consumers often have to be in physical proximity for services provision to take place. Indeed, trade in services takes place through four different "modes of supply": beyond the traditional cross-border mode, it encompasses the consumption of a service in a foreign territory and the movement of the supplier abroad, either to establish a commercial presence or in person. As a result, capital and labour mobility is often inextricably linked to services trade.

Against this background, measures affecting trade in services warrant a separate discussion for at least three, related reasons.

First, the feasibility of applying a tariff, and an *ad valorem* tariff in particular, to the international provision of services is remote. In most instances, it will be next to impossible for customs officials to observe a service "crossing a border", and the value (volume) of a services transaction will only be known after the relevant service has been produced or consumed (Hoekman and Primo Braga, 1997). Trade protection in services is thus essentially in the form of regulatory measures.[58] In a literal sense, all limitations to services trade are "non-tariff". Thus, it makes no sense to discuss why non-tariff measures are used and to analyse their economic and trade effects in juxtaposition with tariffs as, in the case of services, tariffs are not strictly available.

Secondly, an analysis based on whether measures are applied *at* or *behind* the border is also largely unhelpful. Many services transactions involve the presence of either the supplier or the consumer inside the territory of the "importing" country. Hence, services restrictions mostly apply "behind-the-border".

Thirdly, given the modal definition of services trade, the analysis needs to include measures applying both to the product (i.e. the service) and to the producer (i.e. the services supplier). Furthermore, the producer may be physically present in the territory of the importing country. While in the case of goods, factor movement represents a substitute for cross-border trade, with many services it is a precondition, or an important complement, for any trade to take place. All measures that govern how services are produced and consumed in an economy are thus potentially measures affecting services trade. This is why measures discussed here that might appear to go beyond traditional "trade" instruments need to be factored in when considering services trade.

While it would be impracticable to lump together a discussion of services measures and non-tariff measures, this does not imply, however, that services and goods trade, and the respective trade limitations, should be considered in isolation. Not only are trade in goods and trade in services mutually supportive,[59] but also many services trade restrictions affect goods trade, and vice versa.

Services play a key role in supporting production networks. Transport and logistics services are obviously the most important direct services input to international goods trade, but communication, insurance and banking are also key enabling services. A prominent role is additionally played by distribution, business and other after-sales services such as repair and maintenance.

Measures that restrict trade and competition in services markets thus affect not only the economic performance of the sector concerned, but may, particularly with infrastructure services, also have spillover effects on the economic and export performance of goods and other services industries (see discussion in Box D.3).[60]

Restrictions on trade in certain goods may impair the efficiency and export competitiveness of services suppliers that rely on those particular products as inputs. Restrictions on the importation of certain medical equipment may raise costs for hospitals when providing related medical services to national and foreign patients, for instance. Measures raising the cost of imported consumer goods would likewise negatively affect retailers, and particularly foreign retailers sourcing many of their products from their home country.

Such cross-effects are especially important in light of the growing fragmentation of production processes across countries. As much as three-quarters of services trade is in intermediate inputs (Miroudot et al., 2009), while intra-firm trade accounts for 22 per cent of US services imports and 26 per cent of its services exports (Lanz and Miroudot, 2011).[61] Together, these data do indeed paint a picture of services trade as a prominent, though probably still underestimated, component of global or regional value chains.[62] In light of their spillover effects beyond the industry concerned, restrictions to trade in such "intermediate" services can be argued to be of even greater significance.

Similar to the analysis of non-tariff measures for goods trade, this section will first discuss the motivations for governments' intervention in services markets. It will then try to categorize the main forms of intervention used and, to the extent possible, examine their economic and trade effects.

(b) Why do governments intervene in services markets?

This section discusses why governments may intervene in services markets. To a large extent, the analysis in sections B.1(a) and 1(b)(ii) above remains pertinent. A number of services-specific characteristics, however, need to be factored in.

(i) Public interest considerations

From a public interest theory standpoint, government intervention in services markets may be justified on efficiency grounds, as well as on equity considerations. Efficiency concerns relate primarily to the existence, in many services industries of instances of market failure, such as asymmetric information (i.e. one party having more information than the other), imperfect competition and externalities (see below).[63] While these failures also appear in goods industries, they seem to be more pervasive in the case of services. The discussion that follows is largely illustrative.

Instances of asymmetric information in services are frequent. This is, essentially, because of the intangible nature of many services. Immateriality implies that consumers cannot easily assess the quality of a service before consuming it. Producers will tend to be better informed. However, they might not have an incentive to supply more information to consumers, as this might be costly to provide, or retaining information may afford a commercial advantage. At the same time, consumers may lack the expertise required to assess much of the technical information they receive. As a result, consumer choice is insufficiently informed for competition to function effectively. This problem is accentuated by the fact that repeat purchases may not always be an avenue to discipline producer behaviour. Services, by their nature, tend to be much more diverse than goods. Consumers may not be willing, or able, to continually purchase identical services.

Though market-based solutions could see producers signalling a commitment to quality, for instance by investing in reputation, customer service, brand name or easily accessible complaint procedures, they are

unlikely to be sufficient for high-risk activities (Pelkmans, 2006). Governments thus often intervene to curb services suppliers from exploiting information asymmetries. As it is generally impossible to impose, verify and ensure compliance with performance requirements by focusing exclusively on the service, governments frequently intervene at the level of the supplier. They may, for instance, require producers to disclose certain information to consumers, or impose qualification or licensing requirements that seek to ensure the competence of the services supplier and thus the quality of the services provided.

Information asymmetries may also be problematic for producers where consumers possess private information, for example about their health status. A lack of generally available information may also engender situations of "moral hazard". For example, where someone other than the consumer bears the full responsibility and consequences of his actions, excessive consumption may result. Insurance markets are a case in point.

Imperfect competition is another market failure often encountered in services industries. Many services are supplied through networks: telecommunications, postal services, electricity distribution, environmental and rail transport services are prominent examples. Standardized services provided over such infrastructure or distribution networks often exhibit such large economies of scale that the relevant market can be served most cheaply by a single or small number of firms, i.e. they are often naturally monopolistic/oligopolistic. Unchecked, these markets result in under-supply and prices set above marginal cost. Government intervention is thus warranted, and may imply instituting price controls or enabling competition (e.g. through unbundling services, regulating access to essential facilities, franchising and concessions).

Finally, both negative and positive externalities occur in service markets when the price of a service does not reflect the true cost or benefit to society of producing that service. This results, respectively, in excessive or insufficient consumption. The environmental consequences of heavy road transport or intensive tourism are instances of negative externalities. Network expansion in telecommunications services, increased investment in education or vaccination programmes, on the other hand, are examples of positive externalities.

Government intervention in services industries may also be driven by equity considerations. Many services are inputs into human capital development and, as such, they underpin governments' social objectives. Health and education services are typical examples, but similar considerations may also play a role in sectors such as audio-visual, telecommunications, transport, energy and water services. Unfettered

markets would leave certain geographical areas or groups of consumers without affordable prices or adequate supply. The imposition of "universal services obligations" has been one government response to counter these problems.

Box B.7 provides some sector-specific examples of services measures that governments may use to address efficiency and equity concerns.

(ii) Political economy considerations

According to the economic theory of regulation, government intervention is not driven exclusively by the pursuit of the "public interest", but rather, or additionally, by the concerns of special interest groups. Governments may therefore intervene irrespective of the existence of a market failure. Even when intervention is warranted on public policy grounds, governments may still, in deciding which instrument to employ, be "bought" into relying on those measures that benefit more organized groups, generally domestic (or incumbent) producers.

While the discussion in Section B.1 remains pertinent, when it comes to services industries, political economy considerations are particularly significant in at least four respects.

First and foremost, the most transparent form of intervention when it comes to trade policy, i.e. a tariff, is not available in services markets. By definition, governments need to resort to other, often more opaque instruments. This offers greater scope to mask any private interest motivations, and thus potentially reduces the risk of electoral punishment.

Secondly, much less scientific evidence exists on which services intervention might be based and its effectiveness tested. The diverse nature of many services, their intangible nature, and the frequent need to regulate at the producer level all imply that regulation tends to be not only complex, but also much more difficult to assess on the basis of exact criteria applied at the product level. This may, once again, help camouflage governments' true intentions.

Thirdly, the complexity of much services regulation implies that regulators who are less experienced or less resourced might be more easily "captured" by special interest groups even if they intend to act in pursuit of the "public interest". Given such information asymmetries, protection might not even need to be "bought".

Fourthly, given the equity and social concerns attached to many services, consumers might actually side with domestic producers. Consumers may misguidedly fear that, if the interests of domestic producers are no longer upheld, service quality will suffer and/or prices will increase (Hoekman et al., 2007).

Box B.7: **Examples of services-specific measures to pursue public policy objectives**

Equitable access

In the transport or telecommunications sectors, governments often want remote regions to be served by such services regardless of profitability. Basic equity objectives also prompt governments to ensure that all citizens have access to education and essential health care at low or zero costs.

Measures include cross-subsidization schemes to ensure that revenues in profitable areas are reinvested in favour of under-developed regions or persons in financial need and licensing conditions which include universal services obligations (for example, commercial hospitals are required to treat a certain percentage of patients free of charge).

Consumer protection

With regard to professional, financial or health services, the complexity of the service that is provided makes it very difficult for consumers to appreciate quality or safety prior to consumption. Services suppliers may exploit such information asymmetries.

Measures include prudential and other technical standards to be complied with by services suppliers; publication requirements on costs, risks, side-effects, etc., so as to enable the consumer to make informed decisions; education and training requirements to ensure competence; and mandatory professional liability insurance.

Reduction of environmental impacts and other negative externalities

Road and air transport cause pollution and noise; tourism could put the environment under stress and disturb natural habitats, etc.

Measures include traffic restrictions over weekends, during night hours or in sensitive areas; zoning laws and building codes; tax/subsidy schemes to mobilize funds for the preservation of cultural heritage.

Macroeconomic stability

Financial institutions may engage in imprudent lending or design complex financial instruments that are insufficiently understood. As a consequence, depositors may lose confidence and withdraw their money, inter-bank lending may suffer, credit supply to the real economy may be hampered, and so forth.

To ensure stability, financial institutions must comply with measures such as minimum capital requirements and higher capital reserves when new financial instruments are provided. They must also diversify assets to limit exposure to individual clients, report on their activities, or put limits on remuneration of management.

Avoidance of market dominance and anti-competitive conduct

Concerns about anti-competitive conduct arise in sectors prone to market concentration (including services with network effects and interconnection needs, such as transport and telecommunications, and liberalized former monopolies).

Measures include limitations on market shares, introduction of price surveillance or mandatory price caps, interconnection guarantees, and government-mandated technical standards to replace company-specific requirements.

Source: World Trade Organization (WTO) (2005a)

(iii) *Pervasiveness of government intervention*

Services industries exhibit hugely different characteristics and market structures. There is a broad range of sectors in which governments play no specific role. Nonetheless, it is widely acknowledged that, given the greater likelihood of market failures and the potentially bigger role played by private interest considerations, government intervention in services

markets as a whole is more prominent than in goods markets.

The form of this intervention has changed over time, however. Historically, several infrastructural and social services, especially those provided to the general public (traditionally called "public services"), were directly supplied by government entities, usually in monopoly situations. Recent decades have seen a move away from state ownership towards more reliance on private markets to provide these services. Governments progressively moved back from their role of suppliers and increasingly took on the role of regulators. Once such services were no longer publicly financed and provided, governments were forced to introduce new measures, with the stated objective of promoting economic and social welfare. Indeed, regulation of these services markets has expanded at the same time as the industries concerned have been privatized and opened up to competition.[64]

(c) How do governments intervene in services markets?

This section highlights the main types of government measures that have an effect on trade in services. It only sketches broad contours. Given that the definition of trade in services includes services that are produced locally in the importing country, the scope of measures potentially impacting such trade is vast, ranging from corporate taxation to labour laws, to consumer subsidies, to land ownership provisions, and so on. The list is much longer than in the case of measures classified as non-tariff measures in a goods trade context.

The fact that a measure negatively affects trade in services does not imply that it should be automatically viewed as protectionist. On the contrary, as discussed above, governments often intervene in services markets in pursuit of a variety of public policy objectives that are unrelated to trade policy considerations. Their interventions might nevertheless raise the cost for services suppliers to enter/establish or operate in a market.

This section presents a typology of services measures and draws on the (limited) available literature to discuss to what extent such measures may be considered as trade restrictions.

(i) Types of services measures

As highlighted, the concept of "border" is not necessarily a helpful criterion when trying to categorize services measures. Francois and Hoekman (2010) classify services interventions according to whether they affect domestic and foreign services and services suppliers differently, i.e. are discriminatory, and whether they affect the ability of firms to enter/establish in a foreign market or have an impact on their operations (see Table B.2).

Such a classification, which is based on the effect of the measures, captures virtually all forms of government intervention in services markets. It is also helpful in that it enables a rough distinction between measures that usually reduce the number of suppliers in a market (i.e. those related to market entry/establishment), and thus the quantity supplied at a given price, and measures that raise costs once a market is entered into (i.e. those that impact operations) and result in a given quantity being supplied at a higher price.

It also helps to highlight that services interventions comprise measures that affect in the same way foreign and domestic producers seeking access to the domestic market. Measures impacting either entry or establishment in a non-discriminatory fashion may protect national, or incumbent, suppliers, at the expense of foreign or new domestic suppliers. In this regard, some of the measures under discussion may actually be restrictive to competition generally, rather than to "foreign competition", i.e. trade.

Thus, what matters for services trade is not just the removal of discriminatory measures but the contestability of the market. Even in a situation where all discriminatory measures were removed, a sector would still remain highly restricted if only a fixed number of suppliers were permitted to operate. Though there would be no discrimination in favour of nationals, the entry of any new supplier to the market, be they foreign or domestic, would still be constrained.

Alternative classifications have also been proposed. They focus more on the type of instrument being used, rather than its effects. Hoekman and Primo Braga (1997), for instance, distinguish between four main categories: (i) quotas and local content requirements; (ii) price-based instruments; (iii) standards, licensing and procurement; and (iv) discriminatory access to

Table B.2: **Typology of measures affecting services trade**		
	Measures impacting entry/establishment	**Measures impacting operations**
Non-discriminatory	Restriction on the number of licences for pharmacies, for example	Reserve requirement for banks, for example
Discriminatory	A limit on the number of foreign architects, for example	Higher port duties charged on foreign-flagged vessels, for example

Source: WTO Secretariat, based on Francois and Hoekman (2010).

distribution networks. Copeland and Mattoo (2008) propose a fairly similar classification. These classifications, which are more akin to those employed to classify non-tariff measures applying to goods trade (see Section B.1), appear better suited to analyse the economic effects of the various measures, precisely because available literature borrows heavily from traditional (i.e. goods) international trade theory.[65]

One instance that is not captured by either classification is when trade is affected by the absence, rather than the presence, of a measure. For example, as discussed for non-tariff measures, when there is significant uncertainty about the quality of a service, demand for (and trade of) the service concerned might only increase if certification requirements for suppliers are introduced as these help raise consumer confidence. Instances of natural monopolies or oligopolies provide a further case in point. Unless pro-competitive measures are introduced, dominant incumbent suppliers can, through their control of essential facilities, obstruct access to the market (Mattoo and Sauvé, 2003).

(ii) When is a measure a trade restriction?

Much services regulation pursues public policy objectives. Nevertheless, such regulation may unintentionally also have trade-restrictive effects. Or, at the same time as aiming at domestic efficiency or social equity objectives, it might be captured by special interest groups to protect domestic suppliers at the expense of consumers. Economic policy considerations may also lead to services measures being used exclusively for protectionist purposes. They may further affect the choice, among all possible alternatives, of particularly inefficient policy instruments.

Given the pervasiveness of services regulation and its commingling with trade protection a clear identification of which measures are trade restrictions, or a neat separation of the protective component in such measures, is fraught with difficulty. As Copeland and Mattoo (2008) observe, the trade-related implications of services measures depend on the specific characteristics of the service industry in question, and particularly on the market imperfections such measures are designed to correct or equity objectives they are pursuing. Market structures differ widely among services sectors (Francois and Hoekman, 2010). Services trade includes transactions in highly contestable sectors as well as network industries characterized by large fixed costs of entry, for instance. The trade effects of services measures can thus be expected to be different in these two types of industries.[66]

Indeed, at the sectoral level, a great deal of literature is available that assesses the relative efficiency of different regulatory measures in attaining specific public policy goals. Though rarely explicitly trade-oriented, many findings lead to trade-relevant policy conclusions. At a general level, however, very little analysis seems to have been undertaken on the relative efficiency of services measures. Nevertheless, the limited literature that is available does point to some broad observations. The following discussion is organized around the typology of services measures in Francois and Hoekman (2010), complemented by an instrument-based classification. It addresses first discriminatory measures, and then non-discriminatory ones.

First, discriminatory measures that impact either entry/establishment or operations place foreign services and suppliers at a competitive disadvantage relative to domestic services and suppliers. They can be considered trade restrictions almost by definition. They include "traditional" trade measures, such as quantitative restrictions, that impact foreign entry/establishment, and discriminatory taxes or subsidies that affect the cost of foreign suppliers' operations.

International trade theory suggests a ranking of such instruments of protection for goods trade (see Section B.1). If the objective of a policy is to expand the output of an import-competing industry, output subsidies can be shown to be a superior instrument to tariffs, and tariffs normally superior to quotas. As Hindley (1988) indicates, this ranking should, in principle be as valid for services as it is for goods. Nonetheless, applying a similar analysis to services trade presents a number of challenges, as Mattoo (2003) highlights. First, tariffs are not necessarily a feasible option for services. Secondly, measures that may have tariff-like effects in terms of raising foreign costs per unit of output are not tariff-like when it comes to generating revenue. Thirdly, and most significantly, the modal definition of services trade implies the possibility that trade restrictions will bring about mode-switching and that factor movements will directly affect market structures.

Tariff-like measures that do not produce any revenue would imply a much greater loss in national welfare than a straight tariff if income from quotas (i.e. quota rents) does not accrue domestically.[67] Generally speaking, quota rents accrue to the owners of the right to import the product in the domestic economy. In the case of services, foreign suppliers generally sell their service directly to domestic consumers, so they are much more likely to collect the quota rents than in the case of goods. Additionally, quotas are often associated with wasteful administration and rent-seeking activities, including corrupt practices, that push their social cost above that of tariffs. In imperfectly competitive markets, quotas are shown to be even more wasteful (Copeland and Mattoo, 2008).

If trade is possible through only one mode, a limitation on that mode may render the service concerned non-tradable. If modes can be substituted for each other, a prohibitive restriction may not have much effect if the unconstrained mode is the most efficient one (Francois

and Hoekman, 2010). If, however, it is not the first-best option, the switch to the alternative mode may result in deadweight losses induced by trade diversion (though possibly moderated by lower price increases than in the case where this mode-switching option was not available). Thus, any benefits resulting from the multiple modes of services provision at the disposal of suppliers faced with a trade restriction need to be weighed against the additional cost to the importing economy of acquiring the service thorough a relatively inefficient mode (Copeland and Mattoo, 2008).

For those services where cross-border delivery is not feasible, limitations to entry on foreign investment imply that the price and quality of the services concerned are determined exclusively by the domestic market structure. These restrictions on foreign direct investment (FDI) generally take the form of either entry quotas and/or restrictions on foreign equity participation. While the latter restrictions may prevent transfers of technology, skills and know-how, the former have been shown to be more socially wasteful. Foreign FDI might be attracted by returns to investment that have been artificially raised by restrictions on competition and the true social productivity of the investment may thus be lower than the returns to the investor (Mattoo, 2003).[68]

As for non-discriminatory measures, limited theoretical and empirical work has been undertaken on these measures at a general level on the part of trade economists. This is most probably a consequence of their primarily domestic nature. Literature relating to the economic effects of non-discriminatory restrictions to entry in individual sectors is more readily available, but a review of this literature would be beyond the scope of this report.

Nevertheless, it is possible to point to some general observations. First, non-discriminatory measures affecting entry/establishment, most notably quantitative restrictions, would seem to be difficult to justify on efficiency grounds, as Hindley (1988) and Copeland and Mattoo (2008) argue. By protecting incumbent suppliers from competition, such entry limitations reduce market contestability. They have on occasion been defended for infant-industry type reasons and the fulfillment of universal services obligations through cross-subsidization. However, alternative means have been shown to achieve the same objectives without the need to restrict competition, so that entry limitations are at best second or third-ranking alternatives.

Secondly, non-discriminatory measures that impact suppliers' operations would seem to be the services measures furthest removed from protectionist purposes. Even when they are pursuing public policy goals, however, they may, intentionally or otherwise, have spillover effects on trade. For instance, Copeland and Mattoo (2008) observe that, though responding

primarily to problems of asymmetric information, certification requirements for professionals have trade and welfare effects that may vary depending on the screening mechanisms chosen. Moreover, such measures might yet again affect supply patterns by inducing suppliers to switch to alternative modes of trading services (Delimatsis, 2008).

As such, a crucial challenge posed by these measures is how to distinguish between when they are used exclusively for public policy objectives and when they are also being used for protectionist purposes (see Section E.2). Mattoo and Sauvé (2003) argue in favour of a "necessity test". Such a test would enable governments to attain their chosen economic and social objectives, but to do so in a manner that does not "unnecessarily" restrict trade. They contend that such a test would encourage the use of the most economically efficient measure among those available to remedy a market imperfection and pursue non-economic goals.

The ranking of instruments of protection in services trade that emerges from economic theory is, to a large extent, reflected in the General Agreement on Trade in Services (GATS). By design, and as discussed in more detail in Section E, the GATS distinguishes broadly between three types of services measures: those that restrict entry/establishment, whether discriminatory or not; measures that are discriminatory, modifying the conditions of competition in favour of national services and services suppliers; and measures that are non-discriminatory and non-quantitative in nature. The first two types of measures (essentially market access and national treatment limitations as defined in GATS Articles XVI and XVII, respectively) are subject to negotiations to progressively eliminate them. The third type of measures ("domestic regulation") are not considered trade restrictions as such, but the GATS acknowledges that they may nevertheless have trade-restrictive effects and mandates the establishment of relevant disciplines under Article VI:4.

4. NTMs in the 21st century

This section describes how recent or foreseeable changes in the trading environment have affected or may affect governments' use of non-tariff measures and services measures. This allows us to illustrate the practical difficulties involved in dealing with measures pursued for public policy reasons and the trade impact of such measures. Examples include measures taken in the context of the recent financial crisis, policies in relation to climate change and measures addressing food safety concerns.

(a) NTMs, services measures and the recent financial crisis

Economic crises typically result in the implementation of economic stimulus measures by governments.

The use of non-tariff measures is a part of such crisis-induced government intervention. The recent financial crisis, which has had an impact on the use of NTMs by governments worldwide, is a case in point. In this section, an analysis of the NTMs implemented in the wake of the crisis will enable us to illustrate the practical difficulties involved in distinguishing between measures taken for public policy reasons and those that constitute disguised protectionism. This section will also discuss how recent changes in the trading environment brought about by the financial crisis may affect governments' use of NTMs in the future. It emphasizes that better monitoring of non-tariff measures, which ensures greater transparency in their use, is imperative in preserving consumer interests and preventing a proliferation of protectionist measures. It also alludes to the fact that in situations where governments have a preference to protect domestic industry, a monitoring mechanism needs to be accompanied by legally enforceable rules (that enable retaliation if an agreement is violated) to limit the use of trade-distorting NTMs.

(i) The recent financial crisis: attributing motive to the use of NTMs and services measures

It is well-established that the origin of the recent financial crisis can be traced to institutional failures in the regulation of financial systems at a national level. Its effects were then transmitted across many countries through international trade and finance linkages. In response to the crisis, subsidies, in the form of direct funding, special loans and guarantees, were provided to bail out a number of financial institutions in various advanced economies (Baldwin and Evenett, 2010). These "emergency" measures in the financial sector were associated with public policy objectives; they were deemed necessary to stem the spread of systemic damage and help restore the normal functioning of financial markets – critical for both consumers and producers across the world.

A number of countries also introduced subsidies to encourage consumers to buy specific products through, for instance, refunding a certain amount of the purchase price. For example, the Consumer Assistance to Recycle and Save (CARS) Act of 2009 in the United States – referred to as the "cash-for-clunkers" programme – provided credits to consumers who traded in old, fuel-inefficient vehicles when buying or leasing new, more fuel-efficient vehicles (Congressional Quarterly, 2009). Such consumer subsidy schemes, implemented in a number of other advanced economies including Germany, France and the United Kingdom, were used as measures to stimulate domestic demand – once again, a public policy objective. Moreover, they were non-discriminatory internationally.

In times of economic recession, however, high levels of unemployment can result in governments resorting to non-tariff measures and services measures that discriminate against imports competing with "like" domestic products. Hence, as highlighted earlier, it often becomes difficult to distinguish practically between measures taken for public policy reasons (although their imposition may have adverse trade effects) and those that constitute disguised protectionism. This ambiguity in government motivation is further complicated by the increased importance of intermediate goods trade in global supply chains (Hummels et al., 2001; Koopman et al., 2010). For instance, consider the industry-specific subsidies introduced by a number of developed economies to assist their struggling automotive industries during the recent crisis. This is potentially trade-distorting for the final product market in the short-run. However, it is possible that by disrupting an established global supply chain, their collapse would have led to a substantial decline in world intermediate goods trade, thereby resulting in significant job loss among several countries over the medium-run.

Identifying the motive behind non-tariff measures and services measures becomes especially important in a crisis situation because it can easily lead to beggar-thy-neighbour policies, i.e. trade-restrictive actions taken by one country can trigger similar actions by other countries, leading to a spiral of ever more threatening restrictions. Consider, for example, subsidies to financial institutions. If bailout funds are conditional on financial service firms redirecting lending towards the home market, this may be seen as discriminatory despite the apparent prudential concerns. The same holds true if subsidies are conditional on the purchase of a domestically produced product.

(ii) Impact of the recent crisis on future use of NTMs and services measures

Monitoring and coordination

The recent crisis may affect governments' use of non-tariff measures and services measures in the future. Earlier in the section, we argued that the increased incidence of NTMs may be linked, in part, to the fact that they are less transparent than border measures such as tariffs, and hence harder to discipline under international agreements. An outcome of the recent crisis was the revival of the WTO's trade monitoring mechanism in October 2008 (see Section C.1).[69] The revival of this monitoring mechanism represents an advance in addressing transparency in the use of NTMs and services measures. It can act as a communication device to solve a coordination problem that leads to excessive protectionism, via the use of such measures. In the following hypothetical example of how this might work, it is assumed that governments prefer open trade policies to protectionism (see Table B.3).

Given the payoffs specified for two trading partners in the above table, there are two equilibria. If country 1 resists protectionism through non-tariff measures, for instance, country 2's best response is also not to restrict trade (and vice versa). If, however, country 1 is imposing trade restrictions, country 2's best response is also to impose similar restrictions (and vice versa). This reflects a beggar-thy-neighbour policy – if, for example, country 1's exporters cannot compete on a level playing field in country 2, the government of country 1 would not want the country's firms to also lose out on domestic market share to import competition from country 2. For both countries, the first equilibrium outcome is preferable to the second. But if the two are unable to communicate and coordinate their actions, they may end up with the less preferred equilibrium outcome. Hence, by improving the transparency of NTMs, WTO's monitoring mechanism can guide members to a better welfare ("Pareto-superior") outcome.

Of course, it may be the case that governments prefer to protect their domestic industry. If so, the strategic interaction between governments is not simply a coordination game – the payoffs presented in the previous hypothetical example would change. Suppose one country chooses "no protectionism", the other would want to choose "protectionism" as it would get full market access to the former without having to open up to competition itself. Table B.4 reflects this argument with relevant payoffs for the two countries. It shows that the situation is representative of what is known as a prisoner's dilemma game, whereby both parties are motivated by the fear of what the other might do.

Given the payoffs specified for two trading partners in the above table, the equilibrium is both countries choosing the strategy of protectionism. Unlike the coordination game, however, a monitoring mechanism that helps the countries to communicate with each other would not be sufficient to guide them to a better welfare outcome where both choose the strategy of no protectionism. This is because despite the communication, each country would have an incentive to defect from their agreed upon strategy, fearing that the other might do so. Hence, along with a monitoring mechanism, legally enforceable rules – that enable retaliation in the event either country violates an agreement of choosing "no protectionism" – would be required to control the use of trade-distorting non-tariff measures and services measures. It is worth noting, however, that during the recent financial crisis, governments of both advanced and developing economies have reaffirmed their faith in the multilateral trading system with repeated pledges to guard against protectionist policies.

Measures in the financial services sector

Given that the origin of this economic crisis lay in a financial crisis, it is likely to affect governments' future use of measures in the financial services sector, which may affect international market access. The literature identifies the heterogeneity of regulatory practices as a major constraint on services trade (see Section D). The recent financial crisis may affect the motivation of governments to pursue regulatory convergence in the financial services sector due to the reasons outlined below.

First, the recent crisis was anchored in advanced industrialized nations – those perceived to have relatively sophisticated regulatory regimes. In fact, certain developing economies may associate the activities of some foreign financial operators with what they perceive to be legitimate macro-prudential concerns. Secondly, unlike several developed economies which are associated with highly liberalized capital accounts, those which maintained greater restrictions on capital transactions and took a stricter stance on financial leverage appear to have weathered the storm better (Delimatsis and Sauvé, 2010). Thirdly, global liquidity growth, induced by expansionary macroeconomic policies implemented across the globe during the recent crisis, resulted in a surge of capital flows to emerging economies. This has compounded concerns about the intrinsic volatility of short-term capital flows, thereby giving developing countries an additional reason to ring-fence their economies against a sudden reversal (Sidaoui et al., 2011).

(b) NTMs and climate change

(i) *The future scenario*

The Durban Climate Change Conference in December 2011 ended with a commitment ("Durban Platform for Enhanced Action") to work towards a new global treaty to replace the Kyoto Protocol by 2015 at the latest and to establish a new climate fund (the "Green Climate Fund") to help poor countries both mitigate and adapt to climate change. Two years earlier, the UN Climate Change Conference in Copenhagen established a target to keep the increase in global temperature from pre-industrial times below 2 degrees Celsius.

Table B.3: Coordination game

Country 1		Country 2	
		No protectionism	Protectionism
	No protectionism	(2, 2)	(0, 0)
	Protectionism	(0, 0)	(1, 1)

Table B.4: Prisoner's dilemma game

Country 1		Country 2	
		No protectionism	Protectionism
	No protectionism	(2, 2)	(0, 3)
	Protectionism	(3, 0)	(1, 1)

A number of observers (Houser, 2010; Bodansky, 2010) saw that target under the Copenhagen Accord as a significant step forwards for the global community since the lack of an explicit long-term goal meant countries had no clear direction for national and international policy.[70] Furthermore, under the Accord both developed and developing countries notified emission reduction targets to the United Nations Framework Convention on Climate Change (UNFCCC).[71]

Nevertheless, both meetings fell short of expectations that they would produce binding mitigation commitments from both developed and developing countries. Without prejudging the outcome, should the negotiations on a post-Kyoto agreement prove protracted, what will likely emerge in the near term is a patchwork of regional and national climate change regimes with some countries implementing fairly strict mitigation measures, others taking no meaningful action, and a fair number of countries with policies that lie somewhere in between. This may lead to environmental and economic outcomes that countries would then try to manage through the use of non-tariff measures.

(ii) Carbon leakage and concerns about loss of competitiveness

Two related concerns are likely to deepen if no international agreement emerges about the specific actions that all countries need to take to tackle climate change. One is "carbon leakage" and the other is the possible loss in competitiveness of firms or industries in countries which take more stringent mitigation measures.

Carbon leakage refers to a situation in which reductions of greenhouse gas emissions by one set of countries ("constrained" countries) are offset by increased emissions in countries which do not take mitigation actions ("unconstrained" countries). Much of the discussion of carbon leakage has taken place in the context of the Kyoto Protocol where so-called Annex I countries (predominantly developed countries) had commitments to cut back on their emissions while non-Annex I countries (developing countries) did not.[72]

The leakage can occur through a number of channels involving changes in international prices of energy and energy-intensive goods as well as the relocation of production. Basically, the mitigation measures in constrained countries reduce the production of energy-intensive goods and raise their international prices. The decrease in production of energy-intensive goods also reduces the demand for fossil fuels and leads to a drop in their prices. Unconstrained countries expand their production of energy-intensive goods in response to their higher international prices. The lower price of fossil fuels will also induce unconstrained countries to use more of it, thus increasing emissions.

Finally, energy-intensive industries may relocate from constrained countries to unconstrained countries.

However, there are also offsetting effects which need to be considered. The first one is the income effect from the increase in the price of energy-intensive goods (Copeland and Taylor, 2005). The same price change which drives unconstrained countries to increase production of energy-intensive goods increases their income. Assuming that environmental quality is a normal good, this income effect will prod them to take measures to mitigate emissions. The second effect that can counteract carbon leakage is innovation towards more energy-efficient means of production (Di Maria and Werf, 2008). The same price change responsible for carbon leakage also induces firms to devote more of their research and development (R&D) resources to find energy-efficient means of production. This is similar to the argument made by Porter and van der Linde (1995) that properly designed environmental regulations can spur innovation that may partially or more than fully offset the costs of complying with them.

Because of these possible offsetting effects, estimates of the magnitude of carbon leakage vary considerably although it is always greater than zero. The standard method of measuring carbon leakage expresses it as a ratio of the increase in CO_2 emissions of unconstrained countries and the reduction in the emissions of constrained countries. Most of the estimates of the global rate of carbon leakage vary between 5 per cent and 20 per cent (Sijm et al., 2004). However, much higher estimates reaching up to 130 per cent have been calculated (Babiker, 2005). Estimates of carbon leakage above 100 per cent imply that mitigation policies in the constrained countries are actually counter-productive since they lead to higher global emissions as production shifts to unconstrained countries that employ more emission-intensive technologies. [73]

Unlike carbon leakage, there is no precise definition of competitiveness in the climate change literature. It might refer to the impact of the mitigation measures on firms' or industries' cost of production, profits, output, employment, or market share. These indicators have been variously employed in a number of studies to measure loss of competitiveness.[74] Notwithstanding this imprecision, the shift in production of energy-intensive goods from constrained to unconstrained countries, which is what makes leakage possible, captures the essence of this competitiveness concern.

(iii) Measures to address climate change, carbon leakage and loss of competitiveness

The need to mitigate climate change will spur many countries to take unilateral mitigation measures,

many of them falling in the list of non-tariff measures that have been discussed in this report. However, carbon leakage introduces a strategic dimension to constrained countries' mitigation efforts since they may consider it necessary to take into account "free-riding" by unconstrained countries which can dilute or reverse the effect of their mitigation actions. The free-riding refers to the argument that unconstrained countries bear no cost of mitigation efforts, yet assuming carbon leakage is less than 100 per cent they benefit from the reduction in global emissions due to the mitigation activity of the constrained countries. It is argued that trade measures provide a way for constrained countries to alter the incentives to free-ride on their endeavours.

Theoretical work exists on the effect of linking international environmental cooperation with trade (Barrett, 1994; Barrett, 1997; Botteon and Carraro, 1998). The basic insight from these studies is that the number of cooperating countries in an environmental accord would be larger and the agreement more stable (e.g. self-enforcing) if there are provisions for trade sanctions against non-members. In other words, using trade measures against non-cooperating countries can be an effective way of increasing the number of cooperating countries and of guarding against defection by currently constrained countries. As noted previously (in Section B.1), a number of international environmental agreements, namely the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Montreal Protocol, included provisions allowing for the use of trade measures.

Non-tariff measures that might be taken to mitigate climate change as well as to counter carbon leakage or to reduce the loss of international competitiveness by countries with stringent mitigation policies include border tax adjustments, subsidies, and regulatory measures (including TBT/SPS measures). There is by now a long list of papers that have examined the WTO consistency of these types of measures in the context of climate change. A partial list includes Bordoff (2009), Low et al. (2011), Pauwelyn (2007), and World Trade Organization (WTO) and United Nations Environmental Programme (UNEP) (2009). The following discussion will focus on the economic aspects rather than the legality or WTO-consistency of the measures.

Border adjustment measures

Border adjustment measures would impose costs on imports of emission-intensive goods commensurate with the costs of compliance with domestic emissions regulations. On the import side, border adjustments can take the form of a tax on imported products, or to a requirement for importers to purchase emission permits or allowances for those foreign products that they are importing. On the export side, border

adjustments can take the form of an export rebate, where exporters shipping items to unconstrained countries are compensated for the cost of complying with emission requirements. This discussion focuses on a domestic tax on imports since that has drawn more interest.

When constrained countries set their optimal policies, they will need to take carbon leakage into account, i.e. they will have to act strategically. Hoel (1996) shows that the first-best policy of constrained countries will be to impose a tariff on the emission-intensive import and apply a uniform carbon tax on both domestic and foreign emission-intensive goods.[75] The import tariff will be set so as to (i) shift the terms of trade in the importing country's favour and (ii) reduce demand for emission-intensive foreign goods. This second element reflects the constrained country's strategic recognition of carbon leakage and the need to respond to it.

If a country cannot freely adjust its tariffs, the second-best policy will require a non-uniform carbon tax, since it not only needs to reflect the social cost of emissions but also shift demand away from emission-intensive foreign goods.[76] There are two main challenges to implementing such a border tax adjustment. The first is the administrative difficulty of implementing such a scheme given the enormous amount of information required to determine the emissions of foreign-produced goods.[77] The second is the risk that once a system of border tax adjustments is put in place, it will be captured by protectionist interests. Moore (2010) observes that the carbon-intensive sectors that are likely to be at the centre of the issue – steel, chemicals, paper, cement, and aluminium – are intensive users of anti-dumping measures, suggesting that they will be aggressive in their attempts to use border tax adjustments as a means of limiting international competition.

Subsidies

As discussed in Section B.1, the existence of positive effects can provide a legitimate reason for governments to use subsidies to support an economic activity with societal benefits that are not reflected in market prices. In the case of climate change, there are strong reasons to believe that technological change offers the main avenue for reducing future emissions and achieving the eventual stabilization of atmospheric concentrations of greenhouse gas emissions. The Intergovernmental Panel on Climate Change (IPCC) identifies several reasons why R&D subsidies are warranted, particularly in the energy sector (Metz et al., 2007).

The benefits of R&D may not be realized for decades, which is beyond the planning horizons of even the most forward-looking firms. Industry can only appropriate a fraction of the benefits of R&D investments and as a result, firms under-invest in R&D.

Moreover, firms face difficulties in evaluating intangible R&D outputs and regulatory interventions can cap profits in the case of path-breaking research success. Finally, given that the agricultural sector is a major source of emissions, there is also a potential role for subsidies to facilitate the adoption of "climate smart" agricultural technologies.

On the other hand, it is also true that subsidies provide governments with a means of supporting competitively challenged domestic firms and industries. One area where the role of subsidies has gained increased attention is in biofuels. There are no readily available data on the amount of these subsidies at the global level. However, a recent study by Steenblik (2007) using information on five OECD members – Australia, Canada, the European Union, Switzerland and the United States – provides an estimate of biofuel subsidies of about US$ 11 billion a year. A joint report by several international organizations including the WTO (Food and Agricultural Organization (FAO) et al., 2011) estimates that during the 2007-09 period, biofuels accounted for a significant share of the global use of several crops – 20 per cent for sugar cane, 9 per cent for vegetable oil and coarse grains and 4 per cent for sugar beet.

The political economy of subsidies has been raised in the context of biofuel subsidies, where it is claimed that a primary objective of some countries' biofuel policy is to increase farmers' and landowners' incomes (Rubin et al., 2008). A number of concerns, economic, environmental and social, have also been raised about the wisdom of large biofuel subsidies. Some biofuels emit more greenhouse gases than they save. Any expansion of biofuel production will have indirect effects on greenhouse gas emissions through land use expansion. Subsidies for biofuels have also been implicated in the recent spike in commodity prices which has been particularly detrimental to food-importing developing countries (Mitchell, 2008).

Regulatory measures

As noted in Section B.1, regulations are widely used to deal with environmental problems. The discussion there also suggested that governments may prefer these measures for distributional or competitiveness reasons, uncertainty about the costs and benefits of abatement, and the difficulty of monitoring and enforcement.

In the field of climate change, it is possible to distinguish between technology standards that mandate specific pollution abatement technologies or production methods, and performance standards that mandate specific environmental outcomes per unit of production (Sathaye et al., 2007). An example of a technology standard is a regulation that requires the use of specific CO_2 capture and storage methods on a power plant; an example of a performance standard is one that limits emissions to a certain number of grams of CO_2 per kilowatt-hour of electricity generated (Sathaye et al., 2007). Beyond these types of regulations, some have also pointed to the prospect of more sanitary and phytosanitary measures being taken by countries given that climate change will alter the impact of pests and diseases (Jackson, 2008). In the face of greater uncertainty about pest invasiveness, countries could become more risk averse and use emergency trade restrictions as a way of managing those uncertainties.

Assuming foreign producers have higher emissions or their products are less energy efficient, requiring foreign producers to comply with more stringent domestic requirements can reduce carbon leakage. Foreign production of the goods, and their sale in the home country can continue, but it will be employing technology or standards that are as environmentally friendly as those in the home country. Since the requirements also raise the trade costs of foreign producers, domestic firms are able to secure some advantage and the overall effect may be a reduction of imports by the home country.

(iv) Conclusions

Nothing speaks to the intertwining of public policy goals and domestic producer interests more than the issue of carbon leakage and competitiveness. The close link between these two issues confronts us with one of the main themes of this report: distinguishing between the pursuits of public policy goals and of domestic producer interests. There is clearly a global interest in reducing carbon leakage and countries can have strong environmental reasons for using trade measures to prevent free-riding. The other side of the coin, however, is that the same trade measure also helps competitively challenged domestic producers so that the risk of regulatory capture cannot be easily dismissed. We may see increasing use of non-tariff measures in the future to deal with carbon leakage and competitiveness concerns as well as disagreements about the underlying motivation behind those measures and their trade effects.

(c) Food safety measures

This section discusses why food safety measures[78] appear to have become more and more important in recent times and what the challenges are that countries face regarding their impact on international trade. It concludes that more transparency is needed to ensure the pursuit of consumer interests and to prevent protectionist abuse.

(i) Increased importance of food safety measures

The growing interest of consumers worldwide in safety and quality attributes of food has drawn a lot of

attention to the role of food safety and quality measures in international trade, both governmental and private (Henson and Caswell, 1999). On the one hand, governments intervene in food markets as markets alone fail to provide the socially desirable level of quality and safety (Smith, 2009). On the other hand, agri-food enterprises employ private standards as a tool for product differentiation and quality-based competition (Henson and Reardon, 2005). Hence, the widespread incidence of both governmental and private measures in the agri-food sector relates to developments on both the demand and the supply side of the agri-food system, with clear linkages and inter-dependencies.

Demand-driven developments

Technological, social and economic developments have transformed consumer demand, and recent food safety incidents have amplified this trend. A renewed focus on consumer awareness has resulted in a growing demand for higher levels of regulation and communication, and appears to have shifted food markets from price-based towards quality-based competition.

Growing attention by consumers to quality and safety attributes

Demographic and social trends – such as urbanization and the evolving role of women in the workplace – have modified eating habits and patterns of food demand (Reardon and Barrett, 2000). At the same time, increasing levels of income, technological advances, more sophisticated information about the influence of diet on health and its mass communication have influenced consumer attitudes towards food attributes, increasing their awareness of risks and opportunities related to eating behaviour (Caswell and Mojduszka, 1996; Kalaitzandonakes et al., 2004; Grunert, 2005). This change in focus has led consumers to consider aspects of food that cannot be verified at the time of consumption (Caswell and Mojduszka, 1996). In addition, scientific progress has facilitated a more precise identification of health risks, thus allowing consumers to increase their evaluation standards (Mafra et al., 2007).

Moreover, when assessing food quality, consumers appear increasingly to pay attention to a broader range of product and process characteristics, such as the impact of food production on the environment, worker welfare and global poverty (Henson and Reardon, 2005). These developments, which are increasingly prominent also in developing countries (Reardon et al., 2001), have led to a market for quality and safety characterized by imperfect information and substantial transaction costs in obtaining and using information (Caswell and Mojduszka, 1996). Governments and private sector actors have intervened to correct these inefficiencies, introducing governmental measures

that regulate food products and production processes and developing private standards, respectively.

Food safety scares

A number of high-profile food safety scandals have heightened public and private attention to food attributes even further. The dioxin crisis in the poultry sector in the Netherlands in 2006, the bovine spongiform encephalopathy (BSE) in the beef sector in various European countries over a number of years and the Chinese melamine-adulterated milk contamination in 2008 are prominent examples (Latouche et al., 1998; Marucheck et al., 2011). Considerable media attention towards these crises amplified their effects on consumer attitudes, and this process of "social amplification" has resulted in an important decrease in consumer trust in relation to public and private assurances regarding the safety of food (Latouche et al., 1998).

The subsequent need to restore confidence in public authorities and food producers has led to an increase in transparency in regard to the operation of the supply chain (Böcker and Hanf, 2000; Mazzocchi et al., 2008), and governmental and private food safety measures have proliferated as tools to guarantee such levels of transparency (Henson and Humphrey, 2010). While public actors have tightened existing measures and instituted new measures for emerging and previously unregulated issues, food companies have felt the need to control reputational and commercial risks related to food safety (Henson and Reardon, 2005).

Supply-driven developments

Besides demand-driven changes, developments on the supply side of food markets have contributed to an increase in both governmental and private measures related to food safety and quality. The structure of the supply chain has evolved towards increased fragmentation across multiple enterprises and integration into global markets. This development has been driven by technological changes which have led to a re-organization of farm activities and an increased provision of goods and services by off-farm enterprises (Reardon and Barrett, 2000). The large number of players involved in the supply chain has heightened the need for both coordination among firms and government assurance of quality and safety in relation to food products and production processes. The global reach of today's agri-food supply chains, driven by advances in communication, distribution and transportation systems, has further amplified the challenge to ensure traceability and compatibility among food safety measures in different jurisdictions.

Coordination costs and global supply chains

Fragmented supply chains face coordination and monitoring challenges. Agri-food supply chains may

involve a high number of supplier-buyer relationships across which the quality and safety of the final food product needs to be ensured (Henson and Reardon, 2005). Coordination and monitoring efforts increase transaction costs and are further complicated by different levels of information between buyers and suppliers (Gereffi et al., 2005; Hammoudi et al., 2009). This has led firms to adopt "hands-on" forms of coordination or even to strive for complete vertical integration. Alternatively, coordination costs and information problems at the inter-firm level have been managed at arm's length via product and production standards (Ponte and Gibbon, 2005; Gereffi et al., 2005). As agri-food chains become global and involve different regulatory environments, the role of these instruments in the coordination of supply chains and the standardization of product requirements among suppliers becomes of greater importance (Henson and Reardon, 2005; Marucheck et al., 2011).

Importance of, and challenges related to, traceability

Allowing for the precise tracking of food products along the supply chain, traceability systems represent important instruments to assure food quality and safety in agri-food supply chains. Their principal aim is to collect the necessary information for the identification and the eventual recall of products that represent a risk to consumers (Meuwissen et al., 2003). The adoption of traceability systems is related to the broader phenomena of increased consumer attention to food safety and quality, technological progress and the global extension of food supply chains. The safety scandals previously referred to have increased the interest of consumers in these instruments (Souza-Monteiro and Caswell, 2004; Dickinson and Bailey, 2002). In order to function adequately, traceability systems must allow for the identification of all partners in the supply chain, and grant complete information transfers. The trend towards an increased internationalization of supply chains has posed considerable challenges to the accomplishment of these requirements, and led to a growing need for regulation and cooperation (Meuwissen et al., 2003).

(ii) Trade impacts of food safety measures and mitigation strategies

Given the important role that food safety measures play on both the supply and demand side of food, these measures are bound to affect international trade in these products.[79] This part describes some of the principal ways in which food safety measures affect producer strategies and considers mechanisms for mitigating possible negative trade impacts.

Trade impact

Food safety measures can create both challenges and opportunities for producers. Some of the main challenges relate to the costs associated with diverse requirements. By investing in the capacity to produce products that achieve higher safety requirements, producers may also benefit from accessing higher-value markets. Producers may also invest in developing their own standards as a marketing strategy and as a means of managing product quality along the value-chain.

Compliance costs and loss of economies of scale

Costs of compliance can result in the loss of economies of scale for foreign producers if different requirements apply in different export destinations. These costs will be a function of the exporters' administrative and technical capacity for managing diverse requirements (Henson and Mitullah, 2004; Mathews et al. 2003; Otsuki et al., 2001). In addition, food safety measures usually include both a specified level for particular substances and systemic requirements associated with record-keeping and conformity assessment. Therefore, when they are considered cumulatively, regardless of whether the level of these food safety measures is the same, if the conformity assessment procedures are different, costs may increase due to duplicative testing requirements.

Increase in value-added

Food safety/quality measures may also embody advanced regulatory "technology" and help increase value-added in the exporting country. Some analysts stress that rising food safety requirements can catalyse trade, creating incentive for firms to invest in order to re-position themselves in competitive global markets (Jaffee and Henson, 2004; Swinnen and Maertens, 2009). Of course, food safety measures impact the competitive position of individual countries and distinct market participants differently depending on their strengths and weaknesses.[80] High requirements typically are associated with high-value trade, which means producers participating in this type of trade will be able to receive higher returns. In a supportive policy environment, poor producers may benefit directly through contracted participation in the value chain (see, for example, Jaffee et al., 2011).

Private standards and market power

Private sector food safety standards play an important, and increasing, role in determining international trade outcomes, adding an additional layer of complexity to understanding trade in food products.[81] When retailers have buying power, such standards can become *de facto* market entry barriers for certain producers (Henson and Humphrey, 2009; World Trade Organization (WTO), 2005b). This is particularly the case for developing countries which act as "standard-takers" rather than "standard-makers". Research indicates that in many cases, developing countries are standard-takers because developing their own

standards is more costly than adopting the standards of their major markets (Stephenson, 1997).

Increasingly, private companies or groups of retailers have created their own standards to satisfy consumer demand for particular product characteristics and as a tool to segment markets. For example, the UK supermarket chain Tesco has a standard that all its suppliers of fresh fruits, vegetables and salads must meet (García Martinez and Poole, 2004). Private standards often go beyond food quality and safety specifications and include ethical and environmental considerations as well (Swinnen and Maertens, 2009). The implications for the multilateral trading system in regard to private standards as well as further challenges in regard to multilateral cooperation on food safety measures more generally are discussed in Section E.

Mitigation of negative trade impacts

Several approaches are available to mitigate the possible negative impacts of food safety measures on trade. Countries may seek to harmonize their food safety measures to a particular benchmark. They may also negotiate an agreement to recognize other national food safety systems as achieving the necessary level of food safety. Countries also commit to a common set of rules embedded in the WTO's SPS Agreement that seek to limit the potential use of food safety measures for protectionist purposes.

Harmonization and equivalence

While protectionist incentives may contribute to regulatory diversity in food safety regulations, this diversity persists for a variety of other reasons. Risk perceptions and preferences and the interpretation of scientific evidence may vary among countries. These differences may lead to the adoption of different levels of food safety regulations. Food safety measures, however, are typically more complex than a specification of a particular level for content of risky material. A large proportion of food safety measures are process requirements which define particular approaches for achieving specified levels of food safety. Since the conditions within each country vary, the optimal approach for achieving the same level of safety may also vary. There are various collective approaches for reducing the potential negative trade impacts associated with this diversity.

One approach would be for countries to seek to harmonize food safety measures to a single standard or standards system. Harmonization can take many forms and the impact of harmonization will depend upon what level is chosen as the benchmark. WTO rules in relation to food safety encourage harmonization towards international standards set by the Codex Alimentarius Committee. This intergovernmental body collectively decides on

standards, guidelines and recommendations in the area of food safety and, in principle, should incorporate the preferences of all countries participating in the standard-setting (for more detailed discussion, see Engler et al., 2012; Hooker, 1999; Sykes, 1999).

Another approach for addressing regulatory diversity among countries is for countries to recognize food safety measures of trading partners as equivalent even if these measures differ from their own.[82] This approach would enable countries to develop food safety systems to fit their specific context, rather than forcing a one-size-fits-all approach to achieving a particular level of safety (Josling et al., 2005). Equivalence is particularly important in the case of process requirements due to their complexity. By contrast, product requirements are typically defined along fewer dimensions and are thus more easily compared. In practice, the determination of whether a system of food safety requirements achieves a reasonable level of safety may be administratively burdensome because it requires an evaluation of the system of risk management interventions, including infrastructure, programme implementation and specific technical requirements.

Other means to prevent trade distortions

As food safety measure can be abused for protectionist purposes,[83] countries can commit to a range of disciplines that constrain such behaviour. Some principal obligations contained in the WTO SPS Agreement in this regard are outlined below.

First, the right to implement trade-distorting food safety measures is linked to a scientific justification of the measure, specifically that the measure be based on scientific assessment of food safety risks. Another aspect of the rules emphasizes that the level of risk sought within countries should be consistent in different situations. Of course, as noted above, while food safety measures will include a target level for content of risky material, the measures usually also include other dimensions. Some analysts have questioned whether consistency is a realistic expectation given the complex system of factors that contribute to the development of regulations (Sykes, 2006). Finally, the WTO rules for food safety explicitly state that food safety measures should be "not more trade restrictive than required to achieve their appropriate level of sanitary or phytosanitary protection". As in the case of recognition of equivalence across countries, this requirement recognizes that there may be alternative approaches that could be taken to reach desired levels of safety.

5. Summary and conclusions

This section has introduced different categories of non-tariff measures and measures affecting trade in

services, analysed their policy rationales and economic effects and elucidated the difficulties involved in identifying possible protectionist abuses. In Section B.1, reasons for government intervention have been reviewed, as have the policies implemented in pursuit of these goals that may affect trade. This has resulted in the findings outlined below.

National welfare-maximizing policies that seek to manipulate the terms of trade or shift profits from foreign to domestic firms are explicitly trade-oriented. Measures affecting foreign producers may also be taken in order to privilege specific industry lobbies for political economy motives. Other policies address public policy concerns, such as environmental protection or consumer health. As such, they are not targeted at distorting trade, but may nevertheless affect trade in order to reach their objective.[84]

A range of instruments are available to pursue these policies. Trade objectives can be pursued using tariffs or openly trade-distorting non-tariff measures, such as quotas, export taxes or subsidies. For many public policy objectives, non-discriminatory NTMs, such as regulatory measures or product taxes, are first-best policies. However, governments can also implement origin-neutral measures in ways that *de facto* discriminate against foreign producers or employ NTMs that are inefficiently reducing trade more than necessary to fulfill a public policy goal.[85]

While a government may declare its intention to pursue a public policy objective, such as consumer protection, it may employ a non-tariff measure in a way that creates an artificial advantage for domestic over foreign producers. Behind-the-border measures of this sort pose a particular challenge to trade cooperation because their effects and motivations are often less clear than border measures. In general, the costs and benefits of regulatory measures are more difficult to evaluate than classical price and quantity instruments,[86] which is why the remainder of this report puts a particular focus on TBT/SPS measures and domestic regulation in services.

Section B.2 has discussed a number of situations in which governments may be inclined to use certain non-tariff measures rather than more efficient instruments. Under certain conditions, governments may specifically prefer "opaque" measures in terms of both their cause and effect or choose NTMs that increase fixed rather than variable costs. Political motives and institutional constraints can explain the persistence of inefficient NTMs more generally. The recent phenomenon of offshoring, where business relations are characterized by bilateral bargaining rather than market clearing, provides another reason why, also from a national welfare perspective, governments may distort NTMs, including behind-the-border policy instruments such as TBT/SPS measures, in addition to tariffs in order to influence trade. Finally,

Section B.2 has highlighted that governments employ NTMs that are not effectively regulated at the international level and use these to take the place of tariffs or other NTMs that are constrained by trade agreements.

One of the main insights from this discussion has been that neither the declared aim of a policy nor its effect on trade, which may be coincidental in the pursuit of a "legitimate" public policy objective, in and of itself can offer a conclusive answer to the question whether a non-tariff measure is innocuous from a trade perspective or not. A number of factors have been identified in Sections B.1 and B.2 that can be examined in order to assess whether an NTM may be employed for competitiveness reasons despite statements to the contrary or may otherwise unduly influence trade. These include an analysis of the efficiency of the measure in achieving its objective compared with alternative means as well as of its incidence – that is the distribution of costs and benefits among producers and consumers both domestically and abroad. An examination of sector characteristics, such as the degree of organization or extent of bilateral bargaining in international business relations, and the wider political context in terms of institutions, political processes, information problems and the like also informs this assessment. These issues are further elaborated in Section E.4, where challenges faced by the multilateral trading system in relation to NTMs and possible ways forward are discussed.

Section B.3 has briefly presented the specific features of services trade, the types of services measures encountered and the principal reasons why governments intervene in services markets. Despite the peculiarities of services trade, the discussion has revealed the same fundamental difficulty in distinguishing situations when services measures pursue exclusively legitimate objectives from instances in which they also have a trade-related purpose. Section E.2 provides a more detailed account of the progress made and challenges faced in regulating services measures at the international level.

Finally, the case studies contained in Section B.4 have highlighted the prominence of non-tariff measures in a number of current high-profile areas of government activity and the need for a better understanding of the types of NTMs used, their objectives and effects. The recent financial crisis has given rise to a host of new NTMs taken for "emergency" reasons. However, the global extent of the crisis has quickly heightened the need for widespread monitoring of the measures taken in order to forestall temptations to pursue beggar-thy-neighbour policies or to engage in such practices in retaliation for perceived protectionism.

The issue of carbon leakage and competitiveness in the context of climate change policy has given rise to

extensive debates about the use of non-tariff measures in this regard and provides a powerful example of the difficulties involved in distinguishing between the pursuit of legitimate public policy concerns and the ability to serve sector-specific trade interests. The lack of progress in climate change negotiations and the desire by certain countries to forge ahead unilaterally have the potential to lead to an increased use of NTMs and trade rows over their true purpose and impact.

Last but not least, economic, social and technological developments have fuelled the rise of food safety measures as an important tool in supply chain management and consumer protection. Food safety measures offer opportunities and pose challenges to producers, and efforts to mitigate negative impacts have received renewed attention, not least with the creation of the Standards and Trade Development Facility (STDF), an inter-organizational initiative for enhancing developing countries' capacity to meet SPS requirements.

All of these concerns have in common the need for appropriate data, and the challenges faced in improving transparency through notifications, monitoring and other techniques are further discussed in Section E.4. Section C takes stock of the existing information base on non-tariff measures, which for many types of measures is found to be wanting. Wide gaps in the coverage and content of the data make it difficult to gauge the extent to which the use of NTMs in the areas described above (and more generally) has indeed increased over time and whether this has resulted in additional impediments to international trade, as will be further described below.

Endnotes

1   Wolfe makes a similar argument about the positive effect of transparency on trade, pointing to the role of the WTO's monitoring mechanism in reducing the incidence of protectionism during the global economic crisis.

2   In the paper, political transparency refers to openness about policy objectives and institutional arrangements that clarify the motives of monetary policy-makers. This could include explicit inflation targets, central bank independence and contracts. Economic transparency focuses on the economic information that is used for monetary policy, including economic data, policy models and central bank forecasts. Procedural transparency describes the way monetary policy decisions are taken. This includes the monetary policy strategy and an account of policy deliberations, typically through minutes and voting records. Policy transparency means a prompt announcement and explanation of policy decisions, and an indication of likely future policy actions in the form of a policy inclination. Operational transparency concerns the implementation of monetary policy actions, including a discussion of control errors for the operating instrument and macroeconomic transmission disturbances.

3   This is an idea as old as Adam Smith in the *Wealth of Nations*: "As it is the power of exchanging that gives occasion to the division of labour, so the extent of this division must always be limited by the extent of that power, or, in other words, by the extent of the market".

4   A labelling requirement may not be a panacea if for example it required a detailed breakdown of the origin of each component part as this information could be difficult and costly to track down.

5   Where there is less than perfect information about goods, economists generally distinguish between search, experience and credence goods. Search goods (e.g. clothes) need to be inspected before buying in order to observe their characteristics. Experience goods (e.g. wine) have unknown characteristics, but these attributes are revealed after buying or consuming them. Credence goods have the characteristic that though consumers can observe the utility they derive from the good (or service) *ex post*, they cannot judge whether the type or quality they have received is the *ex ante* needed one. See Dulleck et al. (2011). An example of a credence good (or service) is a doctor's advice about medical treatment. The patient may realize that he or she is getting better from the treatment but does not know if he or she is being over-treated – being prescribed drugs and therapies that are not strictly required or are more costly.

6   Bagwell and Staiger recognize that the fact consumers learn about the quality of the goods after purchasing opens the door for the high-quality firm to offer a low introductory price at which it suffers a loss but entice enough consumers to purchase it and learn about its true quality. Thus, there could be circumstances where export subsidies will not be needed to overcome the barrier posed by information asymmetry.

7   As Bagwell and Staiger (1989) note, export subsidies in this situation improve the welfare of both the exporting and importing countries and do not have the beggar-thy-neighbour effects usually associated with their use.

8   There are only a few examples of environmental taxes in the United States, notably taxes on gasoline, motor fuels, oil spills and chemical feedstocks. See Bovenberg and Goulder (2002).

9   The classic discussion of price versus quantity measures under policy uncertainty is found in Weitzman (1974).

10 The US-tuna case is a GATT-era dispute between Mexico and the United States concerning the latter's ban on imports of tuna caught using fishing methods that resulted in rates of accidental kill or injury of dolphins exceeding US requirements.

11 The US-shrimp case involved a dispute between a number of developing country complainants (India, Malaysia, Pakistan and Thailand) and the United States. It concerned a US prohibition of imports of shrimp and shrimp products from countries that did not use a particular type of net in catching shrimp, a net that would allow endangered turtles that were accidentally caught to escape and avoid drowning.

12 The Montreal Protocol banned the trade of ozone-depleting substances and required the phasing out of their production.

13 These are specified more formally in, for example, Meade (1952), Kemp (1960) and Corden (1974).

14 A natural choice of quota level is the policy-maker's forecast of the long-run level of imports when the domestic industry achieves full maturity. The restrictiveness of this quota declines as the industry's experience accumulates until the quota no longer binds when learning is complete.

15 Although Katz and Shapiro (1985) originally applied the term "network externalities" for these effects, Liebowitz and Margolis (1994) disputed whether these were really externalities. In later work by Katz and Shapiro (1994), they switched to the term "network effects" suggested by Liebowitz and Margolis (1994). See also the discussion of network effects/externalities in World Trade Organization (WTO) (2005b).

16 This symmetry between import and export taxes was first formally articulated by Lerner (1936).

17 The reason for this result is as follows. An export subsidy given by the home country to its export good 1 would lead to a fall in that good's world price and an increase in its price at home. Total demand (foreign plus home consumers) for the country's other export good 2 will increase if the two products are complements abroad and substitutes at home. Under certain conditions, the increased demand for good 2 will lead to a terms-of-trade improvement in that product, which will more than offset the terms-of-trade loss in good 1.

18 Under Cournot competition, output decisions are "strategic substitutes". The increase in the output of the home firm induces a reduction in the output of the foreign firm. Strategies are said to be strategic substitutes if the optimal response by one firm to more (less) aggressive play by another firm is to be less (more) aggressive (Bulow et al., 1986).

19 Under Bertrand competition, prices are "strategic complements". An increase in the price charged by the home firm induces an increase in the price charged by the foreign firm. Strategies are said to be strategic complements if the optimal response by one firm to more (less) aggressive play by another firm is to be more (less) aggressive (Bulow et al., 1986).

20 This is to be distinguished from "product" or demand-enhancing innovation. See Athey and Schmutzler (1995).

21 For less resource-strapped developing countries, conditional cash transfer programmes which provide money to poor families contingent on certain behaviour, usually investments in human capital such as sending children to school, have become more widely employed given their apparent success (Fiszbein and Schady, 2009).

22 However, see Levy (2003) for a critique of the Grossman-Helpman approach. In his view, the Grossman-Helpman approach posits fully-informed rational actors who divide up a surplus. This would not explain the use of a voluntary export restraint (VER), which is an inefficient means of transferring income to special interests since the country incurs a terms-of-trade loss.

23 This is because lobbies also have consumer interests and they benefit from lower protection in sectors other than their own.

24 On this last point, one should note that the empirical study by Maggi and Rodríguez-Clare (2000) arrives at the opposite conclusion. They find that the protection level increases with import penetration, both in sectors that are protected with tariffs and in sectors that are protected with quantitative restrictions.

25 See the discussion of conformity assessment in the *World Trade Report 2005* (World Trade Organization (WTO), 2005b).

26 This assumes that the oligopolists are Cournot competitors. This means that each oligopolist uses the level of its output, rather than say the price it charges for its good, as the instrument to compete against its rivals. If it wants to be more aggressive towards its rivals, it expands the volume of its production. If it wants to be more passive, it reduces the level of its output or capacity.

27 It is assumed that cartel members follow a "grim trigger" strategy. They cooperate with other cartel members so long as everyone else is cooperating. They cease to cooperate and pursue that path forever at the first instance of a member cheating.

28 Alternatively, one can assume that the measure applies to both domestically produced and foreign-made goods, but compliance with the regulation raises the costs of foreign producers more than domestic producers. Abel-Koch (2010) and Rebeyrol and Vauday (2009) discuss the case where compliance costs are identical for domestic and foreign firms but where firms have different productivities.

29 An important parameter that affects these trade adjustments is the degree of substitutability of the products, or more precisely the elasticity of substitution (Chaney, 2008). The degree of product substitutability has opposite effects on each margin. A higher elasticity makes the intensive margin more sensitive to changes in trade costs, while it makes the extensive margin less sensitive. Chaney is able to show that if the productivity of firms follows a Pareto distribution, adjustment along the extensive margin will dominate.

30 Here, it is generally assumed that governments, when enacting policy, only take into account national, not global welfare. Or, in the case of political economy, governments only consider the interests of domestic, not foreign firms and, hence, act differently than they would if all producers were located domestically. See, for instance, Fischer and Serra (2000) or Marette and Beghin (2010) for a formalization of this approach. These papers ask more generally when protectionism occurs, while the focus of this sub-section is specifically the choice of policy instruments, i.e. on the conditions under which specific types of NTMs are chosen rather than other policy options.

31 There is no narrowly defined literature in economics on this subject and some of the studies reviewed here belong rather to a political science literature. The list of explanations provided here regarding governments' constraints in the choice of policy instruments, while important, is not necessarily exhaustive.

32 In examining the degree of "welfare-mindedness" of governments across a large sample of countries, Gawande et al. (2005) show empirically that the more informed citizens are, the greater is governments' concern with aggregate welfare rather than special interests in shaping trade policy.

33 As noted in the previous sub-section, in our considerations of political economy, we mainly presume producers to be organized and consumers to be unorganized. For many policy issues, this has found to be a reasonable assumption. However, where consumer organizations exist, they may have considerable political influence as well, for example in the area of food safety (Swinnen and Vandemoortele, 2011). Gulati and Roy (2007) show that political links are created between different policy instruments when governments need to take into account both producer and consumer interest groups. Such links may enhance or cushion the trade impact of relevant policies. In turn, such linkages also imply that when trade agreements deal with behind-the-border issues that have traditionally been seen as being of purely domestic concern, special interest groups that previously have not engaged in trade policy may begin to take an active interest in this domain. Section E deals with international cooperation on NTMs and will touch further on these issues and the implications that they may give rise to, for instance in regard to transparency.

34 A similar argument for the use of public policy measures as disguised protectionist devices arises when several interest groups lobby for protection but the government cannot provide protection to everyone through tariffs (because of some external constraint, e.g. in the form of an international trade agreement limiting the overall level of tariff protection). In this case, the government could protect one industry with an NTM, e.g. a regulatory measure, assuming that interested parties (competitors, consumers) are unable to verify its real protectionist impact. A government may also prefer a comparatively opaque NTM if it has specific ties with certain interest groups (e.g. of an ethnic or cultural nature), but seeks to hide its discriminatory treatment among lobbies (Robinson and Torvik, 2005). In a seminal paper, Laffont and Tirole (1991) show that interest groups themselves may have an interest in inefficient regulations if they are privy to relevant information about policies that is not available to policy-makers and this situation may afford them additional political influence.

35 The authors highlight that for questions of public policy it is rational for an individual to remain ignorant, when the expected benefits are small relative to the costs of acquiring the necessary information.

36 The author explains quite succinctly that, all else being equal, a "bad" politician would prefer to provide a direct subsidy to producers, "since implementing the product standard is distortionary in the low-risk state [i.e. not optimal on welfare grounds] and even bad incumbents care about welfare" (Sturm 2006: 575). However, the re-election perspective can dominate this effect, i.e. "bad" incumbents who attach low importance to social welfare and for whom re-election is sufficiently beneficial prefer to distort the environmental policy in order to make an indirect transfer to local producers rather than to provide a subsidy that would signal their "bad" political behaviour to voters and entail electoral defeat with certainty.

37 See also Yu (2000) who develops a parsimonious model in which changes in the degree of transparency of an NTM, in this case a voluntary export restraint (VER), compared to a tariff and the relative market distortions that these instruments entail have an impact on governments in their choice of substituting an NTM for a tariff.

38 This is different from a strand in the trade literature that has explained the existence of trade policies more generally when the identity of winners and losers from trade opening is uncertain. See, for example, Feenstra and Lewis (1991).

39 In economic terms, this means that the costs of an excessive overpayment must be traded off against the "deadweight" loss associated with a distortionary policy.

40 A similar result holds if legislators are motivated by policy rather than lobbying contributions, so long as the legislator cares about the policies chosen after leaving office (Martimort, 2001).

41 The relationship between policies in the national interest and policies oriented towards individual constituencies can be complex. Some national policies, such as a nation-wide education programme, can have long-lasting impacts. Battaglini and Coate (2007) warn that once such a policy is in place, future legislators can leverage the gains from the investment to divert resources towards less efficient measures that favour their constituency. Anticipating the distortionary effects of a surplus of public goods, the authors note that in some cases legislators may do better by partially limiting investment in public goods to discourage inefficient NTMs.

42 Of course, conformity assessment for individual shipments still entails some form of variable cost related to the measure.

43 See also Schmitt and Yu (2001) and Jorgensen and Schroder (2008) for a perspective on the welfare effects of tariffs in the presence of fixed exporting costs.

44 To be more precise, unlike in Rebeyrol and Vauday (2009), Abel-Koch (2010) shows that even if foreign firms are more productive on average (and, consequently, import penetration is high), the introduction of a behind-the-border NTM may still shift profits towards domestic firms if in the latter the Pareto distribution of firm productivities is less skewed than abroad. In such case, the ratio of highly efficient firms to rather inefficient firms and hence the ratio of winners to losers from behind-the-border measures is higher for domestic than foreign firms, and, overall, profits are shifted from abroad towards the country introducing the measure. This proposition may be seen as a possible contradiction to the prediction by Grossman and Helpman (1994) that the level of protection varies inversely with import penetration. However, as will be discussed further below, it is still generally true, albeit for different reasons, that the level of e.g. a regulatory measure will be higher the fewer foreign firms are active in the domestic market, as in such situations competition among domestic firms and the potential for domestic profit-shifting are relatively more important.

45 Bombardini (2008) shows that when the channeling of political contributions entails fixed costs, the largest firms in a sector will form an interest group. The author goes on to confirm empirically that sectors with a higher share of large firms exhibit a higher level of political activity.

46 For an empirical confirmation see Yi (2003).

47 See also Fischer and Serra (2000), for example, for the application of an environmental measure in an international duopoly situation where the regulation is set inefficiently high in order to shift rents from the foreign to the domestic producer and impose part of the costs of reducing the externality on the foreign producer. The authors only show that environmental measures can be used as a protectionist device, they do not seek to explain why the government would use an instrument that applies to domestic and

foreign producers alike (but imposes a higher cost on the latter who are assumed to produce for several markets according to different requirements) rather than trade taxes.

48 See, for instance, Antràs (2011) for a recent overview of this literature.

49 Unlike Antràs and Staiger (2008), Staiger (2012) obtains "realistic" policy predictions, i.e. policies of increased protection from imports via NTMs, also in a model without political economy considerations. In the former paper, the basic model predicts a subsidization of imports of intermediates by the home government and a taxation of intermediates by the government in the exporting country. While this situation is not unrealistic per se, it may be more relevant in regard to trade in natural resources and other raw materials, where escalating protection (and, hence, a higher effective rate of protection for final products) as well as counteracting export policies have been observed, rather than in regard to trade in manufactured inputs. See also World Trade Organization (WTO) (2010).

50 In other words, prices faced by consumers will increase less for a given reduction in quantity equal to the increase in quantity in response to the marginal decrease in the import tariff, as part of the tax incidence falls on producers.

51 Anderson and Schmitt (2003) also argue that when competition within an industry is lower, tariff liberalization is lower, and the endogenous response of imposing NTMs, such as quotas and anti-dumping duties, is generally more modest.

52 This applies if a "large" country reduces the requirements applied to domestically-produced goods.

53 Defined as the probability of a country filing an AD petition.

54 The data do not distinguish between tariff liberalization that was unilateral or driven by an international agreement – multilateral or regional.

55 Applied rather than bound tariffs are used in the analysis because in the presence of binding overhang, a reduction in the bound tariff may not have any effect on the applied tariff, therefore it would not create any incentive for policy substitution.

56 Details of the estimation of *ad valorem* equivalent of NTMs can be found in Section D.1.

57 Details about the construction of frequency index and coverage ratio can be found in Section C (Box C.1).

58 In a narrow connotation, the term "regulation" may designate the promulgation of a binding set of rules (Baldwin et al., 2012). In a broader sense, it can be used to define all state actions designed to influence economic or social behaviour, referring both to legislative acts and fiscal measures. In the terminology of the GATS, the corresponding notion is that of "measures", as in the Agreement "regulation" refers to a specific type of legislative act (see, for instance, GATS Article XXVIII).

59 Lennon (2009), for instance, argues that "trade in goods and in other commercial services reinforce each other. Bilateral trade in goods explains bilateral trade in services: the resulting estimated elasticity is close to 1. Reciprocally, bilateral trade in services positively affects bilateral trade in goods: a 10% increase in trade in services raises traded goods by 4.6%".

60 Two- or multi-sided platforms (i.e. platforms that serve two or more distinct groups of customers who value each other's participation, such as media platforms that sell advertising to one group of customers and content to another) or

clusters of horizontally complementary or vertically integrated services (e.g. telecommunications, audio-visual and recreational services, or vertically integrated retailers providing wholesale, warehousing and logistics services) are examples of some of the interrelations between different service sectors.

61 The United States is one of the few countries that provide information on intra-firm trade.

62 The role of services in international production may be significantly underestimated in trade data, because services are to a much larger extent than goods traded indirectly, embodied in goods and other services. Thus, it is estimated that local manufacturing value added embodied in exports accounts for less than 50 per cent of the gross value of manufacturing exports, while local services value added account for 150 per cent of gross value of services exports (Johnson and Noguera, 2012). The authors calculated trade in value using the GTAP 7.1. database for 94 countries and 57 sectors. A share higher than one is possible when direct exports of services is low, but local services are embodied in manufactured exports.

63 The manipulation of the terms of trade to increase national welfare is not considered a relevant justification in the case of services trade, essentially because of the oft-associated factor movement (Francois and Hoekman, 2010; Marchetti and Mavroidis, 2011).

64 The shift away from state ownership and responsibility for the provision of a service to private ownership and private provision with enhanced state regulation has been described as the rise of the "regulatory state" (Majone, 1994).

65 For a discussion of the applicability of traditional theoretical models to services trade see, for example, World Trade Organization (WTO) (2008). For alternative views, see Whalley and Chia (1997), for instance.

66 For instance, measures that raise the cost of foreign firms when they sell in the domestic market are more trade restrictive in the presence of incumbent domestic monopoly or oligopoly than under perfect competition (see Deardorff and Stern, 2008 and Helpman and Krugman, 1989). Francois and Wooton (2001) show that, in the presence of an imperfectly competitive domestic industry, a foreign competitor might choose whether to join the home cartel or compete with it depending on the extent of restrictions to cross-border trade.

67 Tariff-like instruments could be applicable in certain sectors for given modes. One might conceive, for instance, of a tax per passenger or per volume of cargo in cross-border transport services, given that a physical, visible entity is associated with the service being supplied. Alternatively, entry, output and profit taxes could be applicable to locally established foreign firms (see Copeland and Mattoo, 2008).

68 However, Laffont (1999) shows that, in the presence of weak democratic institutions, stimulating competition might not always be welfare enhancing.

69 The Global Trade Alert, a similar private initiative that provides information on state measures taken during the recent economic downturn, was established in 2009.

70 See Corfee-Morlot and Hohne (2003) for example.

71 These emission reduction targets, which are conditional on others meeting theirs, can be found in the UNFCCC website: http://unfccc.int.

72 Under Article 3 of the Kyoto Protocol, countries listed under Annex I of the United Nations Framework Convention on Climate Change were to reduce their overall emissions of greenhouse gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.

73 See Copeland and Taylor (1994) for a discussion of how differences in the stringency of environmental regulations between high-income and low-income countries leads the former to specialize in clean industries and the latter to specialize in polluting industries. Furthermore, they establish that the resulting increase in pollution levels in low-income countries more than offsets the decline in high-income countries.

74 To get a sense of the diversity of the indicators used, we examined a random set of studies. Demailly and Quirion (2006) use changes in profits and output as indicators of the change in competitiveness; Zhang and Baranzini (2004) use the increase in cost of production; Reinaud (2008) uses profits and market share; the Stern Review (Stern, 2007) uses the change in producer cost and the pass through to consumer prices.

75 Markusen (1976) derives similar results in a model of trade with transboundary pollution.

76 There is an interesting paper by Lockwood and Whalley (2008) which relates the current debate on competitiveness and border tax adjustments to a 1960s debate on the Value Added Tax (VAT) and border tax adjustments in the EU. As they make clear, the academic literature of the time showed that a change between origin and destination basis in the VAT would be neutral and hence the use of a border tax adjustment in the EU to accompany the VAT offered no trade advantage to Europe. However, that argument rests on the neutrality of the VAT – relative prices in the EU are left unchanged by the VAT. This will not be the case with carbon taxes since the intent of the mitigation measures is to increase the relative price of carbon-intensive goods to reflect their social cost.

77 See Mattoo et al. (2009), though, for how this may be simplified by assuming foreign goods have the same carbon footprint as domestic goods. See Ismer and Neuhoff (2007) for a proposal on how to simplify and make WTO-consistent a border adjustment scheme involving purchases of emission permits.

78 For the sake of brevity, the discussion here principally refers to food safety measures, but also mentions relevant aspects of measures relating to quality and broader attributes, such as environmental implications of food production. Swinnen and Vandemoortele (2009) emphasize the extent to which the nature of such measures affects their politically optimal level and the likelihood of trade conflicts, pointing out important differences in this regard. This discussion is beyond the scope of the present sub-section.

79 Swinnen and Vandemoortele (2011) build a model to illustrate that food safety measures (almost) always affect trade and, in a political economy context, derive the conditions under which such measures act as a catalyst or barrier to international trade. As noted in Section B.1, the authors also show that a possible negative effect on trade flows does not automatically relate to producer protectionism.

80 Mangelsdorf et al. (2012), for instance, find a positive impact of voluntary standards and mandatory requirements on Chinese food and agricultural exports, with the benefits outweighing increased compliance costs.

81 For an extensive literature review on private standards, see International Trade Centre (ITC) at www.standardsmap.org, last visited on 9 March 2012, as well as Organisation for Economic Co-operation and Development (OECD) (2006) and related publications.

82 A recent example is the agreement on organic food products signed between the European Union and United States coming into effect in June 2012. Agence France-Presse (AFP) reports that before the deal, companies had to conform to two different sets of requirements on both sides of the Atlantic.

83 The literature on this subject is rather limited. Foletti (2011) examines the variation in maximum residue limits (MRLs) for various pesticides and products in a range of countries. Analysing the relative contribution of "consumer protection" (at the pesticide level) and "producer protection" (at the product level), she finds that while health motives explain a significant amount of the variation in MRLs, protectionist motives can explain up to one third of the variation. As far as MRL levels are concerned, she finds that higher levels of toxicity result in stricter regulation, as was to be expected. However, whether a pesticide is produced domestically also plays a role, resulting in more lenient regulatory thresholds.

84 In Section E.1 the incentive for countries to cooperate is established in order to avoid beggar-thy-neighbour policies or provide a credible commitment device that helps to contain pressure from domestic interest groups. But countries may also cooperate on public policy objectives in order to pursue the most efficient policy not only from a national, but global welfare perspective, or if they share a common public policy goal.

85 Although, at face value, the requirements of a measure may be the same for domestic and foreign producers, certain aspects in its application may be inherently more difficult to fulfill by foreign than by domestic manufacturers. For conceptual work on this issue, see Swinnen and Vandemoortele (2009; 2011). A well-known example is the obligation for imports to be tested for their conformity with technical requirements in specific laboratories entailing higher access costs for foreigners than for domestic producers. Another example relates to product taxes, where thresholds are set such that competing foreign products fall in the higher tax bracket.

86 Cost-benefit analysis was briefly introduced in Box B.2. For the development of a cost-benefit framework to assess regulatory measures and its application to TBT/SPS, see Van Tongeren et al. (2009; 2010).