

red, yellow and green would fall under the second definition, but not necessarily under the first one. The difference between the two examples is that in the first case the “norm” refers to something that can be measured (lower or higher percentage of vegetable fat), whereas the second does not. For an economic analysis of standards, the difference between norms referring to characteristics that can be measured on an objective scale and norms referring to other characteristics that cannot be measured is quite important.

(a) Vertical versus horizontal differentiation

Product standards specify the characteristics of a product. By nature product standards therefore play a role in markets of differentiated products, i.e. products that appear in different varieties. Economists distinguish between two types of product differentiation: “vertical” product differentiation and “horizontal” product differentiation.¹

products will often voluntarily label their products in order to signal to consumers that their products meet the “(required or agreed) level of quality or attainment”. The possible combinations of voluntary and mandatory standards and labels are summarized in Table 1.

When introducing a public standard a government thus has the choice of the three approaches depicted in Table 1. The following Subsections discuss in detail the effects of these policy options in different market set-ups. In general, the government needs to take into account a number of trade-offs. Mandatory standards tend to lead to the supply of fewer varieties in the market than voluntary standards. This outcome can be desirable if fewer varieties increase efficiency, for instance in the case of network externalities, or if the government has strong reasons to ban certain varieties from the market, for instance in order to protect the health of consumers. When a voluntary standard is introduced, the choice between “negative or positive” labelling will determine who carries the cost of the labelling policy. In the first case the producers (and thus ultimately the consumers) of products not meeting the standard end up paying the labelling costs, whereas in the second case the price of products meeting the standard will incorporate the labelling costs. It has also been argued that consumers react differently to negative labelling than

Box 1: The mobile phone industry in Europe and the United States

Mobile communication networks have experienced dramatic growth over the past decade. In 2002, the number of cellular mobile subscribers around the world exceeded 1 billion, up from just 11 million in 1990. In 1990, mobile phone subscribers represented only 2 per cent of fixed telephone line subscribers, while by the end of 2002 there were more mobile cellular subscribers than subscribers to fixed telephone lines.

The creation of standards in the wireless telecommunication industry followed a different pattern in Europe and the United States. In the early 1980s, Ameritech installed the first analog mobile phones system in the United States. The Federal Communication Commission (FCC) mandated the adoption of a single standard for the United States – the AMPS system (Advanced Mobile Phone Service). To avoid the emergence of a monopoly service provider, the FCC also imposed an antitrust regulation. The adoption of a unified, government-backed standard fuelled the growth of the network, and by 1993 more than half of the worldwide wireless cellular systems used this technology.

By contrast, in Europe standards for first generation mobile phones differed across countries and were not compatible with each other. Two standards for first generation cellular phones competed in the European market: the Nordic Mobile Telephone (NMT) and the Total Access Communication System (TACS). The former was developed by Nokia and Ericsson. It was first implemented in Sweden, then spread to other Scandinavian countries. The latter standard was established in Italy and the United Kingdom. In this situation, not only was mobile communication equipment limited to operation within national boundaries, but there was also limited scope for exploiting economies of scale and forgone savings. The rate of diffusion of mobile phone communication (1995 to 2002) in Europe (7114.350) is lower than in the United States (11.361.719).

roaming (which represents trade in telecommunications service), in which a caller with a domestic cell phone subscription can make a call while overseas, utilizing the network of a foreign telecommunications provider. As the number of GSM users increased from 258 million to 456 million between 1999 and 2000, the number of international roaming calls surged to 540 million in 2000, doubling relative to the year before.

Compatibility standards also facilitate trade in the case of virtual network industries built on complementarities in production or consumption, since an incentive exists here to ensure that compatibility is extended across countries. Modern manufacturing involves a large number of firms in different locations, often also in different countries, who produce parts and components which are assembled before being distributed to the final consumer. Effective assembly of products from a host of suppliers require that the inputs are compatible with

purchased in the same region as the printer. Adoption of incompatible standards across countries works as a market segmentation device and reduces competition and trade. Faced by strong competitive pressure, for example the pressure resulting from the recent depreciation of the dollar for those producing in Europe, multinationals may be induced to price discriminate across countries. Setting incompatible standards between the EU and United States allows multinationals to set different prices for the two markets, as arbitrage from imports is rendered impossible.

(b) Imperfect information: the case of safety standards

Many situations in which consumers, producers and governments have to make decisions are characterized by Imperfect information. Decision-makers do not have all the information at hand when they make purchases, investments or decide on policies. Sometimes, both parties to a transaction do not have all the necessary information. But in many instances, one party to a transaction (typically the seller) may have better information

The economic cost from accidental injuries and deaths can be large. In the United States, for example, there were more than 12 million accidents in 2003 from the use of consumer products that required treatment in hospitals.¹³ The US Consumer Product Safety Commission estimates the economic costs of these accidental deaths and injuries at \$700 billion annually. Unfortunately, risk and its cost are not always easy to measure, in particular because consumers tend to value risk in different ways. It is therefore not straightforward to design optimal policy instruments in these cases.¹⁴

The rationale for government intervention rests on the existence of information asymmetry between the producer of the possibly defective product and the consumer. A manufacturer knows more about the reliability or safety of his product than the consumer. Of course, it may be possible that the threat of a consumer backlash against firms discovered selling unsafe products will deter producers from willingly selling substandard products in the marketplace. Firms also have an incentive to improve the reliability of their products in order to differentiate their output and create a price premium for them (Shapiro, 1983). The extent to which consumers can “punish”

The empirical evidence on whether mandatory standards improve safety is mixed. A study by Peltzman (1975) on auto safety belt regulations found no significant differences in total fatalities from automobile accidents. Similarly, another study by Peltzman,¹⁹ on mandatory prescription drugs, found no effect of standards on the incidence of accidental poisonings or adverse reactions to drugs. Viscusi (1984, 1985) also found no evidence that product specific standards set by the US Consumer Product Safety Commission reduced accident rates. However, Magat and Moore (1995) examined the bicycle industry in the United States and United Kingdom and found a statistically significant decline in accident rates as the stock of bicycles in compliance with mandatory standards increased.

The area of government-mandated product (and process) standards is where the greatest concern exists about possible adverse effects on trade. There are two reasons for this. First, such standards are a requirement supported by the coercive power of the state. Second, it is likely that in the course of developing standards, governments will be most responsive to domestic concerns, in particular the interests of domestic industry whose product competes with imports. As a result, standards may be designed in such a way that gives domestic producers a competitive advantage. Although this is, in principle, not in the interest of domestic consumers, governments may – deliberately or not – impose safety standards that act as protectionist devices.

Safety standards designed with the aim of maximizing national welfare, i.e. not as a protectionist device, may increase trade, decrease it, or leave it unaltered (see Box 5 for an example). The outcome will to a large extent depend on a standard's effect on the relative costs of domestic and foreign producers. But it also depends on many other factors, like the level of competition in exporting and importing countries and the willingness of consumers in different countries to pay higher prices for safer products. It is therefore difficult to predict the effect of a safety standard on trade flows. The following discussion should therefore be considered as indicative of what could happen rather than as a prediction.

If the country introducing the standard is an exporting country, trade is unlikely to increase. To the extent production costs are higher for safer goods, domestic exporters will become less competitive in world markets where their competitors do not need to meet the same safety standards.²¹ If the country imposing the standard imports the relevant good, the effect on trade is ambiguous. Foreign exporters will, in this case, incur higher costs as they must adapt their products to conform to the new regulations. Typically, the change in costs can be modelled either as an increase in fixed cost with marginal cost remaining unchanged (as in the case of a once-and-for-all redesign change) or a percentage increase in cost (Ganslandt and Markusen, 2001). But domestic producers also have to adapt their production and incur higher costs. If the standard affects marginal costs, trade will tend to decrease if the cost increase for foreign producers exceeds that experienced by domestic producers. Trade will tend to increase in the opposite case.

Welfare effects are even more difficult to predict than trade flow effects, but the following scenario cannot be



tax would guarantee an optimal production level for society as both the pure economic benefits of producing and consuming a good and the environmental effects of producing that good are taken into account.²⁵

Although Pigouvian taxes, in theory, represent an optimal policy instrument, their application raises a number of concerns. These include distributional issues, uncertainty about the costs and benefits of abatement, and the costs of monitoring and enforcement (Bovenberg and Goulder, 2001). Governments may be reluctant to saddle households and firms with the distributional consequences of an environmental tax. While an increasingly wider set of methods are being applied by social scientists to measure the monetary value of environmental costs (including hedonic pricing, contingent valuation, etc.), there continues to be a great deal of uncertainty about the exact magnitudes of the benefits and costs from pollution abatement. Finally, there is the cost of monitoring and

Two things are worth noting in Table 2. Firstly, “voluntary product standards” related to consumption externalities tend not to be regulated by the government. This is probably the case because the role of public labelling schemes is taken over by private labelling or branding schemes.²⁷ Secondly, voluntary process standards typically have to be combined with product labelling schemes in order to allow consumers to distinguish between the outputs of more or less environmentally friendly production processes. Through

differ across countries.³⁰ Second, the question arises as to who controls and enforces the standards applied in the production of imported goods, given that production takes place abroad. This question is particularly important if production processes do not leave traces in the traded products, as this will make it impossible to detect upon inspection at the border whether a certain environmental process standard has been applied or not.³¹ If the exporter claims that the standard has been applied, the importing country may either trust the exporter or insist upon inspecting the production site abroad. The latter option raises concerns about countries' sovereignty.³²

standards with the strategic aim of creating a disadvantage for foreign competitors. To the extent that standards increase costs for foreign companies relatively more than for domestic firms, they reduce the ability of a producer to enter a foreign market.

(a) Policy options when standards differ across countries

When countries open up to trade, previous standards may become suboptimal. Consider, for example, the case of two similar countries sharing a common policy objective of ensuring a certain degree of safety for car drivers. Due to country-specific differences, however, the two countries chose different technical provisions before trade. One country required the presence in the vehicle of a frontal and a side air bag, the other country required seat belts and only a frontal air bag. If both countries stick to their standards, car manufacturers who want to export will have to face the costs of adapting their product to the requirements of the destination

There are costs and benefits associated with each of these approaches. In the next Subsections the welfare and trade effects of harmonization and mutual recognition

resulting emission caused acid rain to fall in another country. Yet this behaviour would be inefficient and would likely reduce global welfare (in the simplest form the sum of the welfare of each country). Cooperation is therefore necessary in order to solve the problem, whereby countries may agree on a common standard or on a core standard that increases global welfare. It is not necessarily the case, however, that a welfare maximizing solution involves a single international standard. To the extent that production technologies differ across countries, cooperation may instead lead to the use of different standards in different countries. It may be noted that mutual recognition would not solve the market externality problem in this case (Sykes, 2000 and Pelkmans, 2003).

A similar argument can be made in favour of harmonization for the case of network externalities. However, it needs to be highlighted that in this case market forces are likely to generate the desirable outcome, without need of a government intervention (see discussion above).

As Sykes (2000) argues, it is likely that a certain degree of cooperation is “almost always valuable”, at least to the extent of prohibiting regulators from engaging in rent-seeking behaviour. Focusing on the EU, Pelkmans (2003 p.5) argues that the advantage of the new approach is that in “emphasizing the objective(s), rather than the detailed specifications,...national regulations... are forced to concentrate on overcoming the market failure”.

(c) The trade effects of different policy options

Harmonization and mutual recognition are commonly believed to be steps towards freer trade. However, the impact of harmonization and mutual recognition of standards on trade among the countries participating in an agreement is quite complex.

On the one hand, both harmonization and mutual recognition of product standards will foster trade because they create scale economies and allow a more efficient allocation of resources. In particular, harmonization may facilitate trade more than mutual recognition, because it requires that countries adopt an identical standard. This implies that products manufactured in different countries are more similar, more homogeneous and, therefore, better substitutes from the point of view of the consumer and the producer than when products can enter the market under mutual recognition. Moreover, adoption of identical standards will improve consumer confidence in the importing country about the quality of the good produced abroad. In sum, a common standard will act as a quality signal and lower information costs for the consumer. Also, identical standards will enhance the compatibility of imported and domestically produced goods. In this sense, harmonization would make it easier for producers to match imported components with those available domestically, would reduce costs and increase trade. In the case of network industries, harmonization would allow network externalities to more readily spill over internationally, thus fostering trade. Finally, harmonization can foster trade by enhancing competition. To the extent that different standards serve as market-segmentation devices, harmonization will facilitate arbitrage and parallel trade, thus enhancing competition.

On the other hand, there are potential negative effects of harmonization on trade that could be avoided through mutual recognition of product standards. For example, harmonization imposes a cost in terms of

In contrast, mutual recognition allows a country to choose one standard and sell products meeting that standard to its trading partner(s). Unless consumer preferences are biased towards its partners' technical specifications, a firm can freely access its partners' markets without the added burden of harmonizing its

be more harmonization “from the bottom” (that is initiated by private industry groups), in order to avoid wasteful replication of national standards and a larger number of specialized international standard groups. The model does not rule out the possibility that the number of standards created by the market are non-optimal. Therefore, there is still space for policy intervention. Yet the role of the government that the model envisages is not that of establishing harmonization through inter-governmental treaties, but rather setting up the appropriate regulatory framework to prevent anti-competitive outcomes.

Some empirical evidence supports Casella’s conclusions. First, two main non-governmental international standardization bodies exist: the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). ISO Members are national standards institutes, while IEC Members are national committees representing all electrotechnical interests in that country. Both organizations issue non-mandatory recommendations. Since they are supported by industries, they represent standards-sharing coalitions of the kind found optimal in Casella’s model. Second, industry involvement in international standard setting is increasing as integration progresses. In Germany, for example, the share of resources spent by firms on standard-setting that was directed towards work within international standard-setting organizations rose from 35 per cent to 65 per cent between 1984 and 1991 (Casella, 2001). Third, in accordance with the fragmentation of coalitions predicted by the model, the number of standards institutions devoted to specific areas has been increasing over time. An example is the case of European standards organizations in telecommunications. As market integration has deepened in Europe, standards organizations have evolved

(a) Measuring standardization activity

The empirical literature has tended to rely upon a rather short list of databases to measure standardization activity, such as Trade Analysis and Information System (UNCTAD TRAINS), notifications to the WTO, ISO, IEC and Perinorm. But the data are not usually classified in a way that reflects the various economic functions of standards. Information on whether these are voluntary or mandatory, national or international, can be found in some databases but not in others. While it may be possible to identify the sector to which a standard applies, it will not be clear whether all products in that sector are covered or only a subset of them. Most of the available databases also depend on the willingness of countries to provide accurate and prompt responses to questionnaires or surveys. As a result, frequently the most that one can extract from these databases is the count of standards or measures that have been adopted. However, the likely effect of standards on welfare and trade hinges far more on their functions, design and application than on their sheer number. It is important to keep these limitations in mind when examining how standards are measured in the literature.



As expected, the number of standards is highest in industries characterized by network externalities, such as those related to electronic equipment and communication technology. Neither is it surprising to encounter a limited number of standards in the military engineering industry. Standards are a source of information and the defence industry is characterized by a strong concern for secrecy.

It is worth noting that some network industries are also more likely to harmonize their standards internationally. Chart 2 reports the total number of standards published between 1980 and 2004 by sector, and compares them with the number of shared standards – that is, the number of standards that are not country-specific but are “identical” or “equivalent” to international or regional standards or the standards set by one other country. Global network industries, such as electronic equipment and telecommunications, are deeply harmonized across countries (nearly 70 per cent of standards are shared), while strictly local industries such as stone, clay and glass are characterized by relatively more country-specific standards.

A number of salient features emerge from this look at some available sources of information on standards. First, standard-setting activity seems to be pronounced in industries characterized by network externalities.

Because of the ambiguities introduced by price comparisons, the more direct approach of asking producers and traders directly about the effects standards and technical regulations through surveys or case studies have also been tried. This cost-based approach was pursued in a 1999 OECD study, surveys conducted by the European Commission and the United States Trade Representative on European and American exporters respectively and by Henson et al. (1999) and Wilson and Otsuki (2004) for a sample of developing countries. Detailed case studies on the costs faced by developing country exporters of complying with food standards have been undertaken and reported in World Bank (2005) and Unnevehr (2003). The advantage of the cost-based approach is that respondents are able to pinpoint which standards are particularly troublesome. But since a survey or a case study necessarily covers only a small number of producers and there can be some self-selection involved, the results may not be representative of the overall problems faced by a country as a whole.

meet foreign requirements, even though domestic requirements have been met. The majority of firms surveyed

⁴⁰ The difference between the two is that cross-section data comprise a series of observations made at the same time, while time-series data are a series of observations through time.

⁴¹ Gravity models are econometric models of trade which acquire their name from their similarity to Newton's theory of gravitation. The gravity model of trade predicts that the volume of trade between any two countries will be positively related to the size of their economies (usually GDP) and inversely related to the distance between them. The gravity model has proven to be popular among empirical trade economists because of the very high explanatory value obtained, even with the use of cross-section data. For a time, gravity models were linked primarily with trade models of imperfect competition. However, recent work (Deardorff, 1998) has made it clear that the gravity model can also arise from a traditional factor-proportions explanation of trade. Hence, far from being a purely econometric

are introduced in the regression, harmonization is still found to have a positive and significant effect on trade. Interestingly, importer-specific standards have a negative impact on imports in the non-manufacturing sectors, but have a positive impact on imports in the manufacturing sector. Moenius explains this result in terms of incomplete information. Trading partners face high information costs in the absence of standards. The presence of product standards, even if they are specific to one country, lowers information costs. While there are costs in adapting products to conform to national standards in foreign markets, if these costs are small relative to information costs, the presence of standards increases rather than deters trade. These effects dominate in manufacturing sectors, where products are more differentiated and information about market preferences is, therefore, more valuable.

There are a number of concerns that need to be highlighted about the Moenius study. First, it is not based on the standard version of the gravity model. Instead of using aggregate bilateral trade as the variable to be explained (dependent variable), the study uses bilateral trade at the sectoral level. And it omits measures of distance between countries and tariff barriers, favouring time country-pair fixed effects. Thus, it is difficult to assess the regression on the basis of a comparison of the estimated coefficients with previous studies and some results are likely to suffer from a significant bias arising from omitted explanatory (independent) variables. Second, the study does not distinguish between

recognition present a lower "home bias"⁴² than the average. The study relies on the hypothesis that the large home bias in Europe is induced by technical barriers to trade, such as different technical regulations. Hence,

(d) SPS measures

The focus here is on SPS measures intended to reduce the dangers posed to animal, plant and human life and health by imports. Two sets of empirical studies are considered – welfare-based analysis of SPS measures and

makers are confronted by situations characterized by risk, the studies above provide important evidence that SPS measures are too restrictive. If on the other hand, they are confronted by uncertainty (in Knight's sense)

The welfare-based literature finds that SPS measures are generally restrictive and involve a welfare loss in the importing country. The presumed health risks or losses from the introduction of pests through imports need to be extraordinarily high in order to justify some regulatory regimes in place. But questions have been raised about the appropriateness of the analytical framework employed since there may be circumstances when regulatory authorities are not able to assign credible probabilities to the outcomes and therefore are more risk averse than assumed in the papers.

There are conflicting conclusions too about the trade impact of SPS measures on developing countries. There have been cases where access to export markets was denied due to sanitary or phytosanitary issues, resulting in substantial costs in terms of lost sales and market share. But rising standards also serve to accentuate underlying supply chain strengths so some countries are able to use high quality and safety standards to reposition themselves in global markets.

(e) Environmental standards

The relationship between environmental standards and trade flows has usually focused on the pollution haven and race to the bottom stories.

The pollution haven hypothesis starts with a world where countries differ in the stringency of their environmental regulations and industries differ in their pollution intensities. The hypothesis is that these differences in regulations will induce pollution-intensive firms to locate production to less regulated countries. It also predicts that as a result of this flow of investment, exports of pollution-intensive products will increasingly come from these locations while more regulated countries will progressively become net importers of these products.

The regulatory chill or race to the bottom story focuses more on the effect of increasing economic integration on regulators' incentives to stick to, strengthen or relax environmental standards. With increased competition for footloose investments and trade, countries may be reluctant to adopt new regulations or to strengthen existing ones, for fear of scaring off investors. Worse, they may even move to weaken existing regulations to attract investments. If other countries respond in a similar fashion, a race to the bottom in environmental standards may occur.

In their survey article ten years ago on the effect of environmental regulations on US manufacturing, Jaffe et al. (1995) concluded that while these regulations imposed significant costs on polluting industries, they have not affected patterns of international trade. The paper summed up what numerous studies had up to then shown – that there was little empirical evidence that differences in environmental regulations affected

not survive various extensions and robustness checks (for example, using alternative measures of environmental regulations). The authors therefore cautioned against drawing any strong conclusions from their study.

5. SUMMARY AND CONCLUSIONS

The effects of standards on the direction and size of trade flows tend to be complex and need to be analysed on a case by case basis. Standards typically have an effect on both consumers and producers. They may affect the willingness of consumers to pay for product varieties meeting the standard, because they change consumers' perception or appreciation of these varieties. Standards may affect producers' costs in a number of ways. First, they may imply a fixed cost when producers switch from producing one product variety to producing another, higher quality variety. Second, they may involve a change in variable costs, for instance if it is more expensive to produce a good meeting the standard than one not meeting the standard. Third, the introduction of a standard affects production costs if it causes producers to run additional product lines. And fourth, standards will typically also generate costs related to conformity assessment procedures. Overall, the introduction of a standard is likely to affect the prices that consumers are willing to pay for certain product varieties and the prices at which producers are willing to supply those varieties. Standards will affect trade flows if they have a different effect on the demand for and supply of varieties produced abroad and varieties produced domestically. This may, for instance, be the case if foreign and domestic producers supply different varieties of the relevant good, or if standards affect their production costs differently.

The trade effects of standards will affect countries' welfare, including the welfare of the country introducing the standard. If a standard is purely designed to raise the costs of foreign producers in order to protect the domestic industry, it is very likely to reduce both trade flows and domestic welfare. But standards that reduce trade flows are not necessarily welfare reducing, in particular if they are designed in order to reduce

However, it should be emphasized that in this case, market forces are likely to generate the desirable outcome, without the need for government intervention.

The case in favour of harmonization of standards is weaker when it comes to standards addressing information asymmetries (e.g. safety standards) and local environmental externalities. To the extent that countries differ, it may be preferable to have separate policy instruments for each country rather than one single policy instrument in these cases.

When standards addressing global production or consumption externalities are set at the national level they are likely to be inefficient. This is, for instance, the case for global environmental externalities. International collaboration is necessary in order to correct for such externalities. The optimal solution, however, does not necessarily involve harmonized standards, as production technologies and consumer behaviour differ across countries.

3.2.2.2. Network externalities and compatibility standards

Producers will set standards in a profit maximizing way. As a consequence they automatically take consumer interests into account, but only to the extent that consumer preferences are reflected in prices. This is unlikely to be the case in the presence of production externalities and/or information asymmetries. Consumer and producer interests will diverge in these cases. Government intervention is necessary to ensure that consumer interests are taken into account. Consumer and producer interests are likely to coincide when it comes to network externalities and it therefore makes sense for compatibility standards to be set by the private sector.

Producer and consumer interests may also differ in another important domain – that of international trade. While producers may have an incentive to set standards so as to provide them with an artificial competitive advantage, this is not in the interest of consumers. It should be the aim of governments to take both producer and consumer interests into account and to ensure that standards are not used as protectionist devices.

Two other important issues arise from the discussion above that are of particular importance for the multilateral trading system:

3.2.2.3. Externalities and trade policy

In the presence of market failures such as those discussed here, it is possible that policies which are optimal from a national point of view cause losses to trading partners. It is also possible that these losses outweigh the benefits going to the country introducing the policy. In other words, in integrated markets, regulatory policies that are optimal from a national point of view may not be optimal from a global point of view. The question therefore arises as to whether such policies should be considered consistent with the multilateral trading system. Given the complexity of this issue, questions also arise concerning the precise role of and the interactions between national standard setting bodies, international standard setting bodies and the World Trade Organization. These questions will be alluded to in Section IIC and Section IID.

3.2.2.4. Externalities and process standards

Production processes in one country can exert negative externalities on consumers in other countries. This can be the case because the production process affects global aspects of the environment (e.g. air pollution, maritime pollution). Whatever the justification or appropriateness of process standards, the issue of control and enforcement will be a thorny one in the international domain. If a country wishes to condition imports on compliance with a certain process standard, the question arises as to who controls and enforces this standard, given that production takes place abroad. Section IIC will discuss how international standard-setting bodies and other non-governmental organizations have dealt with this issue. Section IID illustrates that this question has also played a role in WTO jurisprudence.

Ideally, the empirical survey of standards and trade would have examined whether certain types of standards are trade creating, while other types are not. But with the exception of environmental standards and SPS-related measures, a large part of the empirical literature on standards and trade has tended not to distinguish the nature of the standards being studied. The number of empirical studies has also been limited. These limitations have to be taken into account in the recapitulation of some of the results of the empirical survey.

Standard-setting activity seems to be pronounced in industries characterized by network externalities. Insofar as technical regulations are concerned, the bulk of this activity seems to deal with various types of problems associated with information asymmetries. In some major markets these regulations cover a large number of tariff lines and a significant share of imports, so there is potential for these regulations to have an adverse effect on trade.

The cost or price-raising effects of standards do not emerge as an important NTB concern in OECD countries. OECD firms did not identify major problems in complying with regulations in other OECD markets. However, the same relatively benign results seem not to apply with respect to smaller firms. With respect to the cost of compliance by firms in developing countries, the evidence is mixed with the survey work suggesting that firms in developing countries face very high costs, while the case studies tell a more complex story where the costs of and benefits from compliance vary enormously among firms and countries and depend on a range of factors.

The available empirical literature on the effect of standards on international trade flows is still rather limited, reflecting the difficulty of the subject and the nature of the data. But some interesting results have arisen. Intra-industry trade can be spurred by greater standard-setting activity in industrial sectors, suggesting that standards play an important role in increasing compatibility. Also, the adoption of standards, even purely national ones, can increase trade. One possible explanation for this result is that standards convey information about consumer preferences to exporters.

On the relative merits of harmonization or mutual recognition of standards to facilitate trade, it is not possible to draw strong conclusions given the very limited empi