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Standards in the International Telecommunications Regime

Raymund Werle

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Abstract

Technical standards in telecommunications – the central focus of this paper – were traditionally developed by official government accredited or intergovernmental organizations. In the last two decades, however, private forums and consortia of standardization have evolved which initiated a shift from a predominantly technical to a business approach to standards-setting. The business perspective also guides the evaluation of standards in trade policy at the European and at the international level. In the EU and more so in the WTO regional and national diversity of standards is generally regarded as a barrier to trade. Thus harmonization of diverging standards – and not standards competition – and/or the adoption of new international standards is stipulated. Only standards adopted by official organizations are regarded as legitimate. Private organizations and the standards developed by them tend to be ignored.

Zusammenfassung

Traditionell wurden technische Standards in der Telekommunikation – dem zentralen Gegenstand dieses Papiers – von anerkannten nationalen oder intergouvernementalen Organisationen entwickelt. In den letzten beiden Jahrzehnten sind jedoch private Foren und Konsortien entstanden, die einen Wandel initiiert haben von einem technisch zu einem kommerziell geprägten Verständnis von Standardisierung. Dieses leitet auch die Beurteilung von Standards durch die Handelspolitik auf europäischer und internationaler Ebene. In der EU und mehr noch in der WTO werden regional und national unterschiedliche Standards als Handelshemmnisse betrachtet. Deshalb fordert man die Harmonisierung der divergierenden Standards – und nicht deren Konkurrenz – und/oder die Entwicklung neuer internationaler Standards. Nur Standards, die von offiziellen Organisationen verabschiedet wurden, werden anerkannt. Private Organisationen und die von ihnen erarbeiteten Standards werden hingegen tendenziell ignoriert.

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I. Introduction

Standardization is usually regarded as a highly technical matter which is charged to specialized experts. It is extremely difficult to access by business managers who at the same time increasingly stress the strategic significance of standards. Likewise, political actors have become aware that standards affect a country's economic welfare and that they can be used as instruments of trade policy. In network industries such as telecommunications, the crucial economic role of standards relates to positive network externalities. Standards are needed to facilitate coordinated production, installation and operation of complex networks and by this provide a basis on which self-stimulating growth processes unfold. The spectrum of standards, however, also includes other types of technical rules. In Section I, these types are briefly discussed. Despite the economic significance of standards, the traditional international standards regime in telecommunications and partly also in information technology was shaped by and reinforced an understanding of standard-setting as technical problem solving. Noteworthy changes to the institutional landscape did not occur before the early 1980s. The liberalization of telecommunications and a growing overlap of communication and information technology accelerated the process of institutional change of standardization in the 1990s. These changes are examined in Section II. With the evolution of an international free trade regime in telecommunications, the economic significance of standards has been broadly acknowledged. Yet the evaluation of standards has remained somewhat diffuse due to the ambivalent nature of standards which can facilitate as well as impede international trade. Focusing on the intergovernmental deals on services, in particular in telecommunications services, within the context of GATT and WTO, Section III examines the principles according to which standards are assessed. The institutional implications of the trade regime for the international standards regime are also discussed. This contribution, which combines an institutional with a policy perspective, will be concluded with a few remarks referring to incompatibilities of the WTO view of standards and standards organizations, on the one hand, with the landscape of these organizations and the role standards play in international trade, on the other.

II. Types and Functions of Standards

The focus of this contribution is the role of technical standards and the standards regime in international telecommunications. Standards are employed across a wide range of different situations, in which they play different roles.¹ Thus, it is necessary to clarify briefly what is meant with the term standard here. Standards are technical rules concerning either the design of key attributes or components of a product or crucial elements of processes of production, operation or technology use. As such, they can be product or process standards and they can be design-based or performance-based. In telecommunications, standards include transmission frequencies, encryption software, modulation procedures, and addressing and signaling conventions. Standards are technical definitions which have reached a certain degree of *de-facto* or *de-jure* codification, linking technical knowledge with a normative expectation to comply. In this sense, they guide the behavior of actors or provide a basis for judging their behavior.

We can distinguish different modes of standardization. Many standards emerge in markets. They are pushed by dominant firms or evolve in uncontrolled processes of spontaneous adoption by producers and users of technology. Other standards are authoritatively laid down by governments. A third mode of standard setting is the committee process of developing and negotiating technical rules in standardization organizations. These organizations have mushroomed in the area of information technology and telecommunications over the last two decades. This contribution deals with committee standards and governmental standards, but it suggests a distinction of a more analytical nature of two types of standards.

Analytically we can distinguish regulative from coordinative standards (see Table 1). The distinction includes the aim and the economic effect of a standard as well as the mode of its generation, its normative character and the area of a standard's validity. On the one hand, regulative standards — often in the form of maximum or minimum requirements and limits — aim at preventing negative externalities through internalization, i.e. imposing the externalities on those who have induced them. Coordinative standards, such as protocol, code, and interface specifications, on the other hand, frequently aim at interoperability and compatibility of technology with the effect that transaction costs are reduced and positive externalities are generated. Coordinative standards cover economic sectors (industries) or markets for the

1 N Brunsson and B Jacobsson, *A World of Standards* (Oxford: Oxford University Press, 2000).

respective technology, and they ignore political frontiers, whereas regulative standards depend on governments or other political authorities to become effective within their area of jurisdiction. Thus, they have the normative character of a legal rule or a government ordinance, while coordinative standards are similar to conventions and tend to be self-enforcing, i.e. they enjoy a considerable likelihood of compliance. Regulative standards for, say, environmental protection, are mandated by hierarchical political governance, whereas coordinative standards, say, a specific modulation procedure, may emerge in markets or result from the activities of actors who acknowledge technological interdependence and are therefore interested in coordinating with others.²

The strategic relations among the actors involved in setting standards of the coordinative or regulative type can be characterized in game theoretic terms. The first situation is akin to a coordination game, often a battle of the sexes, in which actors strive for a common standard but may disagree as to which particular standard to choose. The second situation shows features of a prisoners' dilemma in which incentives to cooperate are weak, with the result that no common standard or a standard well below the optimum is achieved.³ While, as a rule, the problem of setting and implementing regulative standards can only be overcome in a "collaborative regime" based on enforceable agreements, the task of achieving and gaining acceptance of coordinative standards can also be mastered by institutionalized self-coordination on the part of the actors in a "coordinative regime".⁴

2 S K Schmidt and R Werle, *Coordinating Technology: Studies in the International Standardization of Telecommunications* (Cambridge, MA: MIT Press, 1998), 119-120.

3 D Snidal, 'Coordination versus Prisoners' Dilemma: Implications for International Cooperation and Regimes,' *American Political Science Review* 73 (1985); Schmidt and Werle, 98-108; K W Abbott and D Snidal, 'International "Standards" and International Governance,' *Journal of European Public Policy* 8/3 (2001).

4 A A Stein, *Why Nations Cooperate: Circumstance and Choice in International Relations* (Ithaca, NY: Cornell University Press, 1990)

Table 1: Two Types of Standards

	Coordinative	Regulative
Aim	Interoperability, compatibility	Prevention of negative externalities of technology
Mode of generation	Negotiation of “interested“ actors, self-governance, emergence in markets	Hierarchical political governance
Normative character	Convention, voluntary	Legal rule, mandatory
Area of validity	Industries, markets (techno-economic units)	States (political units)
Economic effects	Reduction of transaction costs, positive externalities	Internalization of externalities

The distinction of coordination and regulation with respect to standards is similar to but not identical with the official terminology of the International Standardization Organization (ISO) and the World Trade Organization (WTO). The ISO and the WTO exclusively focus on what is called in Table 1 the normative character of a standard. They use the term “standard” if compliance is voluntary and they talk of “technical regulation” if compliance is mandatory. Thus, a coordinative standard can also become mandatory and assume the character of a technical regulation if vendors and users are legally or otherwise obliged to conform to that standard. It should be noted that ISO accepts as standards only those “documents” which are adopted by “consensus” and approved by a “recognized body”.⁵ This definition excludes *de-facto* standards and — more important in this context — all documents which were adopted by unofficial bodies.

Diverging technical regulations (regulative standards) at the national or the regional level are traditionally regarded as a significant technical barrier to trade (TBT). In many cases, new regulative standards are drafted in a way that suits national firms more than their foreign competitors since these may also be less aware of the existence of the regulation than the incumbent national firms. As the regulations are mandatory, foreign firms have to adapt to them and incur the additional expenses of adaptation, something which is a competitive disadvantage.

Although voluntary (coordinative) standards appear less problematic than technical regulations, they can also have detrimental effects on the international trade, as can be observed in network industries. Telecommunications is the prototype of a network

⁵ See http://www.wssn.net/WSSN/gen_inf.htm#Whatisstd.

industry in which compatibility standards play a crucial role and strong network externalities prevail. Compatibility can be vital for the emergence of a market because it helps to achieve a critical mass of producers of technical components and users of the technology and by this expand the size of a market.⁶ This is why governments may be tempted to (and in the past did) tolerate a telecommunications monopoly or impose a binding coordinative standard on the industry. Such a national standard creates a barrier to international trade and hinders markets from expanding across national borders.

However, the strategic significance of coordinative standards, in particular compatibility standards, does not ensue from the fact that some of them are promulgated. Rather, they achieve a quasi-mandatory status as a consequence of coordination externalities and more specifically network externalities.⁷ Often a single standard attains prevalence in a market and eventually locks in. That means that producers and users of a specific product or service will feel compelled to conform to the prevailing standard even if they would prefer a different one. In telecommunications, standards traditionally locked in within national markets. As a consequence, it could be prohibitively expensive for a firm which operated networks or provided services in one country to switch to the standards in another country in order to gain access to the market although market entry was not formally prohibited. Proprietary standards can have a similar anti-competitive effect. If a firm which owns a standard does not make it available at reasonable costs and on equal conditions to other firms, it precludes some or all potential competitors from entering the market. Generally open, non-proprietary standards encourage market entry and enhance competition by clearly defining what is required to serve a market. The resulting transparency combined with an unrestricted use of standards allows for competitive supply by firms, but also serves as a guide post for customers, who can compare products or services on the basis of the standards.

This sketch of the types and functions of standards has shown that technical rules — coordinative as well as regulative — affect firms and governments and are not only a matter of purely technical expertise. Standards provide technical specifications concerning the performance or the properties of processes or products which can be combined to complex technical systems such as telecommunications networks. These

6 *E M Rogers*, 'Diffusion of Innovations: Modifications of a Model for Telecommunications,' *Die Diffusion von Innovationen in der Telekommunikation*, eds M-W Stuetzer and A Mahler (Berlin: Springer, 1995).

7 *C Shapiro* and *H R Varian*, *Information Rules: A Strategic Guide to the Network Economy* (Boston, MA: Harvard Business School Press, 1999).

admittedly highly technical definitions have strategic implications for the competitive position of firms and the economic welfare of nations. With the deregulation and liberalization of the markets for telecommunications equipment and services and the removal of tariff barriers to international trade, the significance of, in particular coordinative, standards has increased rather than decreased. They are needed to facilitate interconnecting networks, linking terminals of different brands to a network and providing telecom services in heterogeneous technical environments. This also explains why governments and firms have an interest in standards and why above all multinational enterprises have increasingly become involved in standardization with the effect that the international landscape of standardization has undergone a far-reaching process of change.

III. The Institutional Landscape of Standardization

In the wake of digitization, information and communication technology have started to converge or at least overlap. As a result, standards organizations on both sides have problems drawing undisputed distinctions between their jurisdictions.⁸ Therefore, a comprehensive view on both areas is in order. The analysis is restricted to organized standardization, i.e. to organizational entities in which committees negotiate and adopt standards, but it does include official standards organizations, recognized and often supported by governments, as well as private groups (forums, consortiums) whose work is based on informal agreements or multilateral contracts. The organizations can have national, regional or global significance but all must be seen as parts of a global standards regime for communication and information technologies.⁹ Most standards adopted in this regime are coordinative standards. This does not rule out that some of them are promulgated as technical regulations which have the force of law. Yet the standards organizations usually do not have the authority to issue mandatory standards. The authority remains with national parliaments and governments, the European Commission and the European Council and with intergovernmental organizations if they are entitled by multilateral contracts to impose standards.

8 R Werle, 'Institutional Aspects of Standardization: Jurisdictional Conflicts and the Choice of Standardization Organizations,' *Journal of European Public Policy* 8/3 (2001).

9 L Salter, 'The Standards Regime for Communication and Information Technologies,' *Private Authority and International Affairs*, eds A C Cutler et al. (Albany, NY: State University of New York Press, 1999).

Political authorities may also give standards organizations a mandate to develop binding standards.

A look at the landscape of standards organizations shows similarities — the organizations share, for instance, the goal to achieve consensus on a technical standard — but we also find differences. An important distinction from the angle of the international trade regime relates to the formal status of the organizations which can be either official or private in nature.

A. Official organizations

The two official organizations with the broadest range of responsibilities in the area of standardizing communication and information technology at the international level are the ITU-T, the standardization branch of the International Telecommunication Union (ITU), and the Joint Technical Committee 1 (JTC1) of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Although the ITU and the ISO/IEC differ in legal status, they can be regarded as classical international organizations with national membership and one-nation-one-vote decision rules. The ITU-T issues telecommunications standards, whereas the JTC1 covers information technology. Their standards are international.

In the era of national telecommunications monopolies, the ITU — the oldest international organization stretching back to 1865 — was the undisputed core of the international telecommunications regime. The ITU adopted technical standards (recommendations) to facilitate international telecommunications services and correspondingly issued legally binding administrative and commercial rules to the benefit of the mostly public telephone corporations, which in effect formed an international cartel under the roof of the ITU.¹⁰ During the 1990s, the ITU's institutional procedures were reformed and opened to participation of private firms: among them many equipment manufacturers, service providers, and private network operators. At the same time, the ITU lost control over many commercial and trade issues in international telecommunications, but it still plays an important, although somewhat weakened, role in technical standardization.¹¹

10 *P F Cowhey*, 'The International Telecommunications Regime: The Political Roots of Regimes for High Technology,' *International Organization* 44 (1990).

11 See *W J Drake* and *E M Noam*, 'The WTO Deal on Basic Telecommunications: Big Bang or Little Whimper?' *Telecommunications Policy* 21 (1997).

Formal members of the ISO/IEC are those national standards organizations which most appropriately represent all interested parties in their country. As in the ITU-T, decisions are taken according to the one-nation-one-vote rule. The ISO and respectively the JTC1 were never biased towards the telecommunications monopolies. Occasionally this became a source of conflict where jurisdictions overlapped. In message-handling/electronic mail standardization, for instance, the ISO/JTC1 and the ITU-T collaborated in the 1980s. Yet highly technical controversies concerning addressing and routing conventions emerged, controversies which were obviously motivated by diverging business interests of public telecommunications carriers on the side of the ITU and private networks operators in the ranks of the ISO.¹²

The official standards organizations at the international level are complemented by entities of regional scope. Their emergence reflects the growing significance of regional markets.¹³ Concerning official organizations, the European landscape is more clearly structured than other regions. It mirrors the international level. A relatively new official standards organization in telecommunications is the European Telecommunications Standards Institute (ETSI), created in 1988. Comparable organizations in other regions are the US Exchange Carriers Standards Association (ECSA T1) and the Japanese Telecommunications Technology Committee (TTC).¹⁴ Both entities are virtually national, but they have regional significance. Foreign members are admitted and the membership structure is company-based. Each company has one vote. ETSI has a mixed system with some decisions taken by company-based and others taken by nation-based weighted voting. The European counterparts of the ISO and the IEC are the European Committee for Standardization (CEN) and Electrotechnical Standardization (CENELEC) with national standards organizations as formal members. In North America and South East Asia, comparable regional organizations are missing, but as in telecommunications national standards entities such as the ANSI X3 in the US have achieved regional significance, chiefly as a result of the large homogenous markets of these countries.

Due to the growing significance of regional markets, some regional diversity of standards appears to be inevitable. It expresses the competitive concerns of regional

12 *Schmidt and Werle*, 229-62.

13 *P A David and M Shurmer*, 'Formal Standards-Setting for Global Telecommunications and Information Services: Towards an Institutional Regime Transformation?' *Telecommunications Policy* 20 (1996); *M Egan*, 'International Standardization, Corporate Strategy and Regional Markets,' *Organized Business and the New Global Order*, eds *J Greenwood and H Jacek* (New York: St. Martin's Press, 2000).

14 The name of the ECSA T1 has since been changed to The Alliance for Telecommunications Industry Solutions (ATIS).

companies, and it is reinforced by the regional standards organizations with the result that it may create barriers to interregional trade.¹⁵ Yet the regional organizations do not restrict themselves to adopting regional standards. They also aim at shaping the course of international standardization.¹⁶ In particular, the creation of ETSI in Europe indicates that standard setting was increasingly understood as a matter of business strategy and industrial policy rather than a purely technical business. The European Commission announced its plan to set up ETSI in the Green Paper on the Development of the Common Market for Telecommunications Services and Equipment in Summer 1987. European standards adopted by ETSI should replace or harmonize national standards, be instrumental in creating a common European market, and help liberalize the telecommunications industry. The Commission's initiative was welcomed by European business associations and interest groups. In particular, the manufacturers of telecommunications equipment shared the Commission's view that diverging national standards, even when compliance is voluntary, are barriers to trade. They fragment European markets and reduce economies of scale. As a consequence European companies would be less competitive in world markets.¹⁷ ETSI has developed into a crucial building block of the liberal European telecommunications regime, which — as will be discussed in the next section — complements the international trade regime in this industry.

The spectrum of official organizations is completed by national standards organizations which we find in all industrialized countries. Organizations such as the British Standards Institution (BSI), the Deutsches Institut für Normung, the Association Française de Normalisation (AFNOR) or the American National Standards Institute (ANSI) are politically independent and formally non-governmental organizations, but they are linked to governments in one way or another.¹⁸ Their standards often become mandatory, either being directly included or indirectly

15 See *S Woolcock*, 'Technical Barriers to Trade: A Case Study in the Systemic Impact of Regional Integration and Trade Agreements on the Multilateral Trading System,' paper presented at the conference on 'The Political Economy of Standards Setting', European University Institute, Florence, June 1998.

16 *Egan; M A Olshan*, 'Standards-Making Organizations and the Rationalization of American Life,' *Sociological Quarterly* 34 (1993).

17 *R Werle and G Fuchs*, 'Liberalization and Integration: Pathways to a Trans-European Network in Telecommunications,' *Utilities Policy* 3 (1993).

18 ANSI is no standard developing organization but accredits private standards organizations on the condition that they adhere to open participation, due process and consensus procedures. ANSI also coordinates participation of accredited US standards bodies in official international standards organizations. Standard-setting at the US national level is much more multifaceted than in other countries. See National Research Council (US), *Standards, Conformity Assessment, and Trade* (Washington DC: National Academic Press, 1995).

referred to in national legal documents. The national organizations represent their countries as members in the ISO or the IEC. In general, nationally insulated standardization work has significantly decreased in Europe, as it has in other parts of the world. National organizations, however, play an important role in transposing regional into national standards.¹⁹

Although many private organizations such as business and trade associations, professional organizations, and industry consortiums and forums are involved in one way or another in standard-setting, the official standards organizations have most visibly shaped the landscape's institutional structure. Its prevailing features which have been explored in several studies using different research methods are included in Table 2.²⁰ Many of these features are shared by the private organizations.

Standardization work is done by committees on a voluntary basis. All actors with a substantial interest in a standard can participate. The standards are voluntary and not mandatory. Their implementation cannot be imposed and their diffusion in the market is not guaranteed. Thus, in constellations with a level playing field (symmetric power relations), the standards that are most likely to diffuse are the ones that have been adopted on the basis of consensus by committees open to all interested players. Formally, the decision rules of the official standards organizations allow for some kind of qualified majority voting. *De facto*, however, their work is consensus-based because at the working level, i.e. in the technical committees and study groups where the developmental activities take place and each participating organization has one vote, no decision is taken against the explicit and serious opposition of any single participant.

19 *H de Vries, Standards for the Nation: Analysis of National Standardization Organizations* (Boston: Kluwer Academic Publishers, 1999).

20 See among others *T Egyedi, Shaping Standardization: A Study of Standards Processes and Standards Policies in the Field of Telematic Services* (Delft: Delft University Press, 1996), 111-20; Office of Technology Assessment, *Global Standards: Building Blocks for the Future* (Washington DC: US Government Printing Office, 1992); *P A David and S Greenstein, 'The Economics of Compatibility Standards: An Introduction to Recent Research,' Economics of Innovation and New Technology* 1 (1990).

Table 2: Prevailing Institutional Features of Standards Organizations

- Participation is within certain membership rules **open** to those who are "substantially interested."
- The work is committee-based, cooperative and **consensus-oriented**. It follows formalized rules and procedures.
- Organizations and working procedures are **impartial**, unsponsored and **politically independent** ("due process"). The organizations are non-profit organizations.
- The work is based on technological knowledge and follows the principle of **parsimony of standards**. It is not remunerated (voluntary) and conceived of as superior to market selection of standards.
- Standards are **non-mandatory** and public goods. However, they are not necessarily provided to the public completely free of charge (but on equal terms).

Inclusiveness of committees and consensus as decision rule — two rather undisputed institutional features — facilitate the diffusion of a voluntary standard. However, negotiation processes in these constellations can be time-consuming, and they easily lead to deadlock or to unattractive compromise solutions which in the end nobody wants to implement.²¹ More exclusive standards organizations with fewer players promise to be more efficient and also more effective given that their membership is restricted to technology leaders and firms with substantial market power. The potential benefits of exclusiveness provide an incentive to create new private standards organizations. Yet other goals, as well, have guided the establishment of new organizations, some of which will be examined now.

²¹ See *F W Scharpf, Games Real Actors Play: Actor-Centered Institutionalism in Policy Research* (Boulder, CO: Westview Press, 1997).

B. Private organizations

The majority of standards organizations are private consortiums and forums. They enjoy no official status. An exception is the European Computer Manufacturers Association (ECMA), which has achieved a quasi-official status.²² ECMA is one of the oldest private organizations which were set up as a strategic unit to counterbalance dominant *de-facto* standards. Established in 1961, ECMA restricted its membership to computer manufacturers engaged in Europe in order to adopt standards for the European market. Early on, however, the European thrust in ECMA, which aimed at leveling the playing field in information technology, was moderated because all vendors who owned manufacturing facilities in Europe could join ECMA. Thus, it was no problem for American multinationals to be accepted as regular members. In ECMA's technical committees, all members regardless of their national basis have full voting rights, which means that the global players could block hostile standards proposals. ECMA adopts standards which are meant to complement official international standards or to be put forward as proposals into the ongoing standardization work of the official international organizations. In that role, ECMA established itself as a recognized standards organization with stable links to the ITU-T, the JTC1, ETSI and CENELEC.

The initial interest in neutralizing existing differentials in market power between European and North American vendors underlying the creation of ECMA was also the driving force of the so-called Open Systems Movement which took off in the early 1980 after the ITU and the ISO had adopted the Open Systems Interconnection (OSI) reference frame which provided a layered model of data communication. The OSI was meant to facilitate the development of open, i.e. non-proprietary, standards for computer networks at a time when vendor-specific proprietary networks prevailed.²³ The European Standards Promotion and Application Group (SPAG), the X/Open Group or the European Workshop for Open Systems (EWOS) all started out as alliances of European computer manufacturers and political actors to counterattack non-European vendors by supporting or creating open standards. Other private forums

22 ECMA is now called International Europe-Based Association for Standardizing Information and Communication Systems.

23 *P Genschel, Standards in der Informationstechnik: Institutioneller Wandel in der internationalen Standardisierung* (Frankfurt: Campus, 1995); *P Grindley, Standards, Business Strategy and Policy: A Casebook* (London: Centre for Business Strategy, London Business School, 1992), 85-106; *H L Gabel, 'Open Standards in the European Computer Industry: The Case of X/Open,' Product Standardization and Competitive Strategy* ed *H L Gabel* (Amsterdam: North-Holland, 1987).

and consortiums — such as the Corporation for Open Systems (COS), the X-Window Consortium and the Open Software Foundation (OSF), all set up in the late 1980s — were also committed to open standards but had a broader membership. In most standards organizations of the Open Systems Movement, technical issues were blended with collective business strategies and industrial policy goals. In contrast to the official standards organizations which still emphasized the technical nature of standard-setting, the private entities of the 1980s did not play down the significance of standards for the commercial benefit of firms anymore.

The tendency to set up new standards organizations gained momentum in the 1990s, not only in the area of information technology but also in telecommunications.²⁴ Many new consortiums and forums were created, while others extended their domains. In telecommunications, the Asynchronous Transfer Mode (ATM) Forum and the Frame Relay Forum are two examples. Others are related to the Integrated Services Digital Network (ISDN). The biggest consortium in the area of information technology with over 800 members is the Object Management Group (OMG), which develops software specifications. Estimations of the number of private standards organizations vary. A recent survey of the Information Society Standardization System (ISSS) identified over 140 consortiums and forums which claim to be open organizations.²⁵ Most of them are vendor-driven, “openly responsive to commercial market concerns.”²⁶ Not all of these private groups are transformed into stable institutionalized standardization committees; many disappear once a particular task has been finished.

Many private standards organizations cover areas in which the official ones are also active. This is different with internet standardization, the development of which was completely detached from any official standardization. Internet standards are adopted by the Internet Engineering Task Force (IETF), which is open to anyone interested in participation. All the work is done by volunteers on the basis of consensus, similar to most other standards organizations. For many years, internet standards were almost completely ignored by the JTC1 and the ITU-T. Only recently has the internet been officially recognized, and links of coordination have been established between the IETF and official standards organizations. Internet standards are also developed by the World Wide Web Consortium (W3C), which was established outside the IETF and

24 OECD, *Information Technology Standards: The Economic Dimension* (Paris, 1991), 84-86.

25 CEN/ISSS, *CEN/ISSS Survey of Standards-Related Fora and Consortia*, edition 3.1 (1999), available at <http://www.cenorm.be/iss/survey.htm>.

26 National Research Council, 37.

has more than 500 member organizations. Due to the success of the internet, the official understanding of open standards is gradually changing. Initially, only specifications adopted by official standards organizations were regarded as open standards. Today, a tendency can be observed to accept virtually all non-proprietary standards, regardless of who issues them as open.

C. Hybrid standards regime

Summarizing the changes of the global standards regime in information and communication technology, the following shifts must be noted:

- from regulation to coordination
- from national to regional and international standardization
- from intergovernmental and other official organizations to private forums and consortiums of standardization
- from a predominantly technical to a business approach

The growing significance of private standard-setting which indicates a shift from official to informal standardization can be regarded as the most important aspect of transformation. It was reiterated and assessed in various studies. The CEN/ISSS survey came to the conclusion that there has been a relative decline in the role of official standardization, a decline which has been matched by the development of consortium standardization.²⁷ *Cargill* has observed “a struggle for hegemony” between private and official organizations with some decline in the importance of the official entities. However, in his view, the “majority” of firms accept both as “equal partners in standardization”.²⁸ Furthermore, *Rutkowski*, with regard to internet standardization, stresses the significant role of private standards organizations whose relations to the official ones are both cooperative and competitive.²⁹ Other authors

27 CEN/ISSS. 7.

28 *C F Cargill*, ‘Consortia and the Evolution of Information Technology Standardization,’ *Standardisation and Innovation in Information Technology SIIT '99: Proceedings*, eds *K Jakobs* and *R Williams* (Piscataway, NJ: IEEE, 1999), 37 and 41.

29 *A M Rutkowski*, ‘Today’s Cooperative Competitive Standards Environment and the Internet Standards-Making Model,’ *Standards Policy for Information Infrastructure*, eds *B Kahin* and *J Abbate* (Cambridge, MA: MIT Press, 1995).

emphasize the stability and efficiency, the symbiotic nature or even the synergistic quality of the relationship between formal and informal standards organizations.³⁰

Generally, the landscape of standardization appears as a picture of peaceful coexistence.³¹ We find surprisingly few instances of open conflicts between the official standards organizations and the private ones. Formal committees have been set up to coordinate the standardization activities of different organizations and help avoid conflicts. An example is provided by the Europe-based Information and Communications Technologies Standards Board (ICTSB), which coordinates the work of ETSI, CEN, CENELEC, and many private organizations such as the ATM Forum, ECMA or The Open Group. In addition, many bilateral or multilateral agreements between private consortiums and official standards organizations indicate a preference for cooperation on both sides. The agreements range from formal liaisons and memorandums of cooperation to occasional issue-specific links initiated by individual members of the organizations.³²

If we take all arrangements together we arrive at a complex web of official and unofficial organizations. The new regime is complex and hybrid and relies on self-coordination. The status of the standards produced in this regime is ambivalent. Firms and users may not make a difference as to by which organization a standard was adopted if they regard a standard as beneficial. In international agreements and contracts, however, the tendency prevails to refer to “official” standards and therefore the hybrid character of the institutional landscape of standardization is regarded as a source of uncertainty or confusion.

IV. Standards and the International Trade Regime

Over the last two decades, the international telecommunications regime has undergone dramatic changes. A free trade regime has evolved in an area that was dominated by national monopolies and rigidly regulated international relations. The old order need not be described. It suffices to recall that competition is a term that was

30 *P Genschel*, ‘How Fragmentation Can Improve Co-ordination: Setting Standards in International Telecommunications,’ *Organization Studies* 18 (1997); *David and Shurmer*; *S R Walli*, ‘POSIX: A Case Study in a Successful Standard: Or, Why We Don’t Need Radical Change in the SDO Process,’ *Standardisation and Innovation in Information Technology SIIT ’99: Proceedings*, eds *K Jakobs* and *R Williams* (Piscataway, NJ: IEEE, 1999).

31 *R Werle*, ‘Institutional Aspects of Standardization.’

32 See CEN/ISSS.

missing in accounts of the operation of networks and the provision of services in this industry at the national and the international level. Central elements of the new international order emerged in the context of GATT and the WTO. They are part of a trade regime that aims at removing barriers to trade in goods as well as in services. The transition from a system of national monopolies which formed a cartel at the international level to competitive relations in international and national markets between private network operators and service providers is not yet complete. Concerning the institutionalization of the new order, reform activities at all levels of the international system can be observed. Some of these activities are linked to each other. Changes at the national level induce regional and international changes and *vice versa*. Yet these changes shall not be examined in this section either. The focus is rather on the role attributed in the new order to technical standards and to the organizations which develop these standards.

The analysis starts with a brief look at the process of telecommunications liberalization in the European Union since the Commission explicitly made use of standards as a means to introduce competition and to integrate the highly fragmented European telecommunications market and at the same time enhance international competitiveness of European firms in this industry. We will then turn to the GATT/WTO trade regime, which is designed to prevent the use of standards as an instrument of national or regional industrial policy.

A. The European Regime

Before the WTO regime in telecommunications is examined, the role of standards in the trade regime of the EU, where market integration has progressed significantly, shall briefly be examined. The EU has achieved a deeper form of market integration and liberalization than the WTO system. Obviously the European way requires stronger member states' commitment, centralization of political authority and enforcement mechanisms than can be attained globally.³³ Two strategies are indicative of the European approach concerning standards in general and telecommunications standards in particular:

33 *M Egan and A Zito, 'Regulation in Europe and the Globalization of the Economy: European Standardization at a Cross-roads,' Integrating Scientific Expertise into Regulatory Decision-Making, eds C Joerges et al., (Baden-Baden: Nomos Verlagsgesellschaft, 1997).*

1. the New Approach to technical harmonization and standards
2. the rules regarding Open Network Provision (ONP) in telecommunications

After previous efforts had failed to achieve detailed regulatory uniformity for individual product categories, which was perceived to be a precondition of a common European market, the EU regulators (Commission and Council) switched to the New Approach.³⁴ It was viewed appropriate to cope with national diversity concerning products and production processes, on the one hand, and to provide minimum protection of health, safety, and other public goods, on the other hand. This approach restricted EU legislation to determining and harmonizing these “essential requirements.” The elaboration of technical specifications needed to determine the essential requirements is delegated and mandated to the official European standards organizations CEN, CENELEC, and ETSI. These organizations adopt harmonized standards which include an essential requirement-related core affiliated with specifications needed by the industry to produce and market goods and services.³⁵ Products and services provided in accordance with the harmonized standards are treated as conforming with the essential requirements. The harmonized standards are voluntary. However, producers who choose to use specifications other than the harmonized standards are required to prove conformity with the essential requirements to obtain a certification mark which is necessary to market the items freely in the Single European Market.

The New Approach guided the telecommunications standards policy of the European regulators, who regarded European standards or mutual recognition of national standards by the member states as a precondition of an integrated market. Yet liberalization and an open market required also, and in the first place, a gradual deprivation of power of the national telecommunications monopolies. This was facilitated by the European Commission through the blending of market integration measures with European industrial policy.³⁶ Standards policy, including the establishment of the European Telecommunications Standards Institute (ETSI), played a significant role in this strategy. The most important element was the policy

34 J Pelkmans, ‘The New Approach to Technical Harmonization and Standardization,’ *Journal of Common Market Studies* 25 (1987).

35 J Falke, ‘Achievements and Unresolved Problems of European Standardization: The Ingenuity of Practice and the Queries of Lawyers,’ *Integrating Scientific Expertise into Regulatory Decision-Making*, eds C Joerges et al., (Baden-Baden: Nomos Verlagsgesellschaft, 1997).

36 V Schneider et al., ‘Corporate Actor Networks in European Policy-Making: Harmonizing Telecommunications Policy,’ *Journal of Common Market Studies* 32 (1994).

of Open Network Provision (ONP), which started with the directive “on the establishment of the internal market for telecommunications services through the implementation of open network provision” from 1990.³⁷ Several other ONP-related directives followed. ETSI was requested to draw up European standards to harmonize the technical interfaces and other specifications necessary to ensure access to and interconnection of networks. The 1990 directive requires that standards for ONP must be transparent, based on objective criteria, and non-discriminatory (equality of access). The directive makes use of the essential requirement concept by stipulating that standards may restrict access to public telecommunications networks and services (only) for reasons of network security and integrity (no harm to the network) and protection of data. In order to prevent the member states from maintaining or creating technical barriers to trade with reference to the essential requirement provisions, the EU regulators gave ETSI a mandate to develop harmonized standards in this area. Compliance with these harmonized standards is required unless a technical specification is used which has been certified as being equivalent.

Most harmonized standards which include essential requirement rules (e.g. interface standards) are coordinative in nature what means *ceteris paribus* that there is no need to impose them on the telecommunications industry (see above Table 1). The ONP policy uses these standards to open markets, but they could also be opened without imposing uniform standards. Making coordinative standards mandatory or blending regulative and coordinative standards has some tradition in European telecommunications policy which has served both market integration and industrial policy goals.³⁸ The results of this policy are ambivalent. Most successful has been cellular telephony standardization.³⁹ The GSM standard adopted by ETSI and virtually imposed by the European regulators facilitated market integration and strengthened the position of European firms in the global market for mobile telephony. Efforts can be observed to replicate the GSM strategy in the area of a third-generation mobile communications system (UMTS). A decision of the European Parliament and of the Council on the coordinated introduction of UMTS from December 1998 *inter alia* asks the Commission to promote “in cooperation with ETSI” a “common and open standard for the provision of compatible UMTS services

37 *Official Journal* L192, 24 July 1990, pages 1-9.

38 R Werle, ‘Technische Standardisierung im deregulierenden Europa,’ *Jahrbuch für Neue Politische Ökonomie — Band 16: Neue Politische Ökonomie der Integration und Öffnung von Infrastrukturen*, eds K-E Schenk et al. (Tübingen: J.C.B. Mohr, 1997).

39 See G Bender, ‘Shaping Technology as a Means of Transforming Society: The Case of the GSM Standard for Mobile Telecommunication,’ *Science Studies* 12 (1999).

throughout Europe” and to feed it as draft of an international standard into the ITU-T standardization process (Article 6).⁴⁰ This strategy has been criticized as facilitating European cartels rather than promoting free trade and competition across the European border.⁴¹ It indicates that also in the European telecommunications regime, which is officially committed to free trade, standards are occasionally used to implement industrial policy. However, as far as the internal market is concerned, the European regulators including the Court of Justice made considerable progress in fostering market opening and competition and in eliminating national telecommunications standards which might impede cross-border network interconnection and service provision. After the demise of national monopolies, ETSI took over and autonomous standard-setting at the national level virtually ceased.

B. The WTO regime

The analysis of the WTO regime in telecommunications does not aim at giving an account of how the regime came into being. In this regard, a brief reference to *Cowhey* and *Richards* may suffice. Focusing on the Agreement On Basic Telecommunications, they convincingly argued that this agreement emerged from the interaction of “internal constraints” on the side of the most powerful actors in the negotiation process (US, EU, Japan) and “external constraints” at the international level such as — in this case — the basic rules of the WTO.⁴² In line with earlier studies,⁴³ the authors emphasized that the “domestic political economy” of the actors involved was the “key determinant” of the negotiation outcome which was, however, also shaped by the international institutional rules. The restrictions through which these rules hindered the powerful actors to achieve maximum gains from the agreement provided incentives to strive for bilateral and regional agreements complementary to the multilateral deal. A differentiated evaluation of the

40 *Official Journal* L017, 22 January 1999, pages 1-7.

41 P Grindley et al., ‘Standard Wars — The Use of Standard Setting as a Means of Facilitating Cartels: Third Generation Wireless Telecommunications Standard Setting,’ *International Journal of Communications Law and Policy* 3 (1999), available at: http://www.digital-law.net/ijclp/3_1999/ijclp_webdoc_2_3_1999.html.

42 P Cowhey and J Richards, ‘Dialling for Dollars: Institutional Designs for the Globalization of the Market for Basic Telecommunications Services,’ *Coping With Globalization*, eds A Prakash and J A Hart (London: Routledge, 2000).

43 For example, see J M Grieco, *Cooperation Among Nations: Europe, America, and Non-Tariff Barriers to Trade* (Ithica, NY: Cornell University Press, 1990).

telecommunications regime also lies beyond the scope of this section. Diverging evaluations in the literature notwithstanding, a basic consensus seems to exist that the WTO regime is a significant element but only one element of a global telecommunications policy towards further liberalization.⁴⁴

The following examination is focused on those elements of the WTO telecommunications regime which refer to technical standards. The central agreements in this context are included in Table 3. They relate to services but also to goods such as telecommunications equipment and terminals. Given the growing overlap of communication and information technology, one could add to the list the Information Technology Agreement (ITA) of December 1996.⁴⁵ This agreement eliminates all tariffs on information technology equipment including many telecommunications items but it does not embrace any specific measures regarding non-tariff barriers to trade such as standards.⁴⁶ The Agreement On Technical Barriers To Trade (TBT), on the other hand, is not exclusively geared to telecommunications. Rather, it deals with standards and other potential TBT in general. Likewise, the Agreement on Government Procurement does not focus on telecommunications specifically but lays down rules concerning governments' purchasing behavior in general.⁴⁷

44 K Nicolaidis, 'International Trade in Information-Based Services: The Uruguay Round and Beyond,' *The New Information Infrastructure: Strategies for U.S. Policy*, ed W J Drake (New York: The Twentieth Century Fund Press, 1995); L Tuthill, 'Users' Rights?: The Multilateral Rules on Access to Telecommunications,' *Telecommunications Policy* 20 (1996); Drake and Noam; M Fredebeul-Krein and A Freytag, 'Telecommunications and WTO Discipline: An Assessment of the WTO Agreement on Telecommunication Services,' *Telecommunications Policy* 21 (1997); Hogan & Hartson, *Study on Member States' Legislation in Relation to the Provision of Telecommunication Services and/or Infrastructure Between the European Communities and Third Countries: Report to the Commission of the European Communities DG XIII* (Brussels, 1997); C Blouin, 'The WTO Agreement on Basic Telecommunications: A Reevaluation?' *Telecommunications Policy* 24 (2000); M Fredebeul-Krein, *Die Regulierungspolitik auf dem Markt für Telekommunikationsdienste: Nationale Gestaltung und internationale Regeln* (Cologne: Institut für Wirtschaftspolitik at Cologne University, 2000).

45 Blouin.

46 The issue that standards can be barriers to trade is addressed in the so-called ITA II multilateral talks on regulatory reform. J S Wilson, 'Telecommunications Liberalization: The Goods and Services Connection,' *Unfinished Business: Telecommunications after the Uruguay Round*, eds G C Hufbauer and E Wada (Washington DC: Institute for International Economics, 1997).

47 S J Evenett and B M Hoekman, 'Government Procurement of Services and Multilateral Disciplines,' *GATS 2000: New Directions in Services Trade Liberalization*, eds P Sauvé and R M Stern (Washington DC: Brookings Institution Press, 2000).

Table 3: Main Sources of Standards-Related Elements of the WTO Telecommunications Regime

- General Agreement On Trade In Services (**GATS**) including an Annex On Telecommunications (entered into force 1995)
- Agreement On Basic Telecommunications (**ABT**) including the (regulatory) Reference Paper (entered into force 1998)
- Agreement On Technical Barriers To Trade (**ATBT**) including a Code Of Good Practice For The Preparation, Adoption And Application Of Standards (Annex 3) (entered into force 1995)
- Agreement On Government Procurement (including services) (**AGP**) (entered into force 1996)

The GATS distinguishes four different modes of supplying services: (i) cross-border supply to a host country, (ii) consumption abroad from a host country, (iii) commercial presence in a host country, and (iv) presence of natural persons in a host country. “Supply” includes the production, distribution, marketing, sale, and delivery of a service. In the area of telecommunications, technical standards play a crucial role in facilitating or impeding the supply of services either cross border (i) or through commercial presence in a host country (iii). The other two modes of supplying services are less strongly affected by technical standards. GATS Part II, which includes General Obligations and Disciplines, stipulates in Article VI (Domestic Regulation) *inter alia* that technical standards “do not constitute unnecessary barriers to trade in services.” In determining whether standards conform with this obligation, “account shall be taken of international standards of relevant international organizations.” In a footnote, it is explained that these relevant organizations are “international bodies whose membership is open to the relevant bodies of at least all members of the WTO.”

The GATS Annex On Telecommunications elaborates on certain aspects of the general agreement pertaining to this industry. It specifies, for instance, the general

transparency requirement of GATS Article III. According to this specification, each member will ensure the public availability of definitions of technical interfaces with public networks and services to facilitate access and it will provide information on bodies responsible for the preparation and adoption of standards affecting such access and use. However, the Annex also provides what compares to the essential requirements reservations in the EU. To prevent harm to networks and services, the reservations allow members to impose “conditions necessary to protect the technical integrity of public networks or services” which may include “a requirement to use specified technical interfaces, including interface protocols, for inter-connection” and also “type approval of terminal or other equipment which interfaces with the network.” Again the “importance of international standards for global compatibility and inter-operability” is stressed. The ITU and the ISO are explicitly mentioned as organizations which adopt and promote the relevant standards.

In comparison to the general GATS rules and its telecommunications annex, the Agreement On Basic Telecommunications (ABT) is supposed to be a substantive step further towards opening markets. A major accomplishment is the ABT Reference Paper, which provides a regulatory framework for telecommunications.⁴⁸ It also addresses regulatory policies at the national and regional level such as the establishment of regulatory agencies.⁴⁹ With a view to technical specifications and standards, the paper’s competitive safeguards and rules ensuring interconnection deserve attention. *Inter alia* “major suppliers” will be prevented from “not making available to other service suppliers on a timely basis technical information about essential facilities.” Interconnection will be ensured “at any technically feasible point in the network,” and it is to be provided in a timely fashion “sufficiently unbundled” and on transparent terms including transparency regarding technical standards and specifications.

The Agreement On Government Procurement (AGP) does not explicitly address telecommunications but covers all areas of public procurement of goods and services. Standards are referred to in Article VI, which requires that “technical specifications shall not be prepared, adopted or applied with a view to, or with the effect of, creating unnecessary obstacles to international trade.” Procuring government agencies will prescribe these specifications “in terms of performance rather than design or

48 H Ungerer, ‘Access Issues under EU Regulation and Anti-Trust Law: The Case of Telecommunications and Internet Markets,’ *International Journal of Communications Law and Policy* 5 (2000), available at http://www.ijclp.org/5_2000/ijclp_webdoc_4_5_2000.html.

49 See OECD, *Telecommunications Regulations: Institutional Structures and Responsibilities* (Paris: OECD, 2000).

descriptive characteristics,” and the specifications will “be based on international standards, where such exist; otherwise on national technical regulations or recognized national standards.”

The Agreement On Technical Barriers To Trade (ATBT) focuses on products and not on services.⁵⁰ It is, however, highly instructive because it lays out WTO’s understanding of technical regulations and standards, suggests how to proceed if standards diverge, and provides a Code Of Good Practice For The Preparation, Adoption And Application Of Standards (Annex 3 to the ATBT). Annex 1 includes the definitions of the central terms used in the ATBT. In line with the terminology of the ISO, Annex 1 distinguishes between technical regulations which are mandatory and standards which are voluntary. It reiterates that standards are documents approved by a “recognized body”. Such a body can be national, regional or international in scope. The ATBT only uses the term “regional” or “international” body if these entities are open to the “relevant bodies” of the members in the respective territories. This practice creates difficulties as to how private consortiums and forums have to be treated because the majority of their members are business organizations or individuals. Many of these private standards organizations may formally be open to the “relevant bodies” of the WTO member states. Yet this would have to be checked in every single case. Thus, without further examination, only the bodies which are included in this section’s subsection of “Official organizations” can unequivocally be called recognized bodies.

Similar to the wording in the AGP, Article 2 of the ATBT, which refers to technical (mandatory) regulations, stipulates that members are to ensure that the regulations do not create unnecessary obstacles to international trade.⁵¹ This does not rule out members taking measures to ensure the quality of their exports or to protect the environment and human, animal, and plant health unless these measures result in arbitrary and unjustifiable discrimination between countries or constitute disguised restrictions to international trade. Whenever in the members’ view regulations are required, they are to be based on international standards if they exist and are considered appropriate. Transparency principles oblige members to notify others if

50 See A O Sykes, *Product Standards for Internationally Integrated Goods Markets* (Washington DC: The Brookings Institution, 1995). There is an ongoing discussion in joint seminars of the ISO and the WTO concerning whether the methods used for goods can also be applied to services.

51 Altogether some 30 individual legal texts of the WTO agreement, including the ones examined here, oblige the members to ensure that technical regulations and standards do not create unnecessary obstacles to trade.

they adopt specific technical regulations which are not in accordance with international standards. If regulations differ from country to country, members are to take them to international standards organizations and try to harmonize them. Members are also to consider accepting (recognizing) regulations of other members as equivalent.

Article 4 focuses on the preparation, adoption and application of (voluntary) standards. It contains no substantive rules but rather refers members to the Code of Good Practice in Annex 3. Members are to ensure acceptance and compliance with that code by “government standardizing bodies” but also by “non-governmental bodies” within their territories and by “regional bodies” in which members or their standardizing bodies participate. Likewise, all standardizing bodies complying with the code are to be acknowledged as also complying with the principles of the ATBT. Virtually all standardization organizations are invited by the WTO to declare acceptance of the Code of Good Practice. If they do so or withdraw from this code, they must notify the ISO/IEC Information Center, which promptly conveys a copy of this notification to the WTO secretariat.⁵² The Information Center publishes a directory of the organizations which have declared acceptance and, if available, their work programs every year. The list in Table 4 includes significant substantive rules of the Code of Good Practice concerning the practice of standards organizations.

As of December 2000, 131 standards bodies from 91 countries were officially recognized. The majority are formally non-governmental organizations, but they have a national base, and do not belong to the large group of private “supranational” consortiums and forums which are active in standard-setting in information and communication technology.

The major part of the ATBT deals extensively with rules and procedures to assess conformity with technical regulations and standards. They shall not be examined in this paper.⁵³ The final articles of the ATBT contain institutional provisions regarding dispute settlements according to the GATT Dispute Settlement Understanding and the establishment of a Committee on Technical Barriers to Trade. This committee is composed of representatives from each of the members and is charged with

52 This is one of the few instances of practical cooperation of the WTO and international standards organization.

53 As a potential barrier to trade conformity assessment and the related certification procedures (including the accreditation of test centers or laboratories) raise issues which are in principle similar to those in standardization.

Table 4: Selected Rules of the Code of Good Practice for the Preparation, Adoption, and Applications of Standards (Annex to the Agreement on Technical Barriers to Trade)

- No standards shall be adopted which create “unnecessary obstacles to international trade.”
- If appropriate **international standards** exist they shall be used as a basis for the standards the respective body wants to develop.
- A delegation of each body which adopted a standard regarding a specific subject matter shall participate in an international standardizing body which prepares a standard in that subject matter “with a view to **harmonizing standards**.”
- Duplication or overlap of the work of one standards body with the work of another body in the same national territory or with the work of “relevant international or regional standardizing bodies” shall be avoided (**avoidance of jurisdictional conflicts**).
- Wherever appropriate, standards shall specify product requirements “in terms of performance rather than design characteristics.”
- The work of the standardizing bodies shall be **transparent** and **open** to participation of “interested parties.” After adoption standards shall be promptly published.

examining the implementation and operation of the ATBT and providing a report at the end of each three-year period after the ATBT’s entry into force.

The committee's first triennial review was published at the end of 1997.⁵⁴ After the committee had "reiterated the importance of the prevention and elimination of technical barriers to trade" it concluded that "the status of implementation [of the ATBT] was not satisfactory." This statement is *inter alia* substantiated with regard to technical regulations as well as to standards. The committee emphasized that the promulgation of national regulations should be avoided where they were not necessary, that regulation should not be more trade restrictive than necessary, that coordination between governmental regulatory authorities, trade officials, and national standardizing bodies was essential, and that generally "good regulatory practice" was "a priority for members to facilitate trade." Concerning standards, the committee reiterated the importance of international standards. They should be used as the basis for technical regulations to facilitate trade. The committee also asked for "closer cooperation between the WTO and relevant international standardizing bodies." With regard to the Code of Good Practice, the committee considered its status of implementation as "not satisfactory." The proliferation of standards adopted by bodies which did not follow the disciplines of the code "could have a potentially adverse impact on trade, even if they were voluntary." International standardization should be preferred over national and regional activities to avoid duplication and overlap of work and the adoption of different standards to achieve similar objectives. Finally the committee reiterated the importance of taking "trade needs" into account along with technical progress; this suggests that in many standards organizations technical rather than trade concerns still prevail.

In November 2000 the second triennial review was published.⁵⁵ While it notes that some progress has been made concerning the implementation of the rules of the ATBT, it also illustrates several deficits. Interestingly, some problems shifted from the area of standard setting to that of assessing the conformity of products and services with standards and regulations. The committee expresses "growing concern with respect to the restrictive effect on trade of multiple testing and conformity assessment procedures." In a short section on technical regulations, the committee pleads for a reduction of the regulatory burden through minimizing the use of mandatory regulations and utilizing voluntary international standards. Finally, the committee notes that "a diversity of bodies" were involved in international standardization and that not all of them had "procedures for soliciting input from a wide range of interests" with potentially adverse trade effects of standards adopted by

54 See http://www.wto.org/english/tratop_e/tbt_e/tbt5.htm.

55 Available at http://docsonline.wto.org/GEN_highLight... Document number 00-4811.

these bodies. This problem motivated the committee to specify “principles for the development of international standards” in an appendix (Annex 4) to the report. These principles are virtually identical to what has been identified as the prevailing institutional features of standards organizations in Table 2 above. They include transparency, openness, impartiality and consensus, and they are shared, as argued above, by the official standardization organizations and many private ones as well.⁵⁶

C. Assessment of the role of standards as instruments of trade policy in the WTO regime

In the European as well as in the WTO telecommunications regime, standards are regarded as crucial factors affecting international trade. They can facilitate market access of foreign suppliers but also hinder the international provision of services if, for example, different national standards of telecommunications networks impede cross-border interconnection.⁵⁷ The international trade regime includes institutional provisions and standardization rules which aim at avoiding detrimental effects of standards on trade and promoting supporting ones. The provisions and rules of the WTO regime are assessed from two angles: one relates to their feasibility and practicability and the other concerns their basic principles and underlying assumptions. Only a few critical provisions and rules are examined here.

1. The first rule (one standard rule) is akin to what is called the principle of parsimony of standards in Table 2, which has been identified as an institutional feature of standardization shared by many standards organizations. This principle relates to international trade rules according to which standards and regulations are to be international or based on international standards. If regulations or standards differ from country to country, they must be harmonized.

56 With respect to the other principles stressed by the committee (coherence, effectiveness, and relevance of standards), the official organizations are frequently outperformed by the private ones.

57 It is, however, extremely difficult to measure trade impediments by specific trade barriers such as standards. See *T Warren and C Findlay, 'Measuring Impediments to Trade in Services,' GATS 2000: New Directions in Services Trade Liberalization*, eds *P Sauvé and R M Stern* (Washington DC: Brookings Institution Press, 2000).

The principle of parsimony of standards can be regarded as one *raison d'être* of committee standardization. Actors have an interest in coordinating their activities in order to reduce inefficient variety. From the point of view of the trade regime, variety reduction facilitates competitive international trade. This reduction can be achieved by adopting genuinely new standards, if possible in an organization with a global scope, or by trying to reduce the number of existing functionally equivalent standards through negotiations on harmonization.

It is an undisputed view that having only one standard increases efficiency because economies of scale and other benefits of a standard can be exploited. However, there is often a tradeoff between standards benefits and variety benefits.⁵⁸ In general, standards do not completely exclude but set limits on variety. These limits may be too rigid in an industry such as information and communication technology, where the speed of innovation is high. As such, the harmonization of existing standards, in particular, may not be adequate because it means a reduction of variety on the basis of the technological *status-quo*. This may impede rather than stimulate technological innovation in an area in which even switching from one coordinative standard to a more efficient one is difficult to accomplish.⁵⁹ In addition, the problem of how much harmonization and for which regions it is needed is not addressed in the WTO's view on standards.⁶⁰ Harmonization is perceived by WTO as a precondition rather than an effect of free trade.⁶¹ In the United States, we find many instances in which competition of standards in the market (with the potential result that the most efficient standard will prevail) is preferred to committee selection.⁶² According to this approach, some degree of "harmonization" emerges as the spontaneous result of

58 J Farrell and G Saloner, 'Standardization and Variety,' *Economics Letters* 20 (1986); J S Metcalfe and I Miles, 'Standards, Selection and Variety: An Evolutionary Approach,' *Information Economics and Policy* 6 (1994); Brunsson and Jacobsson, 138-150.

59 H Leibenstein, 'On the Economics of Conventions and Institutions: An Explanatory Essay,' *Zeitschrift für die gesamte Staatswissenschaft* [Journal of Institutional and Theoretical Economics] 140 (1984); P A David, 'Clio and the Economics of QWERTY,' *American Economic Review* 75 (1985).

60 As countries and regions differ with regard to economic performance, citizens' preferences, etc., it may be detrimental to have one uniform standard. Rather, the determination of "optimal regulatory units" would be needed. K Holzinger, 'Optimal Regulatory Units: A Concept of Regional Differentiation of Environmental Standards in the European Union,' *Environmental Policy in a European Union of Variable Geometry?*, eds P Knoepfel and K Holzinger (Basel: Helbing & Lichtenhahn, 2000).

61 This view is shared by the Trans-Atlantic Business Dialogue. P Stern, 'The Trans-Atlantic Business Dialogue: A New Paradigm for Standards and Regulatory Reform, Sector by Sector,' *Regulatory Reform and International Market Openness*, ed. OECD (Paris: OECD, 1996).

62 See M Kende, *The Digital Handshake: Connecting Internet Backbones*, OPP Working Paper 32 (Washington DC: Federal Communications Commission, 2000); see also S J Liebowitz and S E Margolis, *Winners, Losers & Microsoft* (Oakland, CA: The Independent Institute, 1999).

opening trade. In the case of coordinative standards, the standard of the largest market is likely to diffuse into other markets. Also with regulative standards market processes may produce harmonization. It has been argued that this process leads to convergence on the lowest common denominator and to a race to the bottom. However, we have no *a priori* reason to expect that such a result is the most efficient outcome of competition of regulatory standards.⁶³ Arguably, free trade is most efficient when standards differences among regions or countries can be exploited by industry.⁶⁴ Concerning competition, we find many instances in which competition among firms using the same standard (competition within a standard) is less vigorous than competition among firms using different standards (competition between standards). The latter has often been likened to a battle of systems.⁶⁵ These arguments suggest that concerning harmonization and parsimony of standards viable alternatives exist to the WTO rules.

2. The second rule grants national authorities the right to adopt as regulations standards concerning essential requirements in order to ensure, for example, environment and health protection or the technical integrity of telecommunications systems.

This rule allows for standards diversity between countries and regions. If the regulations are restricted to require conformity with essential requirement provisions, efforts towards harmonization, if this is the aim, can be confined to them. Other elements of a regulation or a standard can remain unaffected, facilitating international competition of standards and regulations. If harmonization of essential requirement provisions cannot be achieved, the costs of adapting to this regulation remain comparatively low as long as the provisions are really restricted to what appears to be indispensable. In this case, international trade and competition are not ruled out. In the

63 A Casella, 'Free Trade and Evolving Standards,' *Fair Trade and Harmonization: Prerequisites for Free Trade?*, Vol. 1, eds J N Bhagwati and R E Hudec (Cambridge, MA: MIT Press, 1996).

64 See N Bhagwati and R E Hudec (eds), *Fair Trade and Harmonization: Prerequisites for Free Trade?* (Cambridge, MA: MIT Press, 1996).

65 Opening markets in the presence of diverging standards can be achieved through mutual recognition agreements. However, in a multilateral trade system, these agreements are extremely difficult to accomplish. We do, however, find many instances of bilateral mutual recognition agreements between countries and between regions. See K Nicolaidis, 'Mutual Recognition of Regulatory Regimes: Some Lessons and Prospects,' *Regulatory Reform and International Market Openness*, ed. OECD (Paris: OECD, 1996); A Beviglia Zampetti, 'Market Access Through Mutual Recognition: The Promise and Limits of GATS Article VII,' *GATS 2000: New Directions in Services Trade Liberalization*, eds P Sauvé and R M Stern (Washington DC: Brookings Institution Press, 2000).

GATS Annex On Telecommunications, the “dual role” of telecommunications as a distinct part of the service economy and as a transport infrastructure is emphasized. Arguably essential requirement regulations — if they relate to technical systems integrity — can be restricted to the transport infrastructure, i.e. the networks and connected services, in particular to bottlenecks and “essential facilities” in this area, and leave the vast majority of other services unregulated. This disaggregated approach to technical regulation provides much room for self-coordination through standards and also for competitive network operation and service provision.⁶⁶

3. The third rule includes transparency and public availability requirements concerning standards and technical regulations.

Similar institutional provisions underlining the public good character of standards are widespread in official standardization, but also many private consortiums and forums, in the first place internet standards organizations, adhere to them. Difficulties can arise outside the standards regime since, to ensure interconnection, major network and service suppliers are also addressed in this transparency and public availability requirement. If the suppliers use proprietary standards, property rights issues come up, which, however, are a general problem of telecommunications regulation rather than a specific standards issue.⁶⁷

4. The fourth rule provides a definition of the term standard. After this definition, which is borrowed from the ISO/IEC, only documents approved by a recognized body on the basis of consensus qualify as standards.

This rule is partly linked to the transparency and open availability requirement and it is closely related to the general institutional aspects of the landscape of standards organizations. The definition of standards excludes technical specifications which have evolved in markets as *de-facto* standards and have never been approved by any

66 See G Knieps, ‘Der disaggregierte Regulierungsansatz der Netzökonomie,’ *Zwischen Regulierung und Wettbewerb: Netzsektoren in Deutschland*, eds. G Knieps and G Brunekreeft (Heidelberg: Physica-Verlag, 2000). For a similar argument concerning harmonization of essential requirement standards in the EU, see C B Blankart and G Knieps, ‘Market-Oriented Open Network Provision,’ *Information Economics and Policy* 7 (1995).

67 They do, of course, affect the process of standard-setting. E J Iveresen, ‘Standardization and Intellectual Property Rights: Conflicts Between Innovation and Diffusion in New Telecommunications Systems,’ *Information Technology Standards and Standardization: A Global Perspective*, ed. K Jakobs (Hershey: Idea Group Publishing, 2000).

committee. Yet it also excludes specifications which have been adopted by private consortiums and forums even though these organizations are generally committed to the consensus principle. The problem here is that virtually none of these international private units enjoys the status of a recognized organization. Thus, from the angle of the WTO regime, the standards issued by these organizations are unofficial or private standards. Their use — and their inclusion in more encompassing regulations — cannot automatically be qualified as conforming to free trade principles. Many coordinative standards which are crucial to the global functioning of telecommunications networks and services were issued by these private organizations. Again, internet standards provide the currently most prominent examples. Concerning the substantive quality of standards, we will rarely find significant differences between official and unofficial standards. Often it is contingent on business strategy or simply a matter of historical accident if a standard is adopted by an official or a private standards organization.⁶⁸ The narrow definition of official standards in the WTO regime affords firms wanting to evade this regime an easy opportunity to do so through participation in private rather than recognized standards bodies. These private entities exist in abundance, as has been shown above. Apparently, they have no interest in being recognized, although many of them comply with the ATBT's Code of Good Practice and its specifications by the Committee on Technical Barriers to Trade. The WTO agreements in the area of telecommunications mention only the ISO, the IEC and the ITU as recognized international standards bodies. These and some other official organizations with regional significance have set up liaisons with some of the most visible consortiums and forums and convinced them to feed some of their standards into the adoption process of the official organizations, where they are usually approved without intensive further negotiations. Thus their standards achieve the status of official standards.⁶⁹ These tendencies notwithstanding, the intergovernmental WTO setting appears to have problems dealing appropriately with hybrid international regimes such as the standards regime in which governmental and private elements are blended.⁷⁰ The WTO in effect stabilizes the position of official organizations — just the group of standards entities whose working procedures have

68 See *W Lehr*, 'Compatibility Standards and Industry Competition: Two Case Studies,' *Economics of Innovation and New Technology* 4 (1996); *Werle*, 'Institutional Aspects of Standardization.'

69 See *R Rada*, 'Consensus versus Speed,' *Information Technology Standards and Standardization: A Global Perspective*, ed. *K Jakobs* (Hershey: Idea Group Publishing, 2000).

70 See *P Willetts*, 'Representation of Private Organizations in the Global Diplomacy of Economic Policy-Making,' *Private Organizations in Global Politics*, eds *K Ronit* and *V Schneider* (London: Routledge, 2000).

been challenged as being too slow, as ignoring trade needs, and as being dependent on and influenced by governments' and other political actors' industrial policy concerns. Despite the structural affinity of the WTO and the official international standards organizations, they have not yet managed to set up comprehensive collaborative relations. Given all these unresolved issues, it comes as no surprise that the Committee on Technical Barriers to Trade concluded in the first triennial review that the status of implementation of free trade rules in the area of standards, regulations and other potential barriers to trade was not satisfactory, and reiterated in the second review that the issue of implementation was "of an ongoing nature."

Concerning telecommunications standards, it should be noted, however, that we did not find but a single dispute settlement case in the WTO archives. Allegations have been filed concerning public procurement practices, telephone directory services and network interconnection rates, but technical standards have not been a subject of the dispute settlement procedure.⁷¹ Undoubtedly, the effects of standards are often hidden and difficult to determine. Yet, with the transformation of telecommunications from a hard-wired to a software based technology, adaptation to different specifications in different networks has become less expensive.⁷²

V. Conclusion

Technical regulations and standards are needed to facilitate the interoperation of components of networks, the interconnection of networks and the provision of services in technically heterogeneous environments but also to protect the technical integrity of networks and services. If standards developed to serve specific goals differ from country to country or region to region, they can, deliberately or not, have the effect of impeding market entry and international trade. This is why standards are addressed in free trade provisions.

In the official terminology of the telecommunications regime, a distinction is drawn between mandatory and voluntary technical specifications. The first are called regulations and the second standards. This distinction overlaps with an analytical

71 See also *H A Millán Smitmans*, 'Dispute Settlement in the Services Area under GATS,' *Services Trade in the Western Hemisphere: Liberalization, Integration, and Reform*, ed. *S M Stephenson* (Washington DC, Brookings Institution Press, 2000).

72 In addition, as we have already mentioned, national standards have lost significance. Most of them have been replaced by regional standards which reduce technical variety in telecommunications networks and services.

differentiation between coordinative and regulative standards. These two types of standards differ with respect to their generation and the likelihood of compliance with them.

A look at the landscape of organized standardization in communications and information technology shows that most internationally significant standards are coordinative standards. They are adopted by officially recognized standards organizations as well as by private consortiums and forums. With respect to their substantive quality and their market diffusion, no significant difference can be observed between the standards developed in either type of organization. In addition, the organizations share many institutional features, something which should prevent us from generally favoring one type of organization over the other. Even though some differences still exist, standard-setting is no longer understood as solely technical problem solving. Industrial policy considerations and, even more so, business strategic concerns have moved to the forefront. In this sense, we can talk of a hybrid landscape of international standardization.

The international trade regime in telecommunications as it is shaped by the WTO widely ignores this fact. Where standards are referred to, they only enjoy legitimacy if they have been adopted by recognized standards organizations. At the international level, only the ITU, the ISO and the IEC are recognized entities. Yet they issue no more than a fraction of relevant standards in communication and information technology. Most internet standards adopted by the IETF or the World Wide Web Consortium do not qualify as international standards on which regulations or other standards should be based.

The WTO's restricted understanding of standards is complemented by a view of the role of standards in trade policy which is not uncontested either. The WTO's vantage point appears to be that standards are to be used as instruments of pro-competitive trade policy while national governments tend to use them in an anti-competitive way. Therefore, according to the WTO rules, divergent national standards should be aligned to only one (international) standard in negotiations aiming at harmonization. From this instrumental point of view, the ideal state is to have "one standard, accepted everywhere." In dynamic industries such as telecommunications, however, the coexistence of a variety of standards induces innovation and often boosts competition. Insisting on one single standard may eventually lead to economic disadvantages rather than benefits. Moreover, if standards are regarded as emerging conventions rather than instruments of trade policy, we have good reason to suggest opening markets to competition without harmonizing standards. In open markets, it is contingent on

competitive processes and related self-coordination through voluntary standards rather than administrative or diplomatic deliberation if at the end harmonized standards emerge.

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