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Public Intervention in Private Rule-Making:

The Role of the European Commission in Industry Standardization

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Declaration

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Abstract

The thesis investigates the role of public actors in private rule-making processes at the example of the European Commission's interventions in private industry standardization in the mobile telecoms, high-definition television, digital broadcasting and intermodal transport industries. It demonstrates that, far from having replaced public rule-making or representing a form of 'better' regulation, the private development of technical standards is constrained by the same collective action and decision-making problems that constrain conventional policy-making processes. Without the facilitating interventions of public actors, private standard setters often struggle to overcome these constraints. The ability of public actors to facilitate the private development of technical standards, however, depends on a number of conditions. First they need to rely on entrepreneurial rather than conventional policy instruments based on hierarchical authority and the power of hard law. Hierarchical interventions—in addition to the well-known information problems—only tend to have the unintended effect of exposing technical standardization processes to political contestation, exacerbating the inherent decision-making problems. Entrepreneurial interventions, by contrast, may facilitate the private development of technical standards without exposing the standardization process to political contestation. While such interventions may raise serious legitimacy concerns, they also depend on a number of conditions, such as early intervention, the presence of industry crisis, and the availability of positive feedback mechanisms that drive compliance with the developed standards. With its focus on technical standardization, this thesis seeks to contribute to wider debates on self– and co–regulation and the transforming role of government in the governance of advanced market economies more broadly.

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Chapter 1

Introduction

1.1 Private Industry Standardization as Better Regulation?

Technical standards are everywhere—even where one would least expect to find them. Take football, for instance: From shin guards, to goal posts and even the surface of the pitch almost every aspect of the game is governed by technical standards.[1] Football, however, is for from an exception. Technical standards penetrate into almost every aspect of our daily lives and the international economy alike.[2] According to the OECD (1999a), more than 80% of world trade is already directly affected by technical standards.

Although technical standards are usually unnoticed unless they are missing—as anyone that will be able to confirm who, while traveling, has been confronted with an incompatible electricity socket—they can fulfill a variety of important economic functions. At the one end of the spectrum, reference and quality standards signal consumers that a specific product or service is "fit for purpose" (ISO, 2005, p. 10), complying with a set of health, safety, or environmental quality levels etc. Thereby technical standards significantly increase the efficiency of economic transactions by resolving information asymmetries regarding the quality of products between buyers and sellers (Akerlof, 1970). On the other hand, compatibility and interface standards govern the technological and transactional interconnectivity between different goods and services (David & Greenstein, 1990; David & Steinmueller, 1994, p. 218). For reasons discussed further below, this thesis focuses on the latter and defines technical standards as codifications of

[1] European Norm (EN) 13061, EN 748, and EN 12232, EN 12233 & EN 14954 respectively, see CEN (2008, p. 22).

[2] This thesis itself provides plenty more examples. It was written on a QWERTY keyboard, for instance, the *de facto* keyboard standard; printed with a printer conforming with the European *de jure* health and safety standards EN60950 and EN60825-1 that are presumed to conform with the essential requirements of the 73/23/EEC Low Voltage Directive; however, not always complying with ILO's C171 Night Work Convention.

technology, intended for voluntary but wide-scale and repeated use.[3]

Technical standards are generally developed in private, industry-driven standards-writing organizations, which stand outside of—and tend to be completely independent from—conventional policy-making processes. Therefore, their wide prevalence and the central role they tend to play in the governance of economic transactions could be interpreted as evidence for the superior governance capacity of private rule-makers. In an area where public governance is increasingly constrained by the accelerating pace of technical change and economic internationalization, public actors find themselves increasingly unable to provide the governance—i.e. coordination and public goods—that they used to be able to provide. First, the accelerating pace of technical change is considered to have created a growing information gap between private and public actors (Knill, 2001, p. 237). Public actors are considered increasingly unable to acquire the information and expertise that is necessary to govern complex markets such as information and communication technologies (ICT) and international finance.[4] Because of economic internationalization, secondly, governments find themselves increasingly faced with trans-national challenges, such as global warming, financial crisis or international migration, that exceed the reach of their jurisdiction and instruments of governmental intervention.

Private standard-setters, by contrast, are unconstrained by jurisdictional boundaries and information problems. They are generally expected to be able provide the rules and coordination that public actors increasingly fail to provide. And for they have a market incentive to update their information and to monitor market trends and technological developments continuously (Abbott & Snidal, 2001, p. 365; David, 1985, 1990), governance through private industry standardization rather than public law or regulation is considered to be based on superior information and it is expected to allow for more flexible and timely governance than could be provided by public rule-makers (Abbott & Snidal, 2001, p. 345). This interpretation is also shared by public policy-makers themselves—especially, though not exclusively, by the European Commission.[5].

Technical standardization is also presented as a magic formula to cure a wide range of policy problems. Technical standardization, for instance, is presented as a way to promote growth, innovation and competitiveness:

> A strong role for Europe in international standardization means European leadership in new markets and gaining first-mover advantages in global markets.

[3]This is loosely based on the definition provided by de Vries (1999).

[4]Eberlein and Grande (2005, p. 54), Knill and Lehmkuhl (2002, p. 241), Breyer (1982, pp. 109-119), and Ogus (1994, p. 107)

[5]European Commission [EC], 2004a, p. 2; 2004b, 2008a; European Council, 2002

(EC, 2008b)

This perception has been reinforced—and appears to have been intended to be reinforced—by a range of studies commissioned by national governments and standards-writing organizations, which all emphasize the strong positive impact of technical standardization on economic performance. It is suggested that technical standardization contributes to about 1% to 2.6% of growth domestic product (GDP) growth and that their contribution to labor productivity growth is larger than that of patents.[6]

Governance through standards is even seen as an opportunity to circumvent the decision-making problems that often tend to gridlock conventional public policy-making processes. Günter Verheugen, the previous vice-president of the Commission, for instance, suggested that:

> This [private standardization] is an excellent example of better regulation [...] We thus avoid that legislation becomes overloaded with excessive technical details, we guarantee flexibility because European Standards can be easily adapted and reviewed [...].
>
> (CEN, 2005)

In the European Union (EU) quasi-regulatory tasks are therefore often delegated to private standard-setters. The removal of technical barriers to trade by legislative processes, as set out in the 1969 General Programme on the Removal of Technical Obstacles to Trade, had turned out to be too cumbersome and time-consuming (Egan, 2001, pp. 78-81). The legislative process was often held up by the politicization of minor technical issues of legislation. Therefore, the *New Approach* to technical harmonization and standardization was introduced in 1985 (European Council, 1985b). It was meant to circumvent the 'joint-decision trap' of the European policy-making process (Scharpf, 1988) by privatizing market regulation. The *New Approach* delegates the task to remove the 'technical' to market integration to the European standards-writing organizations, which included CEN (European Committee for Standardization), CENELEC (European Committee for Electrotechnical Standardization) and ETSI (European Telecommunications Standards Institute).

The widespread assumption that the broad prevalence of private standards—as well as the wide range of governance functions that these appear to—fulfill, provided evidence for the higher governance capacity of private standard-setters, however, is directly at odds with two facts: First, the private development of technical standards should be expected to be constrained by significant collective

[6] Harrison, Rutherford, and Tarr (1994), Blind (2004), Department of Trade and Industry (2005) and DIN (2000), Department of Trade and Industry (2005)

action and decision-making problems. Secondly, private industry standardization tends to perform best where the presence of the state looms large over private standardization. The following two Sections (1.1.1 & 1.1.2) elaborate these puzzles in greater detail and suggest that their combination could be interpreted to mean that private standardization may not be as private as it may seem and that public actors may have a considerable role to play in the private development of technical standards, despite the various constraints of public actors discussed in Section 1.2. Therefore, the central research question that this thesis' seeks to investigate, and which is elaborated below, is: *In what circumstances, if any, are public actors able—and willing—to intervene and foster the private development of technical standards?*

1.1.1 How do Private Standard-Setters Resolve their Collective Action and Decision-Making Problems?

As is often the case in the private development and implementation of self-regulatory measures in general (Héritier & Lehmkuhl, 2011, p. 55; Börzel, 2007, p. 47), the development of technical standards tends to be rather costly. In addition to the participation fees of the standardization organizations, the cost of standardization includes research costs, the seconding of company representatives (Berger & Clement, 1990) and the direct opportunity cost of delayed marketing (Blind, 2004, p. 191). The problem with the high development costs is that companies are not necessarily able to recoup these costs. Once published technical standards are effectively in the public domain and their benefits cannot easily be withheld from parties that have not contributed to their development (see Foray, 1994; Weiss & Toyofuku, 1996). Therefore, technical standards are widely regarded as public or collective goods.[7] Standards tend to be non-rivalrous. Their value does not depreciate with any additional user. Standards are also non-excludable. Once published, they are effectively in the public domain and their benefits cannot be withheld costlessly from non-contributors, which encourages free-riding. Hence, standard-setters generally have no way of recouping the cost of standardization, which are considered to be quite substantial because it requires the secondment of technical experts, engineers as well as business executives to standard-setting committees. While the entire industry would profit from their development, individual companies are "fence-sitters, happy to jump on the bandwagon if it gets rolling but insufficiently keen to set it rolling themselves" (Farrell & Saloner, 1985b, p. 78).

[7] Berg (1989a, 1989b); Cohendet and Steinmueller (2000); David and Greenstein (1990); Foray (1994); Kindelberger (1983)

Just like conventional public policy-making, private standardization, too, tends to be constrained by significant decision-making problems.[8] These appear to have two sources. First, companies' preferences as to which technology is eventually selected as the *de jure* industry standard tend to diverge. Each firm seeks to establish its own, proprietary technologies as the industry wide standard. This would increase its income from royalty payments and shifts the cost of adapting to the new standard onto the rest of the industry. Moreover, companies may already have an 'installed base' of consumers that they do not want to drive away by adopting standards that are incompatible with the goods and services that they are already providing to their consumers. Therefore, companies' ability and willingness to make compromises concerning the selection of a single technology as the common industry-wide 'standard' is limited (Schmidt & Werle, 1993; Sirbu & Zwimpfer, 1985). Particularly where companies have already made non-negligible pre-investments in the development of diverging technological solutions to a standards problems or the development of an installed base of consumers, there is little scope for a mutually acceptable agreement (Choi, 1996; David & Greenstein, 1990, p. 105).

Secondly, decision-making problems also tend to result from the fact that companies' competitive struggles in the market place often tend to spill over into the standardization process (Weiss, 1993). Technical standards can have a great impact on companies' market position:

> As more and more products work in conjunction to form systems, [...] standards play a bigger and bigger role in the economy. And, as computer and communications systems encompass for a larger portion of economic activity, compatibility standards become an ever-more important aspect of competitive strategy.
>
> (Shapiro, 2000, pp. 18-19)

Or, as *The Economist* put it, "[n]ew standards can be the source of enormous wealth, or the death of corporate empires" (*The Economist*, 1993). They define the terms of market competition. Therefore, decisions on standards are often blurred with corporate strategy. Companies increasingly use standards to control the structure of an industry and their position in it (Mansell & Hawkins, 1992, p. 50) or for managing technological interdependences between industries (Reddy, 1990, p. 54). Standard-setters will do anything to "prevent their competitors from gaining an advantage at their expense" (Weiss, 1993, p. 122). These decision-making problems are exacerbated by the fact that in most standards-writing organizations the adoption of technical standards traditionally requires the consensus of all participants. This opens the door to a range of bargaining strategies, such as 'hold-

[8] Choi (1996); Genschel (1997); Goerke and Holler (1995); Hawkins (1995)

out' in the form of.[9] 'patent blockade' or 'ambush',[10] or two-level games (Farrell & Saloner, 1988, p. 238). Therefore, companies preferences can be expected to diverge regardless of their pre-investments into alternative technological solutions and the join-decision trap that is considered to constrain public decision-making (Scharpf, 2006), can also be expected to undermine private decision-making.

1.1.2 The Elephant in the Room: How to explain the Strong Presence of Public Actors in Private Standardization?

The second puzzle results from the fact that private industry standardization tends to perform particularly well where it takes place in the shadow of interventionist public actors. In Europe, where both national governments as well as supranational public actors like the European Commission are often actively involved in the private development of technical standards, standardization appears to perform much better than both American and international standardization where the influence of public actors on technical standardization is limited.

In United States (US) American standardization public actors generally stay out of private standardization processes. In the US, standardization is left entirely to the market (see Tate, 2001). This stands in stark contrast to the organization of European standardization, which is characterized by its tight coupling of private industry standardization with public policy (Zuckerman, 1999). National standard-setting bodies have traditionally been publicly funded—according to Mattli and Büthe (2007), public subsidies account for about 20% of the income of national standards-writing organizations. Often they are also delegated quasi legislative powers. At the European level this is exemplified by the above-mentioned *New Approach*. In the US, by contrast, the constitution rules out any delegation of public authority. Direct *ex ante* intervention to coordinate the many private standardization efforts, to give a single standards-developing organization the status of the official national standards body, or to provide financial subsidies to facilitate collective action, is considered unacceptable (Office of Technology Assessment, 1992). The federal government only intervenes sporadically and *ex post* to undermine anti-competitive behavior.[11]

Secondly, European standardization also seems to perform much better than

[9] Genschel (1997), Goerke and Holler (1995, pp. 797-798), David and Schurmer (1996)

[10] Farrell, Hayes, Shapiro, and Sullivan (2007); Hemphill (2005); Soininen (2007b)

[11] Because of the better performance of European standardization American industry representatives have called for more government involvement, suggesting greater government–industry coordination (Garcia, 1992, p. 534; Garcia, 1993; Office of Technology Assessment, 1992). To date, however, all attempts by US governments to centralize standardization under their control have failed (see Tate, 2001).

international standardization. As shown in Figure 1.1, since the 1990s the three official European standards-writing organizations CEN, CENELEC, and ETSI have published more standards per year than the international or even the most active national standards-writing organizations, the German DIN (German Standardization Institute). This is odd for if one considers that—by the simple fact that there neither is an international government nor a national governmental actor whose control reaches far enough into the international realm—international standardization can be considered to be the most independent from public interference and thus the most private. Therefore, private standardization should be expected to perform best at the international level. However, 1.1 demonstrates that this is clearly not the case.

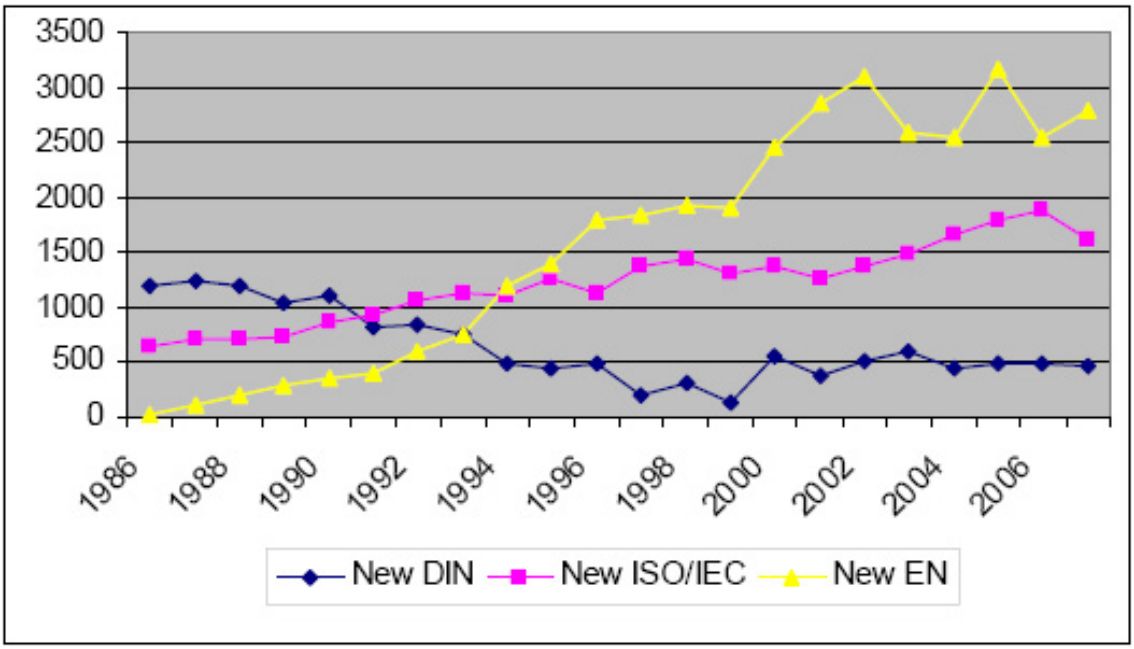

Figure 1.1: Annual standards output at national (Germany), international and European level (1986-2008)

Source: PERINORM, ISO, IEC, CEN, CENELEC, ETSI catalogues, see Mattli and Büthe (2007).

The performance of European standardization is also puzzling considering the fact that it coincides with the integration of the single European market. The above-mentioned decision-making problems should have been exacerbated by the integration project. The systematic reduction of public tariff barriers should have prompted national industry to build on private non-tariff barriers, such as technical standards, to protect their markets. Especially, the companies that were bound to be hurt by the opening of their markets to European competition should have been expected to veto the adoption of European standards and build on national standards instead.

Both the fact that private standards are so wide-spread despite the presence of non-negligible collective action and decision-making problems as well as the fact that private standardization tends to perform best where there is a strong presence of the state are rather puzzling, if looked at in isolation from each other. In combination, however, they appear to suggest that private industry standardization may not be that private after all. Because of its exceptional ability to raise mandatory contributions and to hierarchically enforce compliance, public actors have traditionally played a central role in the mitigation of collective action problems and the provision of public goods, such as education, security and defense. Therefore, public actors might also play a similar role in technical standardization. The better performance of European standardization compared with American standardization might be explained by the active role played by public actors in Europe. And the fact that European level standardization exceeds national and international standardization might be explained by the exceptional role played by the European Commission at the European level.

Clearly, however, the facts presented above should *not* be misunderstood as conclusive evidence for the dependence of private standard-setters on potentially facilitating interventions of public actors. As discussed below, there are significant informational, legal and political constraints that should be expected to constrain public actor interventions. Yet the combination of these two—individually puzzling—facts presented above, provide a first hunch and justify the investigation of the role of public actors in private standard-setting processes. As mentioned above, this thesis therefore seeks an answer to the following research question: *In what circumstances, if any, are public actors able—and willing—to intervene and foster the private development of technical standards?*

This remainder of this Chapter is organized as follows. Sections 1.2 reviews the literature on public interventions in private rule-making process in general, and technical standardization in specific, for potential constraints of such interventions. Based on this assessment, Section 1.3 investigates whether and, if so, to what extent public actors may overcome these constraints. Section 1.4 elaborates the methodology upon which the empirical investigations of the empirical Chapters, which follow this introduction, are based.

1.2 The Constraints of Public Intervention

The literature, however, seems to have little confidence in the ability of public actors to influence—not to mention to facilitate—the private development of technical standards at all. First, they are constrained by significant informa-

tion problems (Section 1.2.1). Secondly, public actor interventions in private standardization are constrained by considerable political constraints 1.2.2.

1.2.1 Information Problems

As suggested above, public actors are considered increasingly unable to keep pace with the accelerating speed of technological change. They generally lack the technical expertise and market information that is necessary to keep pace with—not to mention influencing the direction of—these developments. Therefore, the standardization literature often describes public actors as 'blind giants' (David, 1990). Given their size and ability to adopt and enforce legally binding decisions, public actors are potentially powerful but for their lack of information they are unable to use this power in a purposeful way. Their interventions are therefore bound to have a counterproductive effect—if they have an effect at all. And even where public entrepreneurs had this information and expertise, it is argued, they would only have a 'narrow time window' to intervene before markets were locked in and before their technical knowledge became obsolete (Auriol & Benaim, 2000; David, 1990). Therefore, public interventions either tend to lead to the selection of inferior technologies or fail to have an influence on the market processes that drive the selection of standards at all.

1.2.2 Political Constraints

At the same time, there also are significant political constraints, which even overshadow the above-mentioned informational constraints. Both public and private actors can be expected to resist public interventions.

Resistance by Private Actors

This thesis distinguishes between standard-setters, which are directly involved in the standardization, process and standard-takers, which do not participate in the standardization process but are directly affected by it. They eventually have to adopt and adapt to the resulting standards. Albeit for different reasons, both can be expected to resist public interventions.

According to Héritier and Lehmkuhl (2011, p. 55), "[f]irms—as a rule—shun public intervention into their economic activities." Also private standard-setters can be expected to resist public interferences with their activities. According to Schepel (2004) and Frankel and Hojbjerg (2007) European standardization has developed into an autonomous system of government that enjoys considerable independence from public policy-makers. The European standards-writing

organizations—CEN, CENELEC and ETSI—are formally independent from public actors at national and European level. EU competition law, Schepel (2004, p. 317) points out, provides very little leverage to influence the behavior of private standard-setters.[12] Private standard-setters should be expected to protect their independence. While Spruyt (2001) has shown that the struggle between public and private actors over who gets to set standards is quite an old struggle, which goes back to Roman times. Egan (1998) has described this struggle in the case of European standardization. European standard-setters have resisted against public interventions.

Only where public interventions provide them with an opportunity to strengthen their standards or to weaken rival groups of standard-setters, can private standard-setters be expected to accept—or even actively seek—public actor interventions (see Austin & Milner, 2001). Moreover, they may seek the collaboration with public actors to gain privileged access to the policy-making process (see Coen, 2009). In all other circumstances, however, private standard-setters are likely to resist public interventions.

At the same time, standard-takers can be expected to fight against public interventions where this forces them to adopt and adapt to standards that do not reflect their technical and strategic preferences. These opposing companies would do anything they can, Weiss and Sirbu (1990, p. 122) have shown, "to prevent their competitors from gaining an advantage at their expense." They can either be expected to lobby the intervening public actors and other public actors such as parliaments and the courts to prevent such interventions. Or they can be expected to become directly involved in the standardization process to make sure that the resulting standard eventually conforms with their preferences or to veto the adoption of the given standards all together. Even companies that might have previously chose to free ride or to remain rationally ignorant in order to avoid the high costs, which are involved in the participation in technical standardization processes, may start to fight against public interventions.

Resistance by Public Actors

Furthermore, public actors themselves may resist interventions in private standardization processes, even if this would allow them to facilitate the development

[12] On the one hand, the European standardization organizations cannot be held accountable under Article 86(3) EC because they do not qualify as public undertakings under Article 86(2) EC for they are registered as private non-profit organizations under Belgian and, in the case of ETSI, French law. On the other hand, private industry standardization almost automatically meets the exemptions under Article 81(3) EC. Moreover, Article 81 EC seems impractical as an instrument to influence the behavior of private standard-setters as it only, if at all, seems provide the Commission with an opportunity to prevent but not to demand the development of certain standards.

of technical standards and thus increase economic efficiency. Practitioners as well as scholarly writers often provide functionalist explanations—and justifications—for the intervention in private standardization processes. Repussard (1995, p. 62), the former director of CEN, for instance, argues that, "[c]oncerns for efficiency of a country's economy leads governments to take a general interest in standardization."[13] Similarly Egan (1998) explains the reliance of public actors on private standard-setters as a way to "improve the efficiency of public policy-making" (Egan, 1998, p. 487). Functionalist explanations of public interventions, however, do not go very far in explaining the genuine motivations of public actors to intervene. Börzel and Risse (2010, p. 117) point out that the inclusion of private actors in public policy-making processes generally entails a loss of autonomy for public actors. Why should public actors voluntarily give up authority?

Public actors cannot necessarily be expected to be exclusively problem– or efficiency–oriented.[14] As argued by Schneider, Dang-Nguyen, and Werle (1994) public actors, such as the European Commission, should rather be understood as institutionally self-interested 'corporate actors' whose primary goal is to expand the scope of their competences. As argued by Cram (1994, p. 199), however, this does not necessarily mean that the European Commission was opposed to solving problems. Its quest to expand the scope of its competences, however, has a decisive influence on public actors' decision to intervene. To use the conceptual framework of Kingdon's (1995) agenda-setting theory discussed in Section 1.3.2 below, public actors can be expected to focus their limited capacities on the solving of those policy problems from the infinite number of policy problems that will allow it to pursue its own political interests as well. Therefore, public actors cannot necessarily be expected to intervene in private standardization processes for it might weaken their own autonomy.

Where public actors have already lost some of their autonomy and where they expect to regain it by cooperating with private standard-setters, however, they can be expected to intervene. In the case of European standardization, two situations are conceivable in which this may be the case—one is structural and the other is institutional.

First, public actors may decide to rely on private standard-setters where they find themselves increasingly constrained by structural changes such as the accelerating pace of technical change and economic internationalization, due to which they find themselves increasingly unable to provide the public goods and the social coordination to produce and implement collectively binding rules

[13] Also see the statement by Ex-Commission vice-president Verheugen cited above.

[14] Mayntz (2004, p. 71) has called the assumption that public actors were genuinely problem-oriented the 'functionalist fallacy'—translation by Börzel and Risse (2010, p. 117)—of governance research.

that they used to be able to provide. Since governments are still commonly expected to provide the same functions of governance that they used to be able to provide, however, governments are considered to have responded to this crisis of government by transforming rather than accepting a diminution of their role.[15]

The second situation in which public actors' may actively seek the involvement of private actors, such as private standard-setters, is that the public actors' institutional authority is constrained already and that the collaboration with private actors might help them to regain some of this authority. In the EU, for instance, the European Commission is an actor whose legal competences limited and its action are jealously controlled by the Member States' governments and the European Parliament (EP). Therefore, the European Commission may have more to gain than to lose by including private standard-setters. The collaboration with private standard-setters may allow it to form potent political alliances with private companies against its institutional rivals, the EP and the Council. Such alliances are at the core of neo-functionalist theories of European integration. They may allow the Commission to exert pressure on Member States to achieve certain policy objectives—be they functionally problem-oriented or institutionally self-interested—and to advance the integration process while expanding the Commission's policy competences, as, for instance, through functional spillovers etc. (see Schmitter, 1969, p. 162).

This explanation is supported by the recent literature, which suggests that in addition to direct political lobbying of national governments, the collaboration with private industry may provide public actors like the Commission with the information and technical expertise that they require to strengthen their position vis-à-vis both rival political institutions and opponents within their own organization (see Rhodes & Visser, 2011, p. 112). According to research by Coen and Richardson (2009), information—rather than campaign contributions, as appears to be the case in the US—therefore constitutes the main currency of power in European public policy-making. Its collaboration with—and inclusion of—of private standard-setters may provide the Commission with such information and an opportunity to win an advantage over its institutional rivals, the EP and the Council. This point will be returned to below.

Finally, public interventions to facilitate the private development of technical standards can also be expected to be resisted by public actors not directly involved in the public intervention. In pluralistic political systems, such as the EU, public interventions generally require the consent—or, at least, fall under the scrutiny—of third public actors. And where one public actors, such as the

[15] Braithwaite (2000), Braithwaite (2005), Eberlein and Grande (2005, p. 151), Knill and Lehmkuhl (2002, p. 42)

European Commission, intervenes in order to strengthen its position vis-à-vis its institutional rivals.

As suggested by Héritier and Rhodes (2011a, pp. 163, 173) and Greven (2005, p. 265) the inclusion of private actors in public decision-making processes tends to strengthen the role of executive actors, such as the European Commission, at the expense of legislative actors. The EP and Council have more to lose than to gain from the delegation of quasi-regulatory tasks to private standard-setters. They should be expected to prefer policy-making through conventional legislative processes rather than governance through private standard-setting. Therefore, the EP and the Council should be expected to seek to prevent attempts by the European Commission to make policy with and through private standardization.

1.3 Opportunities: Can Public Actors Overcome their Constraints?

This thesis suggest that whether and to what extent public actors are able to overcome the above-mentioned constraints depends on the policy instruments public actors choose to intervene in private standards-writing processes. This thesis distinguishes between two basic types of policy instruments. On the one hand there are conventional policy instruments that are based on:

- 'Hard law,' which according to Goldstein et al. (2000) is characterized by its high degree of obligation, precision and/or delegation;
- Institutionalized hierarchies of domination and subordination that constrain the autonomy of subordinate (private) actors (Börzel & Risse, 2010). The use of the term 'hierarchy' is based on Oliver Williamson's (1996) markets and hierarchy as alternative forms of economic organization;
- Command-and-control regulation (Baldwin, 1997, p. 65); or
- Incentive-based instruments that create pressures on industry to behave in socially desirable ways through the provision of positive and negative sanctions (Ogus, 1994, ch. 11; Breyer, 1982).

Their performance of these instruments to in the context of private standardization is analyzed in Section 1.3.1.

On the other hand, there are those policy instruments, which rely on:

- 'Soft' law, which according to Abbott and Snidal (2001) begins where legal arrangements are weakened along one or more dimensions of obligation, precision, and delegation;

- Non-hierarchical coordination based on voluntary commitment and compliance, such as benchmarking and peer review as in the Open Method of Coordination; and
- entrepreneurial instruments which seek to induce rather than to coerce actor participation, agreement and compliance (Rhodes & Visser, 2011, p. 133).

Whether and, if so, to what extent these new, non-hierarchical instruments circumvent the problems of conventional policy interventions is discussed in Subsection 1.3.2.

Both types of policy instruments, however, can be seen as part of a continuum of which conventional interventions based institutional hierarchies and on the power of hard law, on the one side, and non-hierarchical, entrepreneurial instruments, on the other, constitute the two extreme points. The above-mentioned *New Approach* would figure in the middle somewhere in between the two extremes. The following two Sections analyze the capacity of these two types of policy instruments to meet the governance challenges posed by technical standardization.

1.3.1 Hierarchical Intervention

Hierarchical,[16] command-and-control based instruments may be used to prompt industry to develop and comply with a given standard by means of positive or negative sanctions. These instruments, however, have undergone considerable criticism. Neoliberal critics have argued that such instruments were overly prescriptive and that such 'one-size-fits-all' regulation was too inflexible. Calls were made for the use of 'less-restrictive' or 'incentive-based' instruments. This line of reasoning can also be found in the standardization literature, which emphasizes the significant information problems faced by hierarchical policy interventions in private standard-setting processes. For they are more precise than entrepreneurial instruments, hierarchical policy instruments tend to require public actors to select one technology from a range of alternative technologies as the *de jure* standard. Public actors, however, are generally considered to lack the technical expertise and market information that is necessary to influence the outcome of private standardization processes, wherefore they are often described as 'blind giants' (David, 1990). Even where public entrepreneurs had this information and expertise, the economic standardization literature suggests, they would only have a 'narrow time window' to intervene before markets were

[16]The term 'hierarchical' will be used to describe all policy instruments that are based on institutional authority, hard law, coercion etc.

locked in and before their technical knowledge became obsolete (Auriol & Benaim, 2000; David, 1990).

Despite this critique, however, hierarchical policy instruments continue to play an important role in the academic literature as well as policy-making. Even proponents of 'softer,' non-hierarchical modes of governance maintain that these would only function and lead to desirable outcomes where they were backed up by hierarchical policy instruments. This assumption can be found in several literatures. In the regulation literature, for instance, Braithwaite (2002, p. 19) argues that "persuasion will normally only be more effective than punishment when the persuasion is backed up by punishment." In the principal-agent literature it is assumed that the stronger public principals' hierarchical control over their private agents, the less likely private industry is going to behave in an undesirable way[17]. Even in the early entrepreneurship literature, which will be discussed in the following Section, it is argued that the greater the initial grant of authority to the policy entrepreneur the stronger its influence will be (Sandholtz, 1993, p. 251).

And the shadow-of-hierarchy literature, in turn, suggests that industry would only engage in self– or co–regulation where it was faced with a credible threat of hierarchical policy interventions, which Schmitter and Streeck (1985, p. 131) describe as the 'the Damocles sword of threatened direct state intervention'.[18] Furthermore, it is maintained that the looming shadow of hierarchy was not only necessary to ensure the effectiveness of non-hierarchical policy instruments but also to ensure the democratic legitimacy of such new policy instruments that include and leave more discretion to private actors and which tend to bypass representative democratic policy-making processes (Börzel, 2007, p. 46; Héritier & Lehmkuhl, 2011, p. 70). Bellamy et al. (2011, p. 162) argue that as democratic legitimacy can only be provided through democratically elected governmental actors, therefore their looming presence was crucial to ensure their legitimacy. If something went wrong, they were there to defend the public interest with the full legal force of hierarchical policy instruments.

Therefore, skeptics of the effectiveness of non-hierarchical policy instruments suggest that if one scratched the surface of these new, non-hierarchical modes of governance, one is likely to find old, hierarchical modes underneath (Rhodes & Visser, 2011, p. 123). Where these underlying hierarchical instruments were ineffective or weak, as in the case of the Open Method of Coordination, they were

[17] Bendor, Glazer, and Hammond (2001), McCubbins and Schwartz (1984), McCubbins, Noll, and Weingast (1987), Pollack (1997), Rasmussen (2005), Thatcher and Stone Sweet (2002)

[18] Ayres and Braithwaite (1992, pp. 35-40), Braithwaite (2002, p. 19), Bercusson (1993), Börzel (2009), Héritier and Rhodes (2011b), Héritier and Lehmkuhl (2008), OECD (2003), OECD (1999b), Mayntz and Scharpf (1995)

likely to fail, it is argued.

The debate on the hierarchical policy interventions, however, has largely focused on the formal effectiveness of such interventions, neglecting—not only the actual compliance with but also—the political implications of such interventions. For their potential ineffectiveness alone, however, public actors should not expected to refrain from using such hierarchical policy instruments. Just as the functionalist explanations of the rise of private standard-setting in public policy-making, the functionalist critique of hierarchical policy instruments, too, neglects the politics involved.

Moreover, and despite the wide-spread assumption that private companies' main objective was to thwart hierarchical interventions.[19] Thus prefer co– or self–regulation—as, for instance, through industry standardization—as a lesser evil for it provides industry with a greater flexibility and influence over the definition of regulatory measures (Boddewyn, 1992), some companies may have a strong preference for command-and-control-based policy interventions.

Market insurgents, for instance, can be expected to have a strong interest in hierarchical, command-and-control-based interventions to either provide them with market access or to limit the dominant players ability to drive them out of the market (Buchanan & Tullock, 1975, see).[20] In the context of technical standardization, market insurgents can be expected to demand open—i.e. non-proprietary—standards that are made legally binding through secondary legislation in order to ensure their access to the market.

Therefore, this thesis' analysis of hierarchical policy interventions in private standardization processes places particular emphasis on the political consequences that such interventions may have. The first effect that the attempt to use hierarchical interventions should be expected to have is—though potentially unintended—that they draw further veto players and veto points into the standardization process, thus it undermines the facilitating exclusiveness of standard-setting communities. Instead of prompting industry to overcome its collective action and bargaining problems, it should therefore be expected to exacerbates decision-making problems rather than prompting industry to agree on and to adopt the desired standards. There are two reasons for this.

First, such interventions raise the stake of the game and therefore increase the number of potential veto players. Even companies that previously chose to remain rationally ignorant may start to participate. The increased number and heterogeneity of participants, however, increases bargaining costs and reduces the

[19] Bartolini (2011, p. 9), Héritier and Eckert (2008, p. 115), Héritier and Lehmkuhl (2011, p. 55)

[20] The liberalization of national utilities—i.e. telecoms, gas, electricity etc.—appears to provided many examples for this.

scope for a mutually acceptable agreement on common standards. Moreover, the raised stakes of the game make it more profitable for companies that have less to lose from hierarchical intervention and less to gain from standardization to hold out agreement against companies that have more to gain from self-regulation. The increased number and heterogeneity of participants, however, reduces the scope for a mutually acceptable agreement on common standards. Such hierarchical policy interventions thus appear to represent what Truman (1951) describes as a 'disturbance' to the established order. According to Truman's 'disturbance theory,' actors that are or expect to be adversely affected by such disturbances, start to organize and mobilize themselves to counteract the disturbance.[21]

Hierarchical interventions thus undermine the main facilitating factor of private standardization, namely its exclusivity. First, exclusivity resolves collective action problems by allowing standard-setters to recoup the cost of developing a common standard by shaping it in a way that is compatible with their technical and strategic preferences potentially at the expense of non-participating rivals—henceforth referred to as standard-takers.[22] Secondly, the exclusivity facilitates collective decision-making. Where the number and heterogeneity of rule-makers is reduced, there is a larger scope for mutually acceptable agreements on common self-regulatory measures. Moreover, collective decision-making in small and homogeneous groups firms, which M. E. Porter (1979, p. 215) defines as 'strategic groups', tends to be facilitated by the fact that firms are more likely to realize their mutual dependence and replace strategic bargaining with more deliberative forms of interaction, such as learning and collective problem-solving.

The exclusivity of private standardization processes generally results from two factors. First, standard-setters may actively try to exclude rival companies, as discussed below. Secondly the exclusivity of private standardization processes often results from the fact that individual companies may deliberately choose not to participate in the definition of self-regulatory measures, such as technical standards. Some companies may not have the financial means and technical expertise that is required to participate and to influence the standards-definition process (Schepel & Falke, 2000). Other groups of actors and interests, such as consumers (Foray, 1994; Link, 1983), may not be able to overcome their collective action problems. Others may choose not to participate out of rational ignorance (Quelin, Abdessemed, Bonardi, & Durand, 2001, p. 7). They may speculate that the process will either not succeed or that the potential cost of eventually having to adapt to the adopted standards will not exceed the cost of participating in the

[21] Such disturbance thus fulfill the same functions that industry crisis fulfill for public entrepreneurship discussed in Section 1.3.2 below.

[22] Austin and Milner (2001, p. 412), Axelrod, Mitchell, Thomas, Bennett, and Bruderer (1995)

process to shape the measures according to their own preferences. The possibility to free-ride on the standardization work of others is considered to provide another reason why companies may deliberately choose not to participate in the standardization process (Weiss & Toyofuku, 1996). Again this does is not particularly uncommon in the world of self-regulation. As suggested by Bartolini (2011), participation in governance arrangements is by definition voluntary. "Opting out is always possible, provided one is willing to bear the costs" (Bartolini, 2011). Where, as the result of hierarchical interventions, the rationally ignorant free-riders realize the potential implications of such arrangements, however, they should be expected to participate.

Secondly, hierarchical interventions tend to open up new avenues of appeal to the opponents of the given standard at stake or standardization in general. This results from the fact that in pluralist political systems, the use of hierarchical instruments generally requires the consent of—or is at least subjected to the scrutiny of—other public actors, such as parliaments and courts. These institutions provide opponents of a specific standard or standardization in general with effective veto points. Abbott and Snidal (2001, p. 349) suggest that companies expecting a given standard to have an adverse effect on their business can be expected to appeal to governmental actors, possibly using normative arguments, to prevent the adoption—or at least the hierarchical endorsement—of that standard.

These avenues of appeal can also be expected to open up where non-hierarchical interventions are backed by a shadow of hierarchy. Particularly where public institutions have retained a large degree of hierarchical authority or formal instruments of public control over the performance of private standard-setters, appealing to different public actors to use these instruments to prevent the adoption of a given technical standard or other self-regulatory measures. This is directly opposed to the hypothesis by Héritier and Eckert (2008, p. 117) that the more rigorous the instruments of control over the self-regulator's performance, the better the latter's performance would be.

And the more credible the shadow of hierarchy and thus the greater companies expectations that the threatened intervention will increase the chances that they may eventually have to comply with the given self-regulatory measures, the more companies will actively push into the definition process in order to make sure that the resulting measures are in line with their preferences. As suggested by the shadow-of-hierarchy literature itself, companies can therefore be expected to overcome their collective action problems and start to participate.[23]

[23] Börzel (2007, p. 6), Héritier and Lehmkuhl (2011, p. 55), Mayntz and Scharpf (1995, pp. 21-23)

1.3.2 Entrepreneurial Intervention

This raises the question whether alternative policy instruments that do not rely on the wielding of hard law and hierarchical authority may have any influence on technical standardization processes without exposing private standardization processes to political contestation. Instruments that do not rely on the power of hard law or material sanctions are commonly described as soft, non-hierarchical or entrepreneurial instruments,[24] such as agenda-setting and consensus building or conflict mediation. Agenda-setting is defined the discovery of unfulfilled needs and the suggestion of innovative means to satisfy them (Mintrom & Vergari, 1996, p. 422; Kingdon, 1984). It involves the mobilization and coordination of collective action and the framing of issues in ways influences actors perception of problems and potential solutions and thereby focuses them on specific goals.[25] And once an issue has been placed on the decision-makers' agenda, entrepreneurial policy interventions may facilitate the decision-making process by promoting consensus-building and/or mediating potential decision-making conflicts. By providing focal points around which actors preferences can converge (see Garrett & Weingast, 1993), for instance, entrepreneurs may be able to promote consensus building or to mediate decision-making conflicts. What both agenda-setting and consensus-building or conflict mediating instruments have in common is that they do not rely on the power of hard law or institutional authority, i.e. hierarchy.

Unlike these hierarchical instruments, the use of entrepreneurial policy instruments should *not* be expected to increase the number of veto players and veto points. *Only* small and homogeneous groups of immediately concerned companies of actors that share a common interest in standardization tend to respond to agenda-setting. Furthermore, entrepreneurial policy instruments, unlike conventional, hierarchical instruments, do not raise the stakes of the game for the participants and non-participants—i.e. rule-makers and rule-takers. If they notice entrepreneurial intervention at all, potentially affected but non-participating companies are unlikely to expect these interventions to have a decisive impact on the standardization process. Therefore, they can remain rationally ignorant and continue to speculate that the standardization process might still fail or that the eventual adaptation costs will not exceed the cost of participating and shaping the content of the resulting standard.

Entrepreneurial interventions should not be expected to increase the number of veto points either. Unlike hierarchical instruments, they do not require the

[24] This thesis will henceforth use the term 'entrepreneurial' to circumscribe all of this types of instruments

[25] Haas (1992) suggests that if actors arrive at a common definition of the problem and its underlying causes, they are more likely to solve it collaboratively.

active participation, of other political institutions, which could scrutinize policy entrepreneurs and hold them accountable for their actions. And for they are generally too vague, inaccessible and opaque, entrepreneurial instruments tend not to fall under the scrutiny of other political institutions such as parliaments and the courts (Cini, 2001, p. 194). Therefore, potential veto players would find it difficult to appeal to such veto points against the use of entrepreneurial instruments. For better or worse, entrepreneurial policy instruments therefore minimize the number of rule-makers and maximize the number of rule-takers. The adoption of and compliance with the resulting standard tends to be self-enforcing, where network and scale economies are present.

Moreover, public entrepreneurs may actively help private standardization alliances to defend their insulation from broader participation. To resolve their collective action and decision-making problems standard-setters may seek to actively exclude of rival companies (Werle, 2001, see). The literature on policy monopolies (Baumgartner & Jones, 1993), policy whirlpools (Griffith, 1939), sub-systems (Cater, 1964), iron triangles (Freeman, 1955) and issue networks, to unitary advocacy coalitions (Sabatier, 1988) etc,[26] which is one of the oldest literatures in the discipline of political science, suggests that all these exclusive groups of rule-makers have two things in common. First, a powerful supporting idea or narrative that justifies this system of limited participation; and secondly, a definable institutional structure that limits participation and interference by broader political forces. Public entrepreneurs may be able to help private standard-setters to achieve both.

Entrepreneurs may push the standardization process into standardization venues whose voting or cost structure excludes or weakens potential veto players. Moreover, public actors can be expected to be in a comparatively better position to frame such a policy narrative defending the limited participation than private companies, for they are generally recognized as more legitimate because of their special ability to invoke democratic rhetoric and symbols (Baumgartner & Jones, 1993).[27] Best ideas are such that can be linked to widely accepted core political objectives that can be easily communicated such as technological progress, productivity, growth, competitiveness, employment, security—i.e. ideas that are hard to contest. Moreover, entrepreneurs may emphasize the 'technical' nature of the standardization process and even the possibility of technological progress that the process may provide to justify the limited stakeholder participation (see Radaelli, 1999, p. 759; Mansell & Hawkins, 1992, p. 46).

[26] In the context of technical standardization, this thesis will speak of 'standardization monopolies.'

[27] This form of strategic framing distinguishes itself from the framing mentioned in the context of coalition building in the sense that it is targeted as the coalition outsiders rather than insiders

> Technically complex issues such as nuclear power can be discussed either in terms of their scientific and engineering details, or in terms of their social impacts. When they are portrayed as technical problems rather than as social questions, experts can dominate the decision-making process. When the ethical, social, or political implications of such policies assume center stage, a much broader range of participants can suddenly become involved (Baumgartner, 1989). Where a positive image dominates, specialists have strong arguments for demanding that political leaders grant them the autonomy and the resources necessary to get on with their work.
>
> (Baumgartner & Jones, 1991, p. 1047)

Thereby public entrepreneurs can help shield the standardization monopoly off from broader participation. This discourages the involvement of political/legislative institutions and thus potential veto points. If everybody wins and nobody loses from the standardization process, it may seem unnecessary to legislative institutions to subject it to democratic scrutiny. Mansell and Hawkins (1992) suggest that there is usually a conscious strategy involved in presenting standardization as a technical process. Technical decisions "tend to acquire a measure of detachment" from rival interests and political contestation (Mansell & Hawkins, 1992, p. 46). While most standardization issues—no matter how 'technical' they may be—tend to have some normative and (re)distributive implications, they can be strategically framed otherwise. In contrast to normative and redistributive issues, technical issues cannot make anyone worse off. This may be used justify the limitation of broader stakeholder participation (see Radaelli, 1999, p. 759).

Thereby, entrepreneurs may insulate standardization from political contestation. As a result, individual standards-setters will be more willing to provide the technical expertise and financial muscle that is necessary to develop the desired standards. The limited number and heterogeneity of participants, will also increase the chances that standard-setters will find a mutually acceptable agreement on a single common standard.[28] While such interventions may facilitate the private development of technical standards, however, this raises serious concerns about the democratic legitimacy of such interventions and private standardization processes in general, as discussed in Section 1.3.2.

[28]Similarly, entrepreneurs may be able to exert pressure on private standard-setters by threatening to expose them to political contestation. Instead of depoliticizing the standardization process and keeping its salience low, the Commission, for instance, may alert the European Parliament and Council and actively push the process into the political debate. While the Commission may use this threat—or 'shadow of politicization'—to convince private standard-setters to develop the standards it desires, however, the enactment of this threat is likely to backfire. The Commission should be expected to lose control of the process and industry is unlikely to produce the desired standard.

Information Problems

A common critique of entrepreneurship theory is that it was based on the unrealistic assumption that entrepreneurs hold an informational advantage over the actors they seek to influence (see Moravcsik, 1999, p. 272). In the context of technical standard-setting, this critique appears to pose a particularly serious challenge. As mentioned above, the technical expertise and knowledge of the relevant market information of private companies is considered to be vastly superior to that of public actors (David, 1985, 1990). While companies have a market incentive to continuously monitor technological developments and market trends (Abbott & Snidal, 2001, pp. 355–356), public actors rarely have the time, skills or resources to keep pace with such developments.

Proponents of entrepreneurship theory, however, have suggested in response to this criticism that the idea of informational asymmetry or advantage is to be rejected. Kingdon (1995), for instance, bases his agenda-setting theory on the "garbage-can model" of decision-making, as developed by Cohen, March and Olsen (1972), in which actors' preferences are loosely defined, information is incomplete, and actor participation in decision-making venues varies over time and across issue-area instead. Hence, both the entrepreneurs as well as the actors whose agenda entrepreneurs seeks to influence are faced with imperfect information and bounded rationality. Their attention to governance problems can therefore be assumed to be scarce, while governance problems are in abundant supply (Mintrom & Vergari, 1996, p. 422; Kingdon, 1984). In these circumstances, policy entrepreneurs should be able to exert a significant influence over policy-makers by simply mixing and matching governance problems, solutions and actor-coalitions that emerge independently from each other (Zahariadis, 2007; Kingdon, 1995). In the context of technical standardization specifically, public entrepreneurs should be able to shape the private standardization processes by:

1. Identifying standardization deficits and opportunities;
2. Framing these in a way that suggests collaborative solutions;[29] and
3. Prosing these solutions to groups of companies that have the financial means and technical expertise necessary to seize these opportunities.

A direct implication of the mixing-and-matching framework is that the entrepreneurs do not necessarily need to come up with new ideas—i.e. standardization opportunities—themselves. Ideas only need to be new in the given context. Therefore, they may be able to import such ideas from different contexts. This

[29]Haas (1992) suggests that if actors arrive at a common definition of the problem and its underlying causes, they are more likely to solve it collaboratively.

constitutes a direct parallel to the business entrepreneur, upon which the concept of the policy entrepreneur is based. According to Schumpeter (1939, p. 102), the father of modern entrepreneurial thought, the function of an entrepreneur is the combination of preexisting factors of production in a way that either lets companies' produce a new product or an existing product more efficiently. Therefore, entrepreneurial interventions also should not be expected to suffer from the same information problems as hierarchical interventions for they can rely on the allegedly superior information and expertise of private standard-setters.

While the mixing-and-matching framework suggests that entrepreneurs do not need to command over 'perfect information,' however, it also reveals the weaknesses of entrepreneurial policy instruments. Entrepreneurial interventions are unlikely to work where actors' preferences are already clearly defined. In lack of coercive powers, entrepreneurial policy instruments are unlikely to prompt actors to do what they would not do otherwise. Entrepreneurial instruments only work where actors are still in the process of defining or redefining their preferences. Therefore, a number of conditions need to be met for entrepreneurial interventions in private standard-setting processes to have an effect.

Necessary Conditions for Entrepreneurial Interventions

While entrepreneurial policy instruments do not tend to expose technical standardization processes to political contestation, they lack the power of hierarchy or hard law. To have an effect, they therefore depend on a number of necessary conditions.

Timing of entrepreneurial interventions The Commission's ability to influence behavior and shape outcome through entrepreneurial actions is recognize to be the largest during the initial stages of the public policy-making process (Héritier, 1996, p. 150; Nugent, 1997; Sandholtz, 1992). This can also be expected to be the case for private standardization processes. It is a direct implication of these potential information problems and the assumption of imperfect information is that entrepreneurship can only work where companies' preference are still not clearly defined.

This is likely to be the case during the early stages of life cycle of the technology that is to be standardized. At this point, there may still be relative uncertainty about the commercial implications of standardization and companies may not have made any significant pre-investments in different development paths (see Schmidt & Werle, 1998, p. 105). Therefore, the potential for decision-making problems is rather low, while collective action problems, as argued above, can

be expected to be relatively severe. However, entrepreneurial policy instruments are more apt to mitigate collective action than decision-making problems. 'Agenda-setting,' as the name suggests, is directly targeted at the initiation of decision-making processes by placing issues on decision-makers' agenda rather than influencing the outcome of the subsequent decision-making process itself. Even the entrepreneurial provision of focal points to mitigate decision-making problems only has an effect where the decision makers' preferences are still relatively loosely defined. Therefore, the scope for public entrepreneurship decreases as the given technology matures.

Entrepreneurial instruments may mitigate modest conflicts of interest. At best, entrepreneurship may still play a role where decision-making problem are as pronounced as decision-making problems, i.e where decision-making-problems and collective-action-problems lines intersect. Admittedly, however, this is a rather optimistic guess. In reality the scope for entrepreneurship may be lower than that. Once companies have started to deploy different technologies, however, it can be expected that there is no scope for entrepreneurship.

After companies have already made significant pre-investments in the development of diverging technological solutions and where the commercial implications of a given technology have already become visible there is little scope for entrepreneurial interventions. Each firm will seek to promote their own proprietary standard. They will not accept a competitors technology as the new standard if this would have an adverse effect on their business. In this situation, there is little that public entrepreneurs can do to persuade companies to potentially give up their preferred technology and adopt another firm's technology as the common standard instead. Therefore, early intervention constitutes the second necessary condition for public entrepreneurship in technical standardization to succeed.

While entrepreneurial interventions need to take place during the early stages of the standardization process, they may also have a significant effect the later stages of the process. Early entrepreneurial interventions may allow groups of companies, such as the above-described standardization monopolies, to agree to common standard much sooner than rival standard-setters. The mediating and coordinating role of an entrepreneur may also prompt a more large-scale and concerted implementation of the given standard. Therefore, the standard is much more likely to achieve a critical mass of consumers with the help of network effects and scale economies before other standards. Once this critical mass is achieved, compliance with the standard enforces itself.

Industry Crisis According to the literature (Fligstein, 2001; Sandholtz, 1992), another necessary condition for policy entrepreneurship is the presence of an

acute sense of crisis.[30] Given the existing institutional organization of the EU and given Member States' existing preferences, for instance, Fligstein (2001) suggests it was not possible to explain the adoption of the single market program and monetary union. Only the presence of acute political crisis—traditional Keynsian and social democratic strategies were failing to produce economic growth stagflation and furthermore the United Kingdom (UK) was threatening to pull out of the EU—Fligstein argues could explain this radical policy change. It allowed the European Commission to frame the notion of the single market program as a project and to build a coalition to support this program. Similarly, industry crisis can also be expected to constitute a necessary condition for public entrepreneurship in private standardization.

The presence of industry crisis implies that the incumbent companies are forced to reconsider the way they do business because their old strategies no longer work. They are beginning to lose out or are no longer benefiting from the existing institutional arrangements that govern the market (Fligstein, 2001, pp. 264–264). In these circumstances, companies can be expected to be particularly receptive to public entrepreneurship (Sandholtz, 1992).[31] Companies preferences are in fluid. While they are in the process of redefining their preferences, entrepreneurs can step in and re-frame companies' conceptions of their interests and create new coalitions, institutions and arrangements that previously may have seemed impossible (Steinmo, Thelen, & Longstreth, 1992).

Positive Feedback Mechanisms As entrepreneurs cannot rely on hierarchical instruments to enforce compliance with the given standards, they depend on some form of positive feedback mechanisms to compliance self-enforced. Network effects constitute one example of such positive feedback mechanisms. These demand side economies of scale are considered to be present where "the utility that a user derives from the consumption of the good increases with the number of other agents consuming the good" (Katz & Shapiro, 1985a). Telephone networks provide a particularly instructive example for this. The larger the number of users that have subscribed to the network, the larger the number of users that they can call. Once a critical mass has been achieved, network effects lead actors that have been excluded from the definition of the standard as well as actors that might have even preferred an alternative technology as the basis of the standard to comply with it. No individual producer or user would have an incentive to

[30] Analytically, a 'crises' is different from the above-mentioned 'problems.' They demarcate distinct events and turning-points rather than persistent difficulties.

[31] Fligstein and Sandholtz focus on the influence of crisis and the potential for entrepreneurship in an intergovernmental context. What applies to public actors, however, also seems to apply to private companies.

switch to another standard, even if it was technically or economically superior. As there is no guarantee that others will switch as well, switching is a very risky strategy for individual actors (Farrell & Saloner, 1985a). Therefore, compliance tends to be self-enforced in the presence of network effects. Network effects are not uncommon in the world of technical standardization, especially in the growing ICT sector, where different systems need to interoperate.

The presence of such positive feedback mechanisms may appear like a rather tough condition. At a closer look, however, it becomes clear that such positive feedback mechanisms are quite common, not only in the world of technical standardization but also in politics, business and society in general. According to Baumgartner and Jones (2002, p. 21), positive feedback mechanisms operate wherever actors' decisions are directly affected by the decisions previously taken by other actors around them. This often appears to be the case. Another example for positive feedback mechanisms are economies of scale, which often accompany and reinforce network effects. The more products a firm company, the higher its returns to scale, the lower it can decrease sales prices, the higher demand for its products and so forth. There is hardly any market, which does not exhibit such increasing returns to scale. Similarly, learning effects may provide first movers with an irrevocable advantage over their competitors (see Milner & Yoffie, 1989).

Legitimacy Problems

While entrepreneurial interventions may facilitate the private development of technical standards, without exposing technical standardization processes to political contestation, the fact that this is achieved by reinforcing the exclusiveness of private standardization processes raises serious concerns about the democratic legitimacy of such interventions. These concerns are increased by the quasi-legislative status of many standards as well as the intrusive impact that technical standards tend to have on our lives. This raises the question whether such exclusive circles of private actors can be trusted with the development of technical standards or whether technical standardization processes should not be made more open and transport. Already Adam Smith suspected that:

> People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices.
>
> (Smith, 1776, Book One, Chapter X, part II)

Any attempt to increase the inclusiveness and accessibility, however, is likely to increase the above-mentioned collective action and decision-making problems (also see Werle & Iversin, 2006, pp. 31-32), creating a trade-off between effective-

ness (output legitimacy) and democratic accountability and transparency of of private standard-setting processes (input legitimacy). As suggested by Kerwer, this dilemma between output and input legitimacy, is not specific to technical standardization.

> Global governance institutions have come under increasing pressure to become more democratic because global regulation has become wider in scope and more intrusive. However, if they abolish the club model a larger and more heterogeneous membership is likely to lead to decision-making deadlocks. Thus, increasing input legitimacy is likely to reduce output legitimacy—and vice versa. A good case in point are the difficulties of the WTO, which now sports over 150 member states and has great difficulties in concluding the present Doha round.
>
> (Kerwer, 2010, p. 4)

Also many other new modes of governance appear to be faced with this dilemma. While several contributors to the governance literature acknowledge the crucial role of exclusivity (Eberlein & Grande, 2005, p. 164; also see Héritier & Lehmkuhl, 2011, p. 68),[32] only few authors have put their finger on the fact that the enhanced problem-solving capacity and effectiveness of these new modes of governance has come at the price of transparency, accountability and thus democratic legitimacy.[33] With the example of technical standardization, this thesis seeks to contribute to the debate about the democratic legitimacy of what Kerwer calls the 'club model' of governance.This thesis investigates whether and to what extent this legitimacy dilemma is or could be overcome.

1.4 Methodology

The thesis' research question—*In what circumstances, if any, are public actors able—and willing—to intervene and foster the private development of technical standards?*—lends itself to a qualitative research approach. It is concerned with the conditions under which public interventions have a given effect, rather than the probability that public actors are willing and able to promote the private development technical standards.[34] Qualitative methods—especially process-tracing—are generally considered to be particularly well suited for the study complex social processes, such as technical standardization, which take place over long periods of time and which tends to be influenced by a large number of factors. Quantitative methods,

[32] Eberlein and Grande (2005, p. 164), for instance, suggest that "access to informal decision-making bodies is necessarily selective and not subject to any classical democratic control."

[33] see Bellamy, Castiglione, Follesdal, and Weale (2011), Greven (2005, p. 264)

[34] This thesis's primary objective is thus one of theory building rather then testing. It is meant to develop and refine the hypotheses formulated above, to investigate potential interactions, to check for spuriousness and to identify potential alternative hypotheses.

by contrast, tend to bias theory away from processes and toward structures, which may be important but rarely explain the variation that takes place within them (Odell, 2001; George & Bennett, 2005).[35]

A further reason for the choice of this process oriented analysis is that it allows to take account of the common methodological critique of studies on policy entrepreneurship. With regards to the entrepreneurial influence of the European Commission on intergovernmental bargaining, for instance, Schmidt (1996; 2000, p. 40) points out that the entrepreneur's action may only appear to influence the behavior of Member States' governments, while the observed behavior rather resulted from the fact that it was in the actors' interest to behave the way they did and that they would have therefore acted in the exact same way in the absence of entrepreneurial leadership.[36] This critique identifies the crucial methodological problem of measuring the distinct influence of policy entrepreneurship. This could also be a problem in the case of public entrepreneurship in private standardization. Process tracing, however, makes it possible to analyze whether or not entrepreneurship has played a distinct role. By tracing the behavior and interests of private standard-setters over time and especially by comparing their behavior and interests before and after entrepreneurial interventions makes it possible to analyze whether and if so to what extent they responded to the entrepreneurial interventions or whether other causal mechanisms drive their behavior.

This thesis is therefore based on four qualitative, in-depth case studies, which were selected based on the presence of some Commission activity in private standardization. These case studies include European standardization in mobile telecoms, high-definition television (HDTV), intermodal transport and digital video broadcasting standardization (see Table 1.1).[37]

[35] Because of the fact that every case study consists of more than just one empirical observation, as is often assumed by quantitatively inclined researchers such as King, Keohane, and Verba (1994), qualitative research allows for the simultaneous investigation of multiple hypothesis with a limited number of cases. As pointed out by George and Bennett (2005), there tend to be a countless number of potential observations the hypothesized causal path between the independent and dependent variables. Each observation on that path provides a test of that hypothesis. Therefore, the small-n research provides a much larger 'degrees of freedom' than it is commonly criticized (King et al., 1994). The higher the degrees of freedom, which are determined by subtracting the number of cases with the number of independent variables, the lower levels of explained variance are necessary to conclude with some confidence that the studied relationship is unlikely to have been brought about by chance.

[36] Often, as in Moravcsik (1999), this critique is based on a misunderstanding. To some extent entrepreneurs change agents' behavior by chancing the way they define their interests. To argue that the observed change in behavior should not be attributed to entrepreneurial interventions because it was in the agents interest to change their behavior would thus miss the point of the entrepreneurship hypothesis.

[37] As mentioned above, this thesis is exclusively concerned with technical interoperability standards. Reference and quality standards are therefore excluded from the case selection.

Table 1.1: Case Selection

Independent variable	Mobile Telecoms	HDTV	Intermodal Transport	Digital Broadcast.
Hierarchical intervention		✓[1]	✓	✓[2]
Entrepreneurial intervention	✓	✓[1]		
Non-intervention				✓[2]
Early intervention	✓	✓		
Industry crisis	✓	✓	✓	✓
Network effects	✓	✓	✓	✓

[1] This case study is subdivided into two phases. During the first phase entrepreneurial policy instruments were used and during the second phase hierarchical instruments were used.
[2] This case study, too, is subdivided into two phases. While there was no public intervention in the first phase, there was a hierarchical intervention—in the form of a shadow of hierarchy—in the second phase.

Mobile Telecoms The Commission relied exclusively on entrepreneurial policy instruments. It sought to act as an agenda-setter and tried to mediate decision-making conflicts and to coordinate the introduction of common standards. What makes this a rather interesting case is that the Commission's entrepreneurial intervention took place in rather unfavorable circumstances. Because of the complexity of the technology in question, the strong resistance from national policy makers and national monopoly operators, and the requirement to bring together a heterogeneous set of actors, mobile telecoms standardization can, *a priori*, be considered to represent a least likely case. If the Commission managed to play an entrepreneurial role nonetheless, however, it may be concluded that policy entrepreneurship should also have an effect in less unfavorable circumstances.

Moreover, this case study allows for a cross-case comparison with the case of HDTV standardization, as elaborated below, and it provides an opportunity for within-case comparison. The analysis covers two decades and two generations of technology. This allows for an investigation of the Commission's entrepreneurial interventions in markedly different economic and political circumstances.

High-Definition Television This case is divided into two phases. In the first phase of the standardization process, the Commission relied on entrepreneurial policy instruments. When it came to the deployment of its preferred standard, however, it took recourse to hierarchical policy instruments. First, the within-case comparison between these two different interventions at the two different stages of the standardization process offers an opportunity to investigate the

Table 1.2: Comparative Framework

	Mobile Telecoms	Intermodal Transport	HDTV
Mobile Telecoms	-	-	Most similar[1]
HDTV	Most similar[1]	Most different[1]	-
Digital Broadcast.	Most similar[2]	Most different[3]	Most similar[2]

[1] Only with regards to the second phase of this case study.
[2] Only with regards to the first phase where private standardization took place in the absence of public interventions.
[3] Concerning the second phase where private hierarchical policy instruments were used.

relative causal strength of hierarchical and entrepreneurial policy instruments in rather similar circumstances. This may provide an answer to the questions whether hierarchical interventions do lead to political contestation despite the initial use of entrepreneurial policy instruments or whether the causal effect of entrepreneurial policy instruments is stronger and standardization succeeds despite the hierarchical intervention.

Secondly, the fact that the Commission's interventions in the second phase of the HDTV standardization process and the first phase of the mobile telecoms case took place in rather similar circumstances, also provides an excellent opportunity for cross-case comparison. If the outcomes of the two cases diverged, more causal significance might be attributed to the different ways the Commission intervened in the two cases. As the circumstances in which the Commission intervened in the two cases cannot be expected to be completely identical, however, the cross-case comparison is complemented with within-case comparison, i.e. process tracing. By tracing the causal process from the independent variables of interest to the dependent variable, George and Bennett (2005, p. 241) suggest, it may be possible to control for potentially interfering variables that differ across the two cases. Therefore, Collier (1993) argues that "within-case comparisons are critical to the viability of small-n analysis."

Digital Video Broadcasting In contrast to the other three cases the Commission did not seek to intervene in the standardization process. Only upon the pressure of the EP, the Commission eventually accepted the formulation of a threat to intervene if industry did not develop and adopt the desired standards. This case study thus, too, is organized in two phases. The first phase provides an opportunity to investigate the conditions under which and the extent to which private standard-setters are able to produce technical standards in the absence

of direct public intervention. This may thus also provide an indication in which circumstances and to what extent public actors may be able to facilitate the private development of technical standards. If it turned out that private standard-setters were very well able to develop the desired standards by themselves, facilitating public interventions would be superfluous.

A priori, the conditions surrounding the standardization processes can be considered to have been rather favorable. The gains from standardization were comparatively large and broadly spread and the responsible standards-writing organization is widely considered to be one of the most progressive of its kind. If it turned out that private standard-setters were not able to develop the desired standards even under these favorable conditions, the private development of technical standards can also be expected to fail in less favorable circumstances.

Secondly, the digital video broadcasting case study investigates the operation and effect of the shadow of hierarchy in circumstances that were markedly different to the intermodal transport case. In contrast to the low-tech intermodal transport case, for instance, this case provides an opportunity to analyze whether and to what extent the high-tech nature of digital television standardization allowed standard-setters to shield their exclusiveness behind technical arguments and thereby undermined political contestation.

Intermodal Transport In contrast to the previous three case studies, which all deal with technical standardization in high-tech industries, this case study is concerned with low-tech standardization, namely the standardization of freight containers. This provides an opportunity to investigate the extent to which the technical complexity—or rather the lack thereof—influences the standard-setters ability to shield their interests behind technical arguments and to prevent political contestation.

The Commission's intervention in this case was based on the *New Approach*, which it backed up with the threat—i.e. shadow of hierarchy—to enact positive and negative sanctions if industry did not develop and adopt the standards desired by the Commission. According to the theoretical predictions formulated above, the Commission's intervention should have led to the political contestation and failure of the standardization process. This case study investigates to what extent this was the case.

Table 1.2 summarizes this thesis' comparative framework.

The remainder of this thesis is organized as follows. Chapters 2–5 present the findings of the four case studies and are followed by a concluding Chapter 6 which summarizes the main results and elaborates the broader contributions of

this study. Given the technical nature of the topic the Appendix also includes a detailed glossary, elaborating the main concepts and terms.

Chapter 2

Mobile Telecoms

The case of European mobile telecoms standardization offers an excellent opportunity to investigate the impact and effectiveness of entrepreneurial policy interventions on private standardization processes. The European Commission relied exclusively on entrepreneurial policy instruments. Therefore, this case study provides an opportunity to study the role public entrepreneurship in isolation from other, harder policy interventions. The case study of HDTV standardization (see Chapter 3) will compare—and investigate potential interactions between—entrepreneurial and hierarchical policy interventions in the same case study. This case study, however, will focus exclusively on policy entrepreneurship.

Moreover, this case allows for an analysis of entrepreneurial interventions and their effects over a period of more than two decades. This long time frame is crucial for the operationalization of the process tracing methodology, mentioned in the introductory Chapter (1).

This Chapter is divided into two main parts, each analyzing the Commission's entrepreneurial role during the standardization that took place during a different generation of technology. Section 2.1 investigates the extent to which the Commission's entrepreneurship influenced the development of second generation mobile telecoms standardization. Section 2.2 analyzes the entrepreneurial impact on third generation standardization respectively. Both Section are subdivided into the two main stages and functions of public entrepreneurship. First, both sections analyze whether and, if so, to what extent the European Commission was able to set the agenda of private standard setters. Secondly, both sections investigate the Commission's entrepreneurial ability to mediate conflicts of interests and to ensure industry commitment with the resulting standard.

During each generation of technology, the European Commission intervened in markedly different circumstances. This allows for within-case comparisons, which may provide opportunities to identify or to reject potential necessary condition for public entrepreneurship.

Moreover, mobile telecoms standardization constitutes a rather interesting case because, *a priori*, public entrepreneurship should be considered to be rather unlikely to succeed during either of the two technological generations, albeit for slightly different reasons, discussed at the beginnings of Sections 2.1 and 2.2. This may allow for the formulation of a number of contingent generalizations. If public entrepreneurship had a facilitating effect on the private development of technical standards, despite these unfavorable circumstances, public entrepreneurship may be expected in more favorable circumstances.

2.1 GSM: An Unlikely Case

As suggested above, the circumstances in which the Commission intervened into second-generation mobile telecoms standardization, can be considered rather unfavorable.

1. Telecoms policy was—and to some extent still—is jealously guarded by national governments and their PTTs (Postal, Telegraph and Telephone administrations), leaving little space for supranational interventions. When the Commission first intervened in the late 1970s, it had almost no policy competences in the field of telecoms. Even today many parts of the telecoms sector remain rather resistant to European integration.

2. The potential standard-setters did not seem to have had any incentive to collaborate on the development of common European standards. Telecoms in Europe was compartmentalized into separate national markets, each dominated by one monopoly operator and one or, at most, two equipment manufacturers per market. To shelter their national markets from international competition, companies' were accustomed to develop distinctly different standards than their international neighbors. For that reason, both fixed as well as first-generation mobile telecoms standards were both developed at the national level and designed to be incompatible. By developing or adopting European standards, national companies only expected to expose themselves to international competition.

3. The collaborative development of common European standards required a heterogeneous set of actors and interests to collaborate. The interests at stake did not only diverge across countries but also across industrial sub-sectors. And the rapid technological change of the telecoms industry increased the number and heterogeneity of directly concerned actors even further. The gradual convergence of conventional telecoms and information

technologies (IT) led to the creation of new companies and the confrontation of existing companies from different sectors.

This Chapter explores to what extent the Commission was able to assume the role of the policy entrepreneur and influence European standardization processes nonetheless.

The analysis of this Section is organized in two sub-sections. Each investigates one of the key functions of the policy entrepreneur. Section 2.1.1 focuses on the Commission's agenda-setting role. Section 2.1.2 investigates to what extent the Commission was able to mediate the decision-making conflicts that emerged during the standardization process.

2.1.1 Agenda-Setting

As argued in the introductory Chapter (1) agenda-setting is the most important function that a policy entrepreneur can provide. This section analyzes whether and to what extent the European Commission was able to set the agenda of private standard-setters by (1.) identifying a policy problem; (2.) matching this problem with a potential policy solution; and (3.) identifying and mobilizing an actor-coalition that would be willing and able to solve the policy problem as suggested by the entrepreneur (see Zahariadis, 2007; Kingdon, 1995).

Identification of a standardization problem

The identification of the policy/standardization problem goes back to the late 1970s. The European Commission had grown increasingly worried about the competitiveness of Europe's IT and telecoms industry. While the European IT industry already seemed to have been overtaken by their American competitors, it was feared that the telecoms industry was going to follow next.

At the same time, it was expected that if the industry fell into crisis Member States would rather respond by shielding national telecoms markets off from international competition rather than opening them to European market integration. Therefore, the Commission sought to gain a role in industrial policy, which had not been a Commission competences. As a first step, Etienne Davignon—Commissioner for Directorate-General (DG) Internal Market (III)—set up the Information Technologies Task Force (ITTF), a group of technical experts with industry experience, under his personal control (Peterson & Sharp, 1998, p. 169).

Davignon and his team were strongly influenced by the emerging New Trade Theory, which was just being developed by (Krugman, 1979, 1980) during the late 1970s, and which goes back to the work of Balassa (1967), Kravis (1971) and

Grubel and Lloyd (1975). It had a significant influence on their perception the problem of and solution to Europe's competitiveness.

In contrast to neoclassical trade theory, New Trade Theory suggested that international patterns of trade—and thus within that the competitive position of individual countries—was mainly determined by increasing returns to scale, rather than natural resource endowments. This was understood to implied an active role for governmental actors. By helping domestic industries to exploit sufficient economies of scale at home, they may be able to win increasing market shares abroad (Krugman, 1986, p. 9). While New Trade Theory was later criticized by Bhagwati (1994) and others for its negative impact on free trade, the Commission enthusiastically embraced this new theory. It did not only provide the Commission with the analytical tools to interpret the crisis of European industry. The theory also represented a convenient justification for the expansion of its competences into trade policy, which had traditionally been a prerogative of national sovereignty.

Based on New Trade Theory, Davignon and his team concluded that the root of the problem was to be found in the fact that the fragmented nature of the European market could not provide enough scale to compete with the US and Japan. At the beginning of the 1980s, the American and Japanese telecoms markets represented 35% and 11% of the world market respectively. The largest national markets in Europe, by contrast, occupied no more than six percent (EC, 1987a, p. 27).

Identification of a standardization solution

As a solution to European industry's competitiveness problem, Davignon and the ITTF suggested a coordinated European response. For European technologies to succeed at the international level, Davignon argued that, "home-markets of sufficient size and, on the European conditions, these can only be provided by the community as a whole" (EC, 1982) because, "[t]aken as a whole, the Community's telecommunications market corresponds to more than 20%" of the global market (EC, 1987a, p. 27). For market integration, which would have triggered a process of industry consolidation and increased companies' returns to scale, it was still too early in the telecoms sector. Member States would not have accepted this. It was going to take another decade until market integration in telecoms eventually made it onto the agenda of Europe's decision-makers. Therefore, the Commission argued for more intensive inter-company collaboration on issues such as research and development (R&D) and technical standardization to achieve the required scale economies instead.

The basic rationale behind this strategy was that companies would be able to share development costs and deploy the technology at a much larger scale if companies coordinated the development and deployment of new technologies instead of introducing competing technologies in each national market as they were used to. A means to achieve such a coordination was technical standardization—or more precisely *ex ante* standardization, the standardization of technologies before they are deployed in the market. The success of Scandinavian First Generation, i.e. analogue, mobile telephony standardization served Davignon and his team as a real-world example for the potential of such a strategy. Despite the comparatively weak state of the Scandinavian telecoms industry and the small size of their home markets, the Scandinavian standard had achieved considerable success throughout the world (Lehenkari & Miettinen, 2002, p. 110). The Scandinavian standard won 1.3 million consumers in Europe and Japan, which was considerably more than the American, French, Italian and British ones and only a little less than the German standard had won.

The Commission thus had successfully performed the first two of the agenda-setter's three functions. It identified (1.) a policy problem and (2.) a potential policy solution (see Zahariadis, 2007; Kingdon, 1995). In order to induce policy change, however, it (3.) had to identify and mobilize an actor-coalition that would be willing and able to solve the policy problem as suggested by the entrepreneur.

Mobilization of a standardization coalition

At the end of the 1970s, however, there was relatively little pan-European cooperation in the telecoms industry, which the Commission might have been able to build on. Telecoms policy was still firmly in the hands of Member States' governments and their PTTs, which only coordinated their standardization activities through CEPT (European Conference of Postal and Telecommunications Administrations), where it was absolutely necessary, as, for instance, in the case of radio spectrum.

At the European Council meeting in Dublin during November 1979, Davignon and the ITTF first approached Member States. They urged Members States to coordinate their efforts in data processing, telecommunications, and microelectronics to catch up to the US and Japan (*Business Week*, 1979). While Member States' generally welcomed the report, they refused to take concrete actions. At this point the Commission realized that it would have to pursue another strategy to achieve the mobilization of collective action.

Next it approached national PTTs and was slightly more successful than it was with Member States' governments. It managed to convince them to share

the radio spectrum, which the 1979 World Administrative Radio Conference had set aside for use in land mobile communications, for the development of a joint mobile telecoms standard through CEPT (Haug, 2002b, p. 12). In 1982, the Groupe Spécial Mobile—henceforth referred to as the 'GSM-Group' after which the resulting standard was going to be called—was set up within CEPT to start developing technical specifications for a pan-European mobile telecoms system (GSM World, 2009). For that purpose the Commission signed a memorandum of understanding (MOU) with CEPT, whereby CEPT would write common standards and specifications for equipment according to priorities established by the commission. In lack of serious commitments by the national PTTS, however, progress was slow. As monopoly providers of telecoms services, the PTTS had little incentive to advance mobile telephony. And the equipment industry, to which mobile telephony meant a new market opportunity, did not participate in CEPT.

Frustrated by the Council's and CEPT's lack of enthusiasm, Davignon and his team finally turned to industry directly. "Only by going behind the backs of the governments, so to speak, and convincing the chief executives", Davignon later stated in an interview with the *The Washington Post*, "were we able to push this through" (Drozdiak, 1984). During 1979 and 1981, the Commission repeatedly gathered the chief executives of the twelve largest European IT and telecoms companies for roundtable discussions to deliberate a joint strategy on mobile telecoms (Sandholtz, 1992, p. 226). "We shopped around for successful firms who realized they had to share the benefits of basic research if they did not want to lose more markets to the Americans and Japanese," Davignon explained (Drozdiak, 1984). Through a number of technical and economic studies,[1] Davignon and his task force had gained enough information to be taken seriously by industry (Sandholtz, 1992, p. 242). Then he told companies that they could no longer content themselves with the easy profits that they were making in their protected home markets and encouraged them to use the size of the European market as a springboard to expand their market shares abroad (Peterson & Sharp, 1998, p. 85).

Industry turned out to be quite receptive to the Commission's reasoning. Adopting the Commission's argumentation "Survival [for Europeans industry] means one thing: getting together and cooperating" (*Business Week*, 1979), a senior analyst from Arthur D. Little Inc. stated. And according to Britain's ICL, "Davignon's proposals address key issues that we consider are vital to resolve for the future of the indigenous computer and telecommunications industries

[1] The studies were conducted by from Arthur D. Little, Macintosh International, McKinsey, and the Yankee group

Table 2.1: Participants of the 'Big Twelve' Round Table (1981)

	Company	Country
1	AEG	West Germany
2	Bull	France
3	CGE-Alcatel	France
4	GEC	United Kingdom
5	ICL	United Kingdom
6	Nixdorf	West Germany
7	Olivetti	Italy
8	Philips	The Netherlands
9	Plessey	United Kingdom
10	Siemens	West Germany
11	STET	Italy
12	Thomson	France

Source: Peterson and Sharp (1998)

in the EC" (*Business Week*, 1979). A group of twelve companies (henceforth referred to as the 'Big Twelve'), which first met in this constellation for round table discussions in 1981, turned out to be most receptive to the Commission's arguments and eventually formed the standardization alliance that was going to provide the technical expertise and financial muscle required for the development and deployment of the European mobile telecoms standard (see Table 2.1).[2]

The Commission's efforts to mobilize industry, however, have benefited from an event which amplified the industry's perception of crisis. The American telecoms monopoly AT&T was soon going to allowed it to move into the foreign markets (Sandholtz, 1992, pp. 163-166). This led to a heightened sense of crisis which made industry more receptive to the European Commission's suggestion to respond in a coordinated fashion. The hypothesis that industry crisis constitutes a necessary condition for public entrepreneurship is thus confirmed (see Chapter 1).

With the formation of this alliance the Commission also managed to perform the last function of agenda-setting. It successfully mixed and matched a policy problem, solution and actor-coalition. During that process it demonstrated a considerable degree of persistence, which, according to Kingdon (1984, pp. 189-190), constitutes one of the key qualities of a policy entrepreneur. It did not cease

[2]There were different Round Tables which met in different constellations. Therefore, information on the membership of these Round Tables often tends to differ (Sandholtz, 1992; Cowels, 1997; Peterson & Sharp, 1998, see).

to approach new groups of actors until it had finally found one that was willing to support its plans. Before it could convince industry to collaborate on common standards, both the Council and CEPT had turned out to be unwilling to follow the Commission's plans.

This episode also illustrates how policy entrepreneurs may overcome their alleged information deficits. Clearly, the Commission did not have an absolute informational advantage over companies and clearly it did not have the technical expertise of companies' R&D departments. As a public actor, however, the Commission turned out to be in a much better position to export new policy ideas from different contexts and time periods—i.e. New Trade Theory and the history of Scandinavian analogue mobile telephony standardization. In the shadow of the PTTS control of the telecoms industry, however, companies did not seem to be able to conceive of the possibility of cross-national inter-company collaboration. And even if an individual firm would have come up with this idea and proposed it to its competitors, other companies —not to mention local competition authorities—are very likely to have viewed this proposal with the suspicion that this firm would want to free ride on its standardization work or steal industry secrets. As a public rather than a private competitor, however, the Commission could make a much more credible case for intensive inter-company collaboration.

With the agenda-setting process completed, the technical standard still needed to be developed. Again, the Commission turned out to play an active role during this stage.

Together with the Commission's ITTF, the Big Twelve identified the lack of cooperation between the member state's individual R&D programs as one of the main reasons why the European Union was falling behind the US and Japan. In the 1980s, R&D was highly fragmented across Europe. In the US and Japan, by contrast, R&D was concentrated within a limited number of research institutes or companies, such as IBM and Sony, which each spent more than $ 2 billion on R&D annually, a ITTF representative argued (Wielaard, 1984). Therefore, the ITTF and the Big Twelve co-drafted a program for pre-competitive and pre-normative R&D collaboration in IT,[3] which was called ESPRIT (European Strategic Programme for Research and Development in Information Technologies) (Cowels, 1997, p. 18). Both the focus on IT rather than telecoms as well as the focus on R&D rather than industrial policy were political choices. In contrast to the telecoms, IT was still relatively unregulated and largely escaped from the direct control of the national

[3] 'Pre-competitive' collaboration takes place before the competitive market introduction of a product. 'Pre-normative' R&D collaboration signifies a collaboration that takes place before and in preparation of technical standardization.

PTTs, which had the tendency to jealously guard their authority (Peterson & Sharp, 1998, p. 76). And the focus on R&D was meant as a fig leaf to conceal the Commission's industrial policy ambitions, for which it did not have a legal mandate.

However, the Big Twelve did not provide the technical expertise and financial muscle necessary to execute the Commission's standardization strategy. Industry also provided political power. The Big Twelve immediately began to lobby their respective national governments to support the collaborative R&D program. In a document prepared for the Stuttgart European Council, they argued that:

> [...] we are concerned that our international competitors are developing a lead over Europe in certain new technologies: this lead may be irreversible unless political leaders act now. Should they fail to do so, this could endanger Europe's future living standards and position in the world, and might lead to a dangerous disequilibrium in world trade.
>
> (European Round Table, 1983, p. 2)

Soon the Twelve's lobbying efforts started to pay off. On November 4th 1983, the Council adopted a resolution that endorsed the Commission's policies and adopted the ESPRIT program.[4] The first phase of ESPRIT provided €1.5 billion of Community funding, which was going to be matched by industry. The Big Twelve received 50% of the total ESPRIT budget and were involved in 70% of projects. Although ESPRIT's actual contribution to innovation and industry competitiveness is rather hard to assess, it became an instant success in the sense that it brought the industry's leaders as well as engineers to the same table. The fact that these experts met continuously and over a long period of time created a community that will be identified as one of the driving forces behind the standardization process (see Section 2.1.2). ESPRIT was initially planned as ten year program. Already after three years, however, ESPRIT's first phase's funding ran out and industry asked the Commission to continue with the second phase ahead of schedule.

According to the research director of Plessey, John Bass, "it [ESPRIT] was certainly the trigger of the funding that helped to get us involved" (Dickson, 1984). At first glance this statement, might be understood to mean that it was the large amount of subsidies provided through ESPRIT instead of the Commission's agenda-setting efforts that caused the mobilization of collective action. The precise sequence of events, however, suggests that this cannot have been the case. First, the Commission mobilized companies, then the latter, together with the Commission, lobbied national governments to adopt ESPRIT. Therefore, it can

[4] In 1985 and 1986, the Council furthermore adopted a decision and regulation in support of the collaborative community action in telecoms (European Council, 1986, 1985a).

be inferred that ESPRIT thus would not have existed had it not been for the Commission's entrepreneurial intervention.

The focus on pre-normative R&D—i.e. the development of new technology standards rather than the standardization of existing technologies—also increased the leverage of the European Commission as a public entrepreneur in two ways. First, and as discussed in the introduction (see Chapter 1), the effectiveness of entrepreneurial policy instruments is rather limited. For they rely on the power of persuasion rather than coercion, entrepreneurial policy instruments can only have an effect where actors preferences are still in flux. During the R&D stage of the technological life cycle of mobile telecoms this clearly was the case. At this point there still was relative uncertainty about the commercial implications of standardization and companies had not yet made any significant pre-investments in different development paths. In these circumstances, the public entrepreneur can be expected to find it much easier to convince companies to develop common standards than at a later point during the technological life cycle where companies have acquired clearly defined technological preferences and may no longer be able to agree to a single technology as the basis of a single common standard. The Commission was well aware of this fact, as a Communication from as early as 1982 suggests (EC, 1982, p. 13).

Secondly, the focus on pre-normative and pre-competitive R&D allowed the Commission to maximize its influence on private companies with a minimal amount of subsidies. When compared with private R&D budgets or the volume of subsidies available from national governments, however, the volume of the European R&D programs have been rather small. However, the European programs were targeted at long-term R&D, for which European IT and telecoms equipment manufacturers generally only spent around ten percent of their R&D budgets (Sandholtz, 1992).[5] During the 1980s, ESPRIT and RACE (Research and technology development in Advanced Communications in Europe) amounted to 60% of the private sector's budget' for this type of R&D (Sandholtz, 1992). This explains industry's strong responsiveness to these programs.

Strengthened by the success with the ESPRIT program in the IT sector, Davignon and his team felt that they had build up enough political capital to extent their actions into the relatively more politicized field of telecoms equipment. For that purpose, however, it had to persuade the conservative PTTS to admit international collaboration in the field of telecoms equipment, which had traditionally been kept quite secretive for military reasons. To warm the PTTS to the

[5]Even today, Siemens Nokia Networks' head of research alliances, Mohr (2006) argues, companies' R&D horizons are usually still not much longer than six or seven years.

Table 2.2: EU-funded R&D programs with relevance for mobile telecoms standardization (in Ecu/EUR)

Years	Project name	FP[a]	Budget
1984-1988	ESPRIT I	1	1.5 billion
1988-1992	ESPRIT II	2	3.1 billion
1990-1994	ESPRIT III	3	
1985-1987	RACE definition phase		
1990-1994	RACE I	3	550 million
1992-1994	RACE II	3	484 million
1994-1998	ACTS	4	682 million
1998-2002	ACTS II	5	
2002-2006	IST: 'Mobile and Wireless Systems Beyond Third Generation'	6	252 million
2007-2013	European Technology platform: eMobility	7	250 million

[a] Framework Programme

idea of R&D collaboration, the Commission organized a 'Planning Exercise in Telecommunications,' which brought experts from PTTs together with experts from industry twice a week during 1984. According to Sandholtz (1992, p. 240) this was "the hook that eventually brought in the telecoms administrations." The PTTs could not help but be attracted by the vision of an integrated digital telecoms network.[6] The final report of the Planning Exercise suggested the community-wide introduction of mobile telephony. The report became the basis for the R&D program RACE (EC, 1984a).

The initial focus on research and technical progress rather than industrial policy payed off. Had the Commission focued on the latter rather than the former, the national PTTs would have surely viewed the Commission's actions with great suspicion. They are likely to have tried to block these, had the Commission openly admitted its industrial policy ambitions. The focus on R&D, however, gave the PTTs a—potentially false—sense of security that their authority would not be undermined. Moreover, the R&D collaboration was also going to change the participating companies' mode of interaction. Instead of an adversarial relationship, the R&D focus led to an intensive inter-company collaboration, which was market by mutual learning and deliberation rather than strategic bargaining. Moreover, R&D fora and the technical committees of standards-writing organizations they tend to be more concerned with opportunities of technological

[6] This is a beautiful example of a case where the Weberian spirit of technical rationality and progress triumphs over power (see Meyer & Rowan, 1977).

progress, rather than the strategic interests of the individual companies that they work for. Therefore, they are more likely to replace strategic bargaining with more deliberative forms of interaction.

With the identification of a policy problem and potential solution, the mobilization of the Big Twelve, the persuasion of Member States' governments and PTTs to admit and fund cross-national R&D collaboration in first IT and then telecoms, the Commission played a crucial role during the first phase of the standardization process. The Commission's intervention had been instrumental.

But this was only the first step toward a common standard. There still were a number of problems to be overcome before a common European standard could be successfully deployed and the case of HDTV standardization will demonstrate (see Chapter 3) some of these problems can have a fatal effect on technical standardization processes.

The standard-setters had to agree to a single common standard, overcome potential conflicts that were bound to result from their diverging strategic interests, and commit to a concerted introduction of the standard. Whether and, if so, to what extent the Commission was also able to influence this stage of the standardization process is investigated in the following section.

2.1.2 Coordination the Standard's Development and Deployment

During the development and deployment stage, standard-setters still had to overcome two basic types of decision-making problems before the Global System of Mobile Telecommunication (GSM) standard—called after the GSM-Group—could be deployed. The first problem exclusively concerned the direct participants of the standardization process. They had to select one technology as the basis of their common standard from a range of possible technologies. This was going to be a difficult choice because different companies had proprietary interests in different technologies. The second problem concerned the standard-setters' relationship with actors that did not directly participate in the standardization process but which were going to be directly affected by it—i.e. the 'standard-takers.' Standard-setters and standard-takers had to commit to a concerted market introduction of the common standard. The European Commission again sought to play an active role in the remedy of these problems. To what extent it has actually contributed to the solution of these problems is discussed in the following two sub-sections.

By the late 1980s, a consensus on the technological basis of the common European standard had emerged in the GSM group.[7] This was a direct consequence of

[7]The chosen technological basis was TDMA (Time Division Multiple Access).

the Commission's agenda-setting efforts that led companies to collaborate already during the stage of pre-normative R&D. If companies had not already started to collaborate at this stage, they are likely to have followed diverging path of technological development and it would have been very difficult to agree on a single technology as the basis of a common standard. As a result of the pre-normative R&D programs that had been initiated by the European Commission, however, all companies followed a single development path, which left a much larger scope for a mutually acceptable agreement on a single technology for a single common standard, rather than several technologies and competing standards.

The following subsections investigate the Commission's role in the mediation of technological conflict and in ensuring commitment respectively.

Mediating Technological Conflict

All the pre-normative R&D collaboration, however, could not prevent that the standard-setters had developed diverging interests in two variants of the agreed technology. One was backed by France Telecom and Alcatel as well as the German companies AEG and Siemens.[8] Another was championed by Ericsson, Nokia and Swedish Telecom (GSM Group, 1987a, p. 1; Ruottu, 1998, pp. 257–258; Telecom Markets, 1987).[9] This almost led to the failure of GSM because standardization through CEPT required unanimity by all members.

The technical experts, mentioned above, which were meeting in the GSM group and the pre-normative R&D projects (see Section 2.1.1), however, did not want to be held up by the strategic games that their companies played a the executive level. "The people on the working level were quite happy to go along with the narrowband [i.e. the Scandinavian] proposal," a GSM Group participant argued (Haug, 2002a, p. 21). The technical experts that sat in the GSM group's meetings had known each other for years and appear to have replaced strategic bargaining with a more deliberative mode of interaction.[10] This is well illustrated by the following statement of the chair of the GSM group:

> GSM [Group] spent long nights discussing this. I recall one night when we went on until 2.30 in the morning and since we were almost dying for something to eat, somebody had the brilliant idea of raiding the refrigerators in the kitchen, adjoining the meeting hall ... Sardines or no sardines, we had arrived at an impasse.
>
> (Haug, 2002a, p. 21)

Regardless of their employers strategic interest, the technical experts decided to

[8] Wideband-TDMA.

[9] Narrowband-TDMA.

[10] Interview A2 with a representative of a large European equipment manufacturer (2009)

adopt the technology preferred by Scandinavian industry as a 'working assumption' and to discontinue the development of the Franco-German technology (GSM Group, 1987a, pp. 1–2; Haug, 2002a, pp. 20–21). The Franco-German variant was not developed further. Thereby, the technical experts and engineers in the GSM work group put considerable pressure on the strategic decision-makers at the executive level of their respective companies because the Franco-German variant became less and less attractive as the development of the Scandinavian variant of the selected technology progressed. An epistemic community formed at the levels of companies' technical experts and engineers. This was a direct result of the Commission's promotion of pre-normative R&D collaboration.

Had the Commission only invited companies to collaborate at the executive level, strategic bargaining is likely to have prevailed as the main mode of interaction. At the level of the technical experts, however, the common technological challenges provided scope for mutual learning and deliberation. This was the first factor contributing to the solution of this decision-making gridlock over GSM. This underlines the importance that entrepreneurs convince standard-setters to start to collaborate early and to push the standardization process into technical, research oriented venues.

At the executive level, however, the gridlock prevailed. The leaders of France Telecom, Alcatel, AEG and Siemens continued to hold out agreement. They did not have a choice. The French and German government had provided considerable funding for the development of their variant of the technology in addition to the money provided the RACE program. Therefore, they insisted that the technologies developed through these subsidies were included into the standard. Eventually, however, the Commission helped to resolve the decision-making deadlock in two ways.

First, the Commission persuaded Member States, PTTs and companies to transfer the GSM project from CEPT to the ETSI, which had been set up to centralize and strengthen European standardization in the field of ICT. In contrast to CEPT, ETSI directly allowed industry to participate directly. They were no longer represented by national delegations/PTTs as it was the case in CEPT. This meant a de-politicization of the standardization process. National governments/PTTs could not longer exert a direct influence. In contrast to CEPT, ETSI also introduced qualified majority voting for some—and simple majority voting for most—decisions. Therefore, the Franco-German coalition was no longer be able to hold out agreement.[11]

[11]Therefore, Pelkmans (2001), suggests that ETSI's institutional design could be seen as a direct response to the deficiencies of CEPT when it came to finding agreement on a single common standard.

Second, the Commission proposed 'basket standard' that would incorporate features of both variants, including the Franco-German one—if only to a symbolical extent. The 'basket standard' allow the outvoted French and German companies to keep their face and to rid themselves of their obligations to their respective governments (Bach, 2000). As a result, GSM's technical specifications ended up being far more complex than technically necessary. But this was the price that had to be paid for the consensus on a single common standard (Ruottu, 1998, p. 270).

During the solution of the technological conflict over the two different variants of the technological basis of GSM, the Commission demonstrated its negotiation skills, which, according to Kingdon (1984, pp. 189-190), constitutes one of the key qualities of a policy entrepreneur. It remains an open question, however, whether the Commission would have been able to mediate these conflicts without the consensus building process that had already been initiated through the pre-normative R&D collaboration programs long before. The latter had not only created a basic consensus on the technological basis of GSM. It had also created a more constructive form of interaction among companies. They respected each other's strategic interests and largely refrained from opportunistic behavior. Therefore, it can be assumed that the pre-normative R&D collaboration initiated by the Commission had a larger effect on the overcoming of the above-described decision-making gridlock than its immediate conflict mediation efforts. In this respect, this thesis' analysis differs from the work of Bach (2000) who argued that the Commission's provision of focal points alone was the crucial factor leading to the solution of the decision-making conflict.

Ensuring Commitment

With the deadlock over the choice of the technological basis resolved, the GSM system could be introduced. The introduction, however, required significant investments in a concerted way from all industry participants in several countries. Manufacturers had to produce the physical infrastructure. The PTTS—most of which were just in the process of reestablishing themselves as commercial network operators—had to operate the network and start providing mobile telecoms services.[12] Moreover, it was estimated that at least three large markets—i.e. Germany, France, Italy or the UK—had to start operations at the same time to generate enough economies of scale and revenues to carry the required

[12] Also the chip-set manufacturers were crucial. They had to develop more advanced chips with less electricity thirst to allow for the size of cellular mobile phones—which still used to be car phones because their batteries were so large and heavy that they could only be transported in cars—to be shrunk in size.

investments (Temple, 2002, p. 40).

This created a commitment problem. If only one large country or one industry participants decided not to introduce GSM, the investments of all of the others would have been made in vain. On the one side, equipment manufacturers were afraid to make the necessary investments because they were concerned that some PTTS would introduce new, more advanced analogue mobile telecoms systems instead. Particularly the Scandinavian and British analogue standards had advanced very quickly and were perceived as an immediate threat to the introduction of GSM (Selian, 2001, p. 11).[13] Moreover, the International Telecommunications Union (ITU) had already envisioned the creation of third generation technology (Selian, 2001, p. 43). Therefore, several operators considered to continue to use First Generation analogue technology until the third generation was ready to be used. This might have put the whole system at jeopardy. Moreover, manufacturers were concerned that the national operators, would favor national over foreign suppliers in public procurement. PTTS and the emerging private network operators and service providers, on the other hand, were concerned that manufacturers would take a long time to complete the development of GSM, while their new analogue standards were already ready to be introduced. Moreover, they doubted that manufacturers would be able to start mass producing transmission equipment in time.

The Commission, once again, played a crucial role in the solution of this problem. In September 1987, it negotiated a MOU between equipment manufacturers and operators that committed both to a firm introduction date, namely 1991 (GSM Group, 1987b, p. 40). Moreover, PTTS were committed to make public procurement open to foreign manufacturers and to sign pan-European roaming contracts. Manufacturers, in turn, committed themselves to finalize the development of GSM by 1991 and to provide royalty free licenses for their GSM equipment.[14] This provided each side with the certainty it need to make the necessary investments. By 1990, eight PTTS and operators had provided procurement contracts to individual manufacturers or consortiums of manufacturers based on the MOU (Temple, 2002, p. 40).

The Commission's intervention was crucial for the success of GSM. The coordination that it provided allowed for a concerted roll-out in Europe in 1992. It quickly generated enough returns to scale to offer GSM handsets and services

[13] These standards were NMT900 and TACS.

[14] The intellectual property rights (IPR) clause was inserted into the MOU due to pressure by the French and German delegations (Temple, 2002, p. 45). Their governments had made significant subsidies toward R&D, which they were going to make available for free. Therefore, they requested that all other participants would provide royalty free licenses as well.

Table 2.3: Signatories of the MoU (1990)

Country	Operator	Manufacturers
United Kingdom	Racal Vodafone	Orbitel and Ericsson
	Callnet	Motorola and Nokia
Germany	Deutsche Bundes Post	ECR900 (Alcatel, AEG and Nokia), DMCS900 (Bosch, ANT and PKI/Philips), Siemens
	Mannesmann Mobilfunk	Siemens and Ericsson
France	France Télécom	ERG 900, Matra, Ericsson and Orbitel
Italy	SIP	Telettra and Alcatel
The Netherlands	PTT	Nederland ERC900
Belgium	RTT	DMCS 900, Siemens

Source: European Commission (1990, p. 9)

at a competitive price. Once a critical mass of consumers had adopted the standard—i.e. purchased GSM compatible phones and signed GSM-based service contracts—network effects led to an accelerating market penetration. From 1994 to 1995, the number of GSM subscribers jumped from one to ten million (see Figure 2.1).

The scale provided by the European market reinforced these network effects at the international level. Meanwhile, the Japanese standard was still under development and in the American market several standards were still in competition with each other. Driven by the network effects and reinforced by the returns to scale provided by the European market, GSM quickly penetrated into the Japanese and American markets. After operators in Australia in 1993, the first American operator started to provided GSM services in 1995. In 1996, Chinese and Russian operators followed. By 1997, 15 American operators were offering GSM services. Eventually, GSM became the *de facto* international standard (GSM World, 2009).

Moreover, it is important to point out that none of the Commission's interventions led to the political contestation of the standardization process. There were two reasons for this. First, *only* a small and homogeneous groups of immediately concerned companies of actors around mobile equipment manufacturers responded to the Commission's entrepreneurial interventions. Standard-takers and potentially adversely affected companies, such as the analogue service providers, did not feel threatened by these interventions—if they noticed them at all—because they were neither very precise nor did they contain any concrete obligations that might have affected their business. Therefore, not even Motorola,

who was developing a different mobile telecoms standard in the US at the same time as GSM was developed in Europe, seemed neither concerned about the Commission's interventions nor did it protest against them. Had the Commission relied on more coercive, hard policy instruments instead, however, Motorola and several other American companies are very likely to have chosen a similar strategy as the HD-MAC (High Definition Multiplexed Analogue Components) opponents chose in the case of HDTV to undermine the Commission's intervention.

Secondly, the Commission's entrepreneurial interventions did increase the number of veto points either. None of the instruments used by the Commission directly required a formal vote by the EP or Council. Moreover, these instruments escaped the informal scrutiny of the EP and Council for they were simply to vague, inaccessible and opaque. While this may have been crucial for the successful deployment of GSM, it clearly came at the price of broader, democratic input by potentially concerned stakeholders, including consumers.

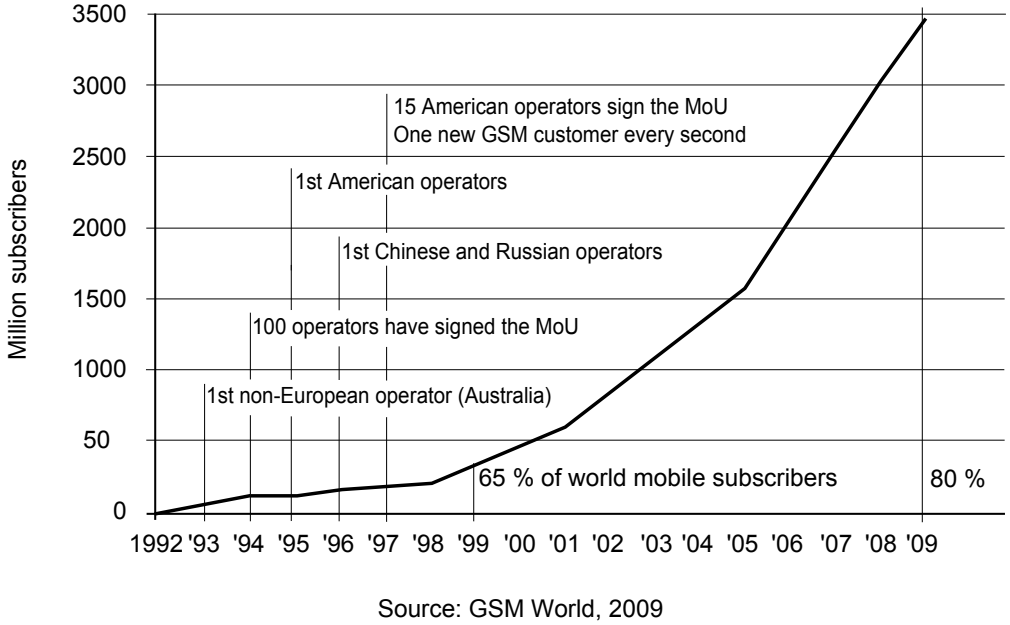

Figure 2.1: Market Penetration of GSM (in Mio. Subscribers, 1992-2009)

As in the case of the above-mentioned technological conflict, the previous actions of the Commission played a considerable role. Had the Commission not brought the standard-setters together at a relatively early stage, they would have never won the crucial first-mover advantage. They may not have completed the technological development so quickly. Furthermore, it is unlikely that the standard-setters would have agreed to a common technology as the single common standard so quickly. Compared with the American standardization

experience, the level of variety reduction achieved in Europe was crucial for the success of GSM. Therefore, it can be concluded that the most crucial intervention of the European Commission took place during the early phases of the standardization process. This underlines the assumption that early intervention constituted a necessary condition for entrepreneurial policy interventions to have an effect.

This episode also demonstrates that policy entrepreneurs do not necessarily need to stay neutral or act out of altruism to be influential. They may have a stake in the issue themselves. While Commissioner Davignon and his team might have well been genuinely concerned about the international competitiveness of European industry, it seems clear that they also sought the close contact with industry in order to win political support for its institutional struggle to expand its legal competences. While it previously did not have any competences in neither industrial nor telecoms policy, the commercial success of GSM suddenly turned the Commission into an actor to be reckoned with in both policy areas. This is also reflected in the changes introduced by the 1992 Treaty of Maastricht. The ITTF was turned into the new DG for Information Society. And industrial policy was official made a new Commission competence, which was divided between DG Information Society and DG Internal Market. Moreover, a clause was included in the treaty, defining 'interoperability' as a public interest, which provided the Commission with a legal basis to continue to intervene in technical standardization processes (EC, 1992a).

Industry appreciated the efforts of the European Commission. Erik Dekker, then chief executive officer (CEO) of Philips, stated that:

> We have a very good and close relationship with the Commission. The Commission appreciates this as it means its members can talk privately with people who have to do things in practice. We also appreciate it because we are able, in a positive way, to influence certain things
>
> (Europe 2000, 1990).

The political collaboration between the Big Twelve and the Commission turned out to be mutually beneficial. Weather and to what extent this collaboration has been beneficial to the European consumers is discussed further below.

2.2 UMTS: Can the Commission do it Again?

By the mid 1990s, the telecoms industry had changed dramatically. On the equipment manufacturing side of the market, the increasing technological complexity had exacerbated R&D costs and lead to an increasing technological convergence

between telecoms and IT drawing in companies from both industries.[15] Moreover, the European market for telecoms equipment had become almost fully integrated. On the services side of the market, the gradual liberalization of the sector had let to the entry of new companies challenging the incumbent operators. In these changed circumstances public entrepreneurship was even more unlikely to succeed than in the case of GSM. And several commentators argued that the commercial success of GSM was exceptional and could not be repeated.

1. Bach (2000, p. 31), for instance, argued that the multiplication of actors and interests resulting from the rapid technological change and economic internationalization would reduce the scope for mutually acceptable agreements on common European standards. While the European telecoms industry still used to be a club of protected national monopolies during the development of GSM, Pelkmans (2001, pp. 434,437) suggested, the introduction of competition in telecoms would render companies more concerned about the strategic implications of standardization and thus reduce the scope for intensive inter-company collaboration.

2. Until the late 1990s, industry did not have an immediate commercial interest in third generation mobile telephony. Instead European manufacturers sought to maximize their gains from GSM. This should have made it very difficult for the Commission to mobilize collective action.

3. The GSM standardization process demonstrated the vulnerability of collaborative standardization processes to aggressive IPR hold-out strategies.[16] After the deployment of GSM, Motorola initially refused to license its patents on essential GSM technologies. Eventually Motorola gave in and provided

[15]The growing complexity of multifunctional telecommunications networks and terminals required new, faster and more efficient network management tools, transmission and switching devices and. These tasks were increasingly carried out by computers and microprocessors. The gradual computerization of telecommunications equipment eventually led to the convergence of two formerly separate industries: information technologies and telecommunications (Werle, 2001, p. 392).

[16]Participants as well as non-participants can conceal the fact that they hold patents on essential technologies during the cooperative development of technical standards and hold-out the implementation of the standard after it has been published by refusing to license these patents (Dunlavey & Schallop, 2007; Shapiro, 2000; Soininen, 2007a). Although such actions might be seen as a potential abuse of a dominant position and although the Commission sought to present it as such (EC, 1992b, p. 20), the application of Article 82 EC in the case of ICT standardization is considered to be rather difficult in (Staniszewski, 2007, p. 16). The first problem lies in the fact that it is almost impossible to defining a relevant market in which the patent holder is alleged to be dominant. Given the rapid diffusion of technological boundaries in ICT, this is often impossible because the patented technology is often used by standards to establish interoperability with other technologies and markets. Therefore, dominance has to be defined by considering the availability of alternative technologies, the cost and time effort required to develop such technology, and barriers to entry. This also requires the consideration of technological change and progress, which adds yet another complicating factor.

the required licenses, albeit not without claiming horrendous royalty payments. The fallout from the IPR conflict with Motorola can hardly be overestimated. Standard-setters started to look at each other with greater suspicion. They always had to expect that they would not be able to recoup their investments into the development of new technical systems through standardization, if patent holders could refuse to license essential patents and demand an unlimited level of royalty payments. This is considered to have eroded the mutual trust among standard-setters and thereby reduced the scope for cooperation within standardization organizations (van Eecke, Fonseca, & Egyedi, 2007, p. 108).[17] This also appears reflected in the proliferation of private litigations (Staniszewski, 2007; Soininen, 2007a) as well as the complaint by the CEO of NET that "[A]ll big telecoms manufacturers have teams of lawyers with the task of bringing in revenues from use of their IPRs" (Purton, 1999). The basis for intensive inter-company collaboration on common standards appears to have been destroyed.

4. Given the speed of technological change and given the presence of strong network externalities, companies should have found unilateral, *de facto* standardization strategies more attractive. Patent hold-outs would have been less of an issue and companies might have been able to move faster alone for they would not be held up by decision-making problems. According to the literature particularly large companies, which the European manufacturers had certainly become at this point, should be expected to use their deep pockets (see Farrell & Saloner, 1985b; Saloner, 1990) and existing installed base of consumers (Weiss & Sirbu, 1990), to set standards unilaterally (see Katz & Shapiro, 1985b, 1985a, 1986). [18]

As European second-generation mobile telecoms standardization, third generation standardization, too, was a rather unlikely case for public entrepreneurship to succeed.

This Section explores to what extent the Commission was able to maintain its entrepreneurial influence, despite these unfavorable circumstances

[17] van Eecke et al. (2007, p. 108) claim that because the legal framework of standardization is blurred and the legal framework recognizing IPRs is on the contrary very clear, IPRs-holders have all the power while standard-setters have none.

[18] Once the market is locked in, the sponsor of the wining technology are in extremely profitable position. First, they can set monopolistic prices and second they can deliberately set proprietary standards that are incompatible with the products of their competitors.

2.2.1 Agenda-Setting

As in the previous section, the investigation of the Commission's entrepreneurial influence begins with an analysis of the Commission's ability to set the agenda of private standard-setters and is subdivided into three parts, each dealing with one of the key agenda-setting functions.

Identification of a standardization problem

The Commission saw itself confirmed by the success of GSM (EC, 1996, 1994a, 1997a), and continued to act as the main agenda-setter in mobile telecoms standardization. The new Commissioner, Martin Bangemann, and his team were keen to maintain both the position of the European Commission in telecoms and industrial policy as well as the competitive advantage that the success of GSM had brought for the European mobile telecoms industry. The emergence of third generation mobile telecoms technology on the horizon, in particular, was perceived as a great challenge to the success of GSM and European dominance. In 1989, the ITU had asked its members to start with the development of third generation standards that could be adopted as international standards.[19] In 1992, the World Radio Conference already identified radio spectrum for such a standard.

> The current speed of technological developments, the high stakes in the uptake of electronic commerce, and efforts of Europe's competitors to try to establish market dominance make a more coordinated and targeted approach to standardization in electronic commerce a matter of urgency.
>
> (EC, 1996, p. 7)

This was the main 'policy problem' that the Commission, as the agenda-setters, had identified.

Identification of a standardization solution

After the successful introduction of GSM, the choice of the 'policy solutions' was relatively straight forward. It encouraged industry to continue to collaborate in R&D and standardization to strengthen Europe's competitive position internationally (EC, 1996).

> The potential commercial gains for a limited number of companies to undertake standardization are often not large enough to be justifiable from their own individual perspective, even if for the market as a whole such an development would be beneficial.
>
> (EC, 1996, p. 11)

[19] This is also referred to as the IMT-2000 program.

As during the development of GSM, the Commission argued that "a strong home market would seem to provide the best conditions for European industry to compete in other parts of the world" (EC, 1997b, p. 2) and defined standardization as "a vital part of European industrial competitiveness policy" (EC, 1996, p. 2). Reinforced by the success of GSM and the new competences it had gained through the Treaty of Maastricht, the Commission had become more confident to admit to its industrial policy ambitions. This stands in stark contrast of the case of GSM standardization where it had to take a strategic detour through the IT sector before it could intervene in the telecoms sector.

The Commission's industrial policy ambitions and its own institutional self-interest appear to have had a strong influence on this choice for collaborative standardization as the policy solution. This stands in stark contrast to the policy choices that the Commission was going to make concerning the development of digital video broadcasting standards (See Chapter 4) and the standardization policy of the US. In both cases it was decided not to let the market select one technology as the *de facto* standard. Instead of ex ante interventions, standardization policy was based on *ex post* corrections of market failures through competition law to correct potential market-failures.

In mobile telecoms standardization—and especially in Universal Mobile Telecommunications System (UMTS) standardization—however, the Commission's choice for collaborative, ex ante and government facilitated standardization was strongly influenced by its institutional self-interest. The close collaboration with industry was perceived as an opportunity to strengthen the Commission's role in the inter-institutional competition with the Parliament and Council and expand its legal competences. As the case of GSM had demonstrated, the close links it had forged with private companies had given it access to invaluable information and political support, which it needed to strengthen its role institutionally and to pursue a range of policy objectives, such as the liberalization and integration of the telecoms market. This conforms with this thesis' conception of a purposefully opportunistic policy entrepreneur.

Mobilization of a standardization coalition

The main difficulty that posed itself to the Commission as an agenda-setter, however, was the mobilization of an adequate 'actor-coalition'—the third function of the agenda-setting according to Kingdon (1995)—that was able and willing to sponsor the standardization process. Operators had no interest in third generation technology for they were still making large profits with GSM and were concerned that third generation services would cannibalize these profits.

> Network operators invested heavily in GSM and were not very pleased to see a new initiative starting and a new system coming across that would basically compete with their investments or with their systems ... They saw it as a threat to what was being widely commercialized.
> (Interview with Siemens employee, in Lembke, 2002b, p. 279)

Equipment manufacturers rather sought to increasing the capacity of and maximize their gains from GSM (Bekkers, 2001),[20] instead of developing a third generation standard. Moreover, the Round Table of the Big Twelve had become less cohesive due to the crisis of Philips and the acquisition of ICL by Japanese competitors.

Commissioner Bangemann's first attempt to mobilize industry was the creation of a new group in 1994, the High Level Group on the Information Society, which gathered the leaders of the European telecommunications industry. Most companies that were part of the Big Twelve (in italics in Table 4) also participated in the new body (Peterson & Sharp, 1998). The 'Bangemann Group'—as the High Level Group later came to be called—was meant to prepare a proposal for a broad policy framework for a European broadband communications market—including both fixed as well as wireless high-bandwidth communication.[21] In the group's final report to the European Council industry stated its intention to continue to collaborate in standardization, following the example of GSM (Bangemann High-level group on the information society, 1994, p. 18) and took up the Commission's argument that industry collaboration on common standards was necessary to enhance Europe's international competitiveness for "competition alone will not provide such a [critical] mass, or it will provide it too slowly" and advocated that "cooperation should be encouraged among competitors so as to create the required size and momentum in particular market areas." Technical standardization was suggested as one of these areas (Bangemann High-level group on the information society, 1994, p. 19).

> [I]f Europe arrives late, our suppliers of technologies and services will lack the commercial muscle to win a share of the enormous global opportunities which lie ahead [...] Joint commercial decisions must be taken [...] without delay to ensure rapid extension of European basic services beyond telephony. This would improve their competitive position vis-à-vis non-European players in their own markets.
> (Bangemann High-level group on the information society, 1994, 7, emphasis added)

[20] Standard-setters continued to advance GSM throughout the 1990s. Several advanced versions of GSM were published, including GPRS, EDGE and HSDPA.

[21] Etienne Davignon, who had become president of Societé Générale de Belgique and Head of the European Round Table upon leaving the European Commission, chaired a subgroup responsible for standardization and intellectual property rights. This 'pantouflage' is further discussed below.

However, no concrete actions followed upon these proclamations. Yet, it helped build a consensus around the need for sustained industry collaboration.

Eventually, it was with the help of the industry's technical experts that the Commission finally convinced companies to use the opportunities that a collaborative development of third generation mobile telecoms standards presented. The technical experts, many of which had already participated in the development of GSM, continued to meet in the GSM Group, which in its last meeting decided to adopt UMTS as a new study area (GSM Group, 1991) and to rename itself to Special Mobile Group (SMG), as well as the collaborative R&D program RACE, which was eventually succeeded by ACTS (Advanced Communications Technologies and Services) in 1994. Since the 'sardine moment' during the decision-making gridlock over the technological basis of GSM (see Section 2.1.2), the technical experts and engineers involved in the actual development of the standard constituted a distinct force to be reckoned with. Also during the development of the UMTS standard, this appears to have been the case. The experts' fascination with the opportunity to develop a new generation of telecoms standard was stronger than their task to merely upgrade GSM, which they had been given by their employers. They pressured their employers to move on to UMTS.

In 1995, the Commission invited the industry's decision-makers and executives to a workshop, titled "Towards third generation Mobile Communication Systems" (Fernandes, 2001, p. 147). Among the workshop's presenters were many members of the RACE research community. They demonstrated the feasibility of third generation mobile telephony and suggested that UMTS was within reach. Thereupon, the leaders of the companies that participate in the workshop decided to set up the UMTS Task Force as an advisory group that was given the task to propose a common strategy and develop a detailed plan for the development of UMTS (da Silva, 2001, p. 125). The Task Force was made up of a group of technical experts, which was handpicked and chaired by DG INFOSOC (See Table 2.4). It was mandated to produce a detailed report within six month. And it met behind closed doors, without leaking much information. The Commission participated as an observer (Beijer, 2001, p. 159). By 1 March 1996, the final report was issued (UMTS Task Force, 1996). Besides (1.) backward compatibility with GSM and (2.) additional radio spectrum, the report demanded (3.) the adoption of a UMTS regulatory framework by the end of 1997 to reduce the risks and uncertainties for the telecoms industry and thereby stimulate the required investments and (4.) proposed the creation of a UMTS Forum to develop this framework.

Following the Task Force's recommendations, the 'UMTS Forum' was set up by the Commission in December 1996, to elaborate the precise industry requirements and to build broader industry support for the UMTS (EC, 1997b). The Forum

Table 2.4: Members of the 'UMTS Task Force' (1996)

	Actor	Country
1	Ericsson Radio Systems	Sweden
2	Nokia	Finnland
3	Siemens	Germany
4	Alcatel	France
5	France Telecom	France
6	British Telecom	United Kingdom
7	Telia	Italy
8	Orange	France
9	T-Mobil	Germany
10	KPN	The Netherlands
11	GSM Association	
12	European Radio communications Office	
13	European Telecommunications Network Operators	
14	DG InfoSoc	
16	ETIS's SMG	

Source: (Lembke, 2002b)

brought together a broad group of regulators, operators, manufacturers and other interested parties and standardization organizations such as ETSI. It was financed via its 70 members and had an annual budget of about €500,000 (Niepold, 2001, p. 133). In a 1997 stakeholder consultation organized by the Commission, the Forum's participants concluded that a joint European approach was "essential to maximize the opportunities for European players within the global market for third generation mobile it was felt that Europe had a narrow window of opportunity in which to develop a clear and winning strategy" (in EC, 1997a).

The report of the Task Force and the creation of the UMTS Forum was the turning point marking the beginning of the collaborative development of UMTS.

Meanwhile, Japan and China were making considerable progress toward a third generation mobile telecoms standard. While Japanese standardization was perceived as a threat, Chinese standardization was, for the enormous size of the potential Chinese market, rather considered as an opportunity. At the same time, the market penetration of GSM reached a new high (see Figure 2.1). GSM turned out to be very profitable. Nokia, for instance, more than doubled its sales from US$ 6.0 billion in 1994 to US$ 15.7 billion in 1998, thanks to GSM, which accounted for 12% of Finnish GDP (ITU, 1999, p. 9). By 1998, four of the top ten

mobile equipment manufacturers were European, accounting for an estimated 50% of the world market (see Table 2.5). In this context, reminded companies that:

> The current speed of technological developments, the high stakes in the uptake of electronic commerce, and efforts of Europe's competitors to try to establish market dominance make a more coordinated and targeted approach to standardization in electronic commerce a matter of urgency.
>
> (EC, 1996, p. 7)

Continued collaboration was perceived as a way to retain their international market position in third generation mobile telecoms.

Once again, the Commission had succeeded to push European standardization on the companies' agenda, or as a participant of the UMTS forum argued, "[t]he Commission was instrumental in setting things in motion and has been an important partner who has contributed in a constructive way" (quoted in Lembke, 2002b, p. 277). As during the GSM standardization process, the Commission defined the policy problem and solution and mobilized a potent actor-coalition. Its agenda-setting was reinforced by the emerging senses of industry crisis, emanating from the standardization activities of foreign competitors. As industry crisis was also present in the case of GSM, a much stronger—though not definite—basis exists to infer that industry crisis constitutes a necessary condition for public agenda-setting in private standardization to succeed.

2.2.2 Coordinating the Standard's Development and Deployment

Similar to GSM (see Section 2.1.2), the developers of the UMTS standard were confronted with significant decision-making problems over the choice of the technological basis and the commitment to a concerted introduction of UMTS. Therefore, agenda-setting alone was not enough to ensure the success of technical standardization. Standardization could only become a success if these problems were overcome. This section analyzes whether and to what extent the Commission was able to help circumvent the discussed decision-making problems.

Mediating Technological Conflict

During the development of UMTS, standard-setters once again clashed over the choice between two competing technological alternatives. Despite the fact that the R&D collaboration under RACE and ACTS program had led to a convergence around the technology upon which UMTS was to be based,[22] industry supported

[22]This technology was CDMA (Code Division Multiple Access).

Table 2.5: Top 10 mobile equipment manufacturers ranked by mobile equipment sales (1998)

#	Manufacturer (headquarters)	Revenue in bio US$	Change (1997-98)	Foreign sales
1	Motorola (USA)	17.9	0%	59%
2	Nokia (Finnland)	14.7	59%	94%
3	Ericsson (Sweden)	14.5	5%	95%
4	Lucent (USA)	4.3	-6%	26%
5	Nortel (Canada)	3.7	8%	36%
6	NEC (Japan)	3.7	-3%	5%
7	Qualcomm (USA)	3.3	60%	34%
8	Matsushitat (Japan)	3.1	16%	51%
9	Siemens (Germany)	3.0	10%	69%
10	Alcatel (France)	2.7	30%	83%
	Top 10	71.0	14%	54%

Source: ITU, 1999, p. 24

different variants of this technology,[23] as in the case of GSM (see Section 2.1.2). One variant was supported by Ericsson and another was championed by Nokia, Alcatel, Siemens and Nortel (Jackson, 1999).

After two failed votes within ETSI (SMG, 1998a, 6ff.), Commissioner Bangemann summoned the CEOs of the five equipment manufacturers to Brussels in 1998 and urged them to accept a compromise, again, involving both variants of the basic technology in a 'basket standard' (SMG, 1998b), as already discussed in the context of GSM standardization (see Section 2.1.2). According to a participant of the SMG and FRAMES (Future Radio Wideband Multiple Access System) project this allowed all participants to 'keep their face.'[24] Wideband-CDMA was chosen for wide-area applications and time division-CDMA was chosen for low mobility indoor applications. According to the source, the fact that industry had 'learned to talk to each other' during its R&D collaboration was crucial. In 1999, ETSI adopted this compromise by a wide majority (Hillebrand, 2002, p. 204).

As during the development of GSM (see Section 2.1.2), the Commission played an important role during the solution of decision-making conflicts. This illustrates the mediating role that public entrepreneurs may play in private standardization processes. As argued above, however, it seems unlikely that the Commission would have been able to mediate this conflict had not there already been a basic

[23] The different variants of CDMA were wideband and time-division CDMA.

[24] Interview A2 with a representative of a large European equipment manufacturer (2009)

willingness to collaborate and to overcome this conflict. This basis was achieved through the previous interventions of the Commission, bringing companies together during a relatively early point during the technologies life cycle. This suggests that early intervention constitutes a necessary condition for conflict mediation to succeed.

Without the entrepreneurial facilitation, standard-setters are unlikely to have overcome the technological conflict or it would have taken them much longer, sacrificing the decisive first-mover advantage that UMTS was going to enjoy over rival standards. This is not to say, of course, that the necessary mediation could only be provided by the European Commission. Another public entrepreneur might have been able to play a similar role.

Ensuring Commitment

To generate a sufficient level of scale on both the demand and supply side of the market, it was necessary that UMTS was introduced in a coordinated way, requiring commitments from a diverse range of actors, including equipment manufacturers, operators and Member States' governments and regulators. As in the case of GSM standardization (see Section 2.1.2) the Commission sought to assume its leadership role. Where it had negotiated a MOU among companies in the case of GSM, it decided to rely on more formal instruments this time around. With the support of the UMTS Forum (Niepold, 2001, p. 135), the Commission proposed the 'UMTS Decision on the coordinated introduction of UMTS by 1 January 2002' to the Council in 1998 (EC, 1998). The proposed Decision was to oblige Member States to award at least one radio spectrum license for UMTS services to national operators that asked for it. Although this Decision would not make the adoption or compliance with the UMTS standard obligatory, it was expected to provide the certainty that manufacturers and operators needed to make sufficient investment into the launch of UMTS. Given the lack of obligation, this intervention therefore is not classified as a hard intervention.

While European industry generally stood behind UMTS because unlike alternative third generation standards because it was backward compatible with GSM, American industry which did not have a stake in UMTS opposed the Commission's proposal for the UMTS Directive. The opposition was led by Qualcomm, which supported the CDMA2000 standard, a direct competitor of UMTS. They were afraid that the UMTS Decision would exclude them from the large and profitable European market.

Qualcomm even appealed to President Clinton's administration for support. In a letter to Commissioner Bangemann signed by US Secretary of State Madeleine

Albright, Trade Representative Charlene Barshefsky, Commerce Secretary Bill Daley and Federal Communications Commission chairman William Kennard, Washington complained that the UMTS Decision would give UMTS an unfair advantage and a "head start" over alternative standards, such as the Qualcomm-sponsored CDMA2000 (*Mobile Communications Report*, 1999).[25] "EC and member state regulations must ensure non-discriminatory access to European markets and not impose unnecessary barriers to trade," the letter stated and threatened with reprisals if the EU did not allow for competition between standards in Europe (Clarke, 1999).[26] And while Commissioner Bangemann, in a formal response, argued that, "[t]]he UMTS decision does not limit other technologies in the European market as member states are free to authorise them next to UMTS if economic operators would propose this" (*Utility Europe*, 1999, p. 3), Federal Communications Commission (FCC) Chairman Kennard pointed out that the UMTS Decision nonetheless, "confers regulatory certainty and therefore a market advantage upon only one type of technology" (*Mobile Communications Report*, 1999).

Additionally, Qualcomm also lobbied the EP and national governments. Soon it had to find out, however, that their access to the to these institutions was limited. The EP and Member States' governments turned out to be unreceptive to their arguments. This had two reasons. First, as an American firm without a seat in the EU, Qualcomm had very little political leverage to influence national governments. Secondly, the majority of decision-makers within the EP and the Council internalized the industrial policy logic of the European Commission. American industry was perceived as a threat to Europe's 'competitiveness.' Moreover, Qualcomm's lobbying strategy in particular was perceived as too aggressive.

> The main result was that it upset people like someone who is using a hammer. The reaction was that it must be something wrong and that they tried to fool us. UMTS was not regarded as a political problem [...] It is political when you have valid arguments on both sides and you have to take a decision.
>
> (Interview with an unnamed MEP, quoted in Lembke, 2002a, p. 172)

The Commission emphasized the important of horizontal competition based on a single common standard. Moreover, it skillfully invoked the notion that the EU had to defend its competitiveness against the US. Bangemann argued, that,

[25] Secretary of Commerce, William Daley, argued that "I am concerned that the Common Position [of EC] would give UMTS an unfair head start on other types of 3G systems if EC member states go ahead without awaiting the results of ITU deliberations" (*Mobile Communications Report*, 1999).

[26] An appeal to the WTO (Worldwide Trade Organization), as threatened by the American administration, however, was not expected to be very successful for the latter's dispute settlement procedure is unlikely to have come to a conclusion before the market had tipped toward one standard or another. Therefore, the issue was dropped eventually.

"UMTS will lead to strong competition *on* services and equipment to the benefits not only of consumers but also of all market players in Europe, including non-European manufacturers and operators in Europe" (EC, 1999a, emphasis added). This narrative turned out to be very influential. With the help of this policy narrative, the Commission successfully managed to protect the standardization alliance from political contestation. This is in line with the hypothesis that public entrepreneurs can have a significant influence on the depoliticization of technical standardization processes.

Despite the fact that there were strong counter arguments—some of which were used by the American opposition that had rallied around Qualcomm—the EP and Council were highly receptive to the Commission's narrative. American industry often countered this narrative by emphasizing the benefits of vertical competition between technologies, i.e. the marked-driven selection of *de facto* technical standards. Another potential counterargument, which was deemphasized by the European Commission, was that the competition based on the common European standard was going to be limited. The European market for mobile telecoms equipment was soon to be dominated by three companies. Therefore, it is hardly possible to speak of a competitive horizontal market. It is not this thesis' intention however, to assess the relative strength of these narratives. Instead these narratives are taken to be strategic tools used by each side in the political debate.[27] This thesis seeks to uncover the strategic interests underneath and the way in which they influenced the decision-making process.

The Commission's narrative had been highly successful. With the backing of national equipment manufacturers, however, Bangemann quickly convinced the telecoms ministers and the EP that an active industrial policy was necessary to retain the competitive advantage that European industry had acquired as a result of the international commercial success of GSM. Only nine month after the Commission's proposal the Council and EP adopted the Decision (European Council and the European Parliament, 1999). Therefore, the use of such a non-entrepreneurial, 'hard' policy instrument did not lead to the failure of the standardization process. In 2000, UMTS was formally adopted and deployed.

In 2000, the market deployment of UMTS began. Although the third generation telecoms market grew much slower than many had expected, the UMTS standard allowed European industry to consolidate its dominant market position. UMTS and GSM together capture 88% of the global mobile telecoms market (ETSI, 2008; GSM World, 2009). This has brought abundant revenues to European

[27]It is rather interested in the way in which the strength were emphasized and the weaknesses concealed.

manufacturers, such as Nokia and Ericsson, establishing them as international market leaders. The industry's international competitiveness, however, appears to have come at the price of worrying degree of market concentration in Europe. The European mobile equipment market today is dominated by three companies—Nokia-Siemens-Networks, Sony-Ericsson and Alcatel-Lucent. This puts the justification of collusion during the development of common standards to create a platform for subsequent market competition somewhat into question. The European Commission appears to have accepted this as a price for the companies political support in the inter-institutional struggle with the Council.

2.3 Conclusion

This case study suggests that the European Commission's entrepreneurial leadership played a decisive role in the development and deployment of both the GSM as well as the UMTS standards. In both cases—though in markedly different circumstances—the Commission was able to set the agenda by identifying and matching standardization problems, solutions and a potent actor-coalitions. It mediated decision-making conflicts over the technological bases of the two standards, it mediated commitment problems by organizing the standards' market deployment. Moreover, the Commission shielded the standardization process off from political contestation by actively depoliticizing the discourse surrounding the process.

The Commission demonstrated all of three crucial qualities of a policy entrepreneur (Kingdon, 1984, pp. 189-190). First, it managed to be taken seriously by the standard-setters; secondly, it demonstrated great negotiation skills; and last, but most importantly, it demonstrated great persistence. Both in the case of GSM and UMTS, it waited for several years until a window of opportunity finally opened up.

In light of the fact that the Commission's entrepreneurial interventions took place in rather *un*favorable circumstances, public entrepreneurship can also be expected to play a similar role in more favorable circumstances.

While the Commission intervened during all stages of the standardization process, the Commission's agenda-setting at the very beginning has to be considered the most important. If companies would have eventually overcome their collective action problems themselves, this is likely to have happened at a much later point during the two technologies' life cycles, as demonstrated in the case studies of digital television and intermodal transport standardization (Chapters 4 & 5). The Commission's agenda-setting role made sure that the standard-setters started to collaborate at a relatively early point in time, namely during the R&D

phase. This was crucial in that it (1.) provided European industry with a first mover advantage internationally, (2.) it minimized the risk of potential bargaining conflicts, and (3.) brought together the technical experts, which turned out to create an epistemic community that became an important driving force behind the collaborative development of common European standards. At a later point during the standardization process, the Commission's entrepreneurial interventions during the standards development and deployment phase are unlikely to have had the same effect. This case study thus confirms the hypothesis that early intervention represents one of the conditions necessary for entrepreneurial leadership to have an effect.

The presence of an acute industry crises is another necessary condition. In both cases, it was not until industry crisis emerged that the Commission was able to mobilize collective action.

Additionally, this case study demonstrates that public entrepreneurs do not necessarily need to be neutral or honest brokers to be effective. While the Commission may have been genuinely concerned about the lack of European industry's competitiveness, it is clear that it would not have intervened had it not allowed the Commission to strengthen its position vis-à-vis its institutional rivals. Through its close collaboration with the standardization coalition, the Commission was able to expand its competences in telecoms and industrial policy. Therefore, the Commission was also happy to accept increasingly worrying degrees of market concentration in the European mobile equipment industry.

Finally, this case study provides important insights into the conditions for political contestation to undermine technical standardization. The UMTS Decision that obliged Member States to provide at least one UMTS license if industry desired did not appear to have led to the political contestation and failure of UMTS because the veto players mobilized by this 'hard' intervention did not have access to the potential veto points. This underlines the assumption that hard interventions and the resulting political contestation can only have a negative effect on standardization process in pluralistic political systems that provide all concerned stakeholders with access to the relevant decision-making processes.

Chapter 3

High-Definition Television

In the case of European HDTV standardization, too, the Commission sought to play an active role. In contrast to the case of mobile telecoms, however, the Commission did not exclusively rely on entrepreneurial policy instruments alone. Only during the initial development stage of the standardization process, it relied on entrepreneurial policy instruments. Eventually, however, it chose non-entrepreneurial, hierarchical policy instruments to strengthen the deployment of its preferred standards. Thereby, this case study provides a good opportunity for both within-case and cross-case comparisons of the performance of hierarchical and entrepreneurial policy instruments.

First, the comparison between the mobile telecoms and the HDTV case presents an opportunity to investigate the impact of hierarchical and entrepreneurial interventions. Considering the fact that in both cases the Commission's interventions have taken place in rather similar circumstances, as discussed below, this case study may allow for a number of contingent generalizations based on the 'most similar' comparison with the mobile telecoms case.

Secondly, it presents an opportunity to compare the impact of hierarchical and entrepreneurial policy instruments during the development and deployment stages of the standardization process respectively. In the light of the mobile telecoms case study's conclusions, which suggest that entrepreneurial interventions during the early development stage were crucial for the success of technical standardization, this comparison is particularly interesting. It may allow for an investigation of the question whether hierarchical interventions during the deployment stage will still lead to the political contestation of the standardization process, despite earlier, entrepreneurial interventions during the development stage. Therefore, this case study may provide an opportunity to test the relative strength of the impact of hierarchical and entrepreneurial policy interventions.

The Chapter is organized in two Sections. The first, Section 3.1, investigates the effectiveness of the Commission's agenda-setting efforts. And Section 3.2

examines the effect of the Commission's attempt to subsidize the deployment of and mandate compliance with its preferred standard.

3.1 Agenda-Setting

Since the late 1970s, the Commission had tried to launch a European industrial policy in the field of television content and equipment. In lack of any significant policy competences in industrial policy, the Commission's initial strategy was rather similar to the case of mobile telecoms. Therefore, it build on entrepreneurial policy instruments. First, it sought to set the agenda of private standard-setters, so that they would develop the desired European standards. This Section is structured around the three functions of the agenda-setter. It investigates to what extent the Commission was able to mix and match a standardization problem, solution and standardization-coalition.

3.1.1 Identification of a Standardization Problem

As in the case of the telecoms industry, the Commission was quite concerned about the competitiveness of Europe's audiovisual and consumer electronics industry. The industry was in crisis. Throughout Europe, TV set manufacturers were experiencing declining sales (Bray, 1996, p. 98). The market for TV sets was saturated. Consumers only tended to replace their TV sets every twelve years on average—not often enough for manufacturers to break even (de Bruin, 1997). While the memory of the defeat to Japan's consumer electronics industry in the video cassette market in the late 1970s was still fresh,[1] Commissioner Davignon and his ITTF feared that after Europe's IT industry, the audiovisual and consumer electronics industry, too, would fall irrevocably behind its international competitors. The lack of common standards was soon identified as a main problem. Europe's national manufacturers as well as broadcasters, which often enjoyed monopolistic positions in their respective home markets, were accustomed to use broadcasting standards as barriers to trade to shield their respective national markets off from their international competitors and from each other. This way Europe had already ended up with two incompatible color television standards: PAL (Phase Alternative by Line) and SECAM (Sequential Color with Memory). According to the Commission,"[t]his discourages mass production, blunts the competitive edge of European manufacturers and increases the price of television for consumers" (EC, 1984b, p. 6).

[1] Interview C1 with a Commission representative (2010)

3.1.2 Identification of a Standardization Solution

As a solution to this policy problem, Davignon and his ITTF called for common standards and increasing industrial cooperation (EC, 1983, p. 5). To retain their competitiveness, European companies need to maximize their returns to scale, which could only be achieved if companies opened their national markets and agreed to common European standards, it was argued:

> This should also be an industrial policy objective in order to increase the competitiveness of European industry in the face of Japanese and US rivals who enjoy large, unified domestic markets.
>
> (EC, 1984b, p. 7)

At the dawn of the emergence of satellite television, the Commission attested the industry a huge growth potential (EC, 1983, 1984b), however, "provided a common policy is launched without delay" (EC, 1983, p. 5). "If it fails to keep up with the demand, this gigantic new market [i.e. satellite broadcasting] will be taken over by American and even Japanese competitors, thereby compounding their economic and cultural penetration of Europe," the Commission warned (EC, 1984b, p. 6). It presented the emergence of satellite television, as an opportunity to adopt a single common standard for television broadcasting throughout Europe:

> The Countries of Europe, despite having been unable to agree on common technical standards for 625-line [standard definition] television, now have a new opportunity to standardize their satellite services. This would help to achieve rationalization on the internal market and to ensure an effective European presence at world level in terms of industry, commerce and exports.
>
> (EC, 1983, p. 12)

The Commission's ITTF suggested that a common market for standardized HDTV equipment could be worth €10 billion (EC, 1986, p. 6). The development of European HDTV system, however, required huge investments. Therefore, the Commission suggested a pooling of resources to minimize the R&D costs and to use the scale of a common European market for television equipment (EC, 1987b, p. 10) and argued that, "[s]tandards are the pre-requisite to economies of scale in manufacture and consequent consumer confidence in the decision to purchase" (EC, 1988a, p. 6).

In its quest for this policy solution, again, the Commission took its inspiration from two main sources. First, with its emphasis on 'scale economies', as in the case of mobile telecoms, the Commission appears to have been influenced by the newly emerged New Trade Theory. Secondly, it took inspiration from the rapid roll-out of satellite television in North America. "The current situation on the United States and Canada, large countries without internal frontiers,

shows how rapidly satellite and cable networks can expand in just a few years," the Commission suggested (EC, 1983, p. 15). Like the case of mobile telecoms standardization, this demonstrates how public entrepreneurs may overcome their alleged information problems by exporting existing ideas and experiences into a new policy context.

3.1.3 Mobilization of a Standardization Coalition

Having matched policy problem and solution, however, the Commission struggled to complete the agenda-setting process and to identify and mobilize an adequate actor-coalition. That is not to say, however, that it was lacking support. By linking its standardization policy to the cultural role of television, it soon won the support of the European Parliament (see European Parliament [EP], 1984, pp. 7,20-21), which turned out to be rather receptive to the Commission's reasoning that Europe's cultural heritage was at stake.

> Television can make a major contribution to the promotion of a sense of common historical, cultural, economic and political destiny amongst Community citizens (p. 6) ... By linking together European culture and the new technologies, which hold the key to future prosperity and employment, a European television policy is now a major imperative.
>
> (EC, 1984b, p. 10)

At the same time, the Commission won the support of the European Broadcasting Union (EBU) and the European Association of Consumer Electronics Manufacturers (EACEM), who were just in the process of developing technical specifications for satellite television system called MAC (Multiplexed Analogue Components), which was intended to be backward compatible with the existing PAL and SECAM systems (EC, 1984b, p. 6; EC, 1986, p. 10). The Commission supported these efforts and called on industry and governments to migrate from the older incompatible standards to MAC. While the new system was generally welcomed, no concrete actions were taken.

In 1986, however, the situation changed dramatically. At the 1986 meeting of the CCIR (Consultative Committee for International Radio)—the organization that used to be responsible for international television standardization—in Dubrovnik, Japan's government proposed the adoption of its domestic HDTV technology as the common international standard. It had just invested €700 million in the development of a domestic HDTV system and suggested that the system was ready to be implemented on a global scale (Lycett, 1989). Throughout European industry, this proposal was perceived as a great threat, as the following statement by an executive of Thomson demonstrates:

> High-definition television was to be the [Japanese consumer-electronic companies'] ultimate weapon—an instrument with which to squeeze their European competitors out of their own domestic market and *blitzkrieg* the wide-open American market. In short, move in for the kill [...] This [the Dubrovnik meeting] was to be the new Verdun.
>
> (Interview with an unnamed Thomson executive in, *The Economist*, 1990)

It was commonly expected that the acceptance of the Japanese standard would consolidate the dominant position of Japan's consumer electronics industry once and for all. Therefore, the European Commission finally had no trouble convincing industry that this had to be prevented by all means.

The Commission helped organize the European industry's opposition against the Japanese standard. At the CCIR meeting, companies were represented only indirectly through their respective national governments. Upon the initiative of Davignon and his ITTF, companies started to lobby Member States' governments to oppose the Japanese standard. Then Davingon coordinated the positions of the European delegations at Dubrovnik (EC, 1988a, p. 2). Moreover, it provided them with a pretext to justify their position, suggesting that the Japanese standard was not backward compatible with European TV systems.[2] "The Japanese 'revolution' would have thrown some 600 million TV receivers throughout the world on the scrapheap," Peterson (1993, p. 511) cited a European diplomat at Dubrovnik echoing the Commission's narrative. To be compatible with the installed base of existing TV sets in Europe with 625 lines any HDTV standard would have to have exactly twice, i.e. 1250 lines, and not 1125 lines as the Japanese technology.[3] In reality, however, backward compatibility should not have been an insurmountable obstacle to the development of a HDTV. After all, the replacement of existing TV sets was the main reason why the European TV set manufacturers wanted to get involved in technical standardization. Yet, they obviously preferred European companies to replace their TV sets with European rather than Japanese HDTV sets.

Together the European delegates pushed for a postponement of the decision on HDTV standards until the next CCIR meeting, which was scheduled to be held four years later in 1990 in Düsseldorf. Under the pressure of its European members', the CCIR eventually decided to defer the decision on HDTV for four years to leave time for the identification of a new standard suitable to all parties. This was to provide the Europeans for enough time to develop a backward compatible alternative (Cawson, 1995).

The Commission's coordinating role during the negotiations at Dubrovnik, strengthened its credibility with the industry's leaders. This is also illustrated by

[2] EC (1986), citetInterviewBrown2010TV

[3]

a telegram from the Director of the French company SGCI, from May 22 1986, to the permanent representation of France to the EU, stating that

> The President [i.e. Mitterrand] *and* the Commission ought to be congratulated for the coordinating role it had played between the twelve European governments present in Dubrovnik.
>
> (quoted in Bray, 1996, 94, emphasis added)

This turn of events finally opened the window of opportunity that the Commission needed to mobilize a broad actor-coalition of companies in support of its standardization strategy. Against the threat posed by the Japanese standard and the shared sense of crisis among Europe's companies, Etienne Davignon and his ITTF had no difficulty in convincing national manufacturers that a coordinated response was needed in order to fend off the Japanese standard. The Commission convinced companies that blocking the Japanese standard alone was not enough. They needed to come up with a European alternative to the Japanese standard (EC, 1987b, p. 10). European industry was very receptive to these arguments. According to Philippe Laven (1998), director of the EBU's Technical Department, it was felt "that they had to achieve agreement [on a common strategy] because they realized that it was 'now' or 'never' " (Laven, 1998).

As the case of mobile telecoms standardization, this, too, confirms that the presence of industry crisis was necessary for public entrepreneurship to have an effect. This episode shows that companies were unwilling to respond to the Commission's entrepreneurial efforts until they were confronted with a real crisis situation that forced them to reconsider their existing strategies and to look for new ones. Once the crisis had occurred, however, companies turned out to be highly receptive to the entrepreneurship—i.e. the mobilization of collective action and the solutions—offered by the Commission. The European TV set manufacturers finally agreed to collaboratively develop a European HDTV standard, based on the existing MAC technology, named HD-MAC.[4] At last, the Commission had succeeded to mobilize an actor-coalition that was willing and able to develop the desired standards. The European TV set manufacturers around Philips, Thomson, Grundig and Nokia were going to drive the R&D and standardization process, providing the technical expertise, investments as well as the political pressure that was necessary to develop the standard.

This episode also demonstrates the importance of persistence, without which entrepreneurship is unlikely to succeed. It took the Commission several failed attempts to mobilize a standardization coalition, until the competitive threat posed by the Japanese HDTV standard proposal at the CCIR had finally opened a

[4]It was meant to be backward compatible with the PAL and SECAM standards.

window of opportunity. Moreover, this case suggests that the Commission may be in a better position to assume the role of an entrepreneur than most elected officials in that it has the possibility to push a policy agenda over a much longer period of time until a window of opportunity eventually opens up.

As both factors could also be observed during the case of mobile telecoms, a much stronger basis exists for concluding that both constitute necessary conditions for public entrepreneurship to have the desired effect.

Together with the standardization alliance that had formed around the consumer electronics manufacturers, the Commission continued to build on a broad political alliance in support of European HDTV standardization. With the support of its private allies, the TV set manufacturers, Davignon and the ITTF started to lobby Member States' governments. Industry lobbied governments at the national level and provided the Commission with the technical information that it needed to make its case at the European level. The Commission, in turn, provided the political narratives linking HD-MAC to broad policy objectives such as growth and competitiveness. Three distinct, strategic narratives can be identified. First, the Commission emphasized the strategic nature of HDTV for European competitiveness, growth and job creation. With a projected volume of €150 billion of the future HDTV market, the Commission argued that, "[t]he scale and potential impact of this new technology make it of strategic importance" (EC, 1988b).

Secondly, the Commission began to frame HD-MAC as a cultural rather than a purely industrial project. It was argued that television played a central role in the functioning of modern democratic societies.[5] "This new medium will offer remarkable new opportunities for economic growth and employment but *also* for the presentation of subjects related to the European Identity in an attractive form," it was argued (EC, 1988b, emphasis added).

Thirdly, the Commission also increasingly began to make use of the image of American cultural imperialism (see Hutchison, 1993, p. 440). In 1989, Delors argued that the EU could not afford "to leave the monopoly of audio-visual techniques to the Japanese and that of programmes to the Americans" (Delors, 1989). While Europe produced as many movies as the US (EC, 1988c, p. 28), it was pointed out that 40% of all movies broadcasted on European public service television channels were American (EC, 1988c, p. 22). If no action was taken, the Commission suggested, by 1995, the European audiovisual industry's share

[5]The Commission's argument appears to stand in sharp contrast to many, such as Putnam (1995), for instance, who argue that "[t]elevision has made our communities (or, rather, what we experience as our communities) wider and shallower. In the language of economics, electronic technology enables individual tastes to be satisfied more fully, but at the cost of positive social externalities associated with more primitive forms of entertainment" (Putnam, 1995, p. 65).

of the market that has a total volume of 125,000 hours of drama productions, will have dropped to 20,000 hours (15%) (EC, 1990).[6] Therefore, Commission President Jacques Delors told the EP in 1989 that as long as he was in charge "[t]he Community refuses to leave the monopoly of audio-visual techniques to the Japanese and that of programmes to the Americans" (Delors, 1989).

Strengthened by the political support of industry and armed with the above-mentioned policy narratives, the Commission eventually turned to EUREKA (European Research Co-ordinating Agency) for financial support. EUREKA was an intergovernmental high-tech collaboration program, which had been launched by the French President Mitterrand in response to the American Star Wars initiative (Carton, 1987). After an extensive lobbying campaign launched by Bosch, Philips, Thomson and Thorn-EMI, Member States governments accepted the HD-MAC project as EUREKA project number 95, also referred to as E!95.

> The European Council considered the situation in the audiovisual media. It agreed that it is urgently important for the Community that European production of audiovisual programs reflecting the richness and diversity of European culture should attain a level more in line with the broadcasting capacity in Europe. [...] It felt that urgent consideration should be given to the possibility of creating a EUREKA project in the audiovisual sphere.
>
> (European Council, 1988, p. 3)

This official statement of the Council thus directly reflected the Commission's argumentation. The Council accepted the reasoning that actions needed to be taken to strengthen Europe's industrial competitiveness and to "to enhance and promote European culture in its richness and diversity" (European Council, 1989, p. 10). Davignon and his team, together with the alliance of equipment manufacturers, succeeded to install the argumentation that justified its standardization work as the dominant policy paradigm. Wary not to openly challenge Member States' sovereignty, however, it continued to downplay its own role. Adam Watson-Brown, then member of Davignon's cabinet, for instance, suggested: "Don't imagine that the Commission defines the reasons why one or another standard should be used. What we've done here is simply that we have organized the European negotiations. We are trying, at the European Commission, to create something 'European' " (Interview with Adam Watson-Brown of the European Commission, quoted in Bray, 1996, p. 97, author's translation).

As a result of—and a reward for—their lobbying efforts, the E!95 project was tailored around the interests of the standardization alliance that the Commission had formed around the TV set manufacturers. The manufacturers were classified

[6] In 1999, the Commission calculated that the share of US import on the audio-visual markets of the Member States was between 60 and 90 percent with a total value of Euro 7 billion, while the share of European import on the US markets was only 1-2 percent (EC, 1999b).

as 'type A partners.' Broadcasters, program-makers, sub-contractors and all other industry participants were classified as 'type B' participants. They only had limited influence and voting rights. This membership structure, allowed the alliance of TV set manufacturers to dominate the standardization process and to bias the developed standard toward its own technical preferences. This is also reflected in the fact, for instance, that HD-MAC was always intended as a proprietary system, which meant that broadcasters and other users of the system would have to pay royalties to the group of manufacturers. The proprietary nature of HD-MAC also meant that the largest returns were to be expected on the equipment rather than the services side of the market.

As argued in the introductory Chapter 1, such exclusivity of the standardization process, for better or worse, constitutes a necessary condition for private, technical standardization to succeed. Assuming that companies interests are not only moderately heterogeneous, but that consensual decision-making processes also open the opportunity for hold-out strategies, it can be considered highly unlikely that standard-setters would be able to agree to a single common standard if all concerned actors and interests are directly involved. In the case of HD-MAC standardization, however, participation was limited to the relatively small and homogeneous group of equipment manufacturers. This meant that they could expect to be able to recoup their investments into the development of the European standard by making sure that it conformed with their technical preferences and by claiming royalties from the standards adopters. Therefore, an important necessary condition for private standardization to succeed had been met.

Initially, however, Davignon and the ITTF had strong reservations about EUREKA. It was feared that the project, which was deliberately set up outside the European Community structures and motivated by Member States' reluctance to give up national R&D prerogatives (Peterson, 1991, pp. 284-287), would reduce national contributions to the European Framework Programmes, such as RACE. Moreover, EUREKA escaped from the control of the Commission. According to its founding document—the Hanover Declaration from 1985—it was officially governed by an intergovernmental Council of Ministers of the participating member states (EUREKA, 1985). In practice, however, EUREKA was de-centrally organized and funding decisions were strongly influenced by national politics. Most of the—at that time—18 member states tended to have their own research priorities and favored their national manufacturers. In the E!95 project, particularly French and, to a lesser extent, German governments took a strong influence on the research (Bray, 1996).

When EUREKA turned out to be an excellent platform to raise contributions from Member States without having to go through the cumbersome procedures of the EU's budgetary rounds, however, the reservations were quickly overcome. According to EUREKA (2010) itself, it raised around €720 million. According to Cawson (1995) and Peterson and Sharp (1998), however, this figure is likely to have been close to €1 billion or more.

Up to this point, it can therefore be concluded that the European Commission's entrepreneurial leadership had a decisive influence on the development of the European HDTV system standard. Its identification and framing of the standardization problem, solution and mobilization of a standardization-coalition that had the financial means and expertise to develop a European standard was crucial to make these developments possible. Moreover, the Commission build broad political support for the European HDTV standardization project.

It might be argued that not the European Commission's entrepreneurial intervention and agenda-setting but rather the financial subsidies that companies were awarded through the E!95 project, led to the mobilization of the standardization alliance. The exact sequence of events, however, suggests that this has not been the case. First, the Commission's agenda-setting efforts led to a mobilization of the standardization alliance. Then the alliance, together with the Commission, lobbied Member States governments to provide the R&D subsidies. Without the Commission's agenda-setting, the alliance would have never formed, companies would not have lobbied Member States, and the latter would not have set up E!95. Therefore, the driving force, in this case, was the Commission's entrepreneurship and not the financial subsidies, Member States or companies.

3.1.4 Favorable Starting Conditions for the Deployment of HD-MAC

Up to this point, the deployment of HD-MAC, the European Commission's agenda-setting was just as successful as—if not more than—it had been in the case of mobile telecoms standardization standardization. With the broad political support that had been won by the Commission and the standardization alliance as well as the EUREKA funding, European HDTV standardization appears to have been in just as good—if not better—starting position than GSM (See Table 3.2). As shown in Table 3.1, the HD-MAC standard-setters had access to much more R&D funding than the developers of GSM. With this funding, the manufacturers participating in E!95 made fast progress toward the development of the HD-MAC system. In 1989, the alliance successfully demonstrated the system International

Table 3.1: R&D Funding for GSM and HD-MAC (in Mio)

	Name	Time	Budget
GSM	RACE I	1988-1992	€550
HD-MAC	E!95	1988-1991	€720

Broadcasting Convention in Brighton (EC, 1988a, pp. 2,12).[7] Member States' representatives are reported to have been highly enthusiastic about the results.[8]

Moreover, the broad political support by the Council and EP, which had turned out to be very receptive to the Commission's arguments that not only Europe's industrial competitiveness but also its cultural heritage was at stake, should have undermined political contestation and protected the insulation of the E!95 project from broader participation and scrutiny.

With the exclusivity of the E!95 standardization project, another important necessary condition for European standardization to succeed was met. As in the case of second generation mobile telephony, HDTV offered great benefits to all market participants, also to operators, broadcasters and not just the equipment manufacturers. To operators and broadcasters, the increased picture quality of HDTV meant an opportunity to offer a new television sensation to customers—in addition to just more channels—making use of the increased broadcasting capacity of satellite television. For many operators, and especially pay TV providers, HDTV might have meant an opportunity to differentiate themselves from conventional free TV operators. For TV set manufacturers, HDTV meant an opportunity to boost their declining sales. Moreover, the deployment of a European HDTV standard also offered both manufacturers as well as operators and broadcasters and opportunity to strengthen their position against their international competitors. All in all, the entire industry could expect to benefit from the introduction of HDTV. While different industry participants may have preferred different technological standards and deployment dates and strategies, however, none opposed the introduction of HDTV, in principal.

Not even the fact that digital broadcasting was already on the horizon, should have prevented industry from adopting the half-digital HD-MAC standard—the transmission of audio signals was already digitalized—until digital television technology was matured. With the benefit of hindsight it can be noted that it was going to take another decade for digital television to be introduced and even

[7]The CCIR timetable had required a successful demonstration of HDTV concepts before the May 1989.

[8]Interview C1 with a Commission representative (2010)

today digital has not replaced analogue television completely. The comparison to mobile telecoms also shows that the emergence of digital technology was not a problem. In this case too, fully digitalized, third generation telephony was already looming over the introduction of the introduction of GSM.

Furthermore, the deployment of HD-MAC could be expected to benefit from considerable network effects and scale economies. The intense collaboration of the entire European TV equipment manufacturing industry within the E!95 project should have offered considerable scale economies. Although HD-MAC equipment would initially have been rather expensive—as criticized by the opponents of HD-MAC (see Section 5.2.4)—these scale economies should have enabled producers to sustainable provide HD-MAC equipment at decreasing price levels opening it to a mass market. And once a critical mass of HD-MAC units would have been sold it could be expected to create its own demand. Therefore, another important necessary condition was present, which was defined in the introductory Chapter (1) and confirmed by the mobile telecoms case study.

Moreover, the European Commission also intervened at a sufficiently early point in time, namely even before the R&D stage of the standardization process. Thereby, also the condition, which was identified as the most important necessary condition in the case of GSM standardization, were met. The GSM case study suggests that such an early intervention should be expected to have a strongly facilitating impact on the deployment of the given standard. The starting conditions for the deployment of HD-MAC can thus be considered to have been very favorable. Whether and to what extent the European Commission was able to use these favorable starting conditions and turn the deployment of HD-MAC into a success equaling that of GSM, is investigated in the following Section.

3.2 Hierarchical Intervention and Political Contestation

In contrast to the mobile telecoms case, however, the Commission chose not limit itself to entrepreneurial instruments to promote the deployment of HD-MAC. Instead of mediating potential conflicts, ensuring commitment and coordinating the market introduction of the standard through entrepreneurial instruments, as it had done in the mobile telecoms case, the Commission sought to force the introduction and adoption of HD-MAC by subsidizing the deployment and adoption, and mandating compliance with the standard. This stands in stark contrast to the mobile telecoms case, where the Commission exclusively relied on entrepreneurial policy instruments (see Table 3.3). Given the broad political

Table 3.2: Starting Conditions of GSM and HD-MAC at Time of Deployment

Starting condition	HD-MAC	GSM
Broad political support by	MS, EP	PTT, MS, EP
Exclusive standardization-coalition around	Telecoms manufacturers	TV set manufacturers
Favorable institutional framework	ETSI	E!95
Supporting policy narrative	Competitiveness and protection of Europe's cultural heritage	Competitiveness
Pre-normative R&D subsidies	RACE	E!95
Potential gains	Large and broadly spread	Large and broadly spread
Next-generation technology on the horizon	Digital broadcasting	Mobile multimedia telecoms
Rival technologies already installed	Analogue satellite broadcasting	First-generation mobile telecoms
Network and Scale economies	✓	✓

support that it had achieved during the agenda-setting stage, the Commission did not only expected the use of these more coercive instruments to guarantee the success of HD-MAC but also to be politically possible. Therefore, the Commission's hierarchical intervention in the European HDTV standardization process provides an opportunity to investigate the different impact of entrepreneurial and hierarchical policy interventions.

Already in 1986, at the time of the CCIR meeting in Dubrovnik, the Commission had proposed a Directive making the MAC system *the* mandatory standard for satellite television within Europe (EC, 1986). This was meant to make sure that any satellite systems introduced before the development of HD-MAC was completed would be compatible with the latter. Against the alleged threat of Japanese dominance in HDTV and with the support of national manufacturers, the Commissioner Davignon had little difficulties persuading Member States to adopt its proposal. Only six month after Dubrovnik, the Council adopted the 'MAC Directive' (86/529/EEC), which made MAC mandatory, though only for a period of four years and only for high powered television broadcasting satellites, an exemption that the proponents of the competing PAL system eventually used to start broadcasting over low-powered telecommunication satellites.

Where in the case of GSM standardization the Commission negotiated a MOU among the different industry participants, which reciprocally committed them to make the necessary investments into compatible equipment and services, the Commission sought to force the deployment and adoption of HD-MAC by means of positive and negative sanctions based on two legal instruments.[9] First, the Commission proposed a new MAC Directive, when the MAC Directive expired at the end of 1991, that was to oblige all broadcasters and satellite operators to use HD-MAC starting in 1992 and force all manufacturers to fit all new TV sets with HD-MAC decoders by 1993 (EC, 1991).

Second, it proposed a financial Action Plan that was meant to provide subsidies toward the deployment of HD-MAC. In 1992, the Commission proposed a five-year Action Plan that was intended to provide between €850 million and €1 billion—approximately €5 million per channel per year—to ease the adaption costs created by HD-MAC (EC, 1992c). In return for this support, industry was asked to sign a MOU committing all broadcasters to a voluntary cut-off date for non-MAC-based standards. These subsidies distinguished themselves from the subsidies previously provided through EUREKA and the mobile telecoms case, that they were not targeted at the technological development but rather the market adoption of the standard.

Soon, however, the Commission's twin strategy of subsidizing the deployment

[9]Interview C1 with a Commission representative (2010)

Table 3.3: Interventions of the European Commission targeted at the Deployment of GSM and HD-MAC

HD-MAC	GSM
Proposed deployment subsidies	Mediation of bargaining conflicts
Proposed mandation of compliance	Ensuring of commitment
Selection and support of a single technology	Coordination of market deployment

and mandating of compliance with HD-MAC started to backfire. The more legal weight—in the form of hierarchical law—the Commission threw behind HD-MAC, it seemed, the stronger the opposition against HD-MAC grew. Instead of supporting the standardization coalition it strengthened the opponents of HD-MAC. The legislative decision-making processes initiated by the Commission's attempt to use such positive and negative sanctions, however, simply multiplied the number of involved veto players and veto points rather than prompting industry to adopt the common standard.

3.2.1 Multiplication of Veto Players and Veto Points

The first effect of the Commission's proposals to mandate and subsidize the adoption of HD-MAC was that it raised the stakes for all actors involved. Prior to the Commission's proposal, the chance that HD-MAC would become the dominant standard depended on how well it competed with alternative standards in the market place. In principle, any system that would have achieved a critical mass of adopters first could become the dominant, *de facto* standard. Therefore, the proponents of alternative systems, namely PAL plus, an evolution of PAL, and SECAM, focused all their energy on the development of the development and deployment of these systems. MAC was merely a market competitor. Before the Commission proposed the Directive, the proponents of PAL and SECAM had no reason to get involved in the HD-MAC standardization process.

The Commission's hierarchical intervention, however, meant a non-market, i.e. a political threat. If the Commission's proposals were adopted, stakeholders knew, HD-MAC would become the *de jure* European standard. They would be forced to comply with it, if they did not prevent its adoption. Therefore, many stakeholders that were previously not directly concerned with the HD-MAC standardization process started to push into the policy process to make sure that the process' outcome would be compatible with their technological and strategic interests. They started to fight this threat outside the market at the political level.

They hence started to participate in the policy process in order to make sure that they were not adversely affected by HD-MAC. The Commission's hierarchical intervention thus had the effect of mobilizing the opposition against HD-MAC.

Just as industry crisis was necessary for collective action in the case of mobile telecoms standardization (Chapter 2), it appears that the hierarchical intervention of the European Commission created the crisis that facilitated the mobilization of collective action of the HD-MAC opponents. Moreover, the fact that in pluralistic political systems hierarchical interventions always implicate multiple public actors, such as the EP and Council, provided the newly emerged veto players with effective veto points. These veto points turned out to be a lot more accessible than the standardization committees. While the participation in the actual standardization process would have required the new veto players to commit significant amounts of time and resources, the cost of participating in the public policy making process was much lower. To raise their voices in the political arena, they did not have to draft a technical proposal and delegate technical experts to the relevant standardization committees. And whereas technical standardization committees generally require actors to formulate their interests in abstract technical terms (Schmidt & Werle, 1993, p. 15; Sirbu & Zwimpfer, 1985), they merely had to point out the redistributive consequences of the standardization process in order to demonstrate that it was not as technical as it may seem and to destroy the policy consensus upon which the Commission's proposal was based (see Section 3.2.2). Moreover, the broadcasters influence in the E!95 standardization project was limited. Therefore, they pushed onto the arena of European politics, appealing to the EP and European Council to influence the standardization process.

The multiplication of veto players and veto points and interests started already with the Commission's proposal for the first MAC Directive in 1986, which was meant to mandate compliance with the MAC standard for satellite television, until the development of HD-MAC was completed and ready for implementation. Because the mandation of compliance with MAC threatened to nullify many broadcasters investments into PAL and SECAM, they began to mobilize themselves against the proposal. As Luxembourg was just reinventing itself as the seat of Europe's satellite broadcasting industry, the MAC opponents started to lobby Luxembourg's government to veto the MAC Directive. Luxembourg held out agreement in the Council until the French government and the Commission proposed, as a compromise, to exempt low and medium powered communications satellites, which were not yet able to transmit television signals but which the proponents of PAL plus and SECAM intended to use for satellite broadcast-

ing.[10] Due to rapid advances in reception technology, the MAC opponents were soon able start broadcasting television signals in PAL and SECAM soon after. In 1988, Rupert Murdoch's Sky started broadcasting over a communications satellite called ASTRA, which was not covered by the MAC directive.[11] Later in 1989 four German channels also started to broadcast in PAL over the ASTRA satellite (Peterson, 1993).

The Commission's proposal for the second MAC Directive—the HD-MAC Directive in 1991—and the proposal for the Action Plan further intensified the opposition. The PAL Plus and SECAM proponents were joined in their opposition against HD-MAC by many broadcasters which were not opposed to HDTV *per se* but which were concerned about the tremendous costs that the adoption of—and adaptation to—the standard would have involved. They had to replace all of their production and broadcasting equipment with HD-MAC equipment. Moreover, they generally favored bandwidth efficiency—i.e. the ability to broadcast a large number of channels over a limited radio spectrum—over picture quality. They were also concerned that the demand for HDTV would not suffice to recoup the required investments.[12]

3.2.2 Decunstruction of the Policy Consensus

To prevent the mandation of HD-MAC they started an intensive lobbying campaign, that was meant to undermine the legitimacy of the HD-MAC alliance. The HD-MAC opponents' arguments can be summarized in three strategic counter-narratives. First, they sought to place the consumer at the center of the debate, which stands in stark contrast to the Commission's HD-MAC strategy that focused on industry competitiveness. "The interests of the industry are being given more weight than those of television viewers," a representative of Thames Television said at a hearing of the EP (European Report, 1991b). And SES—Luxembourg's ASTRA satellites operator—tabled a report that suggested that only 20% of Europe viewers would be able to enjoy the full benefits from the improvements

[10] Interview C1 with a Commission representative (2010). The information gathered during the course of this project, contradict accounts by Cawson (1995); Dai (2008), which suggest that the Directive's exclusion of such satellites was coincidental and based on the common believe that it was not possible to transmit television signals over such satellites.

[11] Satellite transmission was crucial for the viability of pay TV, whose major selling asset was based on its comparatively large amount of offered channels.

[12] This concern seemed to be supported by the high price of HD-MAC compatible TV sets. The first HD-MAC compatible TV sets offered by Thomson and Philips cost €5,000 and €4,350 respectively (European Report, 1991c; Europolitique, 1991; d'Istria, 1991). In principle, these were not proper HDTV sets yet because they still had only 625 lines. In 1990, the first HDTV-sets ever to go on sale, by Sony, cost even more than €20,000 (*New Media Markets*, 1990). However, this neglects the fact that many technologies, such as Personal Computers or mobile phones, were very expensive at first but that their price dropped vary rapidly.

created by D2-MAC, whilst all viewers would be faced with higher costs (Nolan, 1991).

> Try to imagine! On January 1st 1992, all channels would have lost 100% of their audience. This could have only been emanated from the brain of a Commissioner who is completely detached from the economic realities of the European audiovisual industry. Secondly, on January 2nd, millions of consumers would have gone out to buy new equipment and why? To continue to see the exact same channels they still used to see on December 31st. Absolutely ridiculous!
>
> (Interview with Yves Feltes from SES, in Bray, 1996, p. 297)

Therefore, they suggested that it should be left to consumers themselves to decide whether or not to adopt the HD-MAC standard. And the best way to involve consumers more directly, it was argued, was to let the market and not policy-makers decide.

This argumentation was neither better nor worse than the one advanced by the HD-MAC proponents. It simply emphasized a weakness in the argumentation of the HD-MAC alliance that the latter always sought to conceal. This counter narrative was not without flaws either. It concealed the fact, for instance, that market competition hardly leave consumers much choice either. In theory, only the first adopter has a real choice where network effects and scale economies are present. Subsequent adopters have little choice but to adopt the standard chosen by previous adopters.

As mentioned above, however, this thesis is not directly concerned with the actual validity of these arguments. It is rather concerned with the strategic interests behind the use of these narratives and their impact on the debate and standardization process instead. For instance, the HD-MAC used the just-mentioned narrative because they expected to stand a much better chance in the market, where PAL Plus had already achieved small a first-mover advantage, rather than the political arena, where HD-MAC initially enjoyed broad political support within the Council and the EP, not to mention the Commission. The impact of this strategic narrative on the standardization process is discussed further below.

Secondly, the HD-MAC opponents also sought to deconstruct the Commission's narrative that HD-MAC would strengthen the competitiveness of Europe's audiovisual industry against its American competitors. The HD-MAC opponents pointed out that instead of strengthening European content producers it would push the European market wide open for the American producers because of the 16:9 screen format, the preferred format of the Hollywood movie industry. While European program makers—except for some cinema productions—hardly produce films in this format, the American competition has always produced

cinema as well as TV content in this format and therefore hold a dominant position in the production of movies as well as TV series in 16:9 (see European Report, 1991a). Again, this argumentation was not without weaknesses either. It concealed the fact that the screen format of HD-MAC would strengthen—and was meant to strengthen—the exportability of European audiovisual content.

Finally, the MAC alliance was also attacked on technological grounds, arguing that analogue television systems, such as HD-MAC, were soon going to be made obsolete by the nascent digital technology. The German broadcaster SAT Eins, for instance, therefore called the passage via HD-MAC to the digital future, "a shortcut that is longer than the normal path" (European Report, 1991b). Unlike high-definition, digital TV had long been on the minds of the broadcasting industry. Whilst (analogue) HDTV was very demanding in terms of bandwidth and would have either required broadcasters to obtain more radio frequency or reduce the number of channels, digital TV is more economical and would have allowed for more channels with a lower bandwidth. This argumentation was not without weaknesses either. Commissioner Dodlinger argued:

> The fact remains that a standard for digital transmission does not yet exist. At best, it would be operational in the medium to long term and become a market reality some time later. HD-MAC is defined and its development is well advanced. To abandon it now would mean yielding ground to other existing HDTV systems
>
> (Rapid Press Release, 1991).

This counter argument, however, already came too late.

The impact that the emergence of these strategic counter-narratives, accompanying the multiplication of veto-players, had on the standardization process was that it destroyed the consensus around HD-MAC. Despite the fact that none of the arguments appear to have been much stronger—or weaker—than the arguments of the HD-MAC proponents, the debate that emerged as a result of the multiplication of veto players suddenly forced the HD-MAC opponents to justify their choices. Table 3.4 juxtaposes the arguments of both sides.

However, they made the choice to publicly support the introduction of HD-MAC appear much less uncontroversial than it had initially seemed. Suddenly this choice appeared to be a lot less technical and uncontroversial to policy-makers and, unlike before, the Commission increasingly had to begin to justify its HD-MAC strategy. With the help of these counter-narratives the HD-MAC opponents had successfully pushed the standardization process from the arcane and unfathomable world of engineering and R&D onto the center stage of EU politics. A policy debate emerged that would not have been led otherwise. As a result, HDTV standardization was no longer perceived as an opportunity to

Table 3.4: HD-MAC Narratives and Counter-Narratives

	Narrative	Counter-Narrative
1	A government-led, concerted introduction of HD-MAC would minimize adaptation costs for all stakeholders, including consumers.	A market-led introduction would give more power to consumers.
2	HD-MAC will increase the international competitiveness of European industry. The 16:9 format will strengthen the exportability of European audiovisual content.	HD-MAC's 16:9 format will weaken European industry and push the European market wide open to the American competitors because they have always produced content in this format.
3	HD-MAC represents the state-of-the art. It will revolutionize the production, broadcasting and consumption of audiovisual content.	HD-MAC is about to be outdated by digital broadcasting technology.

realize technological progress and to strengthen Europe's competitive position against Japan and the US but as a (re)distributive struggle among European companies.

As a result, the issue of HDTV was no longer perceived as an opportunity to raise European competitiveness—positive sum game—and the redistributive consequences of HD-MAC—negative sum—dominated the debate.

From the standpoint of participatory democracy, the multiplication of veto players and the emergence of political debate certainly is to be welcomed. For better or worse, television does play an important part in the European citizens' lives and technical standards have an direct impact on how television programs are consumer. Therefore, more democratic input in the development of these standards is clearly to be welcomed. To the Commission and the HD-MAC alliance the politicization of the standardization process, however, did pose a problem for this threatened their dominance over this process.

The political debate that was launched by the HD-MAC destroyed the policy consensus upon which the Commission's intervention was based. This was critical as the legislative procedures established by the Single European Act, the proposed Directive mandating HD-MAC required a qualified-majority in the Council and the assent of the EP. The adoption of the proposed Action Plan providing deployment subsidies required unanimity in the Council. These

procedures turned the EP and the Council into effective veto points for the HD-MAC opponents—i.e. the veto players. Both institutions turned out to be quite receptive to the HD-MAC opponents' arguments.

Although the EP adopted the Commission's proposal it did so not without introducing a number of amendments that would water it down to an extent that it no longer posed a threat to the opponents of HD-MAC. The cut-off date was moved back to 1996 and it only required that TV-sets with a 16:9 screen format only would have to be fitted with a HD-MAC decoder. All others merely have to have a socket to make it possible to receive programs in the standard.

Eventually, the HD-MAC opponents also managed to divide the Council over the Commission's proposal. As the result of an intensive lobbying campaign by the PAL Plus alliance, the Council found itself in a deadlock between the UK and Luxembourg, on the one hand, and Germany, France, The Netherlands, which were still supporting the HD-MAC Directive, on the other. Luxembourg's policy was mainly determined by SES who owned the ASTRA satellites and therefore had a major stake in PAL. Italy, Greece, and Spain opposed any reference to financing until the next budgetary round. Ireland and Denmark wanted to reduce it by half. Eventually, the strong PAL lobby also convinced Germany to drop its support for HD-MAC. At the 1991 Council meeting in Brussels, Chancellor Helmut Kohl brought his telecoms minister, Christian Schwarz-Schilling, an HD-MAC enthusiast, back into line. This left France and The Netherlands isolated. Therefore, the German delegation started to demand a reorientation of the Action Plan toward PAL.

Initially, the UK was not directly concerned by the HDTV development but it refused Community subsidies out of principle. Eventually, however, Murdoch's BSkyB (British Sky Broadcasting) convinced the UK government to oppose HD-MAC.[13] The UK hence adopted the argumentation of the HD-MAC opponents, arguing that the introduction of MAC would be to the detriment of the consumers.

> If there's a market for this, then industry will produce it. It's as simple as that. What we're not prepared to do is pour in huge amounts of taxpayers' money into a technology which may be outdated before it even arrives.
> (UK Secretary of State for Telecommunications, Edward Leigh, on CNN Kelly, 1993).

At the November 19st 1991 Council meeting in Edinburgh, Edward Leigh, who also chaired the meeting, therefore vetoed the Action Plan and even opposed to convene a special telecoms Council meeting to resolve the issue. According to Bray (1996, p. 262), this is supposed to have led to a furious confrontation with Commissioner Filippo Maria Pandolfi.

[13] After all Murdoch is supposed to have been a personal friend of Prime Minister Thatcher (Bray, 1996, p. 220).

In December 1991, however, a compromise on the HD-MAC Directive could be reached. The Commission's proposal was adopted albeit not without significantly diluting the provisions of the Directive even further. It only required manufacturers to provide a socket for connection to MAC circuitry instead of actually building the MAC system into all satellite receivers and television sets. Only new satellite services which began transmissions after January 1st 1995 were required to broadcast in MAC as well as PAL. And in 1993, the Council adopted the Action Plan Decision providing financial subsidies at a reduced value of €228 million rather than €800 million to the audio-visual content producers "irrespective of the European television standard used" (European Council, 1993, Article 3(1)),[14] which meant that also PAL Plus compliant program makers were eligible (Chaize, 1993).

This was directly opposed to what the Commission had originally intended in its proposal, illustrating by how much the Commission had lost control of the policy process. From the agenda-setter and main driver behind European HDTV standardization, the Commission's role was diminished to that of one among many actors.

This episode illustrates how little it takes to destroy the policy consensus upon which the public support of the given private standardization processes is based. The standards-opponents merely had to point out the normative and redistributive consequences of the standard in order to destroy the policy consensus and to achieve a blocking minority. It also demonstrates how difficult it may be to force the adoption of a common standard through hierarchical policy interventions. In pluralistic political systems, such interventions always require some form a legislative act. Legislative processes was a lot more accessible to concerned stakeholders, however, than technical standardization processes. Because of the number and heterogeneity of actors and interest that participate in legislative processes, it was almost impossible to achieve a mutual agreement on a single common standard through legislative policy-making procedures. The decision-making problems faced by these procedures may be overcome by means of compromises between the different interests. Where variety reduction is the purpose of technical standardization—as it almost always is the case—however, such compromises do not appear to be good enough for there can be either one technical standard or no standard. The coexistence of multiple incompatible standards or a standard incorporating incompatible technologies, would defeat the purpose of the standardization process.

[14] When Edward Leigh was replaced through Patrick MacLoughlin at the top of the Department of Trade and Industry (DTI), even the British government, which once was one of the fiercest opponents of the Directive, lifted its veto (Bray, 1996, p. 262).

Again the comparison to the case of mobile telecoms standardization is illustrative. The entrepreneurial policy instruments employed by the European Commission did not expose the standardization process to political contestation. *Only* a small and homogeneous groups of immediately concerned companies of actors around mobile equipment manufacturers responded to the Commission's entrepreneurial interventions. Furthermore, the Commission's entrepreneurial interventions did not increase the number of veto points either. None of the instruments used by the Commission directly required a formal vote by the EP or Council. Therefore, neither GSM nor UMTS standardization was exposed to political contestation.

3.2.3 Policy Shift

Another factor undermining the standardization process, this case suggests, is that where hierarchical interventions lead to the politicization of the standardization process the initial standardization alliance of private companies as well as the public entrepreneur lose control of—and thus interest in—the process. Without the financial muscle and technical expertise of the standardization alliance and the coordinating role of the public entrepreneur, technical standards hardly have a chance of being successfully deployed in the market place.

Because of the dilution of the HD-MAC Directive the initial standardization alliance around the manufacturers lost interest in the standard. Both Thomson and Philips began to refocus their attention on the development of next-generation television standards in the profitable US market instead. In 1992 Philips' even withdrew its support of EUREKA all together. That is even despite the fact that the broadcasters and operators had finally agreed to a MOU with the manufacturers, which would have guaranteed the latter a steady demand for HD-MAC equipment.

This meant that also the Commission lost an important political ally. Therefore, the Commission, too, eventually turned its back on HD-MAC. After the political contestation of HD-MAC a growing number of Commission members started to distance themselves from DG Information Technology's (XIII) HD-MAC policy. The lobbying activities of the HD-MAC opponents and the division of the European Council appear to have been the catalyst that provided the anti-dirigiste Commission members with opportunity to raise their voice and criticize the standardization policy publicly. DG Competition (X), especially, become one of the most outspoken opponents. An unnamed DG Competition representative stated that:

> Together with DG I [external relations], we started to question the strategy of

> DG XIII, which only listened to the interests of the manufacturing interest, without talking the interest of the broadcasters and content into account.[...] The advantage that we had compared to DG XIII, was that we were a small DG, which could act more freely. In another DG that would not have been possible because there are 'filters' on decision and initiative. Especially, DG XIII was blocked by its work habits, and its relations/engagements. Quickly the debate became fairly virulent because we presented counter arguments that could not easily be brushed aside.
>
> (Interview with a member of DG X, quoted in Bray, 1996, p. 270)

However, the political contestation of HD-MAC opened up new alliance opportunities. When Martin Bangemann took over DG Information Technology from Maria Pandolfi, he sought to build an alliance with the HD-MAC opponents and to win the support of the growing group of Commission employers that opposed Pandolfi's dirigiste policy, by distancing himself from the HD-MAC policy. Shortly after his inauguration in 1993, he told *Le Monde* that "[t]he project of introducing D2-MAC or HD-MAC by obligation is a mistake [...] Almost the whole world knows this [...] I will therefore propose that we abandon it" (de Gasquet, 1993; *Le Monde*, 1993, author translation). In front of the EP he later said, seemingly proud of what he had done, that:

> I confess my guilt, if you like, in having contributed to killing these hopes [that HD-MAC would succeed] off, for I saw when I took responsibility for this report that we would not make progress with an analogue standard.
>
> (Martin Bangemann at a hearing of the EP, 1994a, p. 15)

This move allowed Bangemann to demarcate himself from his predecessor Pandolfi and to disassociate himself from the great industrial policy debacle that the Commission's HD-MAC soon became to be viewed.

He enthusiastically embraced the argumentation advanced by MAC opponents. First, he adopted the argument that the future was digital. "Digital television is going to be operational in three or four years, which is a lot sooner than we had thought. Therefore, it does not seem to make a lot of sense to continue this [analogue] HDTV program" (Europolitique, 1993, author translation). Unlike high-definition, digital TV had long been on the minds of broadcasters for it promised to allow them to broadcast an even larger number of channels via satellite or other modes using the same amount of radio frequency. As argued above, however, it cannot be concluded that European HDTV standardization failed because it was eventually outdated by digital broadcasting technology. Even today, two decades later, digital broadcasting has not completely replaced analogue television. And also GSM was eventually outdated by UMTS but still became a global success.

And instead of a dirigiste industrial policy, Bangemann adopted a policy

Table 3.5: Intention and Effect of the Commission's Intervention in HDTV Standardization

Intention	Effect
Installation of the HD-MAC as the de facto standard	Boost of digital television
Strengthening of the HD-MAC alliance	Strengthened PAL Plus alliance
Strengthening of the political position of Commission employees adhering to the policy of dirigist industrial policy	A new group of Commission employees supporting the policy of *laissez faire* is strengthened

of *laissez faire* and reached out to the Japanese and American administrations to collaborate on a common international standard (Chaize, 1993; de Gasquet, 1993). To the US Congress he said that European and American standardization authorities should work together, "either mutually acknowledging what they are doing, or better, the best way, to work together to make the standard an international standard" (Federal News Service, 1991).

The fact that the Commission, the initial entrepreneur and main supporter of the standardization process, eventually turned its back on the standardization project marks a direct parallel to the case of intermodal transport standardization (see Chapter 5). Here, too, the Commission eventually abandoned its initial standardization policy after the political debate, which had erupted in response to the Commission's use of hierarchical policy instruments, strengthened the initial policy's proponents within the Commission. In this case too, they adopted the opponents' policy narrative.

3.3 Conclusion

As in the mobile telecoms case, the European Commission's intervention had a decisive influence on the outcome of the European HDTV standardization process. In contrast to the mobile telecoms case, however, its intervention led to the unintended failure rather than the success of the standardization process. Instead of boosting the market deployment of the HD-MAC standard, the Commission's attempt to mandate compliance and to subsidize the adoption had the unintended effect of exposing the technical standardization process to political contestation by multiplying the number of veto players and veto points. As a result, there was little scope for a mutually acceptable agreement on a single common standard.

At the same time, the standardization alliance as well as the public entrepreneur, which initially constituted the main driving forces behind the standardization process, lost control over—and, therefore, also interest in—the process.

Nonetheless, this case study underlines the effectiveness of entrepreneurial leadership during the early phases of the standardization process, provided that there is a sufficiently big crisis for the entrepreneurial agenda-setter to make its voice heard. Through its entrepreneurial interventions during the standards development stage, the Commission created ideal conditions for the standard's deployment. There was no reason to expect HDTV standardization to fail before the Commission started to use hierarchical policy instruments.

The Commission's subsequent use of conventional, hierarchical policy instruments, however, nullified the effects of its entrepreneurial leadership and led to the political contestation and failure of the standardization process. Therefore, the impact of conventional policy instruments on private standardization processes, however, appears to be stronger than the impact of entrepreneurial ones. This should not be misunderstood to mean that entrepreneurial policy interventions were ineffective. If the Commission would have limited itself to policy entrepreneurship, the HDTV standardization might have became as big a commercial success as GSM and UMTS. With the first-mover advantage it had gained as a result of the Commission's entrepreneurial leadership, HD-MAC may have well survived the competition with other systems—such as PAL Plus—as the *de facto* standard.

The Commission's interventions in mobile telecoms and HDTV standardization took place in rather similar circumstances.

- Standardization required the collaboration of a heterogeneous group of actors, however, the benefits of standardization were large and broadly spread;
- In both cases markets, were marked by a high degree of technological change and economic internationalization, leading to a multiplication of actors and interests.
- Threat of foreign competition and the opportunity to penetrate foreign markets through standardization;
- Initially both enjoyed wide political support;
- Network effects and scale economies;
- ETSI's GSM Group and EUREKA's E!95 Project provided a similar institutional context;

- EUREKA and RACE provided substantial pre-normative R&D subsidies in both cases;
- With UMTS and digital broadcasting, next-generation technologies were looming on the horizon in both cases;
- Both HD-MAC and GSM had to compete against an existing installed base of analogue equipment.

In the light of these similarities, more causal significance may be attributed to the different type of policy interventions leading to the diverging outcomes.

Chapter 4

Digital Television

This case study of digital video broadcasting standardization investigates two main issues. First, it analyzes the performance of private standardization processes in the absence of public interventions. It studies the conditions under which and the extent to which private standard-setters are able to produce standards in the absence of direct public intervention. After the HD-MAC debacle, the old dirigist policy was replaced with a policy of non-intervention, which became the dominant policy paradigm in the field of television standardization. In the case of digital video broadcasting standardization, which directly succeeded the failure of HD-MAC, the European Commission thus limited itself to *ex post* regulation through competition/anti-trust rules to correct potential market failures.

This issue is crucial for it defines the functional scope for public interventions and the extent to which public entrepreneurs may facilitate private standardization processes. If it turned out that private standard-setters were very well able to develop technical standards in the absence of public interventions and despite the collective action and decision-making problems that are assumed to be inherent to these processes, the entrepreneurship hypothesis developed in the previous Chapters would be weakened considerably. It would suggest that such interventions were superfluous and that the causal effect of public entrepreneurship was spurious. If, by contrast, it turned out that the assumed existence of the collective action and bargaining problems did in fact prevent industry from setting common standards, the hypothesis would be strengthened.

Secondly, this case study investigates the impact of the shadow of hierarchy on private standardization processes. In contrast to the intermodal transport case (Chapter 5), the shadow of hierarchy was not accompanied by secondary legislation directly concerned with the standardization process. Instead it emerged out of the dominant policy consensus that the industry knew best *what* standards to develop and *how* to develop these and that the regulator should only intervene

ex post, when industry turned out to have failed. The shadow of hierarchy was meant as an extra incentive for private standard-setters to develop the desired standards. Upon the pressure of the European Parliament, which turned out to be the least comfortable with the policy of non-intervention, an explicit threat to intervene if private standard-setters did not behave in a desirable way was formulated.

The case of digital video broadcasting standardization is deliberately chosen for the fact that *a priori*, it represented a rather favorable case for private standard-setting to succeed. The benefits from digital television were not only expected to be quite significant but also very broadly and evenly distributed. Broadcasters saw digitalization as an opportunity to broadcast a higher number of channels at a lower cost. To manufacturers it meant an opportunity to boost their stagnating television set sales numbers. While Europeans were only replacing their television sets every 10 to 12 years on average (de Bruin & Smits, 1999, p. 281), digitalization would have encouraged consumers to replace their TV sets much earlier. At the same time digital television was a very new technology, where none of the industry participants had made any significant pre-investments in different alternatives, which might have undermined consensus building. Therefore, the private development of technical standardization should be expected to succeed.

Member States' governments saw digitalization as a way to gain access to the digital dividend by auctioning off the radio frequencies previously used for analogue, terrestrial broadcasting. Therefore, digital television standardization was seen as, "the opportunity of the decade," as Wood (1994, p. 12) from the EBU argued. Moreover, digitalization was expected to promote important public interests. The reduction in broadcasting costs was expected to increase competition and to improve media pluralism and diversity, increasing the supply of niche programming that would not be profitable in the analogue market and which would targeted smaller and diverse audiences (Biggam, 2000). Interactive digital television was regarded as an opportunity to close the digital gap by providing information services for people without access to broadband Internet (EC, 2003a).

Therefore, the basic set-up is that of a critical case. If private industry standardization turns out to be unable to develop technical standards in these favorable circumstances and even the shadow of hierarchy did not prompt the development of private standards, standardization and the shadow of hierarchy can also be expected to fail under less favorable circumstances.

This Chapter is organized in four main parts. The first, Section 4.1.1 investigates the emergence of Digital Video Broadcasting (DVB) Group. The remaining three Sections, each deal with a different episode of digital television standardization.

4.1 Digital Transmission Standardization in the Absence of Public Interventions

4.1.1 Collective Action and Private entrepreneurship

This Section investigates whether and how private standard-setters are able to overcome their collective action problems in the absence of facilitating public interventions.

The development and standardization of digital television and broadcasting in Europe can be traced back to the initiative of six engineers that started to gather around Ulrich Reimers, the director of engineering of the German public service broadcaster NDR. During the early 1990s, this group provided the entrepreneurial leadership that was necessary to overcome the industry's collective action problems and the inertia that had overtaken the industry after the HD-MAC debacle investigated in Chapter 3. The group's leadership resembles the entrepreneurial leadership provided by the European Commission in the case of European mobile telecoms and the early stages of HDTV standardization. The group of engineers mixed and matched a (1.) standardization problem, with a (2.) solution and (3.) potent actor coalition.

The main standardization problem identified by the group was the interference of policy-makers with technical standardization process. The group saw technical standardization as a technical issue and believed that it should therefore be left to technical experts rather than political actors. As a solution to the problems created by the HD-MAC debacle the group proposed digital television standardization. The six engineers were united by their shared vision that the future of television broadcasting was digital.[1] "We started very clearly seeing that the future is digital and feeling that something needed to be done," one of the six stated (Homer, 1994). As in the examples of public entrepreneurship described in this thesis, the mobilization of an adequate actor coalition, however, turned out to be the biggest challenge to the six private entrepreneurs.

To materialize their vision of digitalized television and broadcasting they soon realized that they would need to gain broad-based support and that they could not rely on the community of engineers alone. They would not have been able to develop and deploy digital television standards by themselves. Because their employers were still officially committed to the development of HD-MAC, however, they had to be very careful. Their first meetings took place in secrecy.

[1] Interview C3 with a member of the DVB Group (2010), Interview C11 with a representative of the broadcasting industry and now member of the (2010) and Interview C2 with a representative of the broadcasting industry (2010)

To make it look as unofficial as possible, the six met on weekends and during their free time. The first meeting was even held on a castle on the Rhine, a popular tourist destination.[2]. Gradually, they invited more and more actors, one of which was Peter Kahl, a senior official at the German Federal Ministry of Communications (DVB Project, 1999). He was recruited to legitimize and win support for the movement on at the highest levels of politics and business.[3]

In 1992, the movement officially established itself as the European Launching Group. In September 1993, the group drafted a MOU that was signed by 87 public and private broadcasters and manufacturers founding the DVB Project, as which it became known from then on (de Bruin & Smits, 1999, p. 14). It was decided that the development and standardization of digital television should involve a much wider set of actors than EUREKA and HD-MAC (DVB Project, 1993, Article 2(1)). To include the entire value chain broadcasters and content producers should be just as much part of the movement as TV-set manufacturers (DVB Project, 1993, Article 6(1)). The six also decided that participation should not be limited to European companies and actively sought the participation of Japanese and Korean companies.[4] In its first year, the DVB grew from 83 to 147 companies (de Bruin & Smits, 1999, p. 14). Today, it includes 250 companies (DVB Project, 2010a). By the including of both manufacturers and broadcasters on equal terms, the DVB Project clearly distinguished itself from E!95.

Only the European Commission was excluded. It was held responsible for the HD-MAC debacle by many in the DVB.[5] Additionally, its exclusion was a deliberate attempt to "depoliticize" the development and standardization of digital television, as one interviewee put it.[6] "We decided at an early stage that we had to keep it [the DVB] away from any regulatory influence," Peter Kahl—who was appointed as the first president of the DVB project—was cited (Homer, 1994). Although the Commission was officially granted an observatory status, it was encouraged not to participate in the discussions of the DVB.[7]

The Commission recognized this arguing that, "the group is an independent body and draws its strength from this. It will not be appropriate therefore that the

[2]Interview C3 with a member of the DVB Group (2010), Interview C12 with a founding member of the DVB Project (2010)

[3](Interview C3 with a member of the DVB Group, 2010)

[4]Interview C3 with a member of the DVB Group (2010)

[5]Interview C2 with a representative of the broadcasting industry (2010), Galprin (2002), Levy (1997), Brown and Picard (2004), Dai (2008)

[6]Interview C11 with a representative of the broadcasting industry and now member of the (2010)

[7]Interview C1 with a Commission representative (2010), Interview C11 with a representative of the broadcasting industry and now member of the (2010). Even today that the Commission appeared willing to support the DVB by mandating some of its standards, such as DVB-H, many in the DVB still do not want to rely on the Commission even though this could potentially strengthen its role.

Commission signs its memorandum of understanding and thus become a member of the group" (EC, 1993a, p. 24). And Commissioner Bangemann declared:

> It is not appropriate to march in with great fanfare, unrolling huge flags and make pledges for the future in a speech of celebration. We have had all this once, and it fell apart.
>
> (Martin Bangemann, EP, 1994a, p. 15)

As discussed in the HDTV Chapter (3), the Commission had adopted a new policy of non-intervention.

As discussed below, however, the Commission's strategy of non-intervention was not the result of a learning process or functional considerations on part of the Commission. This is not to say that policy learning was not possible. However, it is unlikely to happen as quickly as it happened after the failure of HD-MAC. As argued further below, the HD-MAC debacle rather appears to have offered the Commission—or rather a specific group of Commission employees—to exit its failing HD-MAC policy and to build a new policy alliance with pay TV operators.

This suggest two conclusions. First, it emphasizes the importance of entrepreneurial leadership—be it in its public or private form—to organize collective action. In this case the entrepreneurship was provided by a private group of actors. It would be a mistake, however, to view this as a weakening of the hypothesized ability of public entrepreneurs to facilitate collective action. It merely shows that public entrepreneurship is not the only way through which collective action problems can be overcome.

Secondly, the emergence of the DVB Project underlines the importance of epistemic communities that may emerge within the standardization community. As shown by the 'sardine moment' during the GSM standardization process, these communities can provide a considerable driving force behind standardization processes.

The entrepreneurial leadership lead to the creation of a standards-writing organization, which, could be considered as one of the most progressive of its kind. In order to keep the standardization process manageable and to prevent it from being gridlocked by diverging interests, the DVB members adopted a somewhat unique organizational structure. First, the DVB Project broke with the tradition of consensual decision-making and introduced the possibility of majority voting in (DVB Project, 1993, Article 6(4)). *A priori*, should therefore be expected to be more successful in developing common standards than other standardization organizations.

Secondly, the structure of the DVB was designed in direct response to the

HD-MAC debacle. The organization was divided into separate Technical and Commercial Modules. While latter was meant to formulate commercial requirements, such as functionality, cost targets and deadlines the role of the former was deliberately limited to the transposition of these commercial requirements into technical specifications (DVB Project, 2010b; DVB Project, 1993, Article 7&8).[8] This 'market driven' approach was meant to ensure that the DVB Project would be able to respond more quickly to the commercial demands of the industry and to make sure that standards would only be developed if and when they can be translated to products, with a "direct commercial value."[9] This was a direct response to the failed HD-MAC standardization process:

> The burned fingers (or perhaps burnt-out cheque books) in the age of MAC and HD-MAC. [...] The engineers now realized that, before designing a new broadcast system, it was necessary to decide what the system should do for the public and how much it should cost to be successful on the European domestic market.
>
> (Wood, 1995)

Both, the DVB Project's majority voting and its market driven approach are rather unique. While many standards-writing organizations are struggling to introduce majority voting, the DVB project is one of the few exceptions that has been able to do so.

4.1.2 Transmission Standards: A Private Standardization Success Story?

As a result of its innovative organizational structure, the DVB Project could celebrate its first successes soon after its foundation in 1993. By 1994, the DVB Group quickly agreed to a common set of standards for satellite (DVB-S) and cable (DVB-C) transmission via a common digital compression technology (MPEG-2) that was just undergoing standardization in the International Standardization Organization (ISO) and International Electrotechnical Commission (IEC).[10] By reducing bandwidth requirements, digital compression technology allowed satellite broadcasters to deliver between 6–12 digital channels at the cost of one analogue channel (*New Media Markets*, 1998, p. 9; Wood, 1995).[11] Therefore, satellite broad-

[8] The approach was suggested by representatives of the satellite operator ASTRA (Interview C3 with a member of the DVB Group, 2010).

[9] DVB Project (2010c), Interview C3 with a member of the DVB Group (2010)

[10] The Moving Pictures Expert Group (MPEG) started in 1988 as Working Group 11, Subcommittee 29, of ISO/IEC JTC11 with the aim of defining the standards for digital compression of video and audio signals. In 1994 it published the MPEG-2 standard as ISO/IEC13818 (Ely, 1995, p. 12).

[11] Therefore, they were also ready to provide their customers with digital reception equipment at a subsidized prize to accelerate the transition to digital television.

casters were one of the main drivers during the early days of the DVB Project (Reimers, 2006, p. 174).[12]

Due to cooperation agreements with the ETSI and CENELEC, the DVB Group could feed these technical specifications into the latter's standardization processes. ETSI and CENELEC simply rubber-stamped the DVB Project's specifications and transform them into formal European standards (Grimme, 2001).

Today, the DVB Project celebrates itself for the fact that more than 500 million DVB-compliant transmission devices have been sold in Europe and the rest of the world (DVB Project, 2010a). As a result of this first success the literature, without exception, has been quite positive about the European digital television standardization project (de Bruin & Smits, 1999; Cave, 1997). Dai (2008) even goes as far as to present the case of digital television standardization—in comparison to European HDTV standardization—as evidence for the superior governance capacity of private industry and as an argument for non-intervention:

> The spectacular failure and the unexpected success of DVB [organization responsible for digital television standardization, see below] have certainly dealt EU policy-makers, including the European Commission, the Council of Ministers, and the French Government, a powerful blow. The EU finally accepted in 1995 that the outcome of technological standardization should be determined by market forces, rather than policy makers.
>
> (Dai, 2008, p. 61)

Not without *schadenfreude*, Dai (2008, p. 60) continues that, "[i]t is rather ironic that television viewers in France," a country which the author associates with interventionist industrial policies, "today are beginning to experience digital TV from the non-official DVB project, rather than the officially favoured HD-MAC technology!" According to Dai this stands in stark contrast to the UK, which he considers to be very non-interventionist country, where digital television is striving.

Most of the direct participants—some of which were interviewed during the writing of this chapter—too, were of the opinion that their work had been quite successful.[13]

Many commentators, however, failed to acknowledge the subtle but crucial

[12] The business model of terrestrial (free) TV broadcasters was different. It was based on the maximization of audience shares with a limited number of channels. Therefore, they did not have the same incentive to reduce costs and were less keen on digitalizing their transmission systems. The digital terrestrial television standard (DVB-T) was hence developed three years later.

[13] Interview C10 with a representative of a large producer of set-top boxes (2010), Interview C12 with a founding member of the DVB Project (2010), Interview C2 with a representative of the broadcasting industry (2010), Interview C3 with a member of the DVB Group (2010), Interview C7 with a representative of a producer of conditional access systems (2010), Interview C8 with a member of the Digital Broadcasting Project (2010)

limits of the DVB Projects early success. The DVB failed to agree to a single common standard for the transmission of television signals for all modes, meaning satellite, cable and terrestrial broadcasting.[14] The example of Japan, where a single intermodal standard was developed, demonstrated that this would have been technically feasible. However, cable, satellite and terrestrial operators deliberately chose to develop incompatible systems for each mode. In the face of technical convergence and market liberalization, the incumbent operators saw incompatible standards as an opportunity to minimize competition between the different modes of broadcasting—i.e. satellite, cable and terrestrial. [15] Incompatible transmission standards raised the switching costs for consumers. To switch from one mode to another, consumers had no choice but to replace their existing equipment (Brown & Picard, 2004, p. 2). Given high initial equipment prices, however, they were unlikely to do so.

This demonstrates private companies' difficulty in bridging their short term interests to achieve common benefits in the long run. A single common standard could have significantly accelerated the market take-up of digital television by maximized economies of scale and scope and creating the basis for a competitive market for set-top boxes, which would have brought down the retail price of digital TV equipment. However, companies were more concerned with their relative competitive positions rather than the overall size of the market. The lack of a single transmission standard was considered, at least partly, responsible for the relatively modest market penetration of digital television (Brown & Picard, 2004, p. 2; Cawley, 1997, p. 682).

The DVB Project's mixed success with the standardization of digital transmission systems thus demonstrates both the capabilities and limits of private governance in the field of technical standardization.

On the one hand, this first—though limited—success of transmission systems standardization demonstrates that private companies are able to overcome their collective action problems if a private entrepreneur substitutes the public entrepreneurship investigated in this thesis. This is not to say that there are not any other ways in which private standard-setters may overcome their collective action problems. However, this is not the focus of this thesis.

On the other hand, the fact that the DVB did at least manage to agree to three different transmission standards shows that private industry is not completely

[14]Each is based on different technologies, namely QPSK modulation, QAM and Coded OFDM respectively (Reimers, 2006, pp. 175-176).

[15]The incumbent telecoms operators, for instance, that controlled cable television in most European countries were keen to minimize competition from satellite television, which was rapidly gaining more and more market shares during the early 1990s. Similarly, terrestrial television providers—public and private—sought to shield themselves from the growing competition from both cable and satellite pay TV operators.

incapable of adopting technical standards by itself. the DVB Project's failure to agree to a single, universal transmission system, however, demonstrates inability or unwilling of private industry to engage in variety reduction up to an extent that would be socially desirable.

Interestingly, this view even seems to be shared by actors from which this should be least expect. Philip Laven, the DVB Project's current director, stated that:

> [I]n the strange world of digital TV, many operators have deliberately chosen standards that are unique to their services. *This suggests that self-regulation will not be successful in this area.*
>
> (Laven, 2002, p. 6, emphasis added)

To make things worse, one interviewee argued,[16] different countries adopted subtly different versions of the three transmission standards and even incompatible generations of the standards, such as DVB-C and DVB-C2 were made incompatible. Laven criticized that:

> There are now more than 1500 digital satellite TV services using DVB standards in Europe [...] Regrettably, to receive all 1500 satellite services, you would need many different digital TV set-top boxes. The reality is that there is a serious problem with inter-operability.
>
> (Laven, 2002, p. 3)

This failure is not necessarily a direct argument for government intervention. However, it is not an argument for the capacity of private governance in technical standardization either. The case of digital transmission standardization clearly shows that private standardization processes can fail or, at least, produce socially sub-optimal outcomes and therefore supports the hypothesis that public entrepreneurship did have a potential role to play here. And if private industry standardization even fails under such favorable circumstances, it can also be expected to fail under less favorable ones.

There thus appears to be some scope for government intervention. In this case, for instance, the standards-setters may have been legally forced to introduce a single standard for all three modes.

[16] Interview C11 with a representative of the broadcasting industry and now member of the (2010)

4.2 Conditional Access Standardization and the Insufficiency of *Ex Post* Regulation

Conditional Access standardization succeeded the above-described development of transmission standards. Despite the failure of transmission standardization, the European Commission and other public actors continued to stay out of the standardization process. Industry was expected to develop the required standards itself. Conditional Access standardization provided industry with an opportunity to increase the overall size of the digital television market. This section investigates whether and to what extent private standard-setters were able to seize this opportunity by developing common standards in the absence of facilitating public interventions.

Because important public interests, such as media pluralism (see Sub-Section 4.2.1), were at stake, however, the EP pressured the Commission to use competition rules to resolved potential market failures that might result from private standardization. Therefore, Sub-Section 4.2.2 analyzes the extent to which *ex post* regulation through competition rules can be used to deal with the potentially undesirable consequences of failed private standardization processes. Finally, Sub-Section 4.2.3 assess whether and to what extent entrepreneurial *ex ante* interventions would have led to superior outcomes.

4.2.1 Bottle Necks and Media Pluralism

Conditional Access is the technical basis of pay TV. While pay TV was a small niche market in many countries, it was considered to be of critical importance for the commercial viability of digital television. Conditional Access systems allow broadcasters to scramble their television systems and to restrict the consumption of their program to paying customers.[17] In the era of digital television the business model of pay-per-view was expected to gain in importance (see OECD, 2009, p. 196). It was expected to open up the market to new broadcasters and content providers. The increased number of channels that can be broadcasted through digital transmission technology alone would not have this effect as these channels need to compete for the same number of viewers. Therefore, the average advertising revenues per channel and program were expected to decrease, which would allow less and not more companies to break even on advertising revenues alone (see Lyle, 2008, p. 125). Pay-per-view, however, would

[17]The first Conditional Access system, Videocrypt, was developed by Rupert Murdoch's Sky TV in 1990. Conditional access allowed Murdoch to make his investments in alleged 'premium content'—such as Premier League football and Hollywood blockbusters—profitable (Levy, 1997, p. 668).

allow market insurgents to make use of the increased availability of channels. The overall size of and the number of companies and competition in the television market was expected to be increased.

Increased competition was expected to promote media pluralism and diversity. This expectation was based on the 'Hotelling effect'. In markets that are marked by a high degree of market concentration, Hotelling (1929) demonstrated, companies tend to target the same middle ground of consumers by providing a relatively homogeneous range of products (i.e. programs) to maximize sales (i.e. viewing time and thus advertising revenues). This was confirmed by a study of the British Department for Culture, Media, and Sport (2001, Paragraph 1.5), which suggested that companies with a significant market presence tend to 'super-serve' a median audience of young adults rather than to address the full range of cultural, ethnic and religious niche markets. Only where new companies were able to enter the market and competition intensified would companies employ product differentiation strategies and start to offer a more heterogeneous range of programs catering to niche markets and minority interest (Biggam, 2000).

At the same time, however, Conditional Access constituted a major bottleneck in the digital television market. For Conditional Access can be (mis)used to control access of third party providers. Control over Conditional Access therefore meant control over the market. There is a first mover advantage results from two factors (Nolan, 1997, p. 601). First, companies that first manage to obtain a critical mass of subscribers and can exploit economies of scale can reduce retail price and set off bandwagon effect of accumulative sales. Secondly, switching costs for consumers were high. Once having purchased one Conditional Access decoder—which, in the early days, could cost up to €1,000—consumers were unlikely to acquire another one only to access services from another pay TV provider.

The first mover advantage and the dominant position that may result from it is well illustrated by the emergence of satellite-based pay TV in the UK (see Table 4.1). Sky TV, which was owned by Rupert Murdoch's News International Corporation, began transmission two years before its main competitor BSB. With the help of an aggressive penetration pricing strategy—leasing receivers to new subscribers at minimal cost and charging low introductory rates—Sky TV quickly build up an installed base of 1.5 million consumers before BSB entered the market. This initial lead turned out to be irrevocable. Only 7 month after going on air, BSB collapsed and had no choice but to merge with Sky TV—forming BSkyB, in which Murdoch's News Corporation had 40% stake (Hart, 2004, p. 36). Within one year, BSkyB managed to brake even and has held a dominant position in the British satellite broadcasting market since (see Grindle, 2002, pp. 6-7).

Many third party providers complained about the terms which BSkyB obliged them to accept the use of its Conditional Access system, Videocrypt. Therefore, it was regarded necessary to develop a single common non-proprietary standard for Conditional Access to ensure an open and dynamic digital television market. This episode underlines the critical importance of open common Conditional Access standards to ensure fair competition and to exploit the Hotelling effect.

Table 4.1: The Rise of BSkyB

Date	Event	Subscribers of Sky (m.)
1986 Dec.	BSB awarded satellite broadcasting license	
1989 Feb.	Sky TV starts broadcasting in Pal (4 channels)	
Sept.	Sky announces low cost introductory offers	0.5
1990 Apr.	BSB starts broadcasting in D-MAC	1.5
1991 May	BSB merges with Sky (BSkyB)	
1991 May	BSkyB GBP 200m. refinancing	2.0
1992 Mar.	Operational break-even	2.6
Sept.	Sky Sports encrypted	
1993 Jun.	Operating profit GBP 60m.	
Sept.	Subscription package introduced 12 channels + 2 free	3.2
1994 Apr.	Further GBP 500m. financing	3.5
	Accumulated shareholder debt GBP 1.6bn.	
	18 channels planned	
Jun.	Operating profit GBP 186m.	
1999	Shareholder debt repaid	
Source:	Grindle (2002, p. 6)	

To prevent that this bottle neck would be carried over into the digital era, it was necessary to develop a common non-proprietary standard for digital Conditional Access that could provide a large number of companies with equal access to the revenue streams of pay-per-view. Otherwise, the above-described opportunity to increase media pluralism and diversity via a diversification of the television market would be sacrificed.

The incumbent pay TV operators, however, were not very keen to give up their dominant position and share their markets with new entrants. In consequence, the DVB Project soon found itself in a stalemate between the incumbent pay TV broadcasters—BSkyB, Canal+, Filmnet, and Nethold—on the one hand; and

public service and free TV broadcasters, on the other. The pay TV broadcasters proposed a solution of, what could be described as, minimum standardization. Public service and free TV broadcasters, by contrast, supported a solution of maximum standardization to ensure the openness of digital television markets.

The incumbent pay TV broadcasters were keen to transfer their control over analogue proprietary Conditional Access systems into the world of digital television (Verse, 2008, p. 226). They each sought to use their existing installed base of consumers to launch proprietary systems, speculating that they might turn into a *de facto* standards, which would give them a dominant position in the market. Therefore, they proposed proposed the Simulcrypt system in 1994, which was meant to allow third parties to simultaneously transmit streams of encrypted information through the incumbents' proprietary broadcasting system—therefore the name 'Simulcrypt' (Levy, 1997, p. 668). Sure enough this opened their Conditional Access systems to third parties. However, it also meant that the incumbent pay TV broadcasters could negotiate the conditions of third party access themselves. Public and free TV broadcasters and manufacturers, hence, opposed the Simulcrypt option, claiming that it gave pay TV operators too much market power. Ken Sheppard, ITV's representative on the DVB Project's conditional-access committee stated: "Our stance is that digital television is a new playing field and that we should try to make it as even as possible" (*New Media Markets*, 1994; *Screen Finance*, 1995).

Public and free TV operators, by contrast, proposed a system called Multicrypt. This was based on a Common Interface, a socket in the digital set-top box, that would allow consumer to access any pay TV operators' programs by inserting the given operators credit-card-sized decoder card that contained the information that was relevant for conditional access into the decoder. Proponents of Multicrypt argued that it would mean lower risk and lower cost for consumers, which would no longer be forced to buy a whole new decoder to watch another pay TV operators programs. They simply needed to acquire the relevant decoder card. This also reduced their risk of being stranded with a set top box that has lost the 'standards war' to another set-top box. In the medium to long run, its proponents argued, Multicrypt would therefore lead to deeper levels of market penetration of digital television and increase competition between Conditional Access services and create a common European market for Conditional Access decoders and content. Both could be produced at a larger scale and thus be sold at a lower price. Multicrypt had the advantage that no rules or regulations were required to guarantee third party access to digital television markets.

The DVB found itself in a stalemate between the Simulcrypt and Multicrypt proponents. "Those who drive the market at the beginning want to protect their

market and they want Simulcrypt. Those who don't want to be debarred, favour Multicrypt," Robin Crossley, of SES ASTRA, summarized the gridlock (M. Brown, 1995). Both sides realized that the DVB Group was not going to reach a consensus on this issue.

To appease the raising concerns that Simulcrypt could put the Conditional Access operators in a dominant position, the legal departments of BSkyB and Filmnet drafted a voluntary and nonbinding code of conduct on fair reasonable and non-discriminatory conditions (FRAND) third party access to digital decoders (Levy, 1997, p. 668). The code of conduct was eventually adopted by the DVB Project as part of a compromise on Conditional Access, which comprised both Simulcrypt and Multicrypt as well as the DVB Project's Common Scrambling Mechanism and the recognition of (DVB Project, 1994a, 1994b). The proponents of Simulcrypt celebrated the compromise as a good example of successful self-regulation (Eltzroth, 2007). "This underscored the recognition [...] that commercial actors were well placed to find a solution for a perceived market distortion" (Eltzroth, 2007).

In reality, however, this was only a small concession of the pay TV operators. Under European competition rules, they would have to provide licenses according to FRAND rules anyway. Moreover, many critics argued that FRAND rules were not strong enough to guarantee fair market access and to limit the dominant position of the proprietors of Conditional Access systems. First, the legal definition of what constitutes fair, reasonable and non-discriminatory is rather vague. Even the DVB Project's legal director, Carter Eltzroth (2010), admitted that the concepts lacks a common definition and could only be decided on a case by case basis. This might force third parties trying to access proprietary Conditional Access systems into lengthy litigations and potentially act as a deterrent to market entry. Secondly, the FRAND condition did not provide any obligation on the part of pay TV operators to grant a license (Levy, 1997). Thirdly, it was clear that manufacturers were unlikely to include such interfaces if their main customers, which were mainly Conditional Access operators and Simulcrypt proponents, were neither demanding nor paying for their inclusion. "The decision would be up to the manufacturer, who would have to bear the costs of inserting a common interface and this would not be in the manufacturer's interest," ITV's Ken Sheppard argued (*New Media Markets*, 1994).

As the DVB Project's failure to agree to a single multi-modal transmission standard this episode, too, demonstrates the limits of self-regulation and private governance through industry standardization. Where companies strategic and technological preferences are sufficiently heterogeneous technological, industry is

unlikely to agree to a sufficient level of variety reduction through standardization. Industry may reach a compromise involving multiple and incompatible standards but such a compromise is insufficient where variety reduction is necessary to achieve the desired market outcome.

The Conditional Access compromise was insufficient to create a competitive market that would provide a large number of small companies with equal access to pay per view. Standard-setters missed the opportunity to create a new, more culturally diverse and politically pluralistic television landscape. The incumbent pay TV operators could consolidate their dominant position. Their proprietary control over Conditional Access allowed them to fend off market insurgents. Second movers never stood a chance. In April 2002, ITV Digital filed for bankruptcy in the UK and the Spanish Quiero TV failed in 2002, with huge debts and a limited subscriber base (Iosifidis, Steemers, & Wheeler, 2005, pp. 112-114; Iosifidis, 2007). To date, neither TPS in France or OnDigital in the UK could develop into serious competitors of the incumbent pay TV operators.[18]

Moreover, it is interesting to note that in many European countries, such as Germany, pay TV never gained a permanent foothold in the market. The lack of common standards undermined the growth of the pay TV market overall. More content diversity and the availability of a larger variety of niche programming might have attracted more consumers. None of the various Conditional Access systems appears to have achieved a critical mass in these markets, which emphasizes the potential role that public entrepreneurs may play in promoting the deployment of standards.

From this perspective, self-regulation through technical standardization appears to have been a clear failure. Although the structure of digital television markets is probably not any more worrying than the structure of the old analogue television markets, industry as well as regulators sacrificed a good opportunity to create a more competitive and dynamic digital television market that might have increase media pluralism and diversity.

4.2.2 The Insufficiency of *Ex Post* Regulation

In principle, the failure of private standard-setters to achieve a sufficient level of variety reduction through private industry standardization should have justified a public intervention. The Commission's 1993 proposal for an exit strategy from HD-MAC provided an opportunity to do so. Pursuant to Article 7 of the HD-MAC Directive (92/38/EEC), which called on the Commission to report to the Council on market developments and effect of the directive, the Commission, on

[18] See Levy (1999, pp. 65-67), Rediske (1996), *Cable and Satellite Europe* (1996)

November 15th 1993, proposed a Directive on Advanced Television Standards (EC, 1993b). Its primary purpose was "to respond to the changed circumstances" (EC, 1993b, 5 and Article 7) by repealing the 1992 HD-MAC Directive (92/38/EEC). Despite the fact that there was no reference to the DVB Project nor the Conditional Access issue, the Multicrypt proponents took this as an opportunity to make their preferred Conditional Access solution mandatory by law.[19] Initially, the EP turned to quite sympathetic to the Multicrypt proponents' arguments:

> We in the Parliament have been very aware that there are many broadcasters across Europe who have very legitimate concerns about the dangers to pluralism and to free and fair competition in the future which could arise from the dominant gatekeeper position held by these pay TV broadcasters."
> (Read (PSE), EP, 1995, p. 6)

However, the Commission opposed the adoption of more coercive, arguing that, "it would be inappropriate to base a public law exclusively on a specific private initiative, the DVB" (EC, 1994b, p. 3). And Bangemann told the EP that, "if we bring in a standard prematurely, then we will do the opposite of what is rational for industry, consumers and also for a competitive European industry" (Bangemann, EP, 1994a, p. 15). Therefore, the final Directive only included the obligation that operators of Conditional Access systems should be obliged to grant FRAND access to third parties (European Parliament and Council, 1995).[20]

As described in the HDTV Chapter (3), the Commission had replaced its interventionist policy with a policy of *laissez faire* and non-intervention. This development was largely driven by internal political struggles within the Commission. Those Commission employees that were involved in the Commission's involvement in HD-MAC and some of which still supported a more interventionist approach had to realize that they had lost all political capital and credibility they required to intervene into DVB standardization—be it in an entrepreneurial way or through hierarchical policy instruments.[21] Moreover, their opponents within the Commission had created an elaborate policy network with pay TV operators, which represented a perfect ally for the Commission.[22]. Unlike, the public service broadcasters, which were still closely entangled into national politics, pay TV operators were looking to market their services on a EU-wide scale. They became

[19] A vigorous lobbying campaign began, up to point where German member of the EP, Karsten F. Hoppenstedt, remarked that, "[t]he number of lobbyists involved in this game of poker has mushroomed almost out of control" (EP, 1995, p. 7).

[20] The inclusion of the FRAND clause was based on an amendment of the EP, which was approved by all the main parties and passed with the required majority (EP, 1994b), that forced the Commission revise its initial proposal (EC, 1994b).

[21] Interview C1 with a Commission representative (2010)

[22] Interview C1 with a Commission representative (2010), Interview C11 with a representative of the broadcasting industry and now member of the (2010), Interview C8 with a member of the Digital Broadcasting Project (2010)

an important political ally of the Commission against national governments and the European Parliament. This confirms the hypothesis that functionalist considerations only played a minor—if any—role in the decisions of public actors. What is more important in its interactions with private standard-setters is the opportunity to build political alliances against rival public actors.

Therefore, the Commission maintained its non-interventionist policy stance and justified this with the suggestions that potentially negative market outcomes could always be overcome through *ex post* interventions based on European competition rules. As opposed to *ex ante* intervention, A. W. Brown (2005) of DG InfoSoc,[23] argued in an widely-read policy paper:

> [t]]he main mechanism is therefore an [*ex post*] assessment of market power on individual network operators in the style of competition law and the deployment of appropriate remedies—including access remedies—to networks and to associated facilities."
>
> (A. W. Brown, 2005, p. 2)

This also had the added advantage for the Commission that competition policy is an exclusive Commission competence. In the case of all other policy interventions, it needs to cooperate with member states' governments and the European Parliament.

Ex post interventions through competition rules, however, turned out to be inadequate to guarantee third party access to essential facilities such as Conditional Access—or the Application Programming Interfaces discussed below—and to create competitive horizontal markets based on common standards. FRAND rules are vaguely defined and the remedies at the competition authorities' disposal are limited. Unlike American anti-trust law, EU competition law does not allow for the break up of companies deemed too large. Therefore, it is often considered a "blunt instrument:"

> In general, it applies only when there is evidence that a market player has abused a dominant position: in such circumstances, it may be too late to intervene because the gatekeeper may already have gained an unassailable position in the market place, thus preventing true competition.
>
> (Laven, 2002, pp. 7-8)

Implicitly accepting this, the Commission argued that horizontal markets based on open and universal standards were no longer necessary and that vertical markets based on competing, proprietary standards were sufficient to create a new market for digital television (A. W. Brown, 2005).[24] *Ex post* regulation through

[23] Although this article was written ten years after, it still reflects the way of thinking during the mid 1990s quite accurately.

[24] In vertical markets companies control every aspect of the value chain, such as set-top boxes, Conditional Access systems, and interactivity.

competition law was argued to be strong enough, Commissioner Liikanen argued, to create "[...] strong vertical pay TV markets" (Liikanen, 2001).[25]

This argumentation was reinforced by the pay TV operators who suggested that vertical markets would lead to more innovation and investment in the digital television infrastructure. Pay TV operators reminded legislators how their vertical control over proprietary standards had made it financially viable to introduce analogue satellite television. To jump start the market penetration of satellite television, pay TV operators had provided consumers with expansive satellite decoders at a low or now charge. The cross-subsidize satellite decoders, led to a rapid consumer take-up of satellite television. In the same way, they argued, they would also promote the introduction of digital television. If they had to give up proprietary control over Conditional Access and Application Programming Interface, they would lose the investment incentive to cross-subsidize digital receiver sales. In that case, retail prices for digital receivers would be much higher, putting a brake on the market led switch-over to digital television:

> Disproportionate regulatory intervention, or even the threat of such action, could inhibit the investments and innovation needed to sustain current growth in digital and interactive TV. The imposition of mandated technical standards or the use of artificial economic incentives and subsidies will impede digital TV rather than promote continued progress towards eventual switch-off of analogue terrestrial broadcasting.
>
> (Digital Interoperability Forum, 2003)

This turned out to be an excellent lobbying strategy. Throughout Europe, governments saw the switch-over to digital terrestrial broadcasting as an opportunity to auction off some of the radio frequencies previously used for analogue broadcasting. Because of this 'digital dividend' digital television standardization was seen by many as, "the opportunity of the decade" (Wood, 1994, p. 12). The digital dividend could only be reaped, however, if households switched-over to digital television. Therefore, the idea of a market-led, industry subsidized switch-over was very tempting to many governments in Europe.

The slow market penetration of digital television, however, demonstrates that vertical competition only constitutes a limited driver of the digital switch-over. By 2002, all of the large pay TV operators had migrated to digital television,[26] which

[25]The political nature of the Commission's choice for vertical markets based on competing standards is highlighted by the comparison to the case of UMTS standardization (see Chapter 2), where the Commission, in rather similar circumstances, argued for horizontal market. The only difference between the two cases appears to have been that in the case of UMTS the Commission's allies favored horizontal markets and in the case of Conditional Access standardization, they favored vertical markets.

[26]In 1996, Canal+ in France, Telepiu in Italy and the Kirch Gruppe in Germany launched the first digital television services in Europe. Between 1998 and 2001, BSkyB also switched to digital television.

many governments saw as a confirmation of their strategy of non-intervention. Soon, however, pay TV and vertical competition seemed to have lost its steam. As soon as the demand for pay TV was saturated, the market penetration of digital television began to stagnate. Even in countries such as France and the UK, where pay TV has been a great success, take-up has flattened off at 30% to 40%. In countries like Germany, pay TV has remained a small niche market to date. "In such circumstances," Philip Laven (2002, p. 8) from the EBU suggested,"it seems foolish to expect that pay TV will be the mechanism that can achieve universal adoption of digital TV." The Commission's strategy of a market led, pay TV driven introduction of digital television appears to have failed.

The argumentation for vertical markets, however, had further important weaknesses. Vertical markets are inadequate to exploit the 'Hotelling effect' that could lead to greater media pluralism and diversity. Vertical markets can not sustain enough companies to exploit the 'Hotelling effect'. New market entrants need to employ costly penetration pricing strategies and invest in premium content such as football or blockbuster movies to obtain enough consumers to break even. With limited market profits, however, vertical markets can therefore only sustain a limited number of companies. This is confirmed by the following two examples. In the UK, ITV Digital's overbidding on Premier League football rights had pushed the consortium into insolvency (Iosifidis et al., 2005, pp. 112-114). In Spain, Quiero TV failed in 2002 because it could not afford to give their set-top-boxes away for free as its competitors Canal Satellite Digital and Via Digital, which merged eventually, were able to do. Instead Quiero TV had to sell its decoders for around €400 to €500 (Iosifidis et al., 2005, pp. 112-114; Iosifidis, 2007).

Therefore, Europe remains stuck with a limited number of broadcasters that 'super-serve' a median audience with content that represent the lowest common denominator that audience's tastes. Again *ex post* regulation through competition law does not provide a remedy. It does not allow competition authorities to take media concentration into account. Which is obviously problematic where levels of market concentration that are still considered in line with competition rules, already have a detrimental impact on media pluralism. Therefore, only a horizontal market is porous enough to guarantee market access to a sufficient number of companies that is necessary to promote media pluralism and diversity.

In light of these findings, non-intervention, only backed by *ex post* regulation, was a clear mistake.

4.2.3 The Need and Scope for *Ex Ante* Intervention

This section investigates whether and to what extent *ex ante* intervention might have lead to superior outcomes.

Horizontal markets based on common, non-proprietary standards would have had two advantages. First, horizontal markets would have been able to maintain a much larger number of competitors because pay TV would have become a much more widely available and accessible business model. With an open Conditional Access system, for instance, content producers might have been able to cut out broadcasters and market individual programs through pay TV rather than advertising revenues.

Secondly, horizontal markets might have also accelerated the market penetration of digital television and Conditional Access alike, without the cross subsidies of the dominant pay TV operators. Common open standards could have maximized economies of scale and scope that would have eventually brought down the price of digital Conditional Access and Application Programming Interface decoders too. And for the switch-over to digital television this option would have actually been superior. The economic literature has already pointed out that open and universal standards have the advantage of reducing uncertainty about the identity of the winning standard (see Quelin et al., 2001). Hesitant consumers would be reassured that they will not be orphaned or stranded with a proprietary system that has lost the vertical competition against another system that became the *de facto* standard.

Since the HD-MAC debacle, however, *ex ante* interventions were associated with the type of coercive, hierarchical interventions used by the Commission to force the marked deployment of HD-MAC. Such interventions were therefore rejected by most stake holders. And given the strong opposition of the pay TV operators, a hierarchical intervention mandating compliance with or subsidizing the market deployment of any given standard are very likely to have failed and ended up in the political contestation of the standardization process. As Gerard Caudron, member of the EP (PES, France), pointed out, however, this would not have been the only type of *ex ante* intervention:

> The vicissitudes of D2 MAC and HD-MAC should not and cannot be used as an argument against any type of regulation, as the ultra-liberals of all hues would have us believe, particularly when this guarantees them de facto monopolies.
>
> (Caudron, EP, 1994a, p. 12)

Public entrepreneurship might have offered an alternative form of intervention.

There might have been some scope for public entrepreneurship. A public entrepreneur might have been able to build a broad alliance involving both public

service and free TV as well as the incumbent pay TV operators. An entrepreneur might have prevented the emergence of the decision-making deadlock between the proponents of simulcrypt and multicrypt by reminding them of their common interests and mutual dependence. By collaborating on common standards, companies might have been able to increase the overall size of their market—not just digital television but also pay TV. After all, pay TV had always been a niche market. Through common, open standards, however, it might have been transformed into a mass market, just like mobile telephony grew from a niche market into a mass market as a result of European standardization.

Yet the reach of such entrepreneurial interventions appears to be limited and it appears to depend on a number of rather tough necessary conditions. First, public entrepreneurs would have had to intervene at a sufficiently early point in time, namely before the technology has matured and when there still is relative uncertainty about the strategic and commercial implications of the resulting standard. Secondly, there would need to be a situation of crisis for an entrepreneur to organize collective action. Therefore, it is not clear whether public entrepreneurship would have succeeded in the case of Conditional Access standardization. As demonstrated above, however, non intervention and *ex post* regulation were not a solution either.

4.3 Application Programming Interfaces Standardization under the Shadow of Hierarchy

This section focuses on the hypothesis that, instead of prompting private actors to behave in a given way desired by public actors, the shadow of hierarchy is bound to expose technical standardization processes to political contestation. This section is organized in three sub-sections. Sub-section 4.3.1 examines the limits of private standard-setting. Sub-Section 5.2.3 describes the role of Application Programming Interfaces and first attempts to develop a common standard. Sub-Section 4.3.3 examines whether and to what extent public entrepreneurship—rather than the threat of public interventions—might have led to superior outcomes.

4.3.1 The Late Arrival of the Common Standard

An Application Programming Interface is the operating system that connects software applications and hardware. Its role can be compared to that of operating systems, such as Unix or Windows, for personal computers. Similar to personal computer operating systems, Application Programming Interfaces serve as the

platform for a variety of potential interactive television applications, ranging from shopping and gambling to Internet browsers, eCommerce and eGovernment services (Klinkenberg & Schiek, 2008, p. 400; MHP Knowledge Project, 2006, pp. 23-28).[27]

Like Conditional Access, Application Programming Interface standardization was considered one of the critical steps toward the establishment of digital television in the market. Interactive television, which depends on Application Programming Interfaces, was often regarded as the 'killer application' that might generate enough demand to jump start the a market led introduction of digital television. This expectation was based on the realization that a larger availability of television channels alone was not going to prompt consumers to make the costly switch to digital television. Analogue television via cable and satellite broadcasting already allowed for the transmission of a large number of channels. "Besides the better quality of picture, there are no real other benefits for viewers switching from analogue to digital," Sebastian Loudon from the Austrian communications regulator RTR explained (Werner, 2007). Therefore, high hopes were put in interactivity, which is specific to digital television and not possible with analogue TV.[28]

As the development of transmission, encoding and Conditional Access was deemed more urgent, the DVB Project did not start standardization of Application Programming Interface until October 1997, when the DVB Steering Board eventually approved the commercial requirements for a system called Multimedia Home Platform (MHP) and adopted it as a full standard in 1998 (Morris & Smith-Chaigneau, 2005, p. 7).[29] To be able to operate on many different types of set-top boxes, MHP was based on the widely used programming language Java.[30]

By that time, however, it was already too late. Many operators had organized outside the DVB Project and introduced their own, proprietary Application Programming Interface systems (Klinkenberg & Schiek, 2008, p. 402). In 1997, an industry consortium named the Multimedia Hypermedia Experts Group had already published the MHEG standard, which was soon adopted by the BBC. In

[27]The success of services sold over Teletext shows, even with a primitive interface, the willingness of customers to do this.

[28]At the same time, Application Programming Interface, too, constituted another potential bottle neck. Proprietary control over the Application Programming Interfaces would give operators significant powers over how and what interactive television applications are consumed. Just like Conditional Access, it is therefore going to influence the structure, size and growth of the digital television market.

[29]In 1999, the DVB Group successfully fed the new MHP standard into the standardization processes of ETSI. On July 12th 2000, MHP was formally adopted as a European standard (Technical Specification (TS) 101 812 v1.1.1).

[30]The choice of Java made MHP a direct competitor to and incompatible with the HTML and Java Script standard supported by Microsoft and Intel—also known as 'Wintel'.

1998, the Advanced Television Enhancement Forum (ATVEF) was founded soon introduced a further Application Programming Interface standard. By the time that MHP was introduced, it also faced the competition of OpenTV, Liberate, NDS, Microsoft and Canal+. As much as 25 million proprietary Application Programming Interface devices had been sold that were all incompatible with MHP (Wynn & Flynn, 2003). Although the DVB Project as well as the European Broadcasting Union called their members to migrate to MHP, it was clear that operators with investments in their own Application Programming Interface systems were not going to switch. Particularly, the pay TV operators were unwilling to give up their first-mover advantage. Nor were consumers expected to switch. MHP was significantly more expensive than all alternative proprietary platforms (Näränen, 2002, p. 6). To date, over 25 different combinations of middleware systems are still in use in Europe today (Morris & Smith-Chaigneau, 2005, p. 483) and neither MHP, OpenTV, MHEG and Microsoft TV managed to tip the market. Important scale economies are sacrificed and set-top boxes prices markets remain high, further contributing to the low market penetration of digital television.

The Application Programming Interface standardization, too, thus demonstrates the limits of private industry standardization. It highlights that—just like public decision-making processes—the decision-making processes of private standards-writing organizations can be rather slow. And where network effects allow individual companies or small groups of companies to pursue unilateral standardization strategies, these decision-making processes tend to be too slow. This demonstrates that public entrepreneurship can play a decisive role by accelerating the standardization process and providing standard-setters with a first-mover advantage over their rivals.

4.3.2 The Shadow of Hierarchy

The proponents of MHP sought to use the negotiation of the telecoms package, which was formally intended to take account of the increasing convergence between telecommunications, broadcasting and IT sectors (EC, 2000a, p. 3), to have MHP be made a mandatory standard by law. The Commission, however, as in the case of Conditional Access, wanted to leave this issue out of secondary legislation and did not mention it in its proposal (EC, 2000b).[31] Commissioner Liikannen posited that:

[31] The Commission merely agreed to carry FRAND provision of the Advanced Television standards Directive 95/47/EC into the package's access Directive.

> Given the fact that the MHP standard was agreed on the assumption that it would remain a voluntary standard, and given the widespread support for it, I see no need to make implementation of the standard mandatory in our Directives, as some suggest.
>
> (Liikanen, 2001)

However, the EP, by contrast, insisted on the inclusion of an explicit shadow of hierarchy. It was concerned that the failure to agree to a single application programming interfaces standard would have detrimental effects for cultural diversity and media pluralism (see EP, 2001a, Amendment 1, Recital 7):

> If we do not [mandate MHP], then I fear the future of satellite television might be dominated by the TV culture of quiz shows featuring stripping housewives, squeezing out educational and public interest programmes."
>
> (McCarthy (PSE) EP, 2001b)

Therefore, it was argued that:

> Interoperability of digital interactive TV services and terminal equipment, at the level of the consumer, *shall be encouraged* in order to ensure the free flow of information, media pluralism and access of consumers to cultural diversity."
>
> (EP, 2001c, Amendment 3 (Recital 30a), emphasis added)

The EP had been lobbied intensively by public service broadcasters, particularly from Germany.[32]

Upon the pressure of the EP an explicit threat of to make compliance with one standard obligatory was included into the Framework Directive 2002/21/EC of the Telecoms Package that was adopted in April 2002 (European Parliament and Council, 2002). According to this Directive, the Commission was to draw up a list of standards that whose usage Member States were meant to encourage. This list was always intended to contain several standards, not just MHP. There was no obligation to comply with this list. It was also agreed that the Commission should review the market situation after the Directive's entry into force (EC, 2001a; EP, 2001c, Amendment 30). "If interoperability and user choice had not been adequately achieved," the Commission may make a standard from the list obligatory, "to the extent strictly necessary to ensure such interoperability and to improve freedom of choice for users" (Article 17(3)).

According to the shadow-of-hierarchy hypothesis, as mentioned in Chapter 1, this threat should be expected to prompt industry to switch over to MHP. This expectation is strengthened by the fact that industry considered this shadow of

[32] Adler (2001), Interview C4 Interview with a participant of the MHP standardization process (2010), Interview C11 with a representative of the broadcasting industry and now member of the (2010)

hierarchy to be quite credible. Just as the direct use of hierarchical instruments, as in the case of HDTV standardization (Chapter 3), the mere threat to use hierarchical instruments, too, lead to political contestation.

In response to the formulation of this threat, pay TV operators formed the Digital Interoperability Forum in 2003 to prevent the mandation of MHP.[33] Its main message was that:

> Disproportionate regulatory intervention, or even the threat of such action, could inhibit the investments and innovation needed to sustain current growth in digital and interactive TV. The imposition of mandated technical standards or the use of artificial economic incentives and subsidies will impede digital TV rather than promote continued progress towards eventual switch-off of analogue terrestrial broadcasting.
>
> (Digital Interoperability Forum, 2003)

The Digital Interoperability Forum used the implication of the EP, Council and the Commission in the decision-making process, to lobby against the enactment of the threat. Their main counter narrative against MHP was that public attempts to impose a standard would crowd out private investment and innovation. Therefore, the mandation of MHP would "put brakes" on future investment in digital television, as BSkyB's Sheila Cassells told *New Media Markets* (Wynn & Flynn, 2003). Alex Blowers, head of regulatory affairs at NTL that later became Virgin Media, warned that if MHP was mandated industry would stop cross-subsidizing their proprietary set-top boxes. According to Blowers, this practice had made the UK the most advanced digital television market in Europe (Adler, 2001). While this narrative was not strong enough to tip the entire debate it destroyed the policy consensus upon which the formulation of the threat was based. It helped the opponents of MHP to ensure that there was not a sufficient majority to enact the threat.

While the EP was quite sympathetic toward MHP, the MHP opponents had convinced the Commission not to take policy action. The Council was divided. Therefore, the Commission concluded in July 2004, that there was no clear case for mandating MHP or any other standard pursuant to Article 18(3) (EC, 2004c). Instead, it added two direct competitors of MHP—WTVML (Worldwide TV Mark-up Language) and MHEG 5—to the list of standards in line with Article 17. The Commission reconfirmed its decision two years later (EC, 2006a). This provides a direct parallel to the cases of HDTV and intermodal transport standardization, where the hierarchical interventions, too, had a completely unintended effect. In

[33] Interview C9 with a representative of a pay-TV service provider (2010). The members of the forum include: Advanced Digital Broadcast, BSkyB, Canal+, Espial, Flextech, Liberate, Microsoft TV, Nagravision, NDS, NTL, Numéricable, OpenTV, Pace Micro Technology, Sky Italia, Telewest, TF1, TPS, UPC/chellomedia and ZetaCast.

the end, they turned out to support the standard they were meant to weaken. Chapter 5 will return to the issue of the shadow of hierarchy.

In lack of a common standard for Application Programming Interface, interactive television never took off. Consumers seemed to have waited with the adoption of one standard or another in order to avoid stranding or being orphaned with the losing standard (see Besen & Johnson, 1986, p. 119; Besen, 1992). Neither MHP, nor any of the other proprietary Application Programming Interface systems could gain a permanent foothold in the market. Only in Belgium (20 %), Poland (8.1 %), Finland (5 %), Austria (5 %) and Italy (40 %) MHP could gain moderate market shares (MHP Knowledge Project, 2006, p. 40). In most of these countries broadcasters have by now stopped to provide interactive content through MHP.

The failure of interactive television, too, had a negative impact on the market take up of digital television. It deprived digital television of what could potentially have been its 'killer application'. It was widely recognized that the improved screen quality of digital television alone was not enough to convince a lot of consumers to switch to digital TV (de Bruin, 1997). Without interactive services that could boost the demand for digital television, digitalization seemed 'crippled' (Kleinsteuber, 1998).

4.3.3 Scope for Public Entrepreneurship

As during the Conditional Access standardization process, an entrepreneurial intervention might have circumvented the failure of private industry standardization.

First, a public entrepreneur might have been able to make companies start collaborating on the development of a single common Application Programming Interface standard much earlier—that is before the technology has matured and when there still is relative uncertainty about the strategic and commercial implications of the resulting standard. At this point, no firm would have made any significant investments in alternative technological paths of development and there also generally still is relative uncertainty about the strategic and commercial implications of the resulting standard. Under these circumstances, there would have been a comparatively large scope for mutually acceptable agreements. Companies would have found it relatively easy to commit to—the development of—a single common Application Programming Interface standard, no matter how diverse their strategic interests might otherwise have been. Pre-normative R&D subsidies prevent an effective way to prompt industry to start to collaborate early enough. Thereby, such governmental intervention might have persuaded

Table 4.2: Market penetration of MHP in countries deployed (2010)

Country	Platform	No of MHP (in 1,000s)	Overall share (in %)	Share of digital decoders (in %)
Italy	DVB-T	8,600	40	50.2
Belgium	DVB-C	1,000	20	
Poland	DVB-S and DVB-C	1,000	8.1	
Finland	DVB-T, DVB-S, DVB-C	50	5	5
Austria	DVB-C and DVB-T	185	5	
Germany	DVB-S and DVB-C	7	0.3	0.5
Spain	DVB-T	200	1.3	1.8

Sources: DVB Project (2010d); GfK & DGTVi (2009); Flynn (2006); Telenet (2010); Briel (2009); MHP Knowledge Project (2006, 2010)

the DVB Project's members to develop a common Application Programming Interface standard before rival consortia standards would have been able to win an irrevocable first-mover advantage.

Secondly, a public entrepreneur might have provided the coordination that was necessary to deploy MHP successfully. In the case of MHP, this could have had a decisive effect. According to Gupta, Jain, and Sawhney (1999, p. 397) as well as Morris and Smith-Chaigneau (2005, p. 484), one of the reasons why the market take-up of MHP remained below expectations was a 'chicken-and-egg' dilemma faced by equipment and content providers. Without a sufficient supply of MHP compatible equipment, applications and content providers had no incentive to provide interactive applications. And without a sufficient availability of MHP compatible applications and content, manufacturers had no incentive to produce MHP equipment on a scale that would allow for sufficient price reductions. In theory, this was merely a simple coordination problem. A governmental actor might have coordinated among the different actors' and provided a focal point—such as a simple introduction date—around which actors preferences could have converged (see Garrett & Weingast, 1993). In the case of GSM standardization, the European Commission demonstrated its ability to do so. Similarly, the Commission might have concerted the introduction of MHP.

4.4 Conclusions

Despite the fact that more then 200 million DVB compliant products could be sold in more than 40 countries to date, the case of European digital television standardization through the DVB Project demonstrates the clear limits of private industry standardization. This case study highlights the limited capacity of directly competing companies to achieve sufficient levels of variety reduction by agreeing to a single set of common standards where their technological preferences diverge. In the case of transmission, Conditional Access and Application Programming Interface standards, the DVB Project failed to achieve sufficient levels of variety reduction. This seems to have had devastating consequences for the marked-led introduction of digital television as well as media pluralism and diversity.

These findings suggest that under the following conditions, private standardization processes are likely to fail where:

1. Companies have already made non-negligible pre-investments in diverging technological paths so that there is no scope for common, mutually acceptable standards;

2. Companies have diverging strategic interests and the decision-making procedure of the given standards-writing organization provides individual companies with the opportunity to hold out agreement or to employ other bargaining strategies provoking the failure of the process;

3. Individual companies or a groups of companies expect a deterioration of their market position through the adoption of common standards and therefore veto the adoption of that standard;

4. Network and scale economies allow individual companies to unilaterally set *de facto* standards.

In these circumstances there still is a large scope for the potentially facilitating role of public entrepreneurs.

Considering the fact that digital television standardization failed in rather favorable circumstances—large and evenly spread gains, progressive voting rules and the market oriented approach of the DVB Project—private industry standardization can also be expected to fail in more favorable circumstances.

Furthermore, this case study demonstrates that neither non-intervention—only backed by *ex post* regulation through competition rules—nor the shadow of hierarchy are adequate to improve the performance of private standard-setters. Instead, this Chapter suggests ways and conditions under which targeted entrepreneurial interventions might have led to superior outcomes.

This Chapter also demonstrates, however, that functionalist considerations only play a limited role in public actors choice of policy strategy and instruments. Opportunities to build political alliances appear to be more important than functionalist considerations which policy instrument would lead to superior outcomes.

Finally, this case study demonstrated demonstrates that far from being a purely 'technical' issue, which can be safely delegated to technicians, the setting of standards does in reality constitute a battleground on which a range of regulatory philosophies, economic and political interests clash.

Chapter 5

Intermodal transport

This case study of European intermodal transport standardization investigates the impact of the *New Approach*, already mentioned in Chapter 1. This policy instrument was specifically designed to increase the influence of public actors on private standardization processes and to depoliticize the regulatory process. With the help of this instrument, the Commission sought to prompt industry to develop standards for loading units—i.e. shipping containers—that could be used interoperably across multiple modes of transport (EC, 2003b).

As the name suggests, the *New Approach* was a response to the 'old approach' to the harmonization of national regulations and standards, as set out in the 1969 General Programme on the Removal of Technical Obstacles to Trade. The removal of technical barriers to trade through this legislative procedure turned out to be too cumbersome and time-consuming (Egan, 2001, pp. 78-81), for it was often held up by the politicization of technical aspects of legislation. As a result, the decision-making process was often gridlocked.

The *New Approach* in turn was meant to overcome this problem by delegating the 'technical' aspects of market integration to the European standards-writing organizations. These include CEN, CENELEC and ETSI. While this was also seen as an opportunity to make use of the allegedly superior information of industry, this was also expected to allow the European legislators to concentrate on the political objectives, such as health and safety levels, of EU single market legislation, without being held up the politicization of technical aspects. Thereby, the *New Approach* was supposed to accelerate the completion of the single European market.

In the light of the political contestation hypothesis developed in the introductory Chapter 1, the *New Approach* therefore represents a rather interesting case. While it may de-politicize the European public policy-making process, it is rather difficult to predict whether or not it would lead to a politicization of the technical standardization process instead. On the one hand, the *New Approach* does

not raise the stakes of the game because mandated standards, like all technical standards, remain voluntary. Therefore, a multiplication of veto players should not necessarily be expected. On the other hand, like all secondary legislation, the *New Approach* increases the number of veto points by directly implicating the EP and Council in the standardization process. The two institutions need to specify the 'essential requirements' that the standard has to fulfill. This makes it difficult to make a prediction based on this thesis' political contestation hypothesis. Therefore, this Chapter investigates whether or not and, if so, to what extent the *New Approach* can expose technical standardization processes to political contestation.

Furthermore, the case study of European intermodal transport standardization provides an opportunity to investigate the impact of the so-called shadow of hierarchy on technical standardization processes. The Commission threatened industry to introduce further more coercive secondary legislation subsidizing or mandating compliance with its preferred loading unit standard, if industry was not going to agree to and adopt a single common standard. According to the shadow-of-hierarchy hypothesis (Börzel, 2009; Héritier & Rhodes, 2011b; Héritier & Lehmkuhl, 2008; OECD, 2003, 1999b; Mayntz & Scharpf, 1995), such a threat should have prompted industry to intensify its standardization efforts in order to prevent the introduction of more coercive secondary legislation. As suggested in the introductory Chapter 1, however, such a threat should have raised the stakes of the game thus increasing the number of veto players and reducing the scope for agreement on common standards.

This Chapter is organized in two main Sections. Before this Chapter can turn to the investigation of the Commission's intervention, Section 5.1 provides important background information on the international and historic context of intermodal transport standardization; the inadequacy of international standards and the resulting need for European standards; and how European standard-setters have responded to this need. Section 5.2 describes and investigates the impact of the European Commission's intervention into intermodal transport standardization via the *New Approach* and the threat of more coercive interventions.

5.1 The Success of International and the Failure of European Standardization

5.1.1 International Container Standardization: An American GSM?

Standardization plaid a critical role in the international success story of containerization, which, in the words of Levinson (2006), "made the world smaller and the

world economy bigger." Europe, however, only played a minor part in this story. Although the first freight containers were already developed at the beginning of the 19th century in Europe and elsewhere, it was not until the 1958 when the American Standards Association (ASA) standardized its dimensions that the container became an international success.[1] With the help of government subsidies the American standard container quickly gained a critical mass in the US and than in the intercontinental deep-sea shipping (see Levinson, 2006, Chapter 7). This demonstrates, once again, how a coordinating role governmental actors, as in the case of GSM standardization, may provide the catalyst for network effects to take over and to establish a given technology as the *de facto* standard.

When the US proposed its domestic container standard to the ISO two years later, European industry already found itself in the 'second mover' position. The American standard had already achieved a significant installed base and proved its ability to minimize shipping costs. Therefore, the European and other countries' ISO delegates had little choice but to adopt the American standard as the international *de jure* standard. In 1968, the ISO members agreed to the ISO Series 1 containers, which were largely based on the American ASA containers.[2] The ISO container rapidly asserted itself as the *de facto* standard in international deep-sea transport. Today, approximately 20 million ISO containers are in international circulation. (Studiengesellschaft für den kombinierten Verkehr, 2007, p. 36) and all modern container ships and ports nowadays are optimized for the handling of ISO containers.

This episode, once again, demonstrates how a small and exclusive group of standard-setters is able to set a standard for a large group of standard-takers. It also confirms the assumption that technical standardization is unlikely to have been possible had it not taken place in such a small and exclusive circle. Had all the affected stake-holders with their diverging technical preferences for the dimensions and design of the international loading unit standard—determined by their domestic regulations on vehicle weights and dimensions or diverging pallet sizes etc.—directly participated in the process it is unlikely that they would have been able to agree to a single common standard. Only because a small and homogeneous group of American companies was able to agree to a common loading unit and, with the support of network effects eventually confront the ISO with accomplished facts, did the container standardization process succeed. The

[1] The container's width (8 feet) was determined by road regulations and its length (40 feet) was determined by railway regulations. These dimensions were also later adopted by the ISO.

[2] The Series 1 ISO standards defined the terminology, dimensions, ratings and identification markings of containers. In addition to the 40 feet long container, 10, 20 and 30 feet length were specified. In 1970, the corner fittings and minimum internal dimensions of general purpose fright containers were defined.

obvious price that had to be paid for this 'success' was that many actors ended up with a container that was not compatible with their technical preferences.

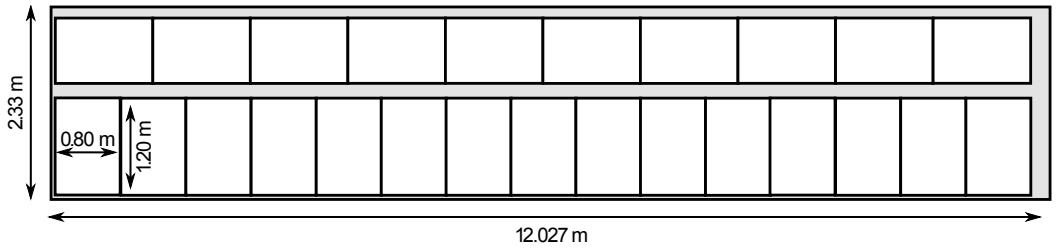

Figure 5.1: Pallet-loading capacity of the ISO 40 foot container

For instance, the international container standard did not take account of the standardization work on pallets that had already been carried out in 1947. As a result the ISO container was incompatible with the standard pallets commonly used in Europe.[3] As illustrated by Figure 5.1, the ISO Series 1 containers sacrificed valuable cargo space. This is a critical determinant of transportation costs. The marginal cost of transporting and handling not fully-loaded loading units tends to be minimal. In container terminals, for instance, the price charged per crane lift generally does not vary with the size, weight or load of the loading unit. Also labor costs, the highest cost factor in road transport, do not increase with the size of the loading unit. At the same time pallets could not be adapted to the new container standard. Although wooden pallets would be relatively inexpensive to replace, assembly lines and warehouses across Europe were already optimized for the handling of pallets. Adapting these to the international container standard, however, would be prohibitively expensive. Therefore, the ISO container is uncompetitive with pallet compatible loading units in intra-European transport. The ISO Series 1 containers hence never gained any significant market shares in intra-European transport.[4] In international transport, including the transport in and out of Europe, however, it is the uncontested *de facto*s standard.

The success story of international containerization was like an American GSM. While the US came too late in the case of mobile telecoms standardization, the coordination provided by American government in the case of container standardization provided the American container with a first-mover advantage that eventually tipped the entire world market. In lack of leadership, Europe had

[3]One generally distinguishes between Euro- and UK pallets, however, this paper will only refer to the former. Both pallets were also standardized by the ISO but in competition to the Series 1 container. According to Egyedi (2000), they were intentionally left incompatible with the Series 1 containers.

[4]There appear to be two reasons why pallet-incompatibility has not affected the proliferation of the ISO container elsewhere in the world. First, several countries use different pallet sizes. Second, ISO containers are not always loaded with palletized goods. Particularly, in countries where labor costs are very low, containers are still loaded and unloaded by hand.

not choice but to pay th cost of adapting to the international standard.

5.1.2 The European Lack of Leadership

Instead of developing a single common standard for intra European transport in response to the international container standard's incompatibility with European pallet standards, however, European industry responded in a largely uncoordinated way. Multiple, largely incompatible loading units were developed, without paying any attention to the loss of efficiency that this meant for the transport system as a whole. Operators from each mode of transport—road, rail, short sea and inland waterway—largely followed their own technical preferences in the development of new loading units, as summarized in Table 5.1.

Rail and road transport operators, for instance, have no interest in stack-ability as it is generally not allowed to transport containers stacked on top of each other on European roads or rail ways. Therefore, road haulers have traditionally preferred light-build loading units over more robust stack-able loading units in order to minimize the tare weight of loading units in order to reduce fuel consumption. Both road and rail transport operators also share an interest in the maximization of payload by increasing the hight and width of loading units to pallet-width, fully exploiting the limits set by Directive 96/53/EC on maximum vehicle dimensions, in order to spread their fixed and labor costs over a larger quantity of transported goods.

Table 5.1: Modal preferences

Mode	Stack-ability	Top-lift-ability	Tare weight	Pallet-width	High cube
Road			✓	✓	✓
Rail				✓	some
Deep-sea	✓	✓			✓
Short-sea	✓	✓	some	✓	
Inland waterways	✓	✓			
Combined transport	some			✓	✓

While operators of all modes share an interest in the reduction of handling costs, they have each found different solutions to this. Road haulers for instance developed the so-called swap body. This unstackable loading unit owes its name to four up-folding legs that made it possible to 'swap' them from one trailer to another, or to leave them at a loading bay, without the help of a crane. This had the advantage that road haulers could separate their fleet more flexibly from

their loading units.[5] The various versions of the swap body today account for approximately 70% of all loading units used in intra-European transport.

Deep- and short-sea operators, for instance, were interested in stack-ability of loading units. Moreover, almost all modern container vessels are fitted with special cellular frames that match the width and length of the ISO containers to increase load stability at sea and to accelerate the (dis)charging process at port. Therefore, they were relatively inflexible when it came to the width and length of loading unit dimensions but they are open to extra high containers, such as the so-called 'high cube.' Inland waterway operators, by contrast, tended to oppose such higher containers for the hight of bridges and locks sets a limit to the container dimensions that they can transport.

As a result of these diverse preferences, European transport operators developed an even more diverse fleet of loading units. Even the swap body, which accounted for the majority of loading units used in intra-European transport was subject to significant variations. "The chaos on this is the biggest abyss of all," Sol Katz, one of the pioneers of American container standardization, argued. "In Europe, when it comes to containers there is no longer a standard, or even the hope of a standard" (in Freudmann, September 15, 1998). This perception is also shared by many Europeans."We have an uncontrolled growth of diverse Euro-containers that companies develop and enter into the transport chain" (*Deutsche Verkehrszeitung*, 2003a, author's translation), it was argued by Georg Waischnor of the German Short Sea Shipping Council. Table 5.2 tries to shed some light on the installed base of European loading units. In reality, however, the situation was even more complex and unorganized than suggested by the complexity of Table 5.2.

The heterogeneity of loading units and the failure to achieve a sufficient level of variety reduction had—and still has—devastating consequences for the European economy and the environment alike.

[5]The swap body experienced its breakthrough with the development of pneumatic suspensions for trucks in the 1970s. Trucks only had to deflate their suspensions to drive under the loading unit suspended on its four legs. This was much quicker and less maintenance intensive than the the mechanical systems that were originally used for the loading and unloading of swap bodies.

Table 5.2: Overview of intermodal loading units used in Europe[a]

Name	Interior (mm)			Exterior (mm)			Weight (t)			Pallet	Stacking	Top-
	Length	Width	Hight	Length	Width	Hight	Gross	Tare	payload	capacity	-hight	liftable
ISO 1CC 20′	6,058	2,438	2,591	5,893	2,330	2,392	30.5	2.2	28.3	11	7	✓
ISO 1CC 20′	6,096	2,438	2,591	5,931	2,350	2,392	34.0	2.2	31.8	11	7	✓
ISO 1BB 30′	9,144	2,438	2,591	8,979	2,330	2,392	34.0	3.1	30.9	18	7	✓
ISO 1AA 40′	12,192	2,438	2,591	12,027	2,330	2,392	30.5	3.7	26.8	25	7	✓
ISO 1AAA 40′	12,192	2,438	2,896	12,039	2,352	2,698	34.0	3.9	30.1	25	7	✓
ISO 2CC	7,430	2,591	2,591	7,265	2,502	2,400				18	7	✓
ISO 2CCC	7,430	2,591	2,896	7,265	2,502	2,705				18	7	✓
ISO 2AA	14,900	2,591	2,591	14,735	2,502	2,400				36	7	✓
ISO 2AAA	14,900	2,591	2,896	14,735	2,502	2,705				36	7	✓
Maritime 45′ HC[b]	13,716	2,438	2,896	13,551	2,350	2,705	34.0	4.5	29.5	27	7	✓
Maritime PW 20′ HC	6,080	2,470	2,896	5,910	2,420	2,700	30.5	2.9	27.6	14	7	✓
Maritime PW 40′ HC	12,192	2,500	2,896	12,080	2,440	2,700	35.0	4.2	30.8	30	7	✓
Maritime PW 45′ SC	13,716	2,500	2,591	13,575	2,440	2,400	34.0	3.8	30.2	33	7	✓
Maritime PW 45′ CS	13,716	2,500	2,591	13,575	2,440	2,400	34.0	3.8	30.2	33	7	✓
Maritime PW 45′ HC	13,716	2,500	2,896	13,575	2,440	2,700	34.0	4.5	29.5	33	7	✓
″ PW 45′ HC CS	13,716	2,500	2,896	13,575	2,440	2,700	34.0	4.5	29.5	33	7	✓
Swap Body C715[c]	7,150	2,500	2,670	7,015	2,440	2,479	20.0	2.9	17.1	16	1	some
Swap Body C715	7,150	2,500	2,769	7,015	2,460	2,526	16.0	2.7	13.3	16	1	
Swap Body C715	7,150	2,500	2,769	7,015	2,460	2,526	16.0	2.7	13.3	16	1	
Swap Body C745	7,450	2,500	2,670	7,315	2,440	2,479	16.0	3.0	13.0	18	1	
Swap Body C745	7,450	2,500	2,769	7,315	2,460	2,526	24.0	2.7	21.3	18	1	
Swap Body C782	7,820	2,500	2,670	7,685	2,440	2,479	20.0	3.2	16.8	18	1	
Swap Body C782	7,820	2,500	2,769	7,685	2,440	2,526	30.0	2.8	27.2	18	1	
Swap Body A1219	12,192	2,500	2,703	12,057	2,440	2,512	30.5	4.0	26.5	30	1	
Swap Body A1250	12,500	2,500	2,670	12,365	2,440	2,479	34.0	4.2	29.8	30	1	
Swap Body A1360	13,600	2,500	2,670	13,465	2,440	2,479	34.0	4.8	29.2	33	3	✓
Swap Body A1360	13,600	2,500	2,670	13,465	2,440	2,479	34.0	4.6	29.4	33	1	

[a] This table is only concerned with *de jure* standards. Additionally, many variants of these standards exist.
[b] HC stands for ‘high cube’, PW for ‘pallet-wide’, SC for ‘side curtain’, CS for ‘chamfered sides’.
[c] The dimensions for swap bodies are only suggested maximum dimensions and can, and do, vary downwards.
Source: ICF Consulting (2003, pp. 8–9).

1. It significantly increased transportation costs.[6] The lack of interoperability between systems often required the reloading of fright from one loading unit to another, whenever national or modal boundaries were crossed, thus defeating the purpose of containerization;

2. The excessive heterogeneity of loading units undermined automation, thus jeopardizing potential efficiency increases even further;

3. The lack of standardization significantly increased the number of empty back-hauls, exacerbating the problem of traffic congestion. Europe's trucks ran empty 35% to 40% of the time (Freudmann, October 21, 1999); and

4. It crippled the integration of different transport networks, undermining the utilization of unused capacities of the rail, inland waterway, and short-sea networks.[7] Because of the high frictional costs involved in integrating different modes of transport, a lot of fright that could be transported more efficiently by alternative modes never leaves the road. Therefore, 72% of all inland fright transport is still carried out by road (Eurostat, 2007, p. 68). This does not only lead to a more road congestion but also increases the number of accidents and environmental pollution.[8]

The failure of European standardization demonstrates the importance of a public actor or entrepreneur in mobilizing and coordinating the development of common standards. The divergence of preferences should not be misunderstood to mean, however, that industry would not have been able to agree to a common standard because their preferences were too diverse. The case of the US, where industry managed to adopt a single common standard, suggests that this could not have been the case. While everyone had a strong interest in common standards, which would significantly increase the overall efficiency of the entire transport industry, each modal actor preferred its own loading unit to become the common standard. This meant that although interests diverged each participant of the intra-European transport economy had a common interest in standardization. A public actor, like the European Commission in the case of mobile telecoms

[6]The European transport industry accounts for 7% of the EU's gross national product (GNP), 7% of all jobs, which is quite large considering that it is merely meant to be an intermediary (Eurostat, 2007).

[7]Air and pipeline transport also commonly regarded to constitute distinct modes of transport. Therefore, they are deliberately excluded from this case study. Because they either require very specialized loading units (round containers in the case of air transport) or no loading units at all (pipeline transport) they generally do not play a role in intermodal transport standardization.

[8]The transport sector accounts for 30% of the Community's energy consumption and the maintenance and adaption of the transport infrastructure ties 40% of member states' public investment (Eurostat, 2007).

(Chapter 2) and the first phase of HDTV standardization (Chapter 3), should have been able to provide the necessary coordination and commitment to overcome this divergence of interests. Initially, however, neither the European Commission nor any other public actor intervened.

5.2 The Involvement of the European Commission

5.2.1 Agenda-Setting?

At first sight, the intervention of the European Commission resembled its agenda-setting in the cases of mobile telecoms and HDTV standardization (Chapter 2 & 3).

First, during the 1990s, it identified the lack of common European standards as the main policy problem in European transport. Faced with growing transport volumes it was estimated that by 2010, the total volume of fright transport would have grown by 38%, outstripping the capacity of the European transport system (EC, 2001b, p. 11).[9] It appeared clear that a better integration of national transport systems alone would not suffice to meet the growing demand for transport capacity.

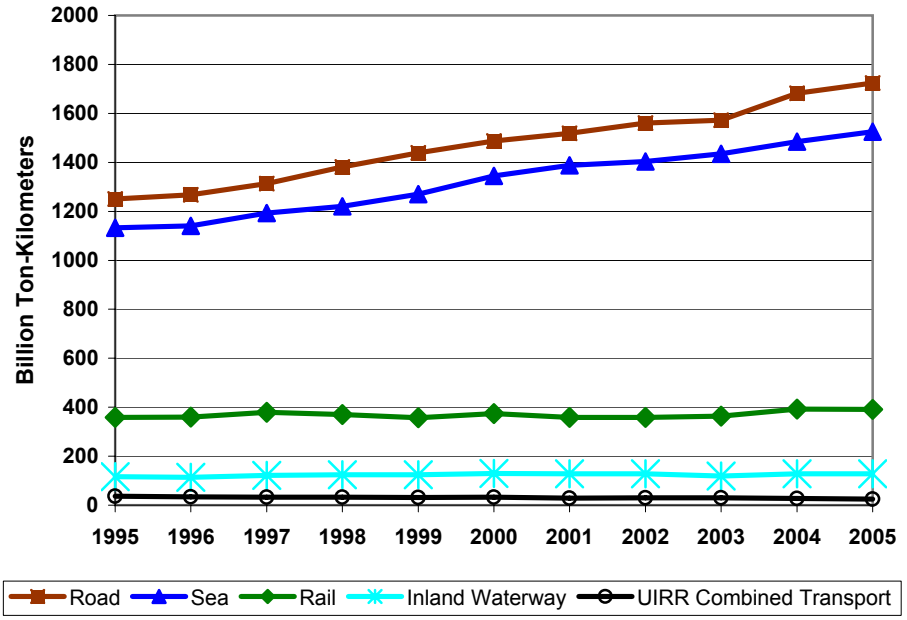

Figure 5.2: EU25 Transport performance by mode in billion ton-kilometers (1995–2005)
Source: EC (2006b) and UIRR

[9]Road fright transport would increase by 50% over its 1998 level, which translates into an additional 156 billion ton-kilometers (EC, 2001b, p. 11).

Secondly, the Commission identified the policy of intermodalism as a potential solution to this problem. Intermodalism suggests that by combining multiple modes of transport–air, rail, road, inland waterways, short and deep-sea–it is possible to take advantage of each mode's inherent economies. According to the Organization for Economic Co-operation and Development (OECD), from which the Commission adopted this policy:[10]

> Intermodal transportation is at the heart of global trade and provides the arteries through which freight moves efficiently and cost-effectively across oceans, along coastal and inland waterways, through ports and terminals, on rail and by highways and roads. Global economic growth and development could not be sustained without intermodal transport
>
> (OECD, 2001, p. 14).

Intermodalism was supposed to unleash unused capacities, relieve pressure on the existing infrastructure, reduce carbon emissions, traffic jams and accidents. "Better integration of transport modes is essential. This will mean greater recourse to environmentally friendly and energy-saving modes offering unused or potential capacity, more modal connections and greater interoperability," Directorate-General for Energy and Transport (DG TREN) argued (EC, 1995). To achieve intermodalism, DG TREN, suggested that common standards needed to be developed, for the lack of common intermodal standards, Patrick Mercier-Handisyde from DG TREN argued, "creates friction costs, which makes intermodal transport uncompetitive" (Freudmann, September 15, 1998). And in its 1997 Communication on Intermodality and Intermodal Freight Transport the Commission suggests that, "unless standards are harmonized ... the growing complexity of logistics requirements and the growth in international trade will reinforce a tendency for transport modes to diverge, (and) the use of specialized containers will increase the occurrence of their empty returns" (EC, 1997c, p. 8).

The Commission successfully assumed the first two agenda-setting functions. However, the Commission does not appear to have played a direct role in the mobilization of standardization coalition, the third function of an agenda-setter. By the time that the Commission first took up the issue of standardization, a group of companies that had specialized in the combination of rail and road transport—and therefore became known as the 'combined transport' sector—had already taken the issue in their own hands. As the transfer of freight between different modes was at the core of their business, the combined transport operators had a natural interest in intermodal interoperability. Initially they were mainly concerned with the combination of rail and road transport but they also

[10] As the mobile telecoms (Chapter 2) and HDTV case studies (Chapter 3) showed, this case, too, demonstrates the Commission's ability to integrate new policy ideas from third parties.

sought to expand their business model into other modes of transport eventually. Therefore, they started to meet in the Technical Committee for "Swap bodies for combined goods transport" (TC119) of CEN to start working on common standards. Particularly the German combined-transport community around the SGKV (Study Group for Combined Transport) supported this development. They pushed for the development of an intermodal loading unit based on the design of the swap bodies.[11] To be able integrate other modes of transport, such as short-sea and inland waterway transport, and to decrease handling costs and to increase the capacity of intermodal terminals, in which space tends to be scarce,[12] however, they sought to diverge from the original design of the swap body by making it top-liftable and stack-able.

This demonstrates that it is methodologically possible to distinguish between outcomes that were achieved through agenda-setting and outcomes that only appear to have been achieved through agenda-setting but were actually achieved by the relevant agents themselves (see Chapter 1). In this case, agenda-setting did not play a role for the combined transport community appears to have overcome its collective action problems itself. Its ability to do so was based on two factors. First, this was a case where a group of actors value the collective good so much that they provide themselves, as for instance labor unions negotiate the collective good of higher wages for members as well as non-members (see Olson, 1971). Secondly, the combined transport community managed to gain control of the standardization process and managed to reduce the cost of collective action by developing container standards according to their own technical and strategic preferences. As suggested in the introductory Chapter 1 and confirmed by the mobile telecoms case study (2) the exclusivity of standardization coalitions represents one of the main facilitating factors for the private development of technical standards.

Participation in the TC119 was highly exclusive. The committee was dominated by the combined transport industry. Operators from other modes did not participate. Deep-sea transport had traditionally focused their attention on the ISO's Technical Committee (TC)104 and the International Maritime Organization (IMO). Inland waterway transport, in turn, was generally not concerned with technical standardization. Moreover, neither the companies themselves, nor their industry associations have the financial resources, expertise nor staff to do participate in formal standardization processes, an industry representative argued.[13]

[11] The SGKV is a think tank for combined transport, with close ties to the Union internationale des sociétés de transport combiné Rail-Route (UIRR) and FAKRA.

[12] Interview B9 with an offical of a national standardization organization (2009), citetInterview-Sorgetti

[13] Interview B14 with a representative of the inland waterway industry (2009)

Only the short-sea shipping operators occasionally participated, particularly in the Dutch and British shadow committees.[14]

Also the organizational structure of the TC119 appears to have been biased toward the combined transport community. The chair of TC119 was traditionally provided by the UIRR.[15] The secretariat was hosted by the Normenausschuss Kraftfahrzeuge (Fakra AA-D4) of DIN. The provision of the chair and the secretariat meant a significant advantage to the combined transport community.[16] According to the rules of procedure of CEN, companies or trade associations are not allowed to participate directly in the technical committees. They have to seek representation through national delegates that are informed by their respective national standardization organizations' shadow committees.[17] Through the chair of the TC119 the combined transport industry was therefore the only industry that was directly represented in the committee.

The exclusive membership and biased organization of the TC119 did not only decrease the cost of collective action by allowing the standard-setters to recoup some of their development costs by making sure that the developed standards conformed with their technical and strategic preferences and that all other actors had to pay the cost of adapting to that standard. The exclusive and homogeneous membership of the TC119 also meant that there was a much larger scope for mutually acceptable agreements on common standards than if all modes of transports had actively participated.

5.2.2 Strategic Alliance

Although the European Commission does not appear to have mobilized the collective action of the combined transport community, it welcomed its work and identified the combined transport industry as its 'natural ally.'[18]. As the Commission, the combined transport industry had a strong interest in modal interoperability. The competitiveness of their business model critically depended

[14]Interview B9 with an offical of a national standardization organization (2009). While the chair or individual members of TC119 would sometimes informally consulted the waterborne transport industries (Interview B8 with a representative of the combined transport industry, 2009; Interview B9 with an offical of a national standardization organization, 2009), this happened at their personal discretion only.

[15]Both TC119's current chair, Martin Burghardt and his predecessor Dr. Christoph Seidelmann, are/were employed by the UIRR.

[16]Interview B4 with a participant of CEN's TC119 (2009), citetInterviewLeGrand, citetInterview-Burghardt

[17]The shadow committees' of German, France and Italy are among the most active. While the industry participation within the national shadow committees varies, the waterborne transport industries tend not to participate (Interview B4 with a participant of CEN's TC119, 2009; Interview B7 with a representative of CEN, 2009; Interview B8 with a representative of the combined transport industry, 2009).

[18]Interview B2 with a representative of the European Commission (2009)

on it. Given their shared interests, a strategic alliance soon emerged between the DG TREN and the combined transport industry. Just as in the cases of mobile telecoms and HDTV standardization (Chapters 2 & 3), companies used this alliance to develop their non-market strategies, i.e. to create a favorable regulatory environment for their businesses. The Commission on the other hand, used the alliance with industry to get access to the invaluable technical and market information that it needed to advance and defend its policies against its institutional rivals—the EP and the Council.

Together, the Commission and the combined transport community managed to install intermodalism as the dominant policy paradigm, which allowed it to claim broad policy competences that went beyond the originally assigned task of promoting the integration of the European transport market. And, largely upon the pressure of the combined transport community, 'modal shift' was defined as a main objective of European transport policy. It meant that freight transport was to be shifted off the road, onto alternative modes of transport. The objective of modal shift thus played directly into the cards of the combined transport community. This was reflected most strongly in the 2001 White Paper, which defined the target to reduce the market share market share of road haulage to the level of 1998 by 2010 (EC, 2001b, p. 11).

With the political support of the combined transport community, the Commission managed to push the Marco-Polo program—replacing the PACT (Pilot Actions for Combined Transport)—through the Council and the EP. With a budget envelope of €75 million, it was designed to shift 12 billion ton-kilometers per year off the road by subsidizing of intermodal transport operations. The Marco-Polo program was to be administered by the European Commission and demonstrates how to the Commission the political alliance with the combined transport industry was quite beneficial. Therefore, the concept of agency capture—i.e. the capture of the Commission by the combined transport community—would be too one-dimensional. It would neglect the fact that the alliance was mutually beneficial.

The policy objective of modal shift, allowed the combined transport community to call for an increase of the regulatory burden on road haulers and to improve its own regulatory environment.[19]. In a technical report prepared by a hand-full of technical experts under the auspice of International Container Bureau (BIC), which stood close to the combined transport community, for instance, they demanded that loading units specialized for road transport should be subjected to the same minimum quality standards and maintenance requirements specified

[19]Interview B3 with a representative of the road haulage industry (2009), citetInterviewHuegel, citetInterviewBerry, citetInterviewStockmann

by the Convention for Safe Containers for sea transport. [20] Furthermore, the experts suggested that loading unites used for combined transport should be exempted from European regulations on maximum vehicle dimensions (Directive 96/53/EC) to give it a competitive edge vis-à-vis alternative loading units. At the same time, the 'technical' report stated that:

> The European Commission must keep a clear focus against the constant pressure to allow greater road vehicle dimensions than given in European Directive 96/53/EC and refuse such requests.
>
> (BIC, 2003, pp. 13–14).

Many of these recommendations were incorporated in the Commission's following policy proposals, discussed below.

With the formation of this political alliance with the combined transport community and the completion of the standards-development process by the latter in the TC119, two further crucial conditions appear to have been met that should have allowed the Commission to promote the market deployment of the loading unit standards developed in the TC119. Instead of relying on entrepreneurial policy instruments, such as the coordination of the market deployment, the solution of commitment problems and the mediation of decision-making problems as in the case of mobile telecoms standardization, the Commission sought to rely on more legally binding policy instruments instead.

UTI-Norm, a Community funded R&D project launched 1998, was another product of the alliance between the Commission and the combined transport community. Formally, it was meant to support the development of a European intermodal loading unit that met the technical requirements and preferences of *all* modes of transport. In reality, however, the project was dominated by the combined transport community. It was led by the combined transport community represented through BIC and the UIRR.[21] The European short-sea and inland waterway industries did not participate. This misrepresentation was also reflected in the project's final report. It proposed a unit that was strongly biased toward the technical preferences of the land-based transport modes in general and the combined transport industry in particular. Although being stackable and top-liftable, which is crucial for waterborne transport, it is too wide and too long to fit into modern container vessels canal barges, reflecting the current work of the

[20] Only stackable loading units had to comply with this set of minimum standards. Swap bodies were excluded. Therefore, particularly the combined transport community pressured to the Commission to expand these rules to swap bodies to have the same regulatory burden on all modes of transport (see BIC, 2003, p. 11).

[21] They were supported by one German and one British consultancies Hannoversche Consulting für Verkehrswesen, Transporttechnik und elektronische Datenverarbeitung, and Three Quays Marine Services Ltd.

TC119.[22] The results of the project turned out to be the basis for the TC119's work.

After long negotiations the TC119 participants came to a preliminary agreement on the basic parameters of a long and a short intermodal loading unit in May 1997 (see *Deutsche Verkehrszeitung*, 1997). The units were supposed to comply with ISO stacking, top-lift-ability and rigidity criteria. To achieve the necessary rigidity, the combined transport community even accepted a slightly increased tare-weight. This choice did not result from the pressure of the deep– and short–sea shipping industry but because their mass production made the more rigid and heavier ISO compliant corner posts (ISO 1496) and other relevant container parts less expensive than lighter and less rigid components (*Deutsche Verkehrszeitung*, 1997).[23]

In order to allow for better pallet accommodation, however, the TC119 community deliberately decided to diverge from the ISO norms by increasing the unit width in order to achieve better pallet accommodation. Only pallet-wide loading units, it was argued, would make the unit competitive for road transport. Therefore, it was deliberately accepted that the loading units would be incompatible with modern container ships and terminals that are specifically designed for the operation with narrower ISO Series 1 containerss. A justification commonly mentioned by the intermodal transport community was that the first-best loading unit—"the egg-laying full-cream milk sow" (see International Union of combined Road-Rail transport companies, 2004, p. 2)—cannot be realized in practice. It would either have to be pallet-wide or ISO-compatible and, because of the important role of pallets in European transport, the TC119 community suggested the former.[24] At the same time, it was argued that these loading units were specifically designed for intra-European transport. And if they were to be used in international deep-sea transport they should simply be stowed above deck, where this does not play a role (BIC, 2003). As shown below, however, this argumentation was not shared by everyone.

In February 2003, two month prior to the publication of Commission's pro-

[22] UTI-NORM suggested two units of the following external dimensions: 2,550 mm x 2,900 mm x 13,600 mm and 7,450 mm respectively.

[23] Therefore, an initial proposition to limit stacking height and to sacrifice rigidity to make the loading unit as light as possible, was discarded eventually.

[24] As mentioned below, however, this does not appear to have been the complete story. The loading unit does not have to be either pallet-wide or ISO compatible. The container manufacturer GE SeaCo, for instance, has already developed an ISO-compatible pallet-wide container. Because of its thin walls, however, it damages very easily. Therefore, it is not very well liked among shippers. Although this may be true, this shows that there are more technical opportunities than suggested by the intermodal transport community. Several stakeholders have therefore complaint about the committees lack of innovativeness and its failure to develop a body that is acceptable to everyone (Interview B16 with a representative of the logistics industry, 2009).

posal, discussed in Section 5.2.3 below, the TC119 formally approved the short version as a Technical Specification (TS 13853). Two years later, in December 2004, CEN also adopted the long version as an official Technical Specification (TS 14993).[25] There appear to have been two reasons why the two units were initially not adopted as full European Norms but as Technical Specifications, which are only valid for a maximum period of twice three years and which do not require the withdrawal of conflicting national standards. First, the committee first wanted to see how the market would respond to these standards. Secondly, the intermodal transport community did not want to adopt the final version of the standard before the ensuing legislative process, discussed blow, was completed. The two technical specifications could have been transformed into European Norms at any time. There appears to have been sufficient support for the two loading units within CEN. This is proven by the fact that the two technical specifications were successfully adopted through the same voting rules that apply to the adoption of European Norms.[26].

The formal agreement on common standards—if only in the form of Technical Specifications provided a further demonstration of the facilitating role of exclusive membership structures. Had more representatives of the deep–, short–sea and road transport industry participated in the voting process, CEN is unlikely to have adopted these specifications. The deep– and short–sea shipping industry is likely to have vetoed the specifications because the specifications were wider than their preferred ISO containers. And road haulers are likely to have voted against the specifications because they were heavier than their preferred swap bodies.

Favorable Deployment Conditions

Despite the fact that the majority of the transport industry was not directly involved in the development of these standards and despite the fact that they were slightly biased toward the technical preferences of the combined transport community, however, the conditions surrounding their market deployment appear to have been quite favorable. It would not have been surprising had the standards been deployed successfully in the market. The initial deployment conditions appear to have been rather favorable.

[25]The explanation for these publication dates appears to be quite obvious. By adopting these specifications around the publication date of the Commission's proposal, the TC119 was hoping to feed its technical specifications into the *New Approach* procedure discussed below, which could potentially transform these standards into Harmonised Documents. This intention is directly reflected in the reports prepared for the Commission by TC119 and BIC. As Harmonized Documents the two standards would enjoy a significantly stronger legal status and were hoped to have a much stronger impact on the market.

[26]70% of the weighted votes, Article 6.2.1 of CEN's statutes) that is need for the adoption of full European Norms and Technical Specifications (Article 6.1.5(b)

First, both versions of the loading unit developed by TC119 appeared to represent the state-of-the-art in loading unit design. Despite the fact the units clearly reflected TC119's bias toward combined transport operators—which mainly manifests itself in the units' comparatively large width; waterborne transport operators would have preferred narrower units—both loading units constituted a vast improvement compared with the existing units used in intra-European transport for it combined pallet compatibility, with top-lift-ability and stack-ability before. Particularly the last two aspects meant an important concession to the interests of sea and canal operators. Therefore, the units offered an opportunity to make better use of the combination of multiple modes of transports, which is considered to more efficient than single-modal transport for it exploits the economies of each mode.[27]

The two units allowed for large and broadly spread gains. The proposed units' increased loading capacity should have outweighed all short term adaptation costs. First, they offered clear advantages to regular swap bodies for they were stackable and top-liftability. This did not only provide an opportunity to make terminal operations for road and rail transport more efficient. It was also essential for the better integration of short-sea and inland waterway transport into the intra-European transport system. At the same time, the loading units developed by in the TC119 were only slightly heavier, which was crucial for the tear weight-conscious road haulers. Secondly, both the short and long version also appeared to show clear advantages to the comparable 20 foot and 40 foot long ISO Series 1 containers. Tables 5.4 and 5.3 show that despite relatively small dimensional difference, the units offer significantly better loading capacity, both in terms of gross mass and pallets. Whereas the comparable ISO container can only accommodate a maximum of 25 pallets, the large version could accommodate up to 33 pallets, as shown in Figure 5.3. That would have meant an increase of 21% in transport capacity.

Therefore, the basic constellation of interests at the time of the Commission's proposal was such that although actors' technical preferences diverged (see Table 5.1), every actor should have preferred a standard that was not completely in line with its preferences to no standard.

Therefore, not only the combined transport community but also road, rail and canal transport operators could be expected to adopt these units. In the short run, their relatively large external width may have posed some adaptation

[27]The quality of a technology, however, does not appear to be crucial for it becoming a de facto standard anyway. The literature on the economics of the QWERTY-keyboard (David, 1986, 1985) and water-cooled reactors (Arthur, 1989a) as well as the example of the ISO Series 1 container's success story have demonstrated that a technical standard's quality, or the lack thereof, tends to have little influence on its market proliferation.

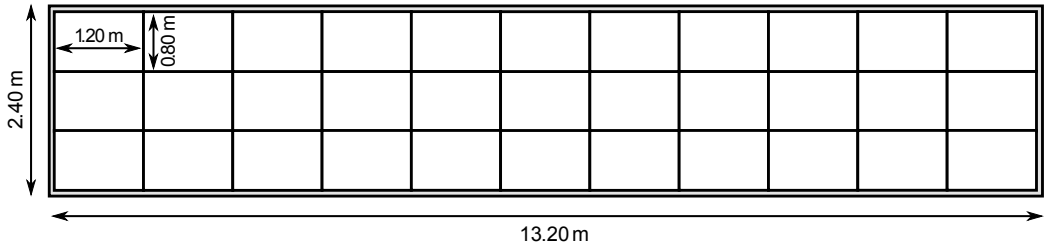

Figure 5.3: Pallet-loading capacity of the proposed European intermodal loading unit

Table 5.3: Short TC119 unit vs. 20 foot ISO

	Internal length (m)	Internal width (m)	Pallet capacity	Maximum gross mass (t)
Short EILU	7.20	2.40	18	16.0
20 foot ISO	6.096	2.33	25	30.4
Difference	0.65	0.07	7	14.4

Table 5.4: Long TC119 unit vs. 40 foot ISO

	Internal length (m)	Internal width (m)	Pallet capacity	Maximum gross mass (t)
Long EILU	13.20	2.40	33	34.0
40 foot ISO	12.027	2.33	25	30.4
Difference	0.65	0.07	7	6.4

costs to the waterborne transport industry. In the long run, however, all modes of transport should have been able to benefit from the adoption of these units. Especially the waterborne transport modes, facing short term adaptation costs, should have been among the largest beneficiaries of the new units. The units' pallet compatibility, stack-ability and top-lift-ability should have made it easier to integrate these modes into the transport mix. The canal shipping industry had traditionally suffered from the frictional costs involved in loading cargo onto and off canal barges. Therefore, the canal shipping industry was—and still is—operating below capacity while the capacity of the European road network had long been exceeded. The units' stack-ability and, especially their, top-lift-ability was bound to decrease these frictional costs.

Secondly, the network effects that had established the American container standard as the de facto international standard, might also establish the TC119's loading units as the *de facto* standard for intra-European transport. It is even conceivable that the loading unit would have eventually penetrate the international transport market. Once the units had achieved a critical mass in Europe that allowed for the mass production and exploitation of scale economies, their decreasing price should be expected to reinforce the network effects. Therefore, non-European producers, particularly producers of low value-added goods that mainly had to compete on costs, may be compelled to take hinterland transportation costs in Europe into account and switch to European Intermodal Loading Unit (EILU)s.

The existence of a large installed base of loading units might weaken these network effects but should not be overestimated. In intra-European transport no individual unit had achieved a critical mass yet (see Table 5.5). Even the most successful swap body had only achieved an installed base of around 55 thousand units, which is rather insignificant compared with the 1 million 20 foot and 40 foot ISO containers in international circulation. And in international transport the position of the traditional ISO containers was not as dominant as it seemed. The the number of non-standard containers such as the 45, 48 and 53 foot containers was growing faster than the number of conventional ISO Series 1 containers (Vasiliauskas & Bazaras, 2006, p. 234). This was explained by the increased loading capacity that these new units appeared to offer. As argued above, also the TC119 units could offer more loading capacity. Therefore, the EILU would not be competing against the conventional 20 foot and 40 foot containers with their installed base of no more than 10 million units but rather the longer units with an installed base of only 120 thousand units (see Table 5.5) (BIC, 2003, p. 19). Moreover, also GSM and DVB standards had to compete against an installed base of analogue units and nonetheless managed to use the inherent

network effects to their advantage.

Table 5.5: Installed base of loading units (2003)

Loading unit	Length	Installed base (1,000s)
ISO container	20 ft.	4,993
Marine container	24 ft.	11
ISO container	30 ft.	12
ISO container	40 ft.	4,881
New ISO container	45 ft.	120
US domestic container	48 ft	82
US domestic container	53 ft.	43
European swap bodies	6 m – 7.8 m	253
European swap bodies	9 m – 9.2 m	29
European swap bodies	12.2 m – 13.7 m	55

Source: BIC, 2003, p. 19

Third, the public support signaled by the European Commission represented the last favorable deployment condition. As the role of American government in international container standardization (see Section 5.1.1) and the role of the European Commission in mobile telecoms standardization (see Chapter 2) had demonstrated, that public actors may provide an important catalyst for the exploitation of network effects. Whether and to what extent the Commission was able to provide this support is discussed in the following section.

5.2.3 Hierarchical Intervention

New Approach Mandate

Despite these favorable deployment conditions, the European Commission sought to boost the deployment of the TC119's standards by giving them it a formal basis in secondary legislation (*Deutsche Verkehrszeitung*, 2003a). In 2003, the Commission made a formal proposal for a *New Approach* Directive mandating CEN with the development of an intermodal loading unit. While standards mandated through the *New Approach* remain voluntary, a *New Approach* mandate tends to strengthen the deployment of the mandated standards by entitling them to free circulation around the EU. Individual Member States would not have been easily been able to restrict their circulation for *New Approach* standards are to be presumed to conform with the essential requirements as well as the General Product Safety Directive 2001/95/EC and, in the case of intermodal transport, Directive 96/53/EC on vehicle weights and dimensions etc. At the same

time, the mandation of a European standard meant that conflicting standards at national level had to be withdrawn. Moreover, mandated standards were privileged in public procurement. Therefore, it was commonly expected that a *New Approach* standardization mandate would give the technical specifications already developed in the TC119 a boost.

The Directive was based on the *New Approach* procedure, a legislative innovation from 1985 (European Council, 1985b), which was meant to accelerate the removal of technical barriers to trade and to allow the European legislators to take advantage of the superior technical expertise of private standard-setters. It was commonly expected that by delegating the task of harmonizing technical standards to European industry's technical standards-writing organizations, would depoliticize and therefore accelerate the market-integration process. In contrast to the 'old approach' of harmonization through technical regulation at the legislative level, the *New Approach* left the development of the actual standards to the private standard-setters themselves. The EU's legislators—the Commission, EP and Council—however, retained the right to specify the limits within these standards could be developed. Therefore, standardization mandates were to include 'essential requirements' to be fulfilled by the desired standards.

Officially, the proposed mandate stated that the advantages of the European swap body and the ISO Series 1 containers should be combined and that the technical requirements and preferences of all modes of transport should be accommodated (EC, 2003b). In practice, however, the essential requirements suggested in the Commission's proposal were directly based on the specifications developed by the combined transport community in the TC119. Tables 5.3 and 5.4 provide on overview of the dimensions suggested by the Proposal.

This does not only demonstrate the influence of the combined transport community but also the benefits that the strategic alliance with these companies brought to the Commission. Without the technical information and support of the combined transport community, the Commission would have been unlikely to develop an equally detailed and technically sophisticated proposal. The combined transport community, in turn, was obviously happy to provide this information in order to have their preferred loading units adopted as the official European standards. Given the reciprocity of this relationship it is not possible to speak of regulatory capture.

Shadow of hierarchy

The Commission's proposal for a *New Approach* mandate was accompanied by an implicit threat that compliance with the EILU standard would be made

mandatory and that other types of loading units would also have to comply with the Directive's essential requirements, if industry did not adopt the proposed standard voluntarily. Industry perceived the threat to be very credible despite the fact that the proposal stated relatively clearly that all types of loading units would be allowed to remain on the market as long as they complied with the safety and security norms defined in the international Convention for Safe Containers (1972, Article 2(b) and Annex I), of which all EU member states were signatories.[28] *Only* the mandated EILU standard, would additionally have to comply with the dimensions and handling features specified in the proposed Directive (Article 2(c) and Annex II). Very soon, however, rumors emerged that other types of loading units would only be allowed to remain on the market for a transition period of several years.

The Commission actively nourished these speculations by refusing to clarify its future strategy. In a consultation paper, for instance, the Commission had formulated the expectation that the old loading units would gradually disappear from the market during the following five to fifteen years (EC, 2002), without specifying whether this was going to happen through regulatory intervention or market forces alone. At an open forum organized by CEN, the Commission skillfully ignored all questions on this issue.[29]. The credibility of the Commission's threat was reinforced by the fact that over the years DG TREN had gained the reputation of superimposing legislation on industry.[30]

Moreover, it was widely expected that if the Commission turned out to be unsatisfied with the market deployment of the EILU standard would be financially subsidized by making eligibility to Marco Polo funding conditional on the use of—and compliance with the—EILU standards. Moreover, industry expected that Members States would be allowed to provide tax incentives and favor the EILU standard in public procurement (*Deutsche Verkehrszeitung*, 2004).

According to the shadow-of-hierarchy hypothesis (Börzel, 2009; Héritier & Rhodes, 2011b; Héritier & Lehmkuhl, 2008; OECD, 2003, 1999b; Mayntz & Scharpf, 1995), the Commission's threat to introduce coercive secondary legislation should have prompted industry to intensify its standardization efforts and to adopt and comply with the proposed intermodal loading unit standard in order to prevent the adoption of more coercive secondary legislation. The fact that the Commission's threat—though implicit—was perceived to be very credibly should

[28]While the Convention for Safe Containers already applies to ISO Series 1 containerss, swap bodies have been so far been exempted.

[29]CEN (2003), citetInterviewBurghardt

[30]According to a Commission employee, DG TREN had lost a lot of credit over the years because of its top-down approach to policy making (Interview B2 with a representative of the European Commission, 2009).

have amplified this effectiveness of the shadow of hierarchy (Héritier & Eckert, 2008, p. 116).

5.2.4 Multiplication of Veto Players and Veto Points

The Commission's intervention raised the stakes of the game for all actors involved. Therefore, no group of actors could no longer afford not to get involved the standardization process. Many actors that were previously not involved in the standardization process started to participate. If the adopted standard ever was to become mandatory, all affected actors wanted to make sure that the standard was aligned with their technical preferences. Many actors, though they may have endorsed the standardization process in general, also sought to prevent that the mandation of compliance (see *German Business Digest*, March 1, 2004; *Deutsche Verkehrszeitung*, 2003a). Therefore, the road, rail, canal and sea transport operators, which were previously not involved in the TC119 started to participate. The Commission's intervention directly increased the number of potential veto players.

The *New Approach* proposal also caused a multiplication veto points. As mentioned above, *New Approach* mandates are decided on through the co-decision procedure, thus directly implicating the EP and the Council. This provided the EILU opponents with two extra veto points. These veto points appear to be far more accessible than technical standardization committees, such as the TC119. The participation threshold in the public policy-making processes appeared to be much lower than that of technical standards-writing committees, such as the TC119. While the TC119 would have required these new veto players to commit significant amounts of time and resources, the cost of participating in the public policy making process turned out to be much lower. The the formal industry consultations of the Parliament and the Council as well as the information dependence of policy-makers provided these new veto players with access to the public decision-making process. A representative of the European Barge Union, for instance, suggested in an interview that the inland-waterway industry would not have the time, resources or expertise to participate in the standardization process.[31] In the political debate, by contrast, the European Barge Union was able to play an active role and provide a range of policy recommendations. Instead of drafting a technical report, delegating a technical expert to a national standards-writing organization's shadow committee to present and defend this report, and hoping that the national committee would finally submit this report to the TC119, actors such as the European Barge Union could simply telephone a Member of the

[31] Interview B14 with a representative of the inland waterway industry (2009)

EP or national ministries to try to influence the outcome of the process. Therefore, actors that had previously shied away from the high costs of participating, such as the road, short-sea and inland waterways operators, joined the standardization process.

The shadow of hierarchy, however, only was supporting rather than a necessary condition for the multiplication of veto players. Without the shadow of hierarchy, the issue may have lost some of its urgency to many affected actors. While the *New Approach* alone may not have increased the stakes of the game, the lower participation cost of the public-decision making process that was initiated through it, however, changed the terms of the game. Some actors that chose not to participate in the technical standardization committees because of the high cost involved, may have used the opportunity to influence the outcome of the standardization process by appealing to the public bodies of decision-making in order to influence the definition of the essential requirements. Therefore, also the proposal of the *New Approach* Directive alone without a shadow of hierarchy looming over it can be expected to have led to a multiplication of veto players.

The increased number and heterogeneity of participants (see Table 5.1) had two direct consequences. First, it destroyed the consensus that had existed in the TC119 before the Commission's intervention and that had facilitated the adoption of the two technical specifications mentioned above. Therefore, CEN never called for a vote on the issue. And after a review of the 'market responses' to the two technical specifications in January 2005, the TC119's secretariat decided 'to put the issue on ice.'[32]

5.2.5 Deconstruction of the Policy Consensus

The second effect that the multiplication of veto players and veto points had is that it also destroyed the policy consensus upon which the Commission's intervention was based. Directly in response to the threat of mandatory compliance, the various industry players—the new veto players—started to appeal to the EP and the Council—the new veto points. First, to undermine the legitimacy of the intermodal transport community and the Commission's proposal—which was presented as an opportunity to increase the overall efficiency of the transport industry—by emphasizing the (re)distributive implications of the proposed standards and by pointing out the weaknesses and inconsistencies in the intermodal transport community's argumentation to justify their technical choices. And secondly, as discussed below, the EILU opponents launched an alternative policy

[32]Studiengesellschaft für den kombinierten Verkehr (2005), Interview B4 with a participant of CEN's TC119 (2009), Interview B8 with a representative of the combined transport industry (2009) and Interview B12 with a participant of CEN's TC119 (2009)

paradigm co-modalism to challenge the dominant paradigm of intermodalism upon which the Commission's proposal was based.

The public decision-making process, it turned out, even allowed those actors that would not have had the capacity to participate in the private standardization process. The above-mentioned European Barge Union, for instance, was going to play an important role in the public decision-making process. Below the different actors argumentations are summarized briefly.

The European Barge Union, for instance, argued that because EILUS were wider than ISO containers many barges would only be able to place three instead of four loading units latter next to each other. This would mean a loss of loading capacity of 25%. While this problem could be circumvented by adapting the design of barges, as suggested by the combined transport community, the canal transport operators argued that the EILUS were still too high for most bridges, ports and terminals. Therefore, the introduction of the EILUS would not only require massive private but also public investments (CEN, 2003; European Barge Union, 2004, pp. 19–21).

The European Rail Freight Association, for instance, complained that mandatory compliance with the EILUS would reduce flexibility and threaten their income stream from the transportation of ISO containers (Hailey, October 6, 2003). The road haulers, represented by the International Road Transport Union, argued that the market rather than policy-makers should be allowed to decide which standard to adopted (*Deutsche Verkehrszeitung*, 2003b).[33] The deep-sea industry also opposed mandatory compliance to be able to continue using its preferred ISO containers. Industry's passionate response to the potential introduction of further secondary legislation making compliance with the EILUS standards mandatory, also demonstrates how credibly the Commission's implicit threat to do so was perceived by industry.

The deep-sea shipping operators, represented by the European Community of Shipowners' Associations (ECSA), complained that the proposal failed to live up to the expectation of combining the advantages of both swap bodies and ISO containers (European Community Shipowners' Association, 2004). The criticism was echoed by the European ports (see comments by bremenports, 2006, pp. 55-56; European Sea Ports Organisation, 2003; Dempster, 2004; Psaraftis, January 22, 2004). As expected, the industry was one of the strongest opponents of the EILU

[33]Given their dominant position in intermodal transport—the last mile also tends to be delivered by road—this argumentation is hardly surprising. It resembles the market narrative of the American equipment manufacturers in the case of third-generation mobile telecoms standardization and the argumentation of the HD-MAC opponents in the case of HDTV standardization. In each case market lead standardization appeared to be more likely to lead to a selection of the technical specifications preferred by these actors.

proposal. The main reason for their opposition was that the EILUS were too wide and too long to fit into the cellular frames of today's container vessels.[34]

The representatives of the deep-sea shipping industry also sought to challenge the combined transport community's justifications of the specific dimensions of their preferred loading units, also reflected in the Commission's proposal. First, the latter had consistently argued that the EILU cannot be compatible with both international containers as well as the pallets used in Europe. And since the latter where much more important in intra-European transport, the EILU should sacrifice container compatibility. A representative of the deep sea shipper NEN-Norfolk line, however, pointed out that there was a way to achieve both by using the thin-wall technology developed by the container manufacturer GE SeaCo (see Peter Sijs CEN, 2003). This was a significant blow to the credibility of the combined transport community. It eventually lost control of the issue.

The intermodal transport community, by contrast, had always discarded this option as unpractical because the thinner the walls the more vulnerable to damage they would become. It was argued that this compromise was not necessary because the EILU was too long to fit into the cellular frames below deck of today's container vessels, they would anyways have to be stowed on deck, where loading flexibility is supposed to be higher (BIC, 2003; CEN, 2004). Therefore, it was suggested unnecessary to make this compromise.

The shipping industry, however, pointed out that an increasing number of container vessels are nowadays fitted with cellular frames that can also fit 45 foot containers. Therefore, the EILU's length did not provide any need to place it on deck. Moreover and although the cellular frames do not extend above deck, the width of containers were even more important on deck because containers need to be directly lashed together. Therefore, the EILU would also be too wide for on-deck transport. [35]

The International Road Transport Union (IRU), responded in a very nuanced, though clearly negative way. It accepted the need for intermodal transport for capacity reasons but rejected the Commission's proposal for the economic impact it would have on the road transport industry (International Road Transport Union, 2003). While it was not directly concerned about the units' dimensions, the IRU took issue with its relatively high tare weight that resulted from its stackability (see Table 5.1).

[34]Erik Hansen of Maersk Sealand, for instance, added that while the European container fleet could probably be modified at a very considerable cost, this would render it inoperable in international deep-sea transport where the ISO containers will continue to be used (CEN, 2003, see).

[35]Interview B13 with a participant of CEN's TC119 (2009), Interview B18 with a container manufacturer (2009)

According to the International Union of Railways (UIC), stackability, which caused the higher tare weight, was an "expensive price to pay for potentially very little benefit" as the rail industry only seldomly required stackability (UIC, 2004). Like road haulers the railway industry criticized that stackability would be interesting only in transport chains where inland waterway transport was used. In all other cases, the non-stackable but significantly lighter swap bodies should be used. The Community of European Railways added that the increased tare weight would jeopardize the viability of rail-road combined transport services, which mainly rely on the use of much lighter units (Community of European Railway and Infrastructure Companies, 2005, p. 18).

Furthermore, the railway community pointed out that in some countries, such as Italy and the UK, the EILUS would be too high for many bridges and tunnels (see response by the English, Welsh & Scottish Railway in Department for Transport, 2003). Nonetheless, the railways demanded to increase the hight to 2,900 mm, if not more, in order to stay competitive against road haulers. A lower unit would not be able to compete with the higher semi-trailer, for instance. For that purpose many operators, had invested in low platform wagons that make it possible to transport such high units anywhere in the EU (International Union of Railways, 2003).

As mentioned above, the EILU opponents also used the political debate in the arena of European politics to launch a new policy paradigm. Instead of intermodalism they suggested co-modalism as an alternative policy paradigm. In contrast to intermodalism, which implied the policy objective of modal shift and the forcing of fright off the road, co-modalism had the objective of maximizing the efficiency of each mode of transport in its own right. The underlying logic of co-modality was that once each mode was allowed to achieve its full potential, fright traffic would automatically shift to the most efficient combination of modes. Instead of *pushing* freight traffic to what policy-makers deemed to be the most efficient combination of modes of transport, the new policy objective was to rely on the market *pull* of the mode that turns out to be the most efficient in practice.[36] In contrast to intermodalism, co-modalism did not provide a direct role for government intervention.

The road transport and shipping operators used this counter narrative to call for a revision of Directive 96/53/EC on vehicle weights and dimensions to permit alternatives larger and longer loading units. Road haulers, on the one hand, used this narrative to call for a exemption from the Directive to

[36]Interview B3 with a representative of the road haulage industry (2009), Interview B5 with a representative of the road haulage industry (2009)

start operations with the Gigaliner , a 25 meter long and 60 ton vehicle, which breached Directive 96/53/EC.[37] This was opposed by the rail and combined transport industry, which feared to lose market shares to road haulers that would be able cut in their long-distance fright transport business. Road transport operators argued that even though the introduction of the Gigaliner might hurt individual sectors of the transport industry it would be beneficial for society as a whole by making road freight transport more efficient, safer and environmentally sustainable (Smets, 2009; *Lloyd's List*, 2009). Road haulers played on the fact that in contrast to the anti-road bias of intermodalism and the objective to shift fright transport volumes off the road, co-modalism was not categorically opposed to an expansion of road transport, provided that it turned out to be more efficient than alternative modes of transport.[38]

The sea shipping industry, on the other hand, employed the new notion of co-modalism to call for an extension of the exemption that Directive 96/53/EC on vehicle weights and dimensions had granted the 45 foot ISO container (Brookes, 2006; Stares, 2006). After the expiration of the Directive's exemption in 2007—ten years after the adoption of the Directive—the 45 foot container would start to breach Directive 96/53/EC for it exceed the allowed length.[39] Therefore, the Maritime Industries Forum, which included shipowners and the ports industry, launched an aggressive lobbying campaign which build on the notion of co-modalism to call for the continued permission of 45 foot containers in European transport (Brookes, 2006; Stares, 2006).

The launch of an alternative policy paradigm constitutes a direct parallel to the political contestation investigated in the case of European HDTV standardization. There, the HD-MAC opponents challenged the existing policy paradigm of interventionist industrial policy with the paradigm of *laissez faire*. This confirms that the political debate resulting from hierarchical policy interventions provides opponents of European standardizations with an opportunity to challenge the justifications for European standardization as well as the policy paradigm upon which this policy is based. This does not even depend on the opponents to have the better arguments. While in neither case this appears to have been the case, it may even be concluded that the validity of the argumentations advanced in the

[37]Currently, the maximum vehicle length is 16,650 mm and the maximum weight is 40 tons for road transport and 44 tons for combined transport.

[38]Interview B2 with a representative of the European Commission (2009), Interview B11 with a Member of the European Parliament (2009)

[39]To give industry a chance to slowly withdraw the 45 footers from the market, a 'grandfather clause' had been included into the Directive (Article 4(6)) in 1997. This clause allowed Member States to permit the container on their roads for a transition period of ten years until 2007. Because an increasing number of container vessels have adapted their cellular frames to accommodate 45 foot containers, however, the number of 45 footers used in European transport continued to grow until the end of the transition period (*Deutsche Verkehrszeitung*, 2006).

political debate does not matter. Opponents only need to propose an alternative argument and paradigm to deconstruct the initial policy consensus upon which the initial policy intervention was based.

As stated in previous Chapters, however, it is not this thesis' intention to assess the actual validity of these arguments. Instead it is more concerned with the effect that these arguments have on the political debate. As could already be observed in the HDTV standardization case study, the use of these arguments allowed the opponents of the European standard to destroy the policy consensus that had initially existed. This is not to say that they gained dominance over the public decision-making process all together but they forced the Commission and standardization alliance that had formed around the combined transport community to justify their standardization decisions. Suddenly European standardization appeared less technical and more political than it had initially seemed. This is not to say that the EILU opponents managed to convince all policy-makers of their position. However, they succeeded to destroy the initial policy consensus upon which the Commission's EILU proposal was based.

As a result the Dutch Council presidency decided after only one round of discussions that the proposal did not have sufficient support among the ministers and removed it from the agenda.[40] The EP initially endorsed the Commission's proposal. As a result of the debate and upon extensive lobbying by the deep-sea shipping operators, however, the EP began to demand the EILU's external width to be decreased,[41] so that it would fit into the cellular frame of container vessels (EP, 2004).[42] This obviously defeated the purpose of standardizing an intra-European loading unit because such a container would not have been pallet compatible, therefore rendering uncompetitive in intra-European transport. Under these conditions, the combined transport industry lost interest in the standardization process. Without the ability to develop the standard according to their technical preferences, they would not have been able to recoup the cost of developing the standard.

Therefore, the TC119 eventually had to put the project on ice.[43] The combined transport community could no longer control the nature and terms nor the locus of and participants in the debate. And as it was no longer able to shape the standards according to their own technical and strategic preference, the alliance

[40]Interview B3 with a representative of the road haulage industry (2009), Interview B5 with a representative of the road haulage industry (2009)

[41]From 2,550 mm to 2,500 mm

[42]In its amended proposal from 2004, the Commission changed the width back to 2,550 mm (EC, 2004d).

[43]Interview B12 with a participant of CEN's TC119 (2009), Interview B4 with a participant of CEN's TC119 (2009)

that was once providing the expertise and financial muscle for the standardization process lost interest. This, too, constitutes a direct parallel to the case of HDTV standardization, where the equipment manufacturers ceased to support the HD-MAC standard after the EP and the Council had watered down the secondary legislation that was meant to support its market deployment.

5.2.6 Policy Shift

With the intermodal transport community, however, standardization did not only lose its main supporter. The Commission also lost an important political ally, upon which it depended for information and expertise. Therefore, their support for the paradigm of intermodalism began to crumble. Individual members of DG TREN had embraced and used the paradigm of co-modalism for internal organizational struggles within their DG. This, too, bears close resemblance to the case of HDTV standardization where the newly emerged policy paradigm of *laissez faire* was used by individual Commission employees to advance their careers at the cost of those that had supported the old standardization policy based on the interventionist paradigm. This group of Commission employees formed an alliance with the EILU opponents and suggested co-modalism as a more pragmatic alternative to intermodalism. After all, the 2005 midterm review of the 2001 White Paper revealed how much effort the intermodal policy had cost and how little impact it had. To strengthen their position within DG TREN they started to forge alliances with road haulers and the sea shipping industry. After the appointment of a new Commissioner who sought to win the support of this raising group of Commission employees, and as a result of a re-shuffling of units and responsibilities within DG TREN, the proponents of co-modalism were suddenly stronger than the proponents of intermodalism.[44]

The rise of this new group of Commission officials and the emergence of new political alliances with the road and short sea transport operators is reflected in the Commission's sudden willingness to reopen the debate on Directive 96/53/EC on road vehicle weights and dimensions. Previously, the Directive was viewed by the Commission as a Pandorra's box (Seidelmann, 26 September, 2006). Remembering the difficult negotiations leading up to the adoption of the Directive, the Commission had always resisted to "open the floodgates to industry demands for ever larger road vehicles."[45] Under the policy of co-modality, however, the

[44]Interview B2 with a representative of the European Commission (2009). The Commission remains internally divided. Contrary to the general policy direction of DG TREN, many officials still pay lip service to the idea of intermodalism (Interview B2 with a representative of the European Commission, 2009). Even Commissioner Barrot was reported to be skeptical about his DG's Gigaliners policy (Stares, 2008).

[45]Interview B2 with a representative of the European Commission (2009)

increase of road vehicle dimensions was suddenly viewed as an opportunity to transport more freight at a lower economic and environmental cost (EC, 2008c). Upon the pressure of the Maritime Industries Forum (Brookes, 2006; Stares, 2006), the Commission therefore eventually published a communication that 'reinterpreted' the relevant clauses of the Directive (EC, 2006c). Although the EP complained about the Commission's unilateralism—"Could the commission explain how it has changed the contents of a Directive of the European Parliament and Council without amending the legislation?" (Stares, 2008)—the Commission thereby allowed for the continuous carriage of the 45 foot containers in national road transport operations. This led to the paradoxical situation where the shadow of hierarchy, as the consequence of the resulting political contestation, led to less rather than more rigorous regulatory standards.

Secondly, the Commission eventually withdrew its EILU proposal on March 25th 2008, suggesting that it was assessing alternatives to the EILUS, namely the Gigaliner (Dahm, 2009; Wahl, January 23, 2009). Therefore, the third manifestation of the policy shift within the Commission is reflected in a more positive stance toward the introduction of Gigaliners. Two studies commissioned by DG TREN confirmed the fears of the rail and combined transport sector. They anticipated a clear drop of rail's and combined transport's market shares. An interviewed Commission representative, however, argued that this was an acceptable price to pay.[46] The studies concluded that heavier and longer vehicles would be beneficial for society as a whole, with road freight transport becoming more efficient, safer and better for the environment (Smets, 2009; *Lloyd's List*, 2009). Therefore, they directly appear to fit into the gap opened by the new paradigm of co-modalism.

Both the exemption of the 45 foot container from Directive 96/53/EC as well as the potential permission of Gigaliners, drew the last nail into the EILUS' coffin. Compared with the 45 foot container and especially the Gigaliners, the EILU did not provide enough loading capacity to be competitive.

The extent as well as the speed of the failure of the EILU proposal and the policy paradigm shift that accompanied was rather remarkable. While the initial proposal of the Commission, which was based on the policy paradigm of intermodalism, was meant to boost the deployment of the EILU and thereby to pursue the policy objective of shifting freight transport volumes of the road, the resulting politicization of the decision-making process led to a policy outcome that seemed like the direct opposite of the initial policy objective. The dominant policy paradigm was replaced by the new paradigm of co-modalism; the Commission and the combined transport community lost control of the standardization

[46] Interview B2 with a representative of the European Commission (2009)

Table 5.6: Intention and Effect of the Commission's Intervention in Intermodal Transport Standardization

Intention	Effect
Installation of the EILU as de facto standard in intra-European transport	Competing loading units, such as the 45 foot container and the Gigaliner, stronger than before
Reduce the market share of road transport	Increased competitiveness of road transport
Strengthening of the political position of Commission employees adhering to the policy of intermodalism	A new group of Commission employees supporting the policy of co-modalism is strengthened

process; instead of promoting the deployment of the EILU, the 45 foot container and the Gigaliner turned out to be the winners of the standardization process; and instead of weakening the road transport sector, road haulers were looking forward to increasing market shares. This development conforms with Baumgartner's and Jones' (1993) theory of incrementalism and radical policy change. When policy venues—or policy images—change, as happened in consequence of the Commission's proposal that shifted the standardization process from the technical committees of CEN into the arena of European politics, they suggest, radical policy change is possible.

5.3 Conclusion

Considering the fact that the *New Approach* was originally intended to de-politicize the decision-making process, the political contestation observed in this case study is rather interesting. The Commission's *New Approach* proposal did not only led to a multiplication of veto players and veto points and thus politicization of the technical standardization process. The politicization of the technical standardization process also spilled over into the public decision-making process. The actors and interests that were previously not involved in the technical standardization process and/or would not have been involved actively pushed into the arena of European politics to make their voice heard. Instead of going through the technical committees of CEN, they rather sought to influence the outcome of the standardization process through the public decision-making process on the essential requirements. This shows that it does not matter whether the technical aspects of market integration are delegated to the standards-writing organiza-

tions, as in the new approach, or whether they are directly negotiated in the main European decision-making bodies, as in the old approach. Where the vested interests are too heterogeneous—and potential veto players cannot be excluded from the decision-making process—there is unlikely to be an agreement an common European standards/rules. This may explain the puzzling underperformance of the *New Approach*. Since its introduction in 1985, no more than 30 Directives were based on this procedure.

Furthermore, this case study also shows that the shadow of hierarchy contributes to this phenomenon. By raising the stakes of the game, it contributes to the multiplication of actors and interests reducing the scope for mutually acceptable agreements in the standardization committees as well as the public decision-making bodies.

In light of the fact that the *New Approach* proposal and shadow of hierarchy had this effect in circumstances that should have rather undermined a politicization of the process, as listed below, these instruments can also be expected to have a similar effect in less favorable circumstances.

1. The proposed loading unit seemed to allow for significant improvements in the efficiency of the European transport industry without making any particular group of actors worth off in the medium to long run;

2. Standardization appeared to promise large and broadly spread gains to the entire transport industry;

3. Initially the Commission's intervention enjoyed the political support of the EP as well as large parts of industry;

4. As a result of its close collaboration with the combined transport community the Commission enjoyed a significant informational advantage against the EP and Council;

Finally, it may be concluded that if even such modest or indirect forms of hierarchical policy intervention, such as the *New Approach* and the shadow of hierarchy, cause a politicization of the standardization process, also the more direct hierarchical interventions will also have this effect.

Chapter 6

Conclusion

This thesis demonstrated that public actors can play a decisive role in private standardization processes. In fact, public interventions even tend to be necessary where the private development of technical standards is constrained by collective action and decision-making problems.[1] Without the facilitating interventions of public actors, technical standardization would fail—i.e. no common standard would be adopted and deployed. To be able to facilitate the private development of technical standards, however, public actors need to rely on entrepreneurial rather than conventional policy instruments that are based on the power of institutional hierarchies or hard law. Due to their lack of formal powers, however, entrepreneurial policy interventions only turn out to have an effect where a number of conditions are met. These conditions include early intervention, the presence of industry crisis and the presence of positive feedback mechanisms (see Section 6.2). Unlike conventional policy instruments that are based on institutional hierarchies and the power of hard law, policy entrepreneurship protects technical standardization processes from political contestation by rival companies—i.e. veto players—and rival public actors—i.e veto points (see Section 6.3). Entrepreneurial interventions tend to pass underneath the radar of conventional politics and public entrepreneurs may contribute to the insulation of private standard setters from political contestation. Such entrepreneurial interventions, however, raise serious concerns about the democratic legitimacy of this processes (see Section 6.4). These findings are elaborated in greater detail below.

The findings of this thesis, however, do not only speak to the literature on technical standardization. Despite its narrow focus, the findings of this thesis may also apply to a wider universe of cases and contribute to a variety of debates

[1] This thesis suggested that these constraints are often present. Where they are not, however, private standard-setters may very well be able to develop the desired standards themselves. Also, this thesis cannot exclude and does not argue that there are other ways through which private standard-setters might overcome these constraints.

beyond technical standardization.

This concluding Chapter is organized around the main themes of this thesis. The failures of private standardization (Section 6.1), the conditions of public intervention (Section 6.2), the failures of public intervention (Section 6.3), and the legitimacy dilemma of technical standardization (Section 6.4). Section 6.5 returns to one of the puzzles of European standardization, which was mentioned in the introduction 1. It interprets the high number of European standards and addresses systemic differences between European and US American standardization. Each section summarizes the main findings and elaborates potential contributions to the wider literature.

6.1 The Failures of Private Standardization

6.1.1 Findings

Although potentially being based on superior information and technical expertise, this thesis demonstrated that private technical standardization is not as successful as it may seem—or as it may be presented. The failures of private standardization were well illustrated in the case study of digital video broadcasting standardization (Chapter 4).

Despite the fact that more then 200 million DVB compliant products could be sold in more than 40 countries to date, the case of European digital television standardization through the DVB Project demonstrated the clear limits of private industry standardization. This had devastating consequences for the marked-led introduction of digital television as well as media pluralism and diversity. The DVB Projects' failures suggests that, under either one of the following conditions, private standardization is likely to fail:

1. Companies have already made non-negligible pre-investments in diverging technological paths at the time of standardization, so that there is no scope for common mutually acceptable standards;

2. Companies strategic interests diverge and the decision-making procedure of the given standards-writing organization provides individual companies with the opportunity to hold out agreement or to employ other bargaining strategies provoking the failure of the process;

3. Individual companies or a groups of companies expect a deterioration of their market position through the adoption of common standards and therefore veto the adoption of that standard;

4. Network and scale economies allow individual companies to unilaterally set *de facto* standard.

DVB standardization failed despite the fact that it took place in rather favorable circumstances. The gains from standardization were relatively large and evenly spread; the DVB Project is generally considered as one of the most progressive standards-writing organizations that introduced majority voting and a market oriented approach; and Member States' governments had a strong fiscal interest in a smooth transition from analogue to digital television as this allowed them to free up and sell valuable radio spectrum to telecoms service providers. Because of the fact that digital television standardization failed in these rather favorable circumstances, the private industry standardization can also be expected to fail in more favorable circumstances where the above mentioned conditions are present.

The failures of the DVB Project also demonstrate that the high number of technical standards produced by private standardization organizations cannot necessarily be interpreted as an indicator for the superior governance capacity of this form of private rule-making, as argued by Mattli and Büthe (2007) and Blind (2004). The sheer number of technical standards produced may just as well be a sign for the failure of private standard-setters to achieve sufficient levels of variety reduction.

While this failure itself is not necessarily a direct argument for government intervention—though the following Section will argue that it is—it is not an argument for the capacity of private governance through technical standardization either. Moreover, this case study (Chapter 4) demonstrated that where important public interests are at stake—such as media pluralism and diversity—private standard setters/industry cannot be trusted to take these into account. Therefore, there does appear to be some functional scope—and potentially even the normative need—for government intervention.

6.1.2 Potential contribution: The Scope for Self-Regulation and Private Governance

The second lesson that may be learned from this study of technical standardization is that, in the absence of facilitating interventions by public actors, self-regulation or private governance is difficult. In addition to the well known compliance issues, the case of technical standardization suggests that the private development of common self-regulatory measures is difficult too. It tends to be constrained by significant decision-making problems. These decision-making problems can also be expected to be present in other cases of co– or self–regulation where two conditions are met. First, the given regulatory objective can be achieved by more

than one regulatory measure but companies—i.e. self-regulators—need to agree to one common regulatory measures to achieve this objective. And secondly, companies' preferences with regards to which measure should be chosen diverge.

The need to agree to common self-regulatory measures is not particular to the case of technical standardization. Also in the case of regulating minimum or maximum quality levels, for instance, it is often necessary to agree to a single quality level, even if the way how these levels may be achieved is not specified. On the demand side, the coexistence of different quality levels would lead to, or fail to solve, the Akerlofian information asymmetries (Akerlof, 1970). On the supply side, races to the bottom or the top could be the result.

Also the divergence of preferences with regards to which specific regulatory measure is chosen is not specific to the world of technical standardization. Although industry is often wrongly conflated into a unitary actor that has one objective, which is to thwart regulation,[2] companies regulatory preferences often tend to diverge, also—but not exclusively— with regards to the level of regulation, i.e. public, self- or co-regulation. Market insurgents, for instance, can be expected to oppose self regulation where this gives the incumbent market players an over-proportional influence over the content of regulation. The liberalization of national utilities markets—i.e. telecoms, gas, electricity etc.—provided many examples for a divergence of companies' regulatory preferences with regards to the level of regulation. Industry also often tends to have diverging preferences as to the rigor and content of regulatory measures. Whenever this is the case, the development of self– or co–regulatory measures can be expected to be constrained by significant decision-making problems. Therefore, the join-decision trap that is considered to constrain public decision-making (Scharpf, 2006), can also be expected to undermine private decision-making, which has been largely overlooked by the governance literature.

In sum, self-regulation *per se* cannot be expected to lead to better and more responsive regulation. This study showed that regardless of the issue of compliance and the fact that industry's preferences may be incompatible with the public interest, which tend to dominate the debate on self-regulation, self-regulation is difficult for it is constrained by significant collective action and decision-making problems. Therefore, the delegation of regulatory authority from public to private rule-makers simply tends to replace public decision-making problems with private decision-making problems. These private decision-making problems can be expected to become more visible and common given the trend toward new forms of co-regulation in which public actors simply specify *what* goals are to be achieved through co-regulation and let industry to decide *how* to achieve these,

[2]See Bartolini (2011, p. 9), Héritier and Eckert (2008) and Héritier and Lehmkuhl (2011, p. 55)

as observed by (Jordan, Wurzel, & Zito, 2005, p. 483). Several authors encourage such 'norm setting' by private companies rather than 'norm consumption' because it allows governance to be more flexible more cost effective (Héritier, 2002, p. 11; T. Porter, 2005, p. 222). This thesis, however, raises serious doubts whether this is always the case.

6.2 The Conditions of Public Intervention

6.2.1 Findings

Given the collective action and decision-making problems of private standard-setting, there is some scope for public interventions to facilitate the privet development of technical standards. However, the ability—and willingness—of public actors to facilitate the private development of technical standards depend on a number of conditions. Public actors need to limit themselves to non-hierarchical, entrepreneurial policy instruments. This thesis distinguished between three entrepreneurial instruments: First, agenda-setting during the mobilization phase of the standardization process. Second, consensus building and conflict mediation during the development and deployment phases of the process, and finally, the insulation of technical standardization from political contestation. These three types of entrepreneurial interventions are discussed below.

Where public actors rely on the power of institutional authority or hard law, by contrast, the next Section (6.3) will show, they only expose technical standardization processes to political contestation.

Public Agenda-setting in Private Standardization

The empirical investigations of this thesis suggest that agenda-setting may not only work in public policy-making but also in private rule-making—i.e. public entrepreneurs set the agenda of private rule-makers, rather than the other way round. In the investigated case studies—GSM, UMTS, and the first stage of HDTV standardization—this thesis showed that the European Commission was able to perform all three vital functions of the agenda-setter:

1. Identification of standardization problems: In each of the three investigated cases the European Commission identified the European industry's lack of competitiveness as the main problem. As the root of this problem the Commission identified comparatively small degree of scale economies of the not-yet-integrated national markets. The lack of scale, the Commission argued, did not allow European industry to compete with its international

competitors in the US and Japan that could build on much larger integrated markets. Especially in the ICT sector, where economies of scale have a particularly strong impact on market success due to high fixed costs, the European industry's lack of scale was considered to be fatal.

2. Proposition of standardization solutions: As a solution to the lack of scale economies, the European Commission proposed the collaborative development of common European standards. The Commission suggested that common standards would allow European companies to pool their R&D expenses and to create the returns to scale that were necessary to regain international competitiveness.

3. Mobilization of standardization coalitions: This turned out to be the most difficult task of the agenda-setting process. In each case, the Commission appears to have proceeded on the basis of trial and error. Before it eventually succeeded to mobilize potent standardization coalitions, had to go through a lengthy process of trial and error. It approached several groups of actors before it eventually succeeded to mobilize potent coalitions. In each case, the standardization coalitions conformed with the hypothesized exclusivity. They were each relatively small and homogeneous. As argued above, a precondition for the overcoming of the inherent collective action and decision-making problems.

In each case, the mobilization of a standardization coalition was helped by an acute sense of industry crises. Industry saw its international competitiveness declining. In consumer electronics, European industry had just experienced defeat in the video-cassette standards war. In the second generation telecoms case, the deregulation of AT&T in the US, was perceived as a great threat because it allowed the newly privatized company to move into foreign markets, such as the European one. In the case of third generation mobile telecoms, the rise of Chinese competition in mobile telecoms had such an effect. As these crises forced the industries' leaders to reconsider their existing strategies and to come up with new ones, the crisis opened a window of opportunity for the Commission to convince companies of its problem analysis and to propose the collaborative development of common European standards as the solution to industry's problems. In the case of HDTV standardization, for instance, it was not until Japan proposed to adopt its domestic technology as the international standard at the CCIR, that the Commission was able to mobilize collective action. The Commission skillfully reinforced this perception of crisis by emphasizing the threat of foreign—mostly American and Japanese—competition to underline the need for a collaborative European response. In the case of third-generation telecoms standardization,

this also allowed the Commission to maintain its influence on Europe's telecoms industry despite the fact that the success of GSM had transformed European companies into global players. By emphasizing the threat of Japanese and especially Chinese competition, which could soon challenge Europe's dominant position the Commission managed to convince companies to continue to collaborate on common standards. Therefore, the initial hypothesis that industry crisis was a necessary condition for public entrepreneurship to succeed could be confirmed.

The Commission's successful performance of the three basic functions of the agenda-setter in second– and third–generation mobile telecoms as well as HDTV standardization also demonstrates how public entrepreneurs may overcome their alleged information problems. Clearly, the problems and solutions were neither very innovative nor was the Commission likely to have been the first to have discovered these. The notion that scale economies were important to industry competitiveness, for instance, was an old idea which could not have been new to the leaders of European industry and the makers of national industrial policy. The fact that technical standards could be used strategically should not have been new to them either. As the critics of entrepreneurship and agenda-setting theory have rightly pointed out (see Moravcsik, 1999, p. 272), the entrepreneur—i.e. in this case the Commission—did not possess an informational advantage over those it sought to influence.

What was new, however, was the context in which the Commission presented the various ideas. The idea to open up national markets through the definition of common European standards, for instance, was radically new in strategic industries like telecoms, which used to be governed by the principals of monopolization and public ownership. Surely, the idea of market integration had been around since the Treaty of Rome and before. The telecoms sector, as most network industries and utilities, however, had long been off limits. To the industry leaders, especially in the telecoms and consumer electronics industries, however, this was mostly seen as a threat to challenge their domestic market position rather than to strengthen their position in international markets. This also becomes particularly clear in the field of technical standardization, where national standards were mostly used to protect rather than to expand domestic markets. Like the business entrepreneur, described by Schumpeter (1939, p. 102), who combines preexisting factors of production in a way that makes it possible to either produce a new product or to produce an existing product more efficiently, the public entrepreneur combines existing policy problems, solutions and actor coalitions to create something new.

Consensus Building, Conflict Mediation and Managing Commitment

The European Commission also had a decisive influence during the subsequent stages of the standardization process. It was able to facilitate private decision-making on technical standards in three ways:

1. Consensus building;
2. Conflict mediation; and
3. Ensuring commitment.

Without its successful agenda-setting during the first phase of the standardization process, however, the Commission would not have been able to assume these three functions.

At each stage, the entrepreneurial leadership of the European Commission was instrumental in building a basic understanding and consensus among the standard-setters upon which the GSM and UMTS standards were build. It did so in two ways.

First, it prompted companies to start to collaborate on the development of common standards at a comparatively early point in time, namely still during the R&D phase. In both cases the Commission achieved this by setting the agenda at a sufficiently early point in time. Thereby, it was ensured that companies followed a common rather than diverging paths of technological development. This minimized the divergences of technological preferences as companies developed a single technology from the beginning. In each case, this left a much larger scope for a mutually acceptable agreement on a single technology for a common standard, rather than several technologies and competing standards. Both in the case of GSM and UMTS standardization (Chapter 2), they quickly managed to agree to the technological basis of these two standards. This stood in stark contrast to the cases of DVB as well as intermodal standardization where companies arrived at the negotiation table with diverging technological preferences. The cases of DVB and intermodal transport standardization demonstrate how difficult it may be to achieve a consensus on a single technology as the basis of a common standard once technological preferences have started to diverge.

The second way in which the Commission facilitated consensus building was to push the standardization process into technocratic, rather than political or company-strategic venues, such as the technical committees of standards-writing organizations or the research committees of large European R&D programs. The Commission emphasized this effect by organizing the provision of pre-normative R&D subsidies to the standard-setters. These venues provided comparatively

large scope for mutual learning rather than strategic bargaining. And they eventually produced epistemic communities among the technical experts that were involved in these committees. These epistemic communities had a particularly strong influence on the GSM standardization process, contributing to the overcoming of a decision-making conflict that had emerged over the choice between two different variants of technological basis of the GSM standard by simply adopting one variant as their working hypothesis and discontinuing the development of the other.

Without the early intervention of the European Commission, however, this intervention would not have been possible. Therefore, early intervention is a necessary condition for the entrepreneurs ability to build consensus. Also the emergence of the epistemic communities of engineers and technical experts, which turned out to be a driving force in the observed standardization processes, depends on the early intervention of an entrepreneur. They too can be expected to suffer from collective action problems. Therefore, it requires an entrepreneur to mobilize them. And because epistemic communities do not form over night it is important that this happens relatively early.

During the development of the GSM and UMTS standards, the Commission also appears to have resolved decision-making conflict between the standard-setters on two variants of the technological basis of GSM and UMTS. Through the proposal to adopt a 'basket standard' incorporating features of the two variants of the technologies proposed (Bach, 2000), the Commission provided a 'focal point' around which the negotiators preferences could converge (see Garrett & Weingast, 1993).

Finally, the Commission's intervention in GSM standardization demonstrated that public entrepreneur can also exert a strong influence on private standardization processes by ensuring the commitment among standard-setters and standard-takers. By negotiating a MOU that committed all relevant actors to a common market deployment strategy, the European Commission helped to concert the introduction of GSM without having to rely on hierarchical, positive or negative sanctions.

Again, however, neither of these intervention were possible without the Commission's early intervention during the R&D phase. Compared to the case of Conditional Access standardization, for instance, the divergence of interests was relatively modest. Companies had already agreed upon the technological bases of GSM and UMTS. Only with regards to the specific variants of these technologies, their preferences diverged. This would not have been the case had not the Commission brought the standard-setters together during the R&D phase.

Therefore, early intervention can also be considered a necessary condition for the entrepreneurial conflict mediation as well as the management of commitment.

The evidence presented by the second– and third–generation mobile telecoms standardization cases suggests that the adoption of common standards would not have been possible without the Commission's role in building consensus, mediating bargaining conflicts and managing commitment. Without its agenda-setting at a sufficiently early stage, however, it would not have been able to play any of these roles. Once again, this underlines the importance of early intervention for public entrepreneurship to have an effect.

Through the combination of, first, agenda-setting and then, subsequently mediating bargaining conflicts and managing commitment, the European Commission helped European standard-setters to gain a first-mover advantage for GSM and UMTS against competing American, Japanese and Chinese standards. This, too, underlines the crucial importance of early policy interventions. Through its consensus building and conflict mediating roles it made sure that this first-mover advantaged was not lost right away. While American standard-setters were still fighting over the selection of *the* American mobile telecoms standard, European industry had already agreed to a single standard and start to deploy it. The Commission's role in concerting the deployment by committing all market participants to a common introduction schedule helped to quickly gain a critical mass of consumers for GSM and UMTS. From this point onward, the deployment of the two standards was driven by self-enforcing positive feedback effects. Once the critical mass of consumers had been achieved reached network effects tipped the European market toward the European standards. The European market then provided scale economies, which by decreasing the price of the European standards reinforced network effects internationally, until the entire global market was locked into the European standard. The American, Japanese and Chinese standards who arrived later did not stand a chance.

Therefore, the cases of GSM and UMTS as well as the case of American intermodal transport standardization, as discussed briefly in the context of intermodal transport case study (Chapter 5), all suggest another necessary condition, namely the presence of positive feedback mechanisms, such as network effects, which cause compliance with these standards to be self-enforced. Once a critical mass is achieved, network effects lead actors that excluded from the definition of the standard as well as actors that might have even preferred an alternative technology as the basis of the standard to comply with it. So the European Commission served as the catalyst that triggered this positive feedback process. Section 6.2.2 below elaborates the contributions that this thesis may make to the literature(s)

on positive feedback mechanisms.

Insulation from Political Contestation through Policy Entrepreneurship

By relying on entrepreneurial rather than hierarchical policy instruments (see Section 6.3 below), the European Commission was able to insulate the technical standardization processes from political contestation by rival actors and interests. In contrast to the European Commission's hierarchical interventions in HDTV and intermodal transport standardization, which are discussed in the following Section (6.3), its entrepreneurial interventions in mobile telecoms standardization, however, did not alarm rival standard-setters and non-participating but potentially affected companies. Therefore, these potential veto players did not mobilize against the Commission's intervention. And since they do not rely on the power of hard law or institutional hierarchies they do not directly implicate other political institutions—i.e. veto points—such as the Parliaments and the courts. Neither in the case of second– nor third–generation mobile telecoms standardization did the Commission's intervention expose the standardization process to political contestation. In the case of HDTV, the political contestation only began after the Commission had started to use hierarchical policy instruments.

Both in the cases of mobile telecoms and the first phase of HDTV standardization, the Commission also actively contributed to the insulation of technical standards-writing processes from broader public participation and political interference. In both cases it provided standards-setters with a narrative justifying their work and defending their isolation from broader participation and political interference. It managed to link standardization to widely accepted core political objectives, such as industrial competitiveness and economic growth, objectives, which are hard to contest. Given its elevated position in European politics, this was much easier for the Commission than standard-setters themselves. Furthermore, the Commission deemphasized potentially normative and (re)distributive implications in the debate and emphasized the purely 'technical' nature of the issues, implying that standardization was merely concerned with the solution of technical problems and the realization of technological progress.

The Commission also assisted standard-setters in the creation of institutional structures insulating the standard-setters from broader participation. In the case of HDTV standardization, it helped set up the E!95 project within EUREKA, which allowed the TV set manufacturers to control the standardization process and merely gave broadcasters and content providers with an affiliate status without voting rights. In the case of mobile telecoms standardization, the Commission helped transfer the GSM project from the PTT-controlled CEPT to the industry-

driven ETSI. This step proved to be critical in that it allowed France Telecom, Alcatel, AEG and Siemens to accept the technological solution preferred by Scandinavian industry against the pressure of the French and German governments.

The insulation from broader participation allowed the standard-setters to develop the given standards in relatively small and homogeneous groups of companies, which minimized the risk of bargaining problems to emerge and increased the scope for mutually acceptable agreements on common standards. If all affected stakeholders had participated, it is unlikely that they would have been able to agree to single common standards. Moreover, the exclusiveness allowed standard-setters to recoup the costs of developing the standards by using them strategically. The implications for the democratic legitimacy of such technical standardization processes are discussed in Section 6.4 below.

6.2.2 Potential Contribution: Changing but Persistent Role of the State

Furthermore, there are a number of conclusions that may be drawn from this thesis investigation of the role of the European Commission in technical standardization for the role of government in the governance of increasingly complex markets characterized by an accelerating pace of technological change and economic internationalization more generally. This thesis suggests that public actors are still to be reckoned with. First, public actors can be expected to intervene in such private processes where this allows them to draw political capital out of such interventions, regardless of their functional problem-solving abilities. Secondly, the private decision-making problems, described in the preceding Section (6.1.1), suggest that there may be a functional need for public actors to in private rule making-processes, if only in a entrepreneurial and facilitative way. Wherever such decision-making problems are present, a public entrepreneur may be able to play a role similar to that of the European Commission discussed in this thesis.

Given the fact that the entrepreneurial interventions described in this thesis do not depend on formal competences and hierarchical authority, a wide range of public actors can be expected to be able to assume the role assumed by the European Commission in the case studies of this thesis. Despite the fact that because of its supranational position, size and mandate, the European Commission should not be the only public actor that could play such an entrepreneurial role. As pointed out by Conlan, Beam, and Wrightson (1995, p. 135) and Baumgartner and Jones (1993, p. 122), policy entrepreneurs are not defined by the position they hold but by the actions they take. And the ability to take such entrepreneurial actions, in turn, depends on the three above-mentioned qualities (see Kingdon,

1984, pp. 189-190).

1. They must be taken seriously either as experts or as leaders of powerful interest groups, or as authoritative decision-makers;

2. Second, they must be known for their negotiating skills;

3. They must be persistent.

Clearly, the Commission is not the only public actor that possesses these qualities. For example, national ministries, parliamentary committees, or non-majoritarian regulators, to mention but a few, may also possess these qualities and provide entrepreneurial leadership. A recent example for such entrepreneurship, is provided by the European Central Bank (ECB). It played a crucial role in the private development of the settlement and payments systems of Single Euro Payments Area (SEPA).

Given the technical complexity of technical standardization, it may be argued that if public actors are even able to play a purposeful role in this case, they should also be expected to be able to play a role in less complex cases of self-regulation. Moreover, this thesis highlighted that technical complexity should not necessarily be understood as a constraint for public actors but as a smokescreen behind which they can hide their political maneuvering. This provides an interesting parallel to the regulation of financial markets, where the high complexity of modern derivatives is often advanced as a argument against regulation.

This thesis has also shown, however, that although public entrepreneurship may be very effective, it has its clear limits. First, it lack input legitimacy, as discussed in in Section 6.4. And Secondly, it depends on a range of necessary conditions, including early intervention, industry crisis and the presence of positive feedback mechanisms, such as network effects or scale economies, because in lack of hierarchical authority public entrepreneurs cannot enforce compliance themselves. This last condition may seem like a rather restrictive condition. In practice, however, such positive feedback mechanisms are quite common. According to Baumgartner and Jones (2002, p. 21), positive feedback mechanisms are almost always present where actors' decisions are directly affected by the decisions previously taken by other actors around them.[3] Therefore, network effects and scale economies are not the only feedback mechanisms that may lead to the self-enforcement of self-regulatory arrangements. Alternative mechanisms

[3] As examples, Baumgartner and Jones (2002, p. 21) mention agglomeration effects in New Economic Geography (Krugman & Venables, 1990), bank runs, fashions, fads, and fund raising of candidates standing for political offices. As potential donors have no interest in giving money to the losing candidate, the candidate considered to have the highest chances of winning ends up winning because she is able to raise more funds than her competitors.

may, for instance, include learning effects (see Milner & Yoffie, 1989), mimetic isomorphisms (DiMaggio & Powell, 1991) or the setting of market expectations. Moreover, the compliance problem may be overcome through mechanisms that are not based on positive feedback such as the incorporation into private contracts, as a defense against tort or as in insurance policies (Majone, 1996, pp. 23-26).

The findings of this thesis may also contribute to the various literatures on positive feedback mechanisms. This thesis may help understand what factors trigger such mechanisms. Though under different names, positive feedback mechanisms are the basis of a whole range of theories in political science, sociology and economics. At this point, however, only three examples shall suffice.

The New Economic Geography literature, for instance, talks about "cumulative causation." Depending on transportation costs, labor mobility and wage flexibility, such positive feedback mechanisms are used to explain the concentration of economic activity in one place rather than another (Krugman & Venables, 1990).[4] In political sociology, Putnam's (1993) explanation of the diverging levels of civic trust and norms of reciprocity in northern and southern Italy, to mention another example, is also based on positive—and negative—feedback mechanisms, which he calls virtuous or viscous circles. The more citizen trust the governance institutions that surround them, Putnam shows, the better these institutions perform, which in turn increases citizen's trust in these institutions. In political science, Converse and Pierce's (1986) study of the French riots and demonstrations during May 1968 and Lohmann's (1994) study of the political protests in the German Democratic Republic that eventually led to the fall of the Berlin Wall may serve as an example. Both studies are based on the assumption that while individual citizens cannot protest alone, the more ready people are to join such demonstrations the more people already participate. This, however, is not an exhaustive list.[5] Theories on positive feedback mechanisms can be found in almost all the social sciences.

What all these theories have in common, as pointed out by Baumgartner and Jones (2002), appears to be that these mechanisms only come into play once a specific threshold or critical mass is achieved. In some cases the threshold may

[4]When a company relocates in one place and brings along its employees it increase the size of that market. Therefore, other companies have an incentive to relocate to that market up to a point where all companies have agglomerated in one market (Krugman, 1991). A similar mechanism is believed to operate on the supply side (Krugman & Venables, 1995). Where companies are suppliers of business inputs to each other, they will relocate to the market where these inputs are most widely available until all companies have relocated to that market.

[5]The list could easily be extended by Chong's (1991) social movements, bank runs, economic business cycles, campaign contributions raised by candidates for political office that are deemed most likely to win (see Baumgartner & Jones, 2002) etc. The Arab Spring and the recent riots in London could serve as further examples.

be reached by a single actor, in other cases it take a larger number of actors to trigger these feedback processes. A priori, however, it is often difficult to predict when the critical mass is achieved and by whom. Usually multiple outcomes—equilibriums—are possible. Different candidates are just as likely to win a critical mass of campaign funding, different regions are just as likely to become the economic core or periphery, and different technologies may as the result of network effects become the *de facto* standard. In the literature, the tipping of toward one equilibrium rather than another is attributed to random events. In the economic standardization literature, for instance, the tipping of the market toward one standard rather than another is usually ascribed to 'random historical event' Arthur (1989a, pp. 126-128). Also in the New Economic Geography literature the initiation of the cumulative causation processes leading to the concentration of economic activity in one market rather than another is attributed to random events. Randomness, however, is a non-explanation.

This thesis' findings may help to replace the supposed 'randomness' with a more systematic explanation. It highlights the politics that may drive these processes and it may explanation how public actors may influence these feedback processes, which are generally deemed beyond their control. By mobilizing collective action, setting the agenda, building consensus, mediating decision-making conflicts and organizing commitment, for instance, public entrepreneurs may help achieve the critical threshold levels. The thesis' findings also tie in nicely with the suggestion of the New Economic Geography literature that conventional interventions in the form of infrastructure investments tend to have a counterproductive effect on the geographic concentration of economic activity. Entrepreneurial interventions, as discussed in this thesis, however, may help to trigger a cumulative causation process leading to the agglomeration of companies in one place or another.

Despite its limitations, however, public entrepreneurship may be necessary where conventional hierarchical policy interventions have the effect of exposing private rule-making processes to political contestation. This is not specific to private standardization. Also other forms of self– or co–regulation can be expected to be run the risk of being exposed to political contestation, provided that exclusivity plays a similar role as it does in technical standardization. Wherever the exclusivity of self-regulatory processes is key to overcoming collective decision-making problems, hierarchical policy interventions by public actors can also be expected to have a similarly unintended and counterproductive effect.

The exclusiveness of decision-making procedures, however, is not particular to the case of technical standardization. Many private decision-making processes

are characterized by this 'club' model of governance. Many of the so-called new modes of governance, which generally bypass conventional democratic decision-making venues, limit the number of actors involved in the decision-making processes (Eberlein & Grande, 2005, p. 164; see Héritier & Lehmkuhl, 2011, p. 68). (Greven, 2005) speaks of a general trend toward the depoliticization and informalization of policy making. Informalization is increasingly used to overcome the decision-making problems that tend to constrain conventional public policy-making processes and lead to costly political stalemates. "The informality of the decision-making processes guarantees and outcome that really solves the problems, or at least prevents complete blockage," it is argued by Héritier (1999, p. 56). Therefore, Eberlein and Grande (2005, p. 164) argue that "access to informal decision-making bodies is necessarily selective and not subject to any classical democratic control." Exclusivity thus is not the price to be paid for but the objective this informalization of policy-making. Therefore, any hierarchical intervention in such informal governance arrangements can be expected to expose it to political contestation.

In addition to the legitimacy concerns that this may raise (see Section 6.4), the strategic instrumentalization of the exclusiveness of private standards-writing processes highlights the politics that is involved in self-regulation as well as entrepreneurial interventions in self-regulation. This thesis could neither confirm the popular expectation of regulatory capture of nor the apolitical view that policy entrepreneurs genuinely problem-oriented. It emphasized the need to understand public entrepreneurs to be purposefully opportunistic, which not be entirely opposed to solving problems but which are primarily by their quest to expand their institutional competences.

6.3 The Failures of Public Interventions

6.3.1 Findings

However, this thesis did not only identify the conditions under which public interventions in private standardization succeed. This thesis also provides an answer why and in what circumstances public interventions may fail to have purposeful influence on private standardization processes. It suggests that the failure of public interventions is to be expected where public actors rely on conventional policy instruments based on hierarchical authority or the power of hard law.

Hierarchical instruments—and even the threat of using hierarchical instruments as in the shadow of hierarchy—tend to have the unintended effect of

exposing technical standards-writing processes to political contestation. Such interventions tend to undermine the exclusiveness of standards-writing processes by mobilizing rival interests—i.e. veto players—as well as rival public actors—i.e. veto points. Even the mere threat of using hierarchical instruments may have this effect. The instruments that were investigated and categorized as hierarchical interventions by this thesis include:

- The legal mandation of compliance (HDTV);
- Financial subsidies targeted at the deployment of standards (HDTV);
- The mere threat to use the two previously mentioned instruments (intermodal transport, Application Programming Interface) ;
- The use of the *New Approach* procedure to prompt industry to develop standards for a given technology (intermodal transport).

The first effect that hierarchical interventions had on private standardization processes is that they raise the stakes of the game. Expecting that they might actually have to comply with the given standard eventually, more companies start to participate in the standardization process in order to make sure that the resulting standards conform with their technological and strategic preferences. Even companies that previously chose to remain rationally ignorant, hoping that the cost of adapting to the final standard would not exceed the immediate costs of participating in the standardization process, will be compelled to start to participate once hierarchical interventions have raised the stakes of the game.

Such a mobilization of actors and interests that were previously not involved in the standardization processes but expected to be affected by it in response to hierarchical policy interventions could be observed very clearly in this thesis. In the case of intermodal transport standardization (Chapter 5) the road, rail, canal and sea transport operators mobilized themselves in response to the Commission's attempt to strengthen the standards developed by the combined transport community. Even the politically weak and unorganized canal transport operators, which initially could not afford to participate in the standardization process, were able to start to get involved. In the case of the Commission's mandation of compliance with and subsidization of the HD-MAC standard, the proponents of the rival PAL standard mobilized themselves against the HD-MAC proponents. And in the case of Application Programming Interface—i.e. digital video broadcasting standardization—the threat to legally mandate compliance with the MHP standard mobilized the proponents of rival Application Programming Interfaces against the Commission's intervention.

A direct consequence of the multiplication of actors and interests involved in the standardization process was that the scope for mutually acceptable agreements within the standards-writing organizations and within the public decision-making processes was significantly reduced. In the case of intermodal transport standardization (Chapter 5) the consensus on the loading units that was already achieved within CEN was destroyed. The new participants did not support the consensus that had been achieved on intermodal loading units before they had become involved. Also in the political arena the mobilization of rival interests eroded the support for the Commission's legislative proposal. In the case of HDTV (Chapter 3) standardization, the Commission's intervention, too, caused a political backlash. The proponents of the rival PAL standard had organized into a strong opposition that eventually vetoed the Commission's plans.

A further result of hierarchical interventions is that it makes it more profitable for companies that have less to lose or gain from a given standard to use the raised stakes of the game to hold out agreement and demand concessions from companies that do. In the case of Conditional Access standardization for instance, the pay TV providers held out agreement and forced the public service broadcasters and free TV providers to accept a compromise involving the technical solution preferred by the pay TV operators.

The second effect that hierarchical public interventions in private standardization processes have is that they open up new avenues of appeal—i.e. veto points. In pluralist political systems, the use of hierarchical policy instruments conventionally requires the consent of—and is subjected to the scrutiny of—other public actors, such as parliaments and the courts. These provide opponents of the given standard and policy intervention supporting that standard with effective veto points that cannot only veto public interventions promoting a given standard but which could also change the policy upon which it is based.

The European Commission's attempted use of hierarchical policy instruments in the case of HDTV and intermodal transport standardization intended to promote the market deployment of its preferred standards—i.e. the HD-MAC and EILU standards—directly implicated the EP and the Council. The Commission's interventions were based on the co-decision and co-operation procedures, which required the consent of both institutions to implement the instruments it had proposed. This turned the EP and the Council into effective avenues of appeal to the opponents of the standard that the Commission sought to support. They did not even have to get involved in the technical standardization organizations themselves—which is rather costly and time consuming—to influence the makeup of the standard or to prevent the adoption of a common standard. The opponents could simply influence the outcome of the standardization process by appealing

to the EP and the European Council.

Appealing to the EP and the Council rather than getting involved in the standards-writing organizations also had the advantage to the opponents of the given standards that they were more accessible than private standardization organizations. In HDTV, the broadcasters and program makers that were formally excluded from EUREKA, were able to make their voices heard in the EP and Council. In the intermodal transport case study (Chapter 5), many companies and industry associations that neither had the technical expertise nor the financial resources to participate directly in the standardization process were able to play an decisive role in the debate surrounding the legislative decision-making process. A representative of the European Barge Union, for instance, suggested in an interview that the inland-waterway industry would not have had the time, resources or expertise to participate in the standardization process.[6] In the debates within the EP, however, it was able to play a leading role influencing the final decision of the EP.

The shift of the standardization process into these political venues also changed the way technical standards were negotiated. In contrast to the technical standardization committees, which were generally focused on the engineering of technical progress and thus resembled a positive-sum game, the political venues are mainly concerned with the (re)distributive implications of the standards. They turned the process into a zero-sum game. In the case of intermodal transport standardization (Chapter 5) the road, rail, canal and sea transport operators used the political debate in the EP and Council to point out the potentially negative effects that the introduction of the EILU standard might have on their business, neglecting the potential that the EILU or another standard might have in increasing the overall efficiency of the European transport system. Similarly, in HDTV standardization broadcasters and program makers put a lot of emphasis on the adaptation costs that the introduction of the HD-MAC standard would impose upon them, without considering the overall potential of HD-MAC or comparable standards. Also in the case of Application Programming Interface standardization, the opponents of the MHP standard rather emphasized how much it had already invested in rival standards rather than proposing an alternative way to use the potential that Application Programming Interface standardization provided for the industry as a whole.

In all three cases, the opponents of standardization initially merely employed a defensive strategy. By pointing out the potentially (re)distributive implications that the introduction of positive or negative sanctions promoting the deployment of the Commission's standard might have, the opponents managed to destroy

[6] Interview B14 with a representative of the inland waterway industry (2009)

Table 6.1: Intentions and Effect of the Commission's Intervention in Intermodal Transport Standardization

Intentions	Effect
Installation of the EILU as de facto standard in intra-European transport	Competing loading units, such as the 45 foot container and the Gigaliner, stronger than before
Reduction of road transport's market share	Increased competitiveness and market share of road transport
Strengthening of the political position of Commission employees adhering to the policy of intermodalism	A new group of Commission employees supporting the policy of co-modalism is strengthened

Table 6.2: Intentions and Effect of the Commission's Intervention in HDTV Standardization

Intentions	Effect
Installation of the HD-MAC as the de facto standard	Digital television is strengthened
Strengthening of the HD-MAC alliance	Strengthened PAL alliance
Strengthening of the political position of Commission employees adhering to the policy of dirigiste industrial policy	A new group of Commission employees supporting the policy of *laissez faire* is strengthened

the policy consensus that had initially existed on the issue and upon which the Commission's interventions were based. In all of the three cases the EP and the Council either vetoed the Commission's proposals or diluted their content to such an extent that the standardization alliances driving the standardization process lost interest. The evidence therefore does not suggest that it was not possible to adopt legislative decisions on standardization issues. However, it turns out to be rather difficult to achieve the consensus that is necessary to adopt and support a single common standard. Given the heterogeneity of interests involved in legislative processes most agreements come in the form of compromises. Where variety reduction is the purpose of technical standardization, however, such compromises are usually not good enough.

What is remarkable about the inclusion of the above-mentioned veto players and veto points is that it did not only destroy the initial policy consensus. Even-

tually, it also left to a complete policy shift. Both in the intermodal transport and the HDTV case the Commission's interventions backfired completely. In the case of European intermodal transport standardization (Chapter 5), for instance, the Commission's intervention was based on the policy paradigm of intermodalism and was meant to boost the deployment of the EILU and to strengthen the combined transport industry against road haulers. The implication of the EP and the Council through the Commission's policy intervention, however, allowed the opponents of the EILU standard to reverse the policy completely. They managed to win legislative support for competing standards, such as the 45 foot container, and to replace the dominant policy paradigm of intermodalism with the new policy paradigm of co-modalism which was more favorable toward the road transport industry. Similarly, instead of promoting the HD-MAC standard and strengthening the standardization alliance that had developed this standard, as intended, the Commission's intervention in HDTV standardization had the, a priori, paradoxical effect of supporting the opponents of that standard.

This had to do with the fact that as a result of the shift of the standardization process from the technical committees into the political arena the standardization alliances lost control of—and therefore interest in—standardization. Thereby, the European Commission lost its important allies, which were the main supporters of their standardization strategies. At the same time new alliance opportunities opened up. Reinforced by Commission-internal struggles, new alliance with the previous opponents of the standardization coalitions were formed eventually.

These dramatic policy shifts directly conform with Baumgartner's and Jones' (1993) theory of radical policy change. When the policy venues change or a new policy venue, such as in this case the EP and the Council—are included in the policy-making process, the image of the policy shifts, which itself enforces the venue shift and further amplifies the policy shift.

6.3.2 Contributions

While hierarchical policy instruments have recently undergone some criticism, they are still considered more effective than entrepreneurial instruments (Braithwaite, 2002, p. 19). Moreover, they are generally considered necessary to strengthen entrepreneurial policy instruments,[7] as for instance through the shadow of hi-

[7]In the regulation literature, this view is supported by Braithwaite (2002, p. 19), tn the principal-agent literature it is assumed that the stronger public principals' hierarchical control over their private agents, the less likely private industry is going to behave in an undesirable way (Bendor et al., 2001; McCubbins & Schwartz, 1984; McCubbins et al., 1987; Pollack, 1997; Rasmussen, 2005; Thatcher & Stone Sweet, 2002), and even in the early entrepreneurship literature, which will be discussed in the following Section, it is argued that the greater the initial grant of authority to the policy entrepreneur the stronger its influence will be (Sandholtz, 1993, p. 251).

erarchy.[8] This thesis, however, demonstrated that, in circumstances mentioned below, this does not need to be the case. Far from being a necessary condition, hierarchy represents an exacerbating factor.

This study has shown, however, that hierarchical interventions, if only through the shadow of hierarchy, do not necessarily need to prompt industry to develop the desired standards. This finding may not only apply to public interventions in private industry standardization. It may apply to self-regulation in general. Where the following conditions are met, such interventions should be expected to expose any self-regulatory process to political contestation, drawing in further veto players and veto points. This conditions are:

1. The objective of self-regulation can be achieved through several self-regulatory measures but firms need to agree to a single measure for self-regulation to succeed;

2. In the absence of governmental intervention, self-regulation tends to take place in exclusive groups of firms.

As argued above, neither condition is very uncommon as suggested by the classic literature dealing with systems of exclusive rule-making ranging from policy monopolies (Baumgartner & Jones, 1993), policy whirlpools (Griffith, 1939), sub-systems (Cater, 1964), iron triangles (Freeman, 1955) and issue networks, to unitary advocacy coalitions (Sabatier, 1988).

6.4 The Legitimacy Dilemma

6.4.1 Findings

Finally, this thesis also revealed the legitimacy problems of private standard-setting in general and the role of public actors in technical standardization in specific.

Confronted with this issue, standardization practitioners often tend to argue that the input legitimacy really was not such an issue because of two related reasons. First, it is often pointed out that compliance with technical standards—in contrast to laws or regulation—was completely voluntary. And secondly, it is argued that the market itself provided the necessary democratic control, as consumers were free to chose another, non-compliant product. However, the market competition is a bad surrogate for democratic decision-making. In the

[8] See Ayres and Braithwaite (1992, pp. 35-40), Braithwaite (2002, p. 19), Bercusson (1993), Börzel (2009), Héritier and Rhodes (2011b); Héritier and Lehmkuhl (2008), and Mayntz and Scharpf (1995).

presence of positive feedback mechanisms, such as network effects and scale economies, consumers actually have little choice. In theory only the first user(s) and early adopter(s) can influence the selection processes. Once a technology is locked in and becomes the de facto standard—and the literature has shown that also inferior technologies can become locked in (Arthur, 1989b)—subsequent adopters have no choice but to choose the standards chosen by previous adopters.

Because of the intrusive nature of technical standardization, however, output legitimacy alone does not appear to suffice. The thesis' case studies showed very clearly that technical standardization is not as technical as it may seem—or as some standard-setters may try to make them appear. Technical standardization tends to have direct normative and redistributive consequences. In each case there were clearly identifiable winners and losers. In the case of digital video broadcasting standardization (see Chapter 4), for instance, standardization turned to have come at the expense of public service and free TV broadcasters in specific and the general public in general. Moreover, the decrease—or at least the failure use the opportunity to increase—of media pluralism provides an example for the potential normative consequences.

A rather sad example for the intrusive—and sometimes even disastrous—impact of technical standards is provided by the recent nuclear disaster in Fukushima, which is potentially the worst of its kind since Chernobyl. Fukushima's power plant used the so-called light-water reactor technology, which is the *de facto*—compatibility not quality—standard for nuclear power plants around the world. Unlike alternative reactor technologies, such as solid graphite and heavy water reactors, however, light-water reactors suffer from a well-known weakness. Their water cooling system tends to be comparatively unreliable, as demonstrated by the events in Fukushima. If any of the alternative reactor technologies had been used the nuclear catastrophe of Fukushima would not have happened—at least not the way it did and potentially it would not have happened at all.

For an explanation why this technology became the international standard despite its technological inferiority, it is necessary to go back to the 1950s. As laid out in Arthur's (1989b) seminal paper on increasing returns and lock-in by historical events, which founded the economic standardization literature, the success story of the light-water reactor started with a generous R&D subsidy awarded by the US Navy. This subsidy provided the development of the light-water technology with a first-mover advantage. None of the other technologies ever stood a chance. Eventually it tipped the entire market toward the light-water reactor, despite the fact that much of the engineering literature had argued that, given equal development, the other technologies would have been superior (Agnew, 1981). Given the alternative technologies relative underdevelopment,

however, they could not compete with the light-water reactor. Its head start had made the light-water reactor more economical and rendered the competing technologies uncompetitive. Therefore, also the operators of Fukushima's power plants chose this rather than another, potentially superior and safer, technology.

One of the reason why the US Navy initially chose to subsidize the development of the light-reactor rather than any alternative reactor technology had to do with the fact that the former could be used on nuclear submarines. It is unlikely, however, that the US Navy could have predicted the nuclear disaster that the light-water reactor would cause more than half a century later in Fukushima. Moreover, it cannot be excluded that an alternative reactor technology might have caused a nuclear disaster too, had the Navy awarded its subsidies to the development of an alternative reactor technology and had that technology become the international standard. Also, it cannot necessarily be claimed that a more democratic standardization process could have prevented the disaster of Fukushima, that, however, is not an argument against greater input legitimacy. For the intrusiveness and—potential disastrousness—of technical standards, however, greater input legitimacy should be deemed necessary.

Increasing input legitimacy, however, is not an easy task. This thesis confirmed the hypothesis by Kerwer (2010) that there was a dilemma between input and output legitimacy. The higher the input legitimacy—in terms of accessibility and broad participation by all affected stakeholders—the lower the output legitimacy appears to be and vice versa. The inclusion of a more representative and thus heterogeneous set of actors only appears to lead to insurmountable decision-making problems which prevent the adoption of common standards. This raises the question whether public actors could solve the dilemma between output and input legitimacy.

The case studies showed, however, that neither hierarchical nor entrepreneurial interventions solve this dilemma. While hierarchical interventions may improve input legitimacy, they also tend to decrease output legitimacy by exposing technical standardization processes to political contestation at the same time. For entrepreneurial interventions it turns out to be the opposite. Entrepreneurial leadership, as provided by the European Commission in the cases of mobile telecoms and the first phase of HDTV standardization, may improve the output legitimacy by facilitating private collective action and decision-making problems. The increased output legitimacy, however, directly turns out to come at the price of input legitimacy. If anything, the Commission's entrepreneurial interventions only increased the exclusivity and insulation from broader participation of private standard-setting processes. And given the political self-interest of public entrepreneurs, as described in this thesis, they cannot necessarily be trusted to

protect the public interest. While they are not generally opposed to protecting the public interest, they are unlikely to get intervene unless it is in their institutional self-interest.

This was also shown by this thesis and becomes particularly apparent in the comparison between the mobile telecoms and the DVB case studies. Whereas the Commission appears to have found it beneficial to intervene in the case of mobile telecoms standardization, it chose not to in the case of DVB standardization. Commissioner Bangemann realized that, after the Commission had burned its fingers in the case of HDTV standardization, there was no political capital to be gained from an intervention in DVB standardization. To the contrary even, a group of Commission employees that had forged a elaborated policy network with the pay TV operators, saw it profitable not to intervene for the pay TV operators benefited most from the status quo and non-intervention.

The cases of mobile telecoms and DVB standardization also illustrate the variable use of the public interest as a political argument by public entrepreneurs such as the Commission. In the case of mobile telecoms standardization, the Commission argued since the 1980s that the technological interoperability of mobile telecoms systems was in the public interest thus justifying *ex ante* policy interventions. In the case of DVB standardization, by contrast, it was argued in relatively similar market circumstances that interoperability was not in the public interest despite the fact that standardization offered an opportunity to improve media pluralism and diversity. Instead the Commission argued that access regulation was sufficient to maintain the public interest, which, as this thesis case study (Chapter 4) showed, was not the case.[9]

The reason for the Commission's different argumentation in the two cases appears to have been linked to the political alliances that it allowed it to make. In the case of DVB standardization (Chapter 4), non-intervention and the Commission's alliance with pay TV operators allowed it to strengthen its position vis-à-vis the EP and Council. And in mobile telecoms, the Commission's entrepreneurial leadership and its close ties with industry allowed the Commission to expand its competences in telecoms as well as industrial policy. Therefore, the Commission

[9]In European mobile telecoms standardization—particularly in the case of third-generation technology—it could be argued that there had a strong case for a governmental limitation to *ex post* regulation. Protect by the dominant policy paradigm of interoperability and on the basis of the common European GSM standard, the European telecoms equipment manufacturers had managed consolidate their market position and the degree of concentration in the market had reached worrying dimensions. More competition between standard-setters might have resolved some of the anti-trust concerns. In the case of DVB standardization, by contrast, the analysis of this thesis shows that the governmental limitation to *ex post* regulation was not sufficient to construct a competitive market for digital television equipment and services. Moreover, it could be argued that the opportunity to increase media pluralism seems to have provided a good case for *ex ante* government interventions to ensure digital interoperability.

also appears to have been happy to tolerate increasingly worrying degrees of market concentration in the European mobile equipment industry.

This irreconcilability of output and input legitimacy in technical standardization raises the question what is more important input or output legitimacy. It was suggests that output legitimacy alone was not sufficient. If increased input legitimacy is only to be achieved at the price of output legitimacy, however, should no standards be preferred to democratically illegitimate standards? This thesis does not appear to provide a conclusive answer to that question. On the one hand, the failure of HDTV suggests that no standard was preferable to an illegitimate standard developed by an exclusive group of multinational companies. On the other hand, the failure of DVB standardization rather suggests that the failure to adopt single common standards represented the worst possible outcome. European standard-setters sacrificed a great opportunity to increase media pluralism and diversity. However, this is not directly an argument for a democratically illegitimate standardization processes. It rather demonstrates the limits of private standardization processes. When important public interests, such as media pluralism, are at stake, alternative governance processes seem necessary. How these should look as if it could not be answered by this study and may require further research.

6.4.2 Contribution?

The dilemma between input and output legitimacy described in this thesis is not specific to the case of technical standardization. Kerwer (2010, p. 4) has argued that this was a more generic phenomenon affecting many global governance institutions, which, as the result of global regulation having become more intrusive and wider in scope, are facing increasing pressure to become more democratic. At the same time, however, the effectiveness of many of these organizations depends on this club model. As an example, Kerwer mentions the WTO, which with now over 150 member states, is struggling to conclude the Doha round. Therefore, the dilemma identified in this thesis may also apply to a wider universe of cases.

Bellamy et al. (2011) and Greven (2005, p. 264), for instance, point out that many new modes of governance, which tend to bypass conventional policy processes and/or include private rule-makers, are faced with this dilemma between input and output legitimacy. They, in fact, criticize that the enhanced problem-solving—i.e. output legitimacy—of these new modes has come at the price of input legitimacy—i.e. democratic accountability.

As a solution to this dilemma, they suggest that a credible threat of hierarchical

interventions by democratically elected actors looming over private rule-making processes would ensure both output and input legitimacy (Bellamy et al., 2011, p. 162; Börzel, 2007, p. 46; Héritier & Lehmkuhl, 2011, p. 70). If something went wrong, they were there to defend the public interest with hierarchical policy instruments. This thesis, however, demonstrated that, under the circumstances mentioned above, this solution is not viable. The shadow of hierarchy does not solve the dilemma between input and output legitimacy either.

Having identified the weaknesses of the shadow of hierarchy, however, this thesis could not present an alternative solution to this dilemma. Above it suggested that where there is a trade-off between input and output legitimacy the question whether input or output legitimacy could or should be sacrificed can only be assessed on a case by case basis. To full grasp the output legitimacy of a technical standard, however, a more technical analysis would be necessary, which goes beyond the scope of a social sciences thesis. This is, perhaps, one of the main limitations of this thesis.

6.5 Explaining the Growth of European Standards

Finally, the role of the European Commission in European standardization that was identified in this thesis may explain the specific nature of European standardization. European standardization distinguishes itself from other standardization systems by its high degree of cooperation among standard-setters, which takes place in highly formalized standards-writing organizations. In the US, by contrast, the development of standards tends to be more market led. Given the collective action and decision-making problems discussed above, this collaborative approach of European standardization should be expected to constrain the adoption of European standards. As shown in Figure 6.1, which is reproduced from Chapter 1, the three official European standards-writing organizations CEN, CENELEC, and ETSI have published more standards per year since the 1990s than the international or even the most active national standards-writing organizations, the German DIN.

There are several approaches to explaining this phenomenon. First, neo-liberal opponents of government intervention, for instance, might argue that the double delegation of (1.) regulatory authority from national public policy-makers to the European level and (2.) from European policy-makers to private standard-setters, finally provided private actors with the room and freedom to demonstrate their superior governance capacity. This argumentation, however, has three weaknesses. First, according to this argumentation, the majority of technical standards should be expected to have been set at the international, rather than the European level.

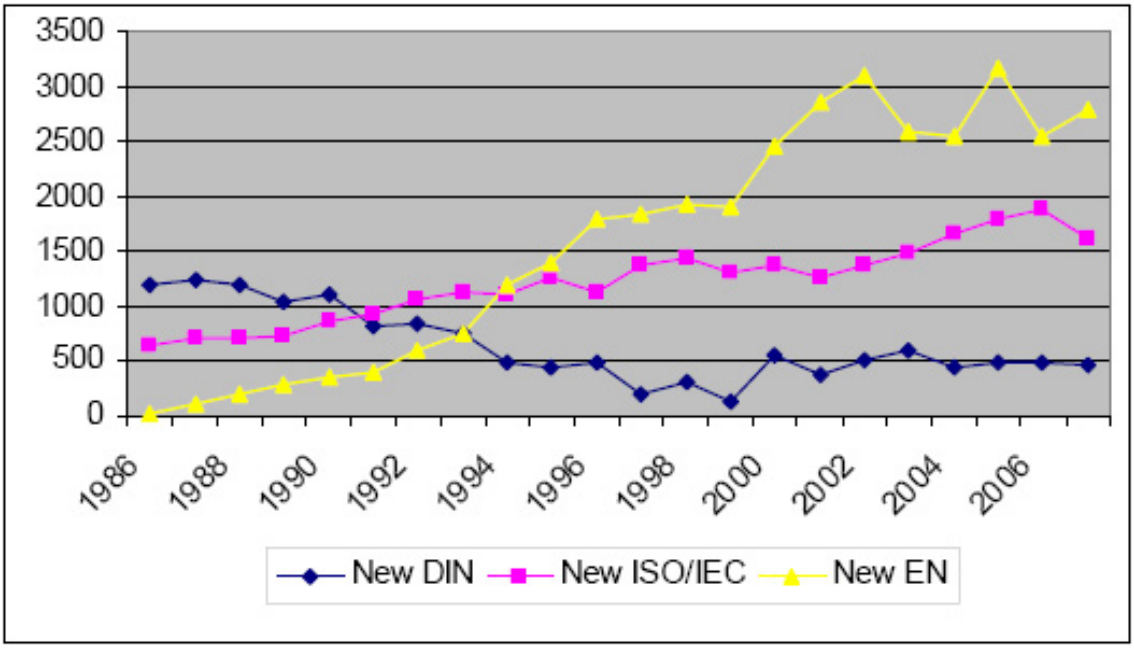

Figure 6.1: Annual standards output at national (Germany), international and European level (1986-2008)

Source: PERINORM, ISO, IEC, CEN, CENELEC, ETSI catalogues, see Mattli and Büthe (2007).

At the international level, the role of public policy-makers is far weaker than at national or, to a lesser extent, at the European level. The scope for private governance is hence much larger at the international level. Yet in reality the majority of standards was developed at the European level.

The second weakness of the above-mentioned argumentation is that it neglects the collective action and bargaining problems that constrain the private development of technical standards as described above. These decision-making problems should have been exacerbated by the European market integration project. The systematic reduction of (public) tariff barriers should have prompted national industry to build on (private) non-tariff barriers, such as technical standards, to protect their markets. Especially, the companies that were bound to be hurt by the opening of their markets to European competition should have been expected to veto the adoption of European standards and build on national standards instead.

Mattli and Büthe (2007, pp. 25–26) provide another potential explanation for the comparatively higher degree of European standardization activity. They argue that this has to do with the formalized inter-institutional cooperation among national—and between national and supra-national— standards-writing organizations in Europe. The inter-institutional cooperation is governed by a variety of private agreements between standards-writing organizations and EU

regulations.

Mattli's and Büthe's formal institutionalist approach, however, leaves several questions unanswered. It fails to answer how this institutional structure came about. The new institutionalist literature on the varieties of capitalism reveals the diversity of standardization institutional standardization traditions that coexist in Europe (Tate, 2001). If anything, Tate (2001) argues, the institutional differences keep diverging rather than converging. This underlines the question how the inter-institutional cooperation observed by Mattli and Büthe came about.

Moreover, such an institutionalist perspective brings attention to the fact that the European standards-writing organizations operate rather slowly. Despite the introduction of qualified majority voting, the principle of consensus has prevailed as the main mode of decision-making (Hawkins, 1995; Schepel, 2004), which often leads to gridlocks. The development of European standards takes several years. Therefore, this perspective does not provide an explanation for this phenomenon. If anything, it underlines the puzzle.

The findings of this thesis, however, may provide an agency-based explanation of the sudden increase in European standardization, which coincided with the growing occupation of the European Commission with standardization issues. Although similar regulatory actors may exist at the national level the European Commission is rather unique in that it is located at the interface between national and international standardization and in that its formal policy competences are limited. Therefore, it can be expected to be more likely to rely on entrepreneurial policy instruments than other public actors with greater hierarchical authority and access to hierarchical policy instruments. As argued in this thesis, the use of entrepreneurial instruments is crucial. Therefore, the unique role and inclination of the European Commission to rely on entrepreneurial instruments may explain why more standards are developed at the European rather than the national or international level. Given the methodological focus of this thesis, further research seems necessary to test this hypothesis.

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Glossary

Application Programming Interface is the operating system that connect software applications and hardware in digital decoders, which can be viewed as the digital TV analogy to Unix or Windows for Personal Computers. 121, 123–126, 129, 131, 182, 184

co-modalism It has the objective of maximizing the efficiency of each mode of transport – including road transport – in its own right. The underlying logic of co-modality is that once each mode is allowed to achieve its full potential, fright traffic would automatically shift to the most efficient option. Instead of *pushing* freight traffic to what is perceived to be the most efficient mode of transport, the new policy objective is to rely on the market *pull* of the mode that turns out to be the most efficient in practice. 157, 159, 162, 163, 186

Common Interface is a socket in the TV decoder that is designed to allow consumer to access any pay TV operators' programs by inserting the given operators credit card sized standardized decoder card containing the information relevant for conditional access. 116

Conditional Access allows broadcasters to encrypted/scramble their television programs and to restrict access to (paying) subscribers owning the broadcaster's set-top box to descramble/decrypt the signal.. 113–121, 123–126, 129, 131, 174, 183

Convention for Safe Containers A United Nations Convention from December 2, 1972, which provides for the approval of ISO Series 1 containers and their periodic inspection. Non-stackable swap bodies are exempted. Most Member States have ratified this Convention, in accordance with Council Recommendation 79/487/EEC (OJ L 125, 22.5.1979, p. 18). 146, 154

de facto This thesis distinguishes between de facto and de jure standards. This distinction describes the two main processes through which standards are developed: cooperation and competition. De facto standards emerge from the market, often with the help of network effects and increasing returns to scale. 12, 60, 64, 66, 74, 91, 102, 116, 123, 132, 135, 136, 151, 168, 180, 188

de jure Standards are developed through cooperation within the formal standards-writing organizations. 12, 16, 25, 91, 135

E!95 A EUREKA funded R&D project aimed at the development of HD-MAC under the, launched in 1988. 84–88, 92, 102, 107, 176

Gigaliner A 25 meter long and 60 ton heavy road vehicle, which breaches Directive 96/53/EC. Currently, the maximum vehicle length is 16,650 mm and the maximum weight is 40 tons for road transport and 44 tons for combined transport.. 160, 162–164

intermodal transport Generally refers to the movement of fright in one and the same loading unit or vehicle, successively using various modes of transportation (road, rail, water, air, pipeline) without any handling of the goods themselves during the transfer between modes. 142The goal of making optimal use of all the various modes of transportation. This notion assumes that the use of multiple modes for a single trip can be advantageous from both an economic efficiency and environmental point of view (OECD, 2001, p. 1). 142, 157, 159, 162.

iso Series 1 containers A loading unit standardized by the ISO. Although hardly used in inter-European transport, they have become the *de facto* standard of intercontinental maritime transport. The dimensions of Series 1 containers vary but all of them are based on a steel frame, which allows them to be lifted from the top corners and to be stacked on top of each other. 135, 136, 147, 149, 153, 154

New Approach The 'New Approach to Harmonisation and Standardisation', represents a legislative innovation from 1985 (Council Resolution of 7 May 1985 on a new approach to technical harmonisation and standards. OJ 136, 4.6.1985, p. 1-9). It limits the responsibility of the legislators to the definition of "essential requirements" that goods must meet to be placed on the European market. The official European standards bodies are then to translate these essential requirements into technical specifications, referred to as 'harmonised standards'. Goods and services that comply with harmonised documents are presumed to conform with the essential requirements. Therefore, they cannot easily be refused market access.. 14, 17, 25, 42, 133, 134, 148, 152, 153, 155, 156, 164, 165, 182

pallets Raised platforms, normally made of wood, facilitating the handling of goods. In 1947, two different dimensions were standardized by the ISO (ISO 6780). The first, also known as the Europallet is 0.8 meters wide and 1.2 meters long. The second, which is also known as the UK pallet, is 1 meter wide and 1.2 meters long (This study will generally refer to the former rather than the letter). These dimensions resulted from the adoption of the basic packaging module (400 mm x 600 mm), which had repercussions on the dimensions of furniture and, in particular, household appliances. Although they were also standardized by the ISO, the ISO Series 1 containers were deliberately left incompatible with these pallet sizes. At the time of standardization, containers and pallets were considered competing technologies. 136

swap body A loading unit that owes its name to four up-folding legs under its frame that make it possible to 'swap' it from one carrier to another, or to leave it at a location, without the help of a crane. In contrast to ISO Series

1 Containers, they can generally only be lifted by forklift from the bottom rather than the top. They are also generally not stackable. 137, 138, 143, 148, 149, 151, 153, 154

Technical Specification A form of draft technical standard with an initial validity of three years, which can be extended to a maximum of six years. During this period the members of CEN are requested to submit their comments, particularly on the question whether the technical specification at question can be converted into a European Norm. Unlike European Norms, technical standards do not require the withdrawal of conflicting national standards until the final decision about the possible conversion into European Norms is reached. 148

technical standard A codification of technology, intended for voluntary but wide-scale and repeated use. In the context of this thesis, the term 'technical' standards is used to refer to compatibility and interface standards, rather than reference and minimum/maximum quality standards.. 12, 13, 15, 16, 172, 173, 184

Acronyms

ASA American Standards Association. 135

BIC International Container Bureau. 145, 146, 148

BSKYB British Sky Broadcasting. 97, 114, 115, 117, 121, 128

CEO chief executive officer. 62, 71

DG TREN Directorate-General for Energy and Transport. 142, 145, 154, 162, 163

DG Directorate-General. 46, 62, 99, 100, 120, 162

DTI Department of Trade and Industry. 98

DVB Digital Video Broadcasting. 105, 107–112, 115–117, 119, 125, 126, 131, 132, 151, 167, 168, 173, 190, 191

EBU European Broadcasting Union. 80, 82, 105, 122

ECB European Central Bank. 178

EILU European Intermodal Loading Unit. 151, 153–159, 161–164, 183, 184, 186

EN European Norm. 12

EP European Parliament. 23, 24, 41, 61, 73, 74, 84, 87, 92–94, 96, 97, 99, 100, 113, 119, 123, 127, 128, 134, 145, 153, 155, 156, 161–163, 165, 183–186, 190

EU European Union. 14, 21, 23, 36, 73, 82, 83, 86, 95, 110, 119, 120, 133, 140, 152–154, 159, 193

FCC Federal Communications Commission. 73

FRAND fair reasonable and non-discriminatory conditions. 117, 119, 120, 126

GDP growth domestic product. 14, 69

GNP gross national product. 140

GSM Global System of Mobile Telecommunication. 55–63, 65–72, 74, 75, 86, 88, 90, 99, 100, 102, 103, 108, 131, 135, 136, 151, 170, 172–176, 190

ICT information and communication technologies. 13, 37, 57, 63, 171

IEC International Electrotechnical Commission. 109

IPR intellectual property rights. 59, 63, 64

IRU International Road Transport Union. 158

ISO International Standardization Organization. 109, 135, 136, 138, 143, 147–149, 151, 157, 158, 160

ITTF Information Technologies Task Force. 46–48, 51, 62, 78, 79, 81–83, 85

ITU International Telecommunications Union. 59, 65, 73

IT information technologies. 45, 46, 49, 51, 53, 55, 63, 66, 78, 126

MHP Multimedia Home Platform. 125–129, 131, 182, 184

MOU memorandum of understanding. 49, 59, 72, 90, 99, 107, 174

OECD Organization for Economic Co-operation and Development. 142

R&D research and development. 47, 51–59, 62, 65, 68, 70, 71, 75, 79, 82, 85, 86, 88, 95, 103, 129, 146, 171, 173, 174, 188

SEPA Single Euro Payments Area. 178

SMG Special Mobile Group. 68, 71

TC119 Technical Committee for "Swap bodies for combined goods transport". 143, 144, 146–149, 151–153, 155, 156, 161

TC Technical Committee. 143

TS Technical Specification. 125, 148

UIC International Union of Railways. 159

UIRR Union internationale des sociétés de transport combiné Rail-Route. 143, 144, 146

UK United Kingdom. 36, 58, 97, 110, 114, 118, 122, 128, 136, 159

UMTS Universal Mobile Telecommunications System. 66, 68–70, 72–76, 99, 100, 102, 103, 121, 170, 173–175

US United States. 17, 23, 47, 48, 51, 61, 66, 69, 72, 73, 79, 83, 84, 96, 99, 101, 135, 136, 140, 167, 171, 188, 189, 192

HDTV high-definition television. 39–41, 44, 55, 61, 77, 79–83, 86, 87, 90, 93, 95–98, 100–102, 106, 108, 110, 119, 128, 141, 142, 145, 157, 160–162, 170–172, 176, 182–184, 186, 189–191

ACTS Advanced Communications Technologies and Services. 68, 70

CCIR Consultative Committee for International Radio. 80–82, 87, 90, 171

CDMA Code Division Multiple Access. 70, 71

CENELEC European Committee for Electrotechnical Standardization. 14, 18, 21, 110, 133, 192

CEN European Committee for Standardization. 14, 18, 21, 22, 133, 143, 144, 148, 152, 154, 156, 164, 183, 192

CEPT European Conference of Postal and Telecommunications Administrations. 48, 49, 51, 56, 57, 176

DIN German Standardization Institute. 18, 144, 192

ESPRIT European Strategic Programme for Research and Development in Information Technologies. 51–53

ETSI European Telecommunications Standards Institute. 14, 18, 21, 57, 69, 71, 102, 110, 125, 133, 177, 192

EUREKA European Research Co-ordinating Agency. 84–86, 90, 99, 102, 103, 107, 176, 184

FRAMES Future Radio Wideband Multiple Access System. 71

HD-MAC High Definition Multiplexed Analogue Components. 61, 82–88, 90–104, 106–109, 118, 119, 123, 157, 160, 162, 182–184, 186

MAC High Definition Multiplexed Analogue Components. 80, 82, 90–93, 95, 97, 98, 100, 109, 123

PACT Pilot Actions for Combined Transport. 145

PAL Phase Alternative by Line. 78, 80, 82, 90–94, 97, 98, 102, 182, 183

PTT Postal, Telegraph and Telephone administration. 45, 48, 49, 51–55, 57–59, 176

RACE Research and technology development in Advanced Communications in Europe. 53, 54, 57, 68, 70, 85, 103

SECAM Sequential Color with Memory. 78, 80, 82, 91–93

SGKV Study Group for Combined Transport. 143

TDMA Time Division Multiple Access. 55

WTO Worldwide Trade Organization. 73, 191

WTVML Worldwide TV Mark-up Language. 128