BUTTERWORTH HEINEMANN

Telecommunications Policy, Vol. 19, No. 6, pp. 487–500, 1995

0308-5961/95 $10.00 + 0.00

0308–5961(95)00026–7

Regulation and transaction costs in telecommunications

A research agenda

Michel Ghertman and Bertrand Quélin

Antitrust and regulatory policies influence the vertical and horizontal integration of firms and the characteristics of their contractual arrangements. This paper examines the relevance of transaction cost economics for the analysis of regulatory policy in telecommunications. It explores the impact of changes in national telecommunications regulation on the level of transaction costs. After building a new theoretical framework based upon previous transaction cost contributions, the paper sets out a research agenda concerning the importance of transaction costs for antitrust and regulatory policies.

Michel Ghertman is Professor of Strategic Management and International Business, and Bertrand Quélin is Associate Professor of Strategic Management and Industrial Organization, HEC Graduate School of Management, F-78351 Jouy-en-Josas, France (Tel: +33 1 39 67 72 74; fax: +33 1 39 67 70 84; email: quelin@gursmtp.hec.fr).

Once dominated by national regulated monopolies, telecommunications have undergone an increasing amount of deregulation in the past ten years, though of different magnitudes according to the country involved. Deregulation has led to a higher number of players in the industry, and increasing competition has induced lower consumer prices. The general logic applied has been that of neo-classical consumer welfare. Interestingly enough, little attention has been given to the transaction cost implications of deregulation. Using the latter line of reasoning[1] it is possible to assert that moving from a small to a large number of players lowers the level of asset-specificty, increases transaction costs and pushes industry players to create new technologies with a general purpose rather than tailored to a specific consumer.

The main question raised by this paper concerns the relevance of transaction cost economics for the analysis of regulatory policy in telecommunications. As it is trying to break new ground in theory, it is partially exploratory. It also offers some empirical illustrations of the new construct, focusing on a comparison between five countries: the USA, Japan, the UK, Germany and France.

As Coase has noted: 'In the real world, to influence economic policy, we set up or abolish an agency, amend the law, change the personnel and so on: we work through institutions. The choice in economic policy is a choice of institutions. And what matters is the effect that a modification in these institutions will actually make in the real world.'[2] In regulated industries the legislator, judge or regulating agency has – among others – a major influence upon institutions as they determine the numbers of players and some rules of the game.

Regulation usually reflects infighting among interest groups, political considerations and other factors specific to each industry. However, if

[1]Williamson, Oliver E *Markets and Hierarchies* Free Press, New York (1975); Williamson, Oliver E *The Economic Institutions of Capitalism* Free Press, New York (1985)

[2]Coase, Ronald H 'The new institutional economics' *Journal of Institutional and Theoretical Economics* 1984 (140)

regulatory policy in telecommunications were consistent with the strategy of economizing on transaction costs[3] all governance structures would be the same in the five countries observed. Otherwise change should direct them towards the same blend of economic institutions.

A rapid observation of the governance structures used for the transactions between equipment manufacturers, operators, customers and regulators during 1982–90 in the five countries studied reveals two facts at first sight contradicting what one would expect from the implementation of transaction cost economics:

- They were different in the early 1980s.
- After they were reviewed and changed in the mid-1980s three countries moved further towards the market, one towards more hierarchy and one remained unchanged. There was a greater variety of governance structures after than before the changes.

This raises two complementary questions: Do transaction costs matter for regulatory policy? If not or only partially, what other preoccupations do matter, including neo-classical consumer welfare?

To answer these two questions a more rigorous classification than 'more or less market-oriented' is required. This paper uses a new theoretical construct termed 'configurations of governance structures' (CGS), based on transaction costs reasoning, to analyse the patterns of transactions – and their change – between the various players in an industry where all three economic institutions – market, contract and hierarchy – exist to some degree.

The first section of this exploratory paper reviews the relevant literature. The second builds a theoretical CGS for a small number of players in regulated high-technology industries and develops a set of hypotheses to be tested in telecommunications. The third section reviews the telecommunications regulations of the five countries observed during the period 1982–90 to evaluate the reasoning. The discussion summarizes our conclusions on the importance of transaction costs reasoning and sets out a research agenda concerning the possible relations between transaction costs and other variables.

It is worthwhile to note the scope of this paper. It deals with the period 1982–90 for transmission and switching equipment only. Its conclusions could very well differ for a later period and/or for customer premises equipment and mobile telephones.[4]

Review of the literature

To implement the strategy of economizing, transaction cost economics proposes an *ad hoc* choice between markets, hierarchies and hybrid institutional forms in conditions of disequilibrium.[5]

Williamson traces the new institutional economics to the influence of the following intellectual traditions. He credits Arrow[6] with 'describing firms and markets as alternative instruments for organizing economic activity in his 1963 presidential address to the Institute of Management Sciences' and Coase[7] as making 'the case for a comparative institutional approach to regulation'. Williamson has given an example of such an analysis with the Oakland cable TV franchise bidding experience.[8] Monteverde and Teece extended the approach to the automobile industry.[9] Some applied work on policies favoring innovation is well underway.[10] A methodology to operationalize a transaction cost analy-

[3]Williamson, Oliver E 'Strategizing, economizing, and economic organization' *Strategic Management Journal* 1991 **12** (special issue) 75–94

[4]For an up-to-date analysis of liberalization in Europe, see Muller, J *et al* 'Telecommunications liberalization in the Nordic countries' *Telecommunications Policy* 1993 **17** (8) 623–630.

[5]Williamson *opera cit* Ref 1; Williamson, Oliver E 'Comparative economic organization: the analysis of discrete structural alternatives' *Administrative Science Quarterly* 1991 **31** 269–296

[6]Arrow, Kenneth J 'Toward a theory of price adjustement' in Abramovitz, M *et al* (eds) *The Allocation of Resources* Stanford University Press, Stanford, CA (1959) 41–51; see also Barnard, Chester *The Functions of the Executive* Harvard University Press, Cambridge, MA (1938; fifteenth printing, 1962); Coase, Ronald H 'The nature of the firm' *Economica* 1937 NS **4** 386–405; Commons, John R *Institutional Economics* University of Wisconsin Press, Madison, WI (1934); Hayek, Friedrich 'The use of knowledge in society' *American Economic Review* 1945 **35** (September) 519–530; Llewellyn, Karl 'What price contract? An essay in perspective' *Yale Law Journal* 1931 **40** (May) 704–751; Simon, Herbert *Administrative Behaviour* Free Press, New York (1945)

[7]Coase, Ronald H 'The regulated industries: discussion' *American Economic Review* 1964 **154** 194–197

[8]Williamson, Oliver E 'Franchise bidding for natural monopolies – in general and with respect to CATV' *Bell Journal of Economics* 1976 **7** (Spring) 73–104

[9]Monteverde, Kirke and Teece, David 'Supplier switching costs and vertical integration in the automobile industry' *Bell Journal of Economics* 1982 **13** 206–213

[10]Teece, David J 'Profiting from technological innovation: implications for integration, collaboration, licensing and public policy' *Research Policy* 1986 **15** (December) 285–305; Teece, David J *The Organization of the Industry and Innovation* Working Paper EAP-34, University of California, Berkeley, CA (1989)

sis of alternative institutional arrangements has been laid out by Williamson *et al.*[11] The analysis of discrete structural alternatives is now possible. It is couched in general terms and concludes that markets are more efficient up to a certain level of asset specificity, while hybrid forms become more efficient for an intermediary level and hierarchies are best thereafter.[12] It may not be used for the analysis of a specific industry unless future work shows how to analyse different levels of asset specificity, including its 'optimal' level. Masten, Meehan and Snyder have measured the costs of face-to-face transactions between several subcontractors involved in the construction of a ship.[13]

If the inquiry concentrates on regulation in a particular industry, one difficulty in the discrete analysis of institutional alternatives is that few industries can be reduced to one of the three institutional forms. All are present to some extent. For example, in the automobile industry relational contracting exists between hierarchies supplying parts and automobile firms, the core of automobile production occurs in the hierarchies, and some form of market relations exists between automobile firms and car buyers. The present paper proposes the concept of a configuration of governance structures to analyse the complexity of institutional arrangements in an industrial sector. It gives special attention to the case of a small number of hierarchies (equipment manufacturers) selling to a small number of operators through relational or recurrent contracting.[14] Transactions with customers and regulators are also taken into consideration even though the focus is on transactions between manufacturers and operators because of the need to simplify at the exploratory stage of research. Until now, the transaction cost literature has dealt mainly with comparisons between markets, hierarchies and hybrid forms. This paper focuses on the various combinations of transactions between different levels of small numbers of hierarchies selling and buying from each other. The market form is not present.

The comparison of economic institutions – market, hybrid and hierarchy – has also not been carried as far as international competition. Analysis of the relative efficiency of the three modes of governance across nations raises an apparent major difficulty. The analysis of discrete structural alternatives uses two core concepts: transactions and governance structures. Introducing a third feature in a qualitative approach brings an additional challenge. The notion of a configuration of governance structures addresses this difficulty. Such structures belong to the category of institutional arrangements as opposed to the institutional environment, including regulation.[15]

Typology of configurations of governance structures

The conditions used for the construction of the typology will first be specified; then each configuration is measured discretely along its attributes; and third, a discrete comparison of the transaction costs of each configuration will be made.

Conditions and construction

In many regulated high-technology industries such as aerospace, defence, telecommunications, public transportation and utilities as well as atomic energy, the existence of markets – defined by the presence of a large number of firms with the price system used as the sole indicator to

[11]Aoki, Mashito, Gustafsson, B and Williamson, Oliver E *The Firm as a Nexus of Treaties* Sage, London (1990)
[12]Williamson (1991) *op cit* Ref 5
[13]Masten, Scott, Meehan, J W and Snyder, E A 'The costs of organization' *Journal of Law, Economics and Organization* 1991 **7** 1–25
[14]Ring, Peter and Van de Ven, Andrew 'Structuring cooperative relations between organizations' *Strategic Management Journal* 1992 **13** (7) 483–498
[15]Davis, Lance and North, Douglass C *Institutional Change and American Economic Growth* Cambridge University Press, Cambridge, UK (1971)

change production levels – is sparse. There is very often a small number of large firms controlling different types of assets (manufacturing and operating) in the industry, and some type of contractual relations between them. Long-term relational contracting on a national or regional basis is the most frequent case, with quasi-zero breach of contract uncertainty and low uncertainty at contract renewal intervals. Conditions of high asset specificity usually prevail.[16]

Technological content, variety and mix of products and services are not factors used to determine cost but major stakes in the transactions between the hierarchies involved. The different levels of small numbers of hierarchies for each type of asset plus the nature of their contractual relations have transaction cost implications.

Williamson makes a discrete analysis of alternative governance structures – market, hierarchy and hybrid forms. The present authors perform a similar analysis by means of a comparative measurement of the attributes of each governance structure to determine the structure that best economizes transaction costs. The new construct starts with a descriptive mapping of the existing mix of economic institutions organizing transactions. It continues with a logic similar to Williamson's: the properties of transactions are inferred from the governance forms. By discrete evaluation of the comparative levels of attributes, the levels of transaction costs of governance structures are determined and the relative efficiency of the various configurations obtained.

Whereas Williamson distinguishes small from large number situations, this paper deals only with small numbers. We shall examine them below using the following simplifying conditions. They specify the nature of assets, the number of players, the types of transactions and the role of the regulator:

(1) Each type of asset is controlled by separate hierarchies (1 a), or a vertically integrated one (1 b).
(2) The assets owned by the manufacturer and the operator and the transactions between the two are the basis of the typology. As this work is exploratory, other assets and transactions are mentioned but not analysed in the same depth.
(3) Even though each player may possess several assets belonging to different technological types, all transactions can be simplified into an average transaction moving 'across a technologically separable interface'. Even though technologies change rapidly in incremental terms, major breakthroughs involving technological discontinuities and therefore new types of transactions rarely come more than once in a decade.
(4) The number of hierarchies for each asset is either one or more than one. The latter case is limited to five hierarchies.
(5) Transactions between hierarchies are organized by either relational or recurrent contracting or ultimately vertical integration (condition 1 a).
(6) Transactions between operators and end users (individual or firm) take the form of market or recurrent contracts. Their role in influencing product, service, technology, quality or price is either negligible (*n*) or important (*i*).
(7) The regulator has an influence over the product, service, technology, number of players in each asset category and price. This role is either important (*i*) or negligible (*n*). For Williamson 'regulation may be described contractually as a highly incomplete form of

[16]Doz, Yves *Strategic Management in Multinational Companies* Pergamon Press, Oxford, UK (1986)

Table 1. Typology of the configuration of governance structures (CGS): the case of small numbers.

	Type of hierarchy			
Type of CGS	**Manufacturers[a]**	**Operator[a]**	**Consumers[b]**	**Regulator[b]**
Integrated hierarchy (IH)		1	*n*	*n* to *i*
Mutual hostage (MH)	1	1	*n*	*n*
Regulated operator bidding (ROB)	1	1	*n*	*n* to *i*
Regulated manufacturer bidding (RMB)	>1	1	*n*	*n* to *i*
Regulated multilateral contracting (RMC)	>1	>1	*n* to *i*	*i*

[a] Measurement is in number of players.
[b] Estimated for the importance of their bargaining power with the other industry players for variables such as technology, product, service variety, quality and price.

long-term contracting', while in this paper it is considered as part of the environment of economic institutions rather than a governance structure, even though some overlap is acknowledged.

In the analysis of the geographical scope of configurations of governance structures, the regulator is key. It is the regulator and not national or multinational hierarchies who determines the boundaries of his or her authority over transactions. It follows that in most regulated high-technology industries the country is the relevant level of analysis for the mix of economic institutions, though not necessarily so for the strategies of firms. For the construction of configurations we have counted multinational hierarchies as one separate player in each of the countries where they manufacture, sell or operate.

Table 1 gives the five possible types of configurations of governance structures under the conditions specified above. They are: integrated hierarchy (IH); mutual hostage (MH); regulated operator bidding (ROB); regulated manufacturer bidding (RMB); and regulated multilateral contracting (RMC). There is one example of RMB and one of ROB worth noting: when the only operator is also one of the manufacturers (RMB) or the sole manufacturer is also one of the operators (ROB). Unless the regulator strongly influences product, technology and price, the vertically integrated hierarchy will dictate the rules of the game to the other players. This sub-case of RMB and ROB is analoguous to IH, which is not necessarily so for RMC.

Discrete measurement of attributes

To measure the discrete and comparative levels of transaction costs of the configurations of governance structure we have selected the following attributes:

- for transactions: assets and skills specificity, uncertainty and frequency;
- for management instruments: administrative and bureaucratic controls (internal), incentive intensity.

In regulated high-technology industries, by and large, conditions of higher asset and skill specificity obtain together with lower uncertainty at contract renewal intervals and lower frequency of renewals than in less technology-intensive industries. However, within the small number situation conditions vary. Among the configurations of Table 1, RMC has maximum uncertainty: buyers can change their suppliers more easily after each contract expires, and *vice versa*. In spite of the 'fundamental transformation', change of contractants is bound to be higher for RMC than RMB and indeed ROB, MH or IH. Higher uncertainty will entice

Table 2. Discrete comparison of the levels of transaction costs of CGS.

	Transactions		Management instruments	
Type of CGS	**Assets and skill specificity**	**Uncertainty and frequency**	**Administrative and bureaucratic controls (internal)**	**Incentive intensity**
Integrated hierarchy (IH)	1	1	5	5
Mutual hostage (MH)	2	2	4	4
Regulated operator bidding (ROB)	3	3	3	3
Regulated manufacturer bidding (RMB)	4	4	3	3
Regulated multilateral contracting (RMC)	5	5	1	1

1: lowest transaction cost; 2: lower cost; 3: intermediate cost; 4: higher cost; 5: highest cost

RMC players to make less asset-specific investments relative to other, less uncertain governance structures. Transaction costs are therefore higher than for other configurations. RMB has lower uncertainty than RMC because the operator can play one supplier off against another, but the reverse is impossible. Manufacturers are more willing to invest in assets and skills specific to their transactions with the operator, decreasing transaction costs relative to RMC.

ROB uncertainty is lower than in the case of RMB because the sole manufacturer has no competitor at contract renewal intervals. The contractor is likely to be able to standardize rather than customize operator-related specific investments, economizing on transaction costs relative to RMB. MH has even lower uncertainty as the sole manufacturer and operator have no alternative. They are locked into their previous asset-specific investments. MH transaction costs are clearly economizing relative to the ROB configuration. IH uncertainty is still lower than for MH because manufacturer and operator belong to the same hierarchy. Their opportunism would have to overcome the barrier of fiat and bureaucracy for any kind of outsourcing. The asset specificity of IH is higher than for MH, though not necessarily by a large magnitude. IH has the lowest transaction costs of all configurations due to transactions.

In Williamson's words: 'As asset specificity increases . . . , the balance shifts in favor of internal organization.'[17] For the CGS above, transaction costs decrease with an increase in asset specificity while transaction costs of management instruments decrease together with asset specificity. Table 2 gives a summary of the above analysis.

Review of regulations and hypotheses in telecommunications

The third simplifying condition for the construction of Table 1 stipulated an 'average' transaction between manufacturer and operator with at most one technological breakthrough even ten years. In telecommunications, we are focusing on two types of transactions, those for switching and transmission equipment, representing about two-thirds of the value added of the industry during the period examined. Both types of transactions are averaged into one for the purpose of simplification.

Over the last few years telecommunications regulations have been reviewed and changed in several major industrialized countries. Policy makers perceived that technological and economic pressures were forcing change. Technological developments had created the potential for new services which could not easily be fitted into the existing legal

[17]Williamson (1985) *op cit* Ref 1

and regulatory environment. Thus the emergence of new services and service providers required reviewing both industry and institutional structures, as well as the mechanisms for the control of the industrial sector. In addition, economic pressures on the price structure of services significantly influenced the outcome of policy deliberations about the industry structure of telecommunications. The regulations of the five countries are now reviewed.

United States

The greatest changes have occured in the USA, where the initial situation was rather different from that in Europe or Japan. The structure of telecommunications, although private, was a near-monopoly with full integration of equipment manufacturing and network operations (AT&T), akin to configuration IH, and a policy of universal service and equal treatment of customers.[18] In 1982 an agreement negociated between AT&T and the US Justice Department resolved a long antitrust controversy over the structure and activities of the Bell System: its competitive operations were separated from its monopoly operations by divestiture.[19] On the technology side, the development of new carrier technologies helped the introduction of competition in basic services.

Many factors help explain the AT&T antitrust settlement and the end of the Bell System. Although transaction costs considerations are not explicitly in the forefront of the factors of change, regulation made room for innovators once they had initially performed.[20] The cumulative effect of these factors and policy decisions has been the evolution of a highly pro-competitive environment in the USA. In the terms of our typology of configurations of governance structures (Table 1), the USA moved from type IH to a mix of the type RMB for local exchange and RMC for intercity and international calls as well as value-added services. Note that manufacturers are not allowed to be operators in RMB. In RMB transactions occur between manufacturers and operators, while in RMC transactions exist between the latter two and providers of value-added services as well as consumers. While pre-1982 regulation controlled only one type of transaction, the new regulation dealt with the same type as previously plus new kinds of transactions. The boundaries of regulation were expanded to incorporate new transactions between new (and previous) players. Their lower level of asset specificity pushed towards RMC rather than RMB, ROB or MH.

The US institutional environment and economic institutions were unique before 1984, and remain so. One notable difference with other countries is that AT&T is present as both a major manufacturer of telecommunications equipment within RMB and a telecommunications operator within RMC, together with its manufacturing role. AT&T has selected internal development and synergies through vertical integration. One possible advantage of vertical integration may be more effective coordination between complementary businesses and therefore greater synergies between these activities. In addition, there will be the largest incentive to invest in transaction-specific assets compared to other governance structures. Furthermore, the risk of leakage of tacit knowledge to competing firms is minimized. There is also a minimization of competition-induced uncertainty, since the transactions occur within the same firm.

Before 1984 the USA belonged to configuration IH. After 1984 it

[18]Temin, Peter *The Fall of the Bell System* Cambridge University Press, Cambridge, UK (1987)
[19]Crandall, Robert W *After the Breakup* Brookings Institution, Washington, DC (1991)
[20]Chick, M *Governments, Industries and Markets* Edward Elgar, Cheltenham, UK (1990)

adopted a mix of RMC and RMB rather than MH on a national or even regional level. Our transaction cost reasoning above pointed to the creation of new transactions with new players, most likely with lower levels of asset specificity requiring a different configuration. RMB rather than MH (more transaction cost efficient) was adopted for basic services.

Japan

From the inauguration of telephone service, telecommunications operations in Japan were conducted as a monopoly by NTT, a state-owned corporation, for domestic communications, and the publicly owned firm KDD for international communications. The communications equipment bought by NTT was manufactured in Japan by the so-called NTT family of enterprises, headed by NEC and Fujitsu, and closely linked to NTT through relational contracts for the procurement of equipment and supplies. This close linkage with NTT had the effect of conspicuously improving the technological levels of this group of manufacturers through joint technological R&D projects and other activities. In terms of configurations of governance structures, Japan belonged to RMB.

In April 1985 the Public Telecommunications Law was abolished in favor of the new Telecommunications Enterprise Law, and NTT was sold to the public. This law introduced the principle of free competition for all services, including telephone, leased circuits and data transmission services, regardless of whether telecommunication services were domestic or international. In particular, KDD, previously the sole provider of international services, lost its monopoly.

More specifically, carriers were divided into two categories. Carriers of type 1 own their facilities and can therefore supply a wide range of services. They are severely regulated because of the high public service content of their activity. They are required to obtain a permit from the Ministry of Posts and Telecommunications. By contrast, type 2 carriers, leasing facilities from type 1 corporations to provide services, can start business operations simply after registration or notification.

To remain leader in new services, NTT must play an important role in research and development in order to develop new services before telecommunications equipment manufacturers. NTT links its skills with those of its suppliers. NTT has chosen inter-firm cooperation through relational contracting.[21] This mode of coordination has involved a relatively long-term, stable cooperative relationship with a small number of suppliers, relying on trust, reducing opportunism and transaction costs.

The Japanese institutional arrangement is more effective than the market at coordinating transactions between supplier and carrier. A relatively stable relationship may lead not only to better information flows but also to more effective user-oriented innovation. Less competition inside a closed group of suppliers consisting of a small number of firms means that there is less competition-induced uncertainty and hence a greater incentive to invest in transaction-specific assets, accompanied by a reduction in transaction costs.

However, the ability in the short run to switch suppliers is limited. There may also be relatively high coordination costs as the carrier attempts to share information and get agreement between several autonomous firms. From the supplier's point of view there is always the danger that commercially sensitive knowledge will leak to the other

[21]Fransman, Martin 'Controlled competition in the Japanese telecommunications equipment industry: the case of central office switches' in Antonelli, C (ed) *The Economics of Information Networks* North-Holland, Amsterdam (1992) 253–275

competing suppliers who are also involved in the cooperative research and development.

The 1986 move to RMC economized less on transaction costs than RMB. Large numbers of new players increase uncertainty and transaction costs. Political considerations in favour of allowing new players into telecommunications were more important than transaction cost reasoning.

United Kingdom

In the UK liberalization began in 1981 with a Telecommunications Act dividing the Post Office into two state-owned corporations: one for postal services and banking, and the other, British Telecom (BT), for telecommunications. The monopoly power of BT as a carrier was reduced through the licensing of a second operator, Mercury (a subsidiary of Cable & Wireless). As the competition was in the short run only potential, the new regulatory framework included measures to control the dominant carrier. Until then RMB was the configuration used by the UK.

Unlike AT&T, BT was not significantly involved in manufacturing activities prior to its partial sale to the public. However, BT was closely involved with several domestic equipment manufacturers in the research, design and development of complex telecommunications equipment.[22] The results for BT were not all positive. Since its sale to the public, BT has significantly reduced its involvement in these areas by pulling out almost entirely from the joint research, design and development of telecommunications equipment. While each carrier is a significant purchaser of telecommunications equipment, BT has opted for greater use of recurrent contracting as a mode of acquiring network elements. Therefore software and systems engineering relating directly to the provision of competitive telecommunication services are seen as core skills to be developed within the company.

When the UK moved from RMB to RMC, the number of operators increased according to policy, while the number of manufacturers decreased. Transaction cost considerations were not present; political considerations of a financial and ideological blend were at the forefront. The British economic tradition of moving away from industry into services may also have influenced its change of regulation.[23] Of the five countries observed, the UK is the only one to move out of manufacturing telecommunications equipment as a result of its regulatory policy.

Germany

The German telecommunications industry is under the sole authority of the Deutsche Bundespost (DBP), a part of the Secretariat for Posts and Telecommunications with an overall service monopoly. Its legal and institutional framework gives DBP an ambivalent institutional character. On the one hand, it is a financially independent state-owned enterprise, earning revenues like any private firm. On the other hand, it is an administration directly dependent on political fiat and burdened with all the incentive problems that are typical of bureaucratic public organizations. DBP does not produce its own network equipment but has important monopsony power in the market for telecommunications equipment akin to the RMB configuration.

Based on the findings of the Witte Governmental Commission (1987), a reform was initiated by the Secretary of Posts and Telecommunica-

[22]Quélin, Bertrand 'Trajectoires technologiques et diffusion de l'innovation: le cas des équipements de télécommunication' *Revue d'Economie Industrielle* 1992 **59** 132–153

[23]Ghertman, Michel and Allen, Margaret *An Introduction to the Multinationals* Macmillan, London (1984)

tions. A 1989 law transferred the 'sovereign tasks' of DBP to the Secretary and split its operations into three administrations under his jurisdiction: Postdienst (mail), Post Bank (banking) and Telekom. Transparency is higher than before and the three separate administrations constitute a less powerful economic, social and political force than the three combined.

Deutsche Telekom has inherited the network and service monopoly of its predecessor. Its supply conditions are the same. Of the five countries observed, Germany has undergone the least change. Current regulation looks similar to the initial position. The RMB configuration remains. Transaction cost reasoning has been less important than traditional German business and government practices. Breaking up the former P&T into three separate entities received more attention than the regulation of the telecommunications segment.

France

In France public networks are generally financed, built and operated by a government body. Telecommunications is a sector where the French policy of promoting national champions for industrial objectives has been successful, unlike in computers. Alcatel's world leadership position in equipment supply owes much to its privileged position as the main supplier of equipment to the state-owned operator. The RMB configuration obtained at the beginning of our period of study.

Until 1988 there was no competition in services. The extent of private activities was limited to customer premises equipment (CPE), for which competition between the state-owned operator and publicly owned firms was allowed. After 1988 competition became widespread for CPE and began to grow for services. Changes in regulatory policy were consistent with economizing on transaction costs. Ironically the choice of the most efficient configuration of governance structure for manufacturing and operating was made for reasons of economic policy, ie protecting the national champion in the manufacture of transmission and switching equipment.

France Telecom, the French operator, also used its transaction cost advantages to export engineering systems in basic services. The mutual hostage configuration is most efficient for transactions between manufacturers and operators. It is not concerned with transactions between operators, service providers and consumers. Unless the French regulator considers a mixed structure of CGS adapted acording to the type of transaction, French players are not likely to carry over to value-added services their advantages in basic services.

Summary

The transaction cost perpective used here sheds new light on the discussion of whether there should be more or less deregulation for telecommunications, especially regarding asset specificity. Some of the previous recommendations favouring total deregulation are not necessarily transaction cost efficient, especially for basic services where conditions of high asset specificity prevail. Table 3 provides a summary of the configurations of governance structures found in our five case study countries.

Apart from the USA (IH), the telecommunications regulations and economic institutions used to implement them appear quite similar in the early 1980s (RMB) for four out of the five countries observed. The

Table 3. CGSs in telecommunications before and after policy changes, and results of the test of hypotheses.

	Configuration before regulatory change	Date of change	Configuration after regulatory change
USA	IH	1984	RMB and RMC
Japan	RMB	1986	RMC
UK	RMB	1986	RMC
Germany	RMB	None	RMB
France	RMB	1987	MH

task set by the regulator for manufacturers and operators was simple and analogous for the five countries: construct a network and operate it for basic services. Most reasons for making regulatory changes were specific to each national context. France and Germany wanted a stable situation for their indigeneous industrial suppliers. Japan, the USA and the UK bowed to pressures from new players. There were some reasons in common, including technological, neo-classical and transaction costs rationales. The current blend of economic institutions has not moved towards a common type, nor have national regulatory environments. Obviously regulators have tackled new kinds of transactions rather differently.[24]

The types of configurations found in these countries can be compared to those constructed theoretically (see Table 1). All the configurations of Table 1 except ROB existed in telecommunications at some point between 1982 and 1990. IH, the configuration adopted by the USA prior to 1984, has not been used since. MH is used by France alone and RMB by Germany alone. RMC is used by Japan and the UK, while the USA has a mix of types RMC and RMB. Transaction cost economizing played some role when policies and configurations were reviewed and changed; however, idiosyncratic national reasons seem to have played a larger role. Differences in the choice of economic institutions seem to depend more on the nature of the national environment than on transaction cost economizing reasoning. Unless such thinking makes headway, governance structures are likely to remain dependent variables in most cases and operate largely in a nationally idiosyncratic way.

Discussion and research agenda

As we have noticed in the case of the USA, adding new transactions and new players enlarges the boundaries of the telecommunications industry. The US case does not fit the simplified theoretical construction of Table 1, which for exploratory reasons restricted the analysis to transactions between manufacturers and operators.

Transaction cost reasoning adds more insights than noted in the summary above. Using the new CGS construct, transaction cost analysis reveals more than the three groups initially observed in the introduction to this paper: more market (USA, UK and Japan), less market (France) and no change (Germany). CGS focuses attention on the types of transactions favoured by the regulator and emphasizes the role of national players on both sides of the transaction. In the USA the focus is on all transactions and all players. In the UK the focus is on all transactions, the operator, service providers and consumers; the importance of national manufacturers of equipment is treated with benign neglect. In France and Germany the focus is on transactions for basic services and manufacturers and operators. French and German regula-

[24]For another analysis of regulatory institutions and processes, see Tiller, Michael and Bednarczyk, Susan 'Regulatory institutions and processes in telecommunications: an international study of alternatives' *Telecommunications Policy* 1993 **17** (9) 650–676

tors are in no hurry to make up their minds about other transactions and other players. In Japan the focus on political consensus provides a regulatory framework encompassing all transactions and all players in the same configuration.

Transaction cost reasoning explains a large part of the CGSs and their change. It also leads to the following conclusions:

- Extension of the boundaries of an industry requires a mix of CGSs to map the transactions in that particular industry. As noted above in the context of alternative modes of governance structure: 'the better mode at an early stage of an industry's development may no longer be better later when a lesser degree of uncertainty prevails'.[25] In the case of a change in the boundaries of an industry and the introduction of new types of transactions with different levels of asset specificity and uncertainty, the CGS construct must take the new transactions into consideration. The regulator is advised to take note of the difference in the intensity of their attributes relative to those of the initial CGS. If they are of different orders of magnitude, as exemplified by telecommunications in the USA, a mix of different CGSs is advised. Otherwise, the same CGS can obtain.
- The focus of regulatory policy in some countries on one type of transaction and the neglect of others has economic policy implications, as shown in the case of the UK leaving manufacturing to foreign firms, probably as an unintended consequence of a regulatory move to RMC for all transactions. Regulators in the five countries addressed this issue and gave different answers. These were implicit in the case of the USA and Japan because of lobbying from AT&T in the first case and the NTT group of companies in the second. They were explicit in the case of France and Germany, which wanted to promote their own manufacturers and operators. If the EC regulator in Brussels pushes all countries towards a more market-oriented structure, ie RMC, this would probably be less dangerous now for Alcatel and Siemens than in the mid-1980s, as they have built a strong position at home and abroad largely because of MH and RMB. However, it would raise the transaction costs of these two firms with their operators. But the gist of the argument would have to lie in the acceptance by the regulator of economic policy implications analogous to the British case – the neglect of industry in favour of services. Such a policy implication runs contrary to the industrial traditions of France and Germany and raises serious questions about levels of employment, a sensitive political issue in both countries in the 1990s.
- Where there are differences between the CGS observed and the one suggested by theory, these differences are due to national idiosyncratic considerations, among which are the lobbying strength of existing and new players, the country's traditions of consensus, industrial policy, litigation and ideological considerations. Industry variables such as physical characteristics or development stages also have a role in explaining differences such as those observed between Tables 1 and 3.
- MH stands out as the most transaction-economizing national configuration for basic services in conditions of a global economy where other countries adopt more competitive configurations. Equipment manufacturers and operators gain on transaction costs without the bureaucratic failure of IH where innovation is frozen. Equipment manufacturers are likely to gain more than operators because they

[25]Ghertman and Allen *op cit* Ref 23

are part of downstream transactions with higher asset specificity than the downstream transactions of the operators.

- There is no evidence that Germany, which is keeping RMB, or France, which is moving from RMB to MH, are doing any worse on economic welfare grounds than Japan, the UK or the USA, which have moved towards more competitive configurations. Unless future research points to the contrary, regulators have little reason to push towards the more competitive types of configurations, like RMC, especially for all transactions. The opposite, ie a move towards MH, seems better aligned with transaction cost reasoning for basic services. A discriminating attitude on the part of the regulator, depending on the type of transaction and its comparative degree of asset specificity and uncertainty, is recommended.
- Future change in regulation, in telecommunications or in any of the regulated high-technology industries mentioned in the introduction, would lack legitimacy unless transaction cost considerations are taken explicitly into account.

The last recommendation provides a transition to discussion of the research agenda. The first question on the agenda is methodological. It concerns the exploratory typology of Table 1. Should a more complex construct be developed, including transactions between all players? The answer is undoubtedly positive. Two solutions seem possible. The first, adopted in this paper, is to use a mix of CGSs, one for each transaction. The second is to create a new and more complex typology including all the sequences of transactions. The advantages of the latter would lie in a better understanding of all possible combinations. The disadvantages come with the advantages: if the number of combinations becomes unmanageable, understanding will worsen rather than improve.

The second question concerns the lack of empirical research, which could not be undertaken without a proper theoretical base. Now the CGS construct makes new research possible. Regulators and industry players working in the public interest have the responsibility of promoting such research if they are really concerned with public welfare. Such research necessitates an empirical measurement of the transaction costs of CGSs and their changes. Relationships between levels of transaction costs, total costs, industrial policy and welfare considerations are also made possible.

More complex typologies of configurations are required, encompassing service providers in situations of lesser asset specificity than analysed in the present paper. It is possible that the most transaction cost economizing configurations for transactions between manufacturers and operators become least efficient for transactions between operators and service providers or the latter and consumers. Regulators and other players should therefore promote empirical research into the different configurations at the various stages of transactions within the same industry. Less market may be more efficient at one end under conditions of high asset specificity, while the reverse can apply when asset specificity conditions decrease.

The third set of questions concerns the international aspects that can be researched with the new construct. Empirical measures of transaction costs would help to confirm (or otherwise) the recommendations stemming from the theoretical construct on a comparative international basis. Allowance will be made for idiosyncratic national variables increasing (or decreasing) the levels of transaction costs. National

comparisons will be much easier if they remain within the same CGS. Analysis of changes in CGS and their respective costs should be especially worthwile.

A provocative issue concerns the efficient geographical borderline of CGS. Should countries such as Denmark, Switzerland or Holland have their own operator within a united Europe? Are the present borders of the Baby Bells efficient? Should there be seven, more or fewer? This issue could be researched for transactions with equipment manufacturers but also with service providers and customers.

The fourth question concerns the strategic management of hierarchies. Can they use the new construct when making decisions to integrate vertically or horizontally? As the new construct enables the analysis of transactions across different kinds of technologically separated assets, their attributes will vary in intensity, particularly for off-the-shelf type products or services compared to basic network installation. Large firms rushing to integrate forward towards new services for the consumer may find they lack the proper assets and skills and are not necessarily capable of integrating them at low transaction cost within their own hierarchy after acquisition.