

A New View of Scale and Scope in the Telecommunications Industry: Implications for Competition and Innovation ¹

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Abstract: Telecommunication economic analysis has largely relied upon a conventional economic framework that has its roots in neoclassical analysis that emerged almost a hundred years ago, and has contributed to reshaping the direction of economic policies by attacking the premises of the 1996 Telecommunications Act, and providing far greater leeway to incumbents, as well as challenging the economic efficiency of new entrants. Common approaches based upon a large number of simplifying assumptions that include, for instance, the idea that the technology is exogenous. Such hypotheses make little sense at a conceptual level. In addition, this idea is largely contradicted by the short period during which the sector achieved some level of competition around the 1900's and 2000. Not only have economists not thought about any number of such hypotheses, but they have also failed to consider how they might have an impact on their analysis. Evaluating a number of such issues in this paper, we are able to show how conventional economic analysis, uncritically applied to the sector, contributed to the undoing of the 1996 Telecommunications Act and of much of the competition it helped facilitate.

Key words: scale and scope, competition, telecommunications industry structure.

■ Introduction: the problem of scale and scope as a source of confused assumptions

The telecommunications industry continues to be dominated by a small number of established players, most of whom are incumbents. Yet, notwithstanding their continued dominant market position, the prospects of

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these players are troubling to financial analysts². These worries are fuelled by declining numbers of access line³ and declining prices in the traditionally more lucrative parts of the business in particular⁴. The uncertain financial position of dominant firms, operating in dynamic markets⁵ with seemingly limitless market opportunity, creates a strange incongruity that applied economic analysis is called upon to explain, but has not been able to so far.

At the same time, the legacy monopoly structure of the industry continues to exert considerable influence on today's market even though there has been a legislated end to most monopoly-endorsing public policies. This influence is rooted in the incumbent's sunk network, which already connects most of the population in its serving territory and which, in most cases, can be easily upgraded to newer technologies at a far lower cost than "evergreen" network builds by new entrants⁶. The financial realities have thwarted many new entrants, heralding the widespread bankruptcies among new entrants witnessed towards the beginning of this decade, even in the face of observations that these failed entrants did many things much more efficiently than incumbents⁷. The financial difficulties encountered by

² Consultants Analysys recently commented that: "Most operators are only just managing to balance costs and revenues in a market place that is now under intense economic pressure," noting specifically that in Europe: "Telecoms competition has been increasing steadily, but is only now beginning to affect the overall rate of growth. Fixed network operators are taking the brunt of this." (Analysys, 2004b). Typical of financial analyses is Deutsche Bank's Q2 review of the U.S. market: "The story was much more mixed on the wireline side. Although the RBOCs delivered better than expected revenues and EBITDA, most operating metrics declined faster than estimated" (Analysys, 2004a).

³ For example: "Two years ago, the regional Bells that were created by the 1984 AT&T break-up looked as if they would emerge as the winners of the telecom bust. As owners of the nation's local phone systems, they had what appeared to be a sure-fire advantage: direct lines into America's homes and offices. "Now, new technology is hurting the value of that network. The Bells have lost some 28 million local phone lines since the end of 2000 – a drop of more than 18% (*Wall Street Journal*, 2004, p. A1).

⁴ A Deutsche Bank analysis of the U.S. market stated, "We maintain that the market-clearing price for the local/LD [long distance] service bundle will collapse from the current typical USD50-55 level to USD 35-40 longer-term. Given that the RBOCs have an EBIT break-even level of USD 35 per switched access line, such a shift would have a devastating impact on profitability." (Wireline Services, p.2, 27 May 2004).

⁵ Industry estimates (by Telecommunications Industry Association, for example) claim the broader communications sector accounts for as much as one-seventh of the U.S. economy and telecommunications is expanding at a rate approaching a compound 9-10%.

⁶ In a recent U.S. government-sponsored study, the Computer Science and Telecommunications Board, National Research Council estimated that the transformation of the existing network to broadband can be accomplished for about 20% the cost of an "evergreen" network (National Research Council, 2002).

⁷ Examples of this can be seen throughout the functions performed to provide communications services, from laying conduit to creating and operating operations support systems, to basic

entrants have often been assumed to relate to presumed efficient scale and scope economies of incumbent networks. Yet, there is no direct evidence to substantiate such assumptions. On the contrary, it appears that such scale and scope assumptions boil down to a tautology at best. If sunk network technologies exhibit any scale and scope effects on a product level, we observe them as characteristics of technologies that were designed and adopted by the incumbent in response to the market structure specificity they operated in and over which in many, if not most cases, they were able to exert conscious choices different to those that might have been dictated by market efficiencies. The incumbent, as a monopoly, was absolved from any need to respond to market forces and instead could adopt network designs and develop technology that furthered its monopoly service mandate on some other basis. What we are therefore observing is the technology environment of a legacy monopoly and as such, there can be no assumptions that this technology is "efficient" in a market-honed economic or social welfare sense. Even if scale and scope economies within the technology of incumbent's "sunk" networks could be demonstrated, they would not have any necessary connection to efficiency. From the standpoint of economic welfare analysis, or even profit maximization in the use of assets, such observed economies would indicate only how to adjust the use of sunk assets, but not whether it would be better to use them differently, or to abandon them altogether.

The technology source of incumbent networks also has consequences for policy debate. A fundamentally changed policy from monopoly to competition requires a fundamentally changed governance structure. Not surprisingly, we observe policy makers and industry members attempting to steer policy changes towards a wide variety of often shifting goals such as the construction of alternative facilities, unbundling at "wholesale" rates, the redefinition of bottlenecks, etc. Much of this debate, however, is characterised by a discussion framework rooted in the legacy of the past, featuring scant economic analysis regarding the forward-looking impact of alternative policies on industry members, the evolution of markets and evolving social equity considerations⁸. The failure to pursue such an inquiry

task management. A survey of this phenomenon was presented to the Federal Communications Commission in a paper entitled, "Why Inefficient Incumbents Can Prevail in the Marketplace over More Efficient Entrants: An Analysis of Economies of Scale and Scope, Transaction Costs, and the Misuse of Data", BOURDEAU de FONTENAY Alain & SAVIN A. Brian, 2003, filed in FCC Docket 01-337.

⁸ The "governance structure" of a sector must not be equated with the narrow concept of industry-specific regulation, although the concepts are related. All markets exist pursuant to a

has as adverse an impact on would-be entrants, incumbents, consumers and the capital markets as policy makers themselves. Without a basic understanding of where a changed policy is heading, the policy transition itself becomes a blur and business risk assessments become harder to manage⁹. In the worse case scenario, if business risk rises to the level of utter uncertainty, capital will flee the sector.

Consequently, even though incumbents have mostly survived the maelstrom of this sector's recent financial history, they must still compete for investors with every other sector. If policy uncertainty or a perceived lack of adaptation to market changes prevent their efficient use of capital in a forward-looking economic sense, they will ultimately be punished in their financial results¹⁰. Here we will unravel the problem of scale and scope analysis to show how a misguided approach to the problem has distorted markets and regulation, as well as severely affecting competition. In an accompanying paper, we also show how an alternative approach to modelling will stimulate innovation and provide guidance for the forthcoming restructuring of the industry. We will begin with a new reading of telecommunications history and then move on to discuss analytical approaches (BOURDEAU de FONTENAY & LIEBENAU, 2005). We conclude with a discussion of the effects on innovation and industry restructuring.

The central problem inhibiting a better understanding of the scale and scope of market forces currently at work today may well be the incumbents' perception of themselves – their market position and challenges. Incumbents (and indeed most others in the industry, even policy makers with whom incumbents feel eternally at loggerheads) naturally continue to look at the legacy of vertical (and horizontal) integration as the way to control the environment, including what incumbents perceive as the two primary sources of uncertainty: competition and innovation. In view of the longstanding mindset of monopoly and service obligation, the difficulty of

governance structure that informs, guides and enforces trading within them. A particular market's governance structure may be more or less industry specific. In telecommunications the governance structure has historically been monopoly centric, a kind of *ex ante* regulation of the monopoly that goes beyond general-purpose economic regulation.

⁹ Economic sociologists have been much more alert than economists in identifying the central role stability plays in a firm's objective function (FLIGSTEIN, 2001).

¹⁰ As one major investment bank recently observed in discussing the next-generation network build options of American RBOCs, "...We believe there are no easy solutions to the challenges facing the RBOCs. One essentially must make a choice between several highly uncertain and potentially dilutive outcomes." DB North America analysis, November 11th, 2004.

evaluating that environment, and established success in dealing with their historical environment, it is understandable that incumbent firms today continue to allocate substantial resources to protect their legacy (POSNER, 1975) ¹¹.

Nevertheless, established firms now face a highly complex adjustment process that will force them to think and act in terms of fundamentally new models brought about by increasing collateral entry and innovation. In a dynamic market environment, delay in recognizing new and newly possible models increases financial risk and limits profit opportunities.

■ Monopoly defines technology, efficiency assumptions about legacies are unwarranted; a new reading of telecommunications history

Economists generally assume that the technology of any industrial sector is state-of-the-art and known to all, and that firms are bounded and formed by the dimensions of that technology (BOWLES, 2004). In other words, technology causes firms to look the way they do. The choice of technology is presumed efficient, reflecting the firm's incentive to maximise profit and is seldom scrutinized for form by economists. On this basis, we have come to assume (since SRAFFA, 1926) that a sector with few large firms, often a single monopoly, has to reflect the economies of scale inherent in the technology of the sector. Applied to telecommunications, the presence of such economies of scale justifies both the size and staying power of incumbents and why there is not more local competition provided by other firms.

On the contrary, there is every reason to believe that the assumed relationship between technology and firms has worked the other way around in telecommunications. Here, the monopoly selects and shapes the technology to serve its own interests. If the technology is endogenous, that is, if it becomes a strategic variable managed by the firm in pursuit of its own private objectives, then the technology we continue to observe throughout existing concentration in the sector cannot be presumed to be socially

¹¹ Even unwitting internal decisions, taken on a business as usual basis, can influence technology and market organization in a transition environment in ways that may not inure to the benefit of the firm making those decisions (BULLOCK, 1901; STIGLER, 1971; LEE, 1998).

efficient, even if it could be efficient for the firm itself. Indeed, it is generally the case that a monopoly largely determines technology to meet its needs. Once the efficiency of technology assumption erodes, so does the efficiency of any apparent scale and scope economies. With an endogenous technology, observed scale and scope economies reflect a market structure-specific private economic efficiency at best. It may be nothing more than a technology the firm selected with the goal of fostering a technological path that shelters it from the risk of competition. In other words, such path dependence may create an entry barrier that increasingly obstructs competition and undermines the socially efficient allocation of assets.

This situation is clearly illustrated by the history of telephony, where systems and entities were built and organized pursuant to a policy design that worked outside of competitive market forces – the franchised or government controlled monopoly. However, it does not follow that, at least in the case of telecommunications, the structures and technology are, from a market perspective, efficiently produced. Telephone networks were built to fulfil a firm-level planned ubiquitous service policy expectation, and were not built in response to competitive market pressures.

The difference can be easily illustrated by an activity as basic as dialling a telephone number. From the standpoint of a monopoly serving a large metropolitan area, it might be "efficient" administration to adopt a seven, eight or even ten-digit dialling requirement¹². However, people living in neighbourhoods might well find added value in remembering and dialling only three or four numbers to reach their neighbours. Indeed, short dialling was one of the "instant" innovations included in competitive PBX equipment. This one example illustrates that, had the market ruled from the beginning, even the simplest technology might have looked different than it does today. Efficient technology for the monopolist may not be welfare enhancing from the standpoint of society or an economic analysis grounded in competition.

The numbering example illustrates the dimensions of the problem of how to transform this formerly monopoly sector into an effectively competitive one that can efficiently innovate, and why this understanding is important to investors, incumbents and policy makers alike. Blauvelt's dialling plan was a significant invention that went far beyond accommodating more subscriber addresses. With his system individual subscribers no longer controlled the

¹² W.G. BLAUVELT of the American Telephone and Telegraph Company developed the seven-digit dialling plan in 1917.

routing of their calls. The first three digits represented an address for an AT&T switch. That switch would then take control of the call and route it in the manner most efficient from the standpoint of AT&T's network. In other words, trunking became divorced from the customer's dialling and became governed by the telephone company, not the customer. Understanding this simple invention, how it came about and was implemented, and the underlying assumptions of technology that stemmed from it helps us to recognise the continuing primary role of the incumbent in developing technology throughout the monopoly period and even in today's market.

The telephone business started in 1877 as a monopoly built on a series of Bell patents, but the original monopoly did not survive after their expiration. By the early 1900s, the United States had over 3,000 telephone operators and in 1907 competitors already controlled 51% of the telephone market. The situation alarmed the Morgan banking interests who, by then, financed and controlled AT&T. In 1907 they named Theodore Vail to head a revamped AT&T¹³. Vail's approach was an acquisition strategy designed to expand the company's reach across the country, to reverse its market losses, and to protect it from the uncertainties of competition (BORNHOLZ & EVANS, 1983; TEMIN, 1987). Vail leveraged AT&T's control over key long distance patents, hence, over long distance interconnection to get this new foothold¹⁴. In 1908, he coined the motto: "One System, One Policy, Universal Service" in a campaign to placate the government's antitrust concerns¹⁵ and in 1913 successfully negotiated the Kingsbury Commitment with the federal government, essentially gaining government acquiescence to the Bell monopoly.

At that time, economists generally saw a clear dichotomy between utility-type monopolies and other types of monopolies. The idea that some sectors have unique economies of scale dates back to John Stuart Mill (BULLOCK, 1901) at least. Debates tended to deal more with whether the sector was

¹³ Vail worked as general manager and then CEO of the Bell Company in 1878-1887 (OGLE, 1980). This time, he would stay until 1919.

¹⁴ BROCK (1981) documents how the AT&T system has used its patents to maintain its market power throughout its history.

¹⁵ This motto effectively conveyed the AT&T perspective that a commitment by a centrally-managed, centrally-owned network to connect virtually everyone in its territorial reach was the efficient way to go from an economic policy perspective, thus confronting the government's antitrust-based challenge to its acquisition policy directly. His usage of "universal service" differed from what later was known as "universal service" in that he used it as a reminder that only the Bell System could provide long distance services.

best managed as a public or private utility. Vail's solution was original, elegant and generally accepted as in line with thinking at the time.

As a result of Vail's business strategy, and AT&T's successful sale of its policy to state and federal governments, the Bell System's control of the sector became almost complete. AT&T used its market power both to set standards and practices and, of course, to dictate prices¹⁶. It ended the practice of requiring customers to provide their own inside wire and hook-up points and took over that function. TEMIN (1987), among others, tells us that the integration of the telephone set as a part of the telephone network was not so much, "Because there were joint costs," but, "Precisely because it was so easy for anyone to make a telephone set that Bell could never hope to police licenses for their manufacture." Vail's genius was not just to convince the government that telephony was a utility, it was also to define that utility as the complete, end-to-end system, a system that remained the most vertically integrated utility through time. There was no implication that the "one system" Vail was talking about was subject to technological constraints. The idea that technology was a constraint on the market potential of the sector is an "afterthought" that was introduced much later. On the other hand, VAIL was certainly, like Ford, among those who best understood Bullock's "law of economy in organization" (1902). Consequently, throughout the decades, AT&T political disputes were waged with the objective of preserving the entity's integration strategy.

AT&T's integration strategy never had anything to do with the kind of calculus described by Coase in his research of 1937 (1988) and WILLIAMSON (1971). Their work establishes the boundary between what is purchased by a business enterprise on the market and what is integrated within the (telephone) company based on what is most efficient, using a competitive market benchmark. Under normative analysis, a firm that integrates a function that is more efficiently produced within a competitive market will put itself at a cost disadvantage vis-à-vis its competitors¹⁷. AT&T's all-encompassing structure essentially precluded the existence of such a competitive market benchmark and shielded it from market discipline. Vail's "one system" became the foundation on which the Bell System's culture emerged and, through time, created the routines that still permeate

¹⁶ Most operators saw no alternative, but AT&T's monopoly pricing was such that telephone companies in Canada decided to build their own transcontinental line instead of having to rely on AT&T, and more generally, submit to its terms and conditions (OGLE, 1980).

¹⁷ Correspondingly, the market is the prerequisite to ensuring that vertical integration is efficient.

the management process, as well as negotiations with the government (GRANT & LIEBENAU, 2000) ¹⁸. It also created legacy technologies that still make it difficult for new entrants and also inhibit innovation by incumbents themselves in ways that a few are only just beginning to appreciate.

Most of the early historical experience with competition is centred in North America. However, there are some experiences elsewhere, especially in Scandinavia, that can enlighten us as to the market potential of telecommunications. In Sweden, competition became so intense with the end of the Bell patents that AT&T decided to pull out of the country. At the time, telephone rates were lower in Stockholm than they were in U.S. cities, a trend that continued for decades. This pricing advantage was achieved in spite of the supposed benefits of economies of scale and scope ¹⁹.

After the Bell exit, a latecomer in the Swedish telephone sector, the telegraph company Televerket, was able to leverage its technological control over long distance services together with its existing infrastructure of poles, to gain control over a growing number of competitors, generally following the pattern of AT&T. Only recently have regulation and interconnection requirements arrived ²⁰. Yet here, too, there is no evidence that scale and scope played a role in the costs or industry structure of Swedish telecommunications.

In 1923, Clark concluded that "[t]elephone companies... show no signs of economy with increased size, but rather the opposite" ²¹. Today, a small minority of economists argue that those economies are not playing a role that is all that significant (ROSSON & TEECE, 1997). Nevertheless, economists rarely challenge the assumed existence of those economies (TEECE, 1995). In the absence of proof of scale and scope economies,

¹⁸ Sengupta's (2001) brilliant analysis considers those same dimensions in a far more complex process over a much longer historical period.

¹⁹ There are numerous other examples around the world that are consistent with the Swedish experience such as Edmonton Telephone (now part of AGT) in Canada, Kingston Communications in the U.K., and Rochester Telephone (today's Frontier) in the USA, all small operators that were commercially successful and generally more innovative than the major incumbents.

²⁰ The first obligation to interconnect came in the early 1980s, when Televerket was forced by the government to interconnect with the second cellular license. Regulation came in the early 1990s when the Swedish incumbent started to implement its competition policy.

²¹ CLARK's (1923) *Studies in the Economics of Overhead Costs* (p. 321) cited by THIERER (1994).

there is no basis for assuming that incumbents' structures and their current organization of assets are performing efficiently.

■ Analytical framework: policy change, innovation and investment

Policy makers, investors and financial analysts have a lot in common with a CEO running a business. The CEO is obliged to make the most efficient use of the assets investors have assigned to the management's care to maximize profits, excluding agency problems. Use of investments and innovation are the tools of this trade, and assessment of their use serves as the benchmark for financial analysts in their evaluation of management performance. Similarly, policy makers engage in economic regulation to foster greater economic efficiency and social welfare. Public investment and innovation are also the tools of that trade, although policy makers frequently do not recognize the extent of the investment required to effect a policy, or understand that innovations in government conduct are required to effect the desired goal's implementation. In a dynamic environment the challenge is to recognize opportunities and problems as they arise and the assumptions we hold, especially about scale and scope, make huge differences to the conclusions we arrive at.

One of the best ways to disaggregate the monopoly structure is to look at the existence, *vel non*, of wholesale markets and understand their importance and the problems standing in the way of their creation. To begin with, there is no basis for assuming that the traditional monopoly vision of end-to-end service provisioning is a natural and inevitable product of technology. There are literally thousands of functions that take place to build and operate networks and provide different services, and for many of them, improvements to economic efficiency could arise from desegregation. For immediate discussion purposes, we refer to all these intermediate functions (and potential markets) together under the heading of "wholesale markets".

The idea of wholesale markets in telecommunications emerged only once the sector had been privatized and opened up to free entry/exit. For incumbents, the wholesale concept did not begin as a means of fostering greater profits, but as a forced response to policy changes. If a highly integrated, former monopoly was now to face competition, would-be competitors needed to have the technological means of getting to

customers. To a large extent, there was only one practical source of that technological means – the incumbent. Additionally, over the years the incumbent had incorporated into itself all the many intermediate functions of providing telephony, from laying of conduit to network and equipment design, to creating standards for interconnection. So there were few substitutes not only for the incumbent's network, but also for many of the intermediate functions necessarily involved in providing communications to end-users.

The question for incumbent management became, is there greater profit to be gained by cooperation or is this policy change only a question of sharing "my" existing market with others? If there are considerable legacy scale and scope forces at work, then new entrants add little value by expanding markets, but only compete for a market already served "efficiently" by the incumbent, given the existing technological path. The question for would-be investors in entrants becomes, what is the cost/risk associated with investment in this market? Is the regulator up to the task at hand? The question for policy makers becomes, what is required of us to make open entry model feasible? Wholesale access to incumbents' resources appeared obvious, but there was little understanding of what specifically was going to be required to realize this change of policy or what the consequences of it all would be.

At the core of this set of problems lies the question of scale and scope. If large, exogenous economies of scale and scope exist, then a policy that forces competition where it conflicts with technology is a policy that imposes inefficiency, is wrongly conceived, and cannot be implemented without constant intervention. KNIGHT (1925) and SRAFFA (1926) were among the first to clearly analyse such a situation. However, where there are not significant scale and scope economies, then the monopolization of a sector is inefficient and the reluctant incumbent's vertically integrated structure obstructs innovation and market growth. In the latter case, an incumbent's integrated structure, focused on providing a limited set of end-user services, is an albatross for itself, as well as for public welfare. Preserving its monopoly will limit the capital applied to the sector and thus also its market growth and opportunity. Indeed, in a dynamic market setting, the incumbent continually needs to examine its market opportunities and even rethink its structure. Following STIGLER (1951), as well as recent work on innovation and vertical disintegration by experts like CHRISTENSEN (2000), if we think of the incumbent as a collection of assets, in a dynamic setting, these assets look less attractive as a vertically integrated monolith. They are more usefully evaluated as a conglomerate of businesses that it may, or may not

make sense to be engaged in and which may, or may not be maximising their profit potential. So, the scale and scope issue is one of the most fundamental of questions for all parties.

■ Guideposts on scale and scope from economics

Existing quantitative findings do not support the conclusion that large scale and scope economies exist within the telecoms firm. Yet there is much work built upon assumptions that they exist (STEHMAN, 1925; KAHN, 1971; MITCHELL & VOGELSONG, 1991; BAUMOL & SIDAK, 1994; HARING, 2002; SPILLER, 1999; LAFFONT & TIROLE, 2000; ARMSTRONG, 2002; National Research Council, 2002; SPULBER & YOO, 2003)²². Most of this work is general and not intended to offer pragmatic guidance for business and policy decision-making. However, if it were applied to practical questions of telecommunications business planning and policymaking, this body of work could mislead in critical ways.

Most definitions of competition in telecommunications are based on concepts of models that consider a single entrant that is essentially trying to duplicate what the incumbent is doing. Such a "monopoly-centric" approach is an easy path of analysis and is consistent with the hypothesis of a technology that is exogenous and known to all. It focuses on incremental changes to the established environment and uses the knowledge base associated with the status quo. Yet the change of policy that drives the need for new modelling is far more than just an incremental change. It is what Schumpeter saw as an innovation, and in such cases, it is the official responsible for policy implementation: "Who as a rule initiates economic change, and consumers are educated by him if necessary; they are, as it were, taught to want new things"²³. The official who implements the policy, and the investors and incumbent managers who have to deal with it, must face a world that does not have a concept of what competition might mean in this case other than to realise that it must be something different from what people are used to. Consumers, for their part, are not in a position to

²² Crandall, for instance, noted in 1988 that, "Despite the popular belief that the telephone network is a natural monopoly, the AT&T monopoly survived until the 1980s not because of its naturalness, but because of overt government policy."

²³ Schumpeter's 1911 book translated in 1934 under the title *The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle* as cited by SWEDBERG (1991), p. 35.

imagine what a maturely competitive telecommunications environment may mean for them. They may imagine lower prices, but how much lower? What kinds of new services they can expect?

If there was no knowledge available relating to the kind of environments competition could bring about in telecommunications, it might be impossible to imagine the competitive environment other than with monopoly-centric environment biases.

In general it is possible, by combining observations and analogies from other sectors, to gain some insight into what that new environment could be like and the business strategies that might be successful in harnessing new opportunities. One useful approach is to look at the process of desegregation that competition brings about when applied to other monopoly sectors. STIGLER (1951) describes the process of vertical disintegration and innovation that accompanies competition and it is possible to observe some elements of the process he describes in telecommunications, both during the competitive period around 1900 and the modern competitive period. For instance, in France the regional independent construction companies used by France Telecom, as well as its competitors build significant portions of France Telecom's local infrastructure. Those companies evidently have a comparative advantage in construction, facilities management and maintenance over the construction departments integrated into the legacy service companies. It did not take long for new entrants to discover that there were a wide range of rights-of-way and properties available that, with some imagination, could be used more cheaply than the methods incumbents continue to use²⁴. That implies that there is the potential for a commercial market place for rights of way and construction that is broader than telecommunications and can be more efficiently pursued as an independent activity.

²⁴ In North America, incumbents had been sharing poles with public utilities for a long time. However, that appears to be more of an administrative than an economic matter. For example, they never managed the communication space on poles as a commercial activity. They had to be mandated by federal legislation to share those facilities with cable operators and, since 1996, with new entrants. This sharing has been far less common in other parts of the world. The fact that many of those alternatives were cheaper helped new entrants, but did not necessarily provide them with a competitive advantage over incumbents. Entrants still had to link those other rights-of-way so as to be able to achieve a complete network reaching the desired nodes. In the absence of a well-developed specialized construction market, the linking of those piece parts was still a costly endeavour.

Once the monopoly-centric bias of data is understood, then little of the recent analysis that has been applied to explain the plight of competition in the sector makes sense. For example, virtually every existing study of new entrants' investment incentives, including the innovation dimension of those incentives, implicitly uses a monopoly as the benchmark. As a result, they deal in aggregate with the firm and cannot disaggregate the layers of infrastructure that constitute the network. (JORDE, SIDAK & TEECE, 2000; HARING *et al.*, 2002; CRANDALL, 2002; BREYER 2004) ²⁵.

■ Conclusion: "scale economies", integration and functional disintegration

Economies of scale and scope, and vertical integration are at the heart of STIGLER's (1951) demonstration that the division of labour need not lead to monopolies and therefore we understand that organizational choices require skilled and informed management. Stigler, as well as SRAFFA (1926), demonstrated that economies of scale and scope cannot be considered independent of the vertical integration of tasks ²⁶.

Higher production levels make it possible to use more efficient production techniques, a cornerstone of the theory of the division of labour, a dimension upon which CHANDLER (1990) built his analysis of the emergence of increasingly large and, eventually, multifunctional and multiproduct firms. TIROLE (1988) tells us that engineers confirm Chandler's results. Sraffa's observation was that most firms could increase their output substantially without increasing their per-unit cost and, potentially, with the possibility of reducing it further. BESANKO *et al.* (2000) discuss the L-shaped curve as being far more common than the Viner's U-shaped curve and remarks that, "In reality, large firms rarely seem to be at a substantial cost disadvantage relative to smaller rivals" (p. 73). Those economies are not necessarily

²⁵ Those studies are all based on a conventional investment analysis as applied to a mature firm competing in a mature and fully competitive static sector, a sector largely free of innovation. New entrant investment through venture capital is naturally based upon a totally different model (OECD 2002-present; ROBERTSON & GATIGNON, 1998; HELLMAN & PURI, 2000, 2002; SAHLMAN, 1990; MARTIN & SUNLEY, 2003). CHRISTENSEN (1997 and 2000) has studied the danger of applying conventional investment analysis to innovations and new ventures.

²⁶ "In classical economics... the law of increasing returns... was much less prominent, as it was merely regarded as an important aspect of the division of labour, and thus rather as a result of general economic progress than an increase in the scale of production." (p. 537).

abstract assumptions, but may be associated with concrete factors such as Robinson's "economies of mass reserves." However, care must be taken in applying these observations to a sector not maturely competitive, such as telecommunications, where the economies engendered by great size are less likely to have been the result of efficient technology (insofar as they exist at all).

Economies of scale and scope are properties that are associated with technology, the organisation of technology and the technology of the organisation. Moreover, as Tirole points out: "Returns to scale have their limits." BESANKO *et al.* (2000) identify capacity bottlenecks, as well as agency problems as possible contributors to the eventual emergence of diseconomies of scale in a firm. They identify:

"[...] four major sources of economies of scale and scope economies: indivisibilities and the spreading of fixed costs, increased productivity of variable inputs (mainly having to do with specialization), inventories, [and] the cube-square rule" (p.75).

All of those sources imply some limits to those economies of scale and scope at any point in time or over a finite time period. They do not justify a blank assertion regarding the economies of scale and scope of telecommunication operators. Interestingly, three of those determinants refer not to the firm, but rather to the kind of activities Stigler identifies within a firm that is by the normal, proper definition correctly vertically integrated.

References

Analysys:

- (2004a): "Indian Summer at High Noon", August 9th 2004.
- (2004b): "Industry Comment: Telecom Trends".

ARMSTRONG Mark (2002): "The Theory of Access Pricing and Interconnection", in CAVE Martin, MAJUMDAR Sumit Kumar & VOGELSANG Ingo (Eds.), *Handbook of Telecommunications Economics: Structure, Regulation and Competition*, New York: North-Holland.

BAUMOL William J. & SIDAK J. Gregory (1994): *Toward Competition in Local Telephony*, Cambridge, MA: MIT Press.

BESANKO David, DRANOVE David & SHANLEY Mark (2000): *Economics of Strategy*, 2nd edition, New York, NY: John Wiley & Sons.

BROCK Gerald W. (1981): *The Telecommunications Industry: The Dynamics of Market Structure*, Cambridge, MA: Harvard University Press.

BORNHOLZ Robert & EVANS David S. (1983): "The Early History of Competition in the Telephone Industry", in EVANS David S. (Ed.), *Breaking Up Bell: Essays on Industrial Organization and Regulation*, New York: North Holland.

BOURDEAU de FONTENAY Alain, CHAVES Bruno & SAVIN Brian (2003): "Why Inefficient Incumbents Can Prevail in the Marketplace Over More Efficient Entrants: An Analysis of Economies of Scale and Scope, Transaction Costs and the Misuse of Data", Working Paper presented at Columbia University, ATOM, Sorbonne-Université de Paris I, January and February 2003.

BOURDEAU de FONTENAY Alain & HOGGENDORN Christiaan (2005): "The Economics of Vertical Integration: Adam Smith, Allyn Young, and George Stigler", Working paper and CITI Workshop Reforming Telecom Markets: A Commons Approach to Organizing Private Transactions, New York: Columbia University, at: <http://www.citi.columbia.edu>

BOURDEAU de FONTENAY Alain & LIEBENAU Jonathan:

- (forthcoming): "Modelling Scale and Scope in the Telecommunications Industry: Problems in the Analysis of Competition and Innovation", in *COMMUNICATIONS & STRATEGIES*.
- (forthcoming): "Innovation in Telecommunications: the Judicial Process and Economic Interpretations of Costing, Transacting and Pricing".

BOWLES Samuel (2004): *Microeconomics: Behavior, Institutions, and Evolution*, Princeton, N.J.: Princeton University Press.

BREYER Stephen (2004): *Economic reasoning and judicial review*, AEI-Brookings Joint Center 2003 Distinguished Lecture. Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies.

BULLOCK Charles J. (1901): "Trust literature: A survey and a criticism", in *Quarterly Journal of Economics*, 15 (2), pp. 167-207.

CHANDLER Alfred D. Jr. (1990): *Scale and Scope: The Dynamics of Industrial Capitalism*, Cambridge, MA: Bellknap.

CHRISTENSEN Clayton M. (1997): "Making Strategy: Learning By Doing", in *Harvard Business Review*, November-December.

CHRISTENSEN Clayton M. (2000): *The Innovator's Dilemma*, New York, N.Y.: Harper Business.

COASE Ronald H. (1988): "The Nature of the Firm", reprinted from *Economica*, 1937 as Chapter 2 in *The Firm, The Market, and the Law*, Chicago, IL: The University of Chicago Press.

CRANDALL Robert W.:

- (1988): "Surprises with Telephone Deregulation and with AT&T Divestiture", in *American Economic Review*, 78 (2), 323-327.

- (2002): "An Assessment of the Competitive Local Exchange Carriers Five Years after the Passage of the Telecommunications Act", in *Criterion Economics*, June 2001, revised January 2002.

Deutsche Bank (2004): *Newsletter*, November.

ECONOMIDES Nicholas (1997): "The Tragic Inefficiency of the M-ECPR", Working Papers 98-01, New York University, Leonard N. Stern School of Business, Department of Economics.

FLIGSTEIN Neal (2001): *The Architecture of Markets: An Economic Sociology of Twenty-First-Century Societies*, Princeton, N.J.: Princeton University Press.

GRANT Gerard & LIEBENAU Jonathan (2000): "The Strategic Dimensions of Information Systems Capability: An Evolutionary and Resource-based View", Typescript.

HARING John (2003): "Telecommunications", in *The Concise Encyclopedia of Economics*, at: www.econlib.org/library/Enc/Telecommunications.html (January 2003).

HELLMANN Thomas & PURI Manju (2000): "The Interaction between Product Market and Financing Strategy: The Role of Venture Capital", in *The Review of Financial Studies*, 13 (4), 959-984.

HELLMANN Thomas & PURI Manju (2002): "Venture Capital and the Professionalization of Start-up Firms: Empirical Evidence", in *Journal of Finance*, 57 (1), pp. 169-197.

JORDE Thomas M., SIDAK J. Gregory & TEECE David J. (2000): "Innovation, Investment, and Unbundling", in *Yale Journal on Regulation*, 17 (1), pp. 1-37.

KAHN Alfred E. (1971): *The Economics of Regulation: Principles and Institutions*, Cambridge, Mass.: The MIT Press.

KNIGHT Frank H. (1925): "On Decreasing Cost and Comparative Cost", in *Quarterly Journal of Economics*, 39 (2), pp. 331-333.

LAFFONT Jean-Jacques & TIROLE Jean (2000): *Competition in Telecommunications*, Cambridge, MA: MIT Press.

LEE Kong-Rae (1998): *The Sources of Capital Goods Innovation: The Role of User Firms in Japan and Korea*, Amsterdam: Harwood Academic Publishers.

MARTIN Ron & SUNLEY Peter (2003): "Deconstructing Clusters: Chaotic Concepts or Policy Panacea?", in *Journal of Economic Geography*, 3, pp. 5-35.

MITCHELI Bridger M. & VOGELSANG Ingo (1991): *Telecommunications Pricing: Theory and Practice*, New York: Cambridge University Press.

National Research Council, National Academy of Science (2002): *Broadband: Taking Home the Bits*, Computer Science and Telecommunications Board, Washington, D.C.: National Academy Press.

OGLE E.B. (1980): *Allô, l'interurbain! L'histoire du réseau téléphonique transcanadien*, Montréal, Canada: Editions Pierre Tisseyre.

POSNER Richard A. (1975): "The Social Costs of Monopoly and Regulation", *Journal of Political Economy*, 83, 807-827.

ROBERTSON Thomas S. & GATIGNON Hubert (1998): "Technology Development Mode: A Transaction Cost Conceptualization", in *Strategic Management Journal*, 19 (6), pp. 515-531.

ROSSTON Gregory L. & TEECE David J. (1997): "Dynamics of the New Local Telecommunications Markets", in NOAM Eli M. & WOLFSON Alex J. (Eds), *Globalism and Localism in Telecommunications*, Amsterdam: Elsevier Science, pp. 1-26.

SAHLMAN William (1990): "The Structure and Governance of Venture Capital Organizations", in *Journal of Financial Economics*, 27, pp. 473-521.

SCHUMPETER Joseph A. (1934): *The Theory of Economic Development*, Cambridge, MA: Harvard University Press (first published in German in 1911).

SENGUPTA Nirmal (2001): *A New Institutional Theory of Production: an Application*, New Delhi: Sage Publications.

SPILLER Pablo T. (1999): "Institutions and Commitment", in CARROLL Glenn R. & TEECE David J. (Eds), *Firms, Markets, and Hierarchies: The Transaction Cost Economics Perspective*, New York, NY: Oxford University Press.

SPULBER Daniel F. & YOO Christopher S. (2003): "Access to Networks: Economic and Constitutional Connections", in *Cornell Law Review*, 88.

STEHMAN J. Warren (1925): *The financial history of the American Telegraph and Telephone Company*, Boston, MA: Houghton Mifflin.

SRAFFA Piero (1926): "The Law of Returns Under Competitive Conditions", in *Economic Journal*, December 1926.

STIGLER George J.:

- (1951): "The Division of Labour is Limited by the Extent of the Market", in *The Journal of Political Economy*, 59 (3).

- (1971): "The Theory of Economic Regulation", in *Bell Journal of Economics and Management Science*, 2, pp. 3-21.

SWEDBERG Richard (1991): *Schumpeter: A Biography*, Princeton, N.J.: Princeton University Press.

TEECE David J. (1995): "Telecommunications in Transition: Unbundling, Reintegration, and Competition", in *Michigan Telecommunications Technology Law Review* 47, at: <http://www.mttl.org/volone/teece.html>.

TEMIN Peter (1987): *The fall of the Bell System*, Cambridge, MA: Cambridge University Press.

THIERER Adam D. (1994): "Unnatural Monopoly: Critical Moments in the Development of the Bell System Monopoly", 14 (2).

TIROLE Jean (1988): *The Theory of Industrial Organization*, Cambridge, MA: MIT Press.

WILLIAMSON Oliver (1971): "The Vertical Integration of Production: Market Failure Considerations", in *American Economic Review*, 61, pp. 112-125.