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Structural Separation versus Vertical Integration:

*Lessons for Telecommunications from Electricity Reforms**

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Bronwyn Howell, Richard Meade & Seini O'Connor**

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**Bronwyn Howell is Acting Director and Research Principal at the ISCR, and Director of the Certificate of Management Studies and the Diploma in Business Administration at the Victoria Management School, Wellington, New Zealand. bronwyn.howell@vuw.ac.nz. Richard Meade is a Research Principal at the ISCR, and Principal of Cognitus Advisory Services Limited. richard.meade@cognitus.co.nz. Seini O'Connor is a Research Fellow at the ISCR.

Abstract

Structural separation between network and retail functions is increasingly being mandated in the telecommunications sector to countervail the market power of incumbent operators. Experience of separation in the electricity sector offers insights for telecommunications. Despite apparent competitive benefits, the costs of contracting increase markedly when short-term focused electricity retail operations are separated from longer-term generation infrastructure investments (which require large up-front fixed and sunk cost components). The combination of mismatches in investment horizons, entry barriers, and risk preference and information asymmetries between generators and retailers leads to thin contract markets, increased hold-up risk, perverse wholesale risk management incentives, and bankruptcies. Direct parallels in the telecommunications sector (e.g. separated retail and infrastructure functions) indicate exposure to similar complications, intensifying many of the contractual risks arising from regulated access arrangements. In both sectors, competition between vertically integrated providers appears more likely to efficiently and sustainably induce both investment and competition than separation.

1. Introduction

Structural separation between wholesale and retail functions is increasingly being mandated in telecommunications sectors around the world. Electricity sectors—which share many features in common with telecommunications—have long experience with structural separation, which has commonly arisen as a key element of sector liberalisation. Notably, while integrated electricity operators may have been an artificial "norm" pre-liberalisation, vertical integration is now rapidly re-emerging—where it has been permitted—in response to failings in wholesale-retail contracts (a necessary concomitant of structural separation). These failings have manifested themselves in poor wholesale price and quantity risk management, problems of adverse selection and strategic bargaining in the presence of asymmetric information and market power, forestalled investment (undermining supply insecurity), and company failures. Research into structural arrangements in the electricity sector increasingly suggests that vertical integration between wholesale and retail functions is the more natural and resilient industry structure. Indeed, vertical integration supports investment, mitigates market power, and sustains competitive retail entry. Research also highlights the (potentially destructive) role of excessive retail-level competition in undermining contracting, investment, and durable retail competition.

What lessons can be learned for telecommunications sectors from the experience of contracting and re-integration in electricity sectors? Do telecommunications sectors share the important characteristics that complicate contracting (and hence structural separation) in electricity sectors? If they do, is vertical integration the natural response for telecommunications, as it appears to be for electricity? Or are the other interventions sometimes suggested for electricity, such as regulating for contracts, to be preferred? The debate between structural separation and vertical integration in each sector highlights important questions about the optimal degree and durability of retail competition, optimal arrangements for managing risks and mitigating

market power and asymmetric information, the importance of the trade-off between static and dynamic efficiency, and the relative efficacy of endogenous and regulated approaches to industry restructuring.

In this paper we argue that structural separation in telecommunications suffers from a number of the key problems that complicate contracting in electricity, as well as its own industry-specific problems. Furthermore, we argue that vertical (re-) integration in telecommunications is a preferable solution to problems of wholesale market power, asymmetric information, and of sustaining retail competition, as it is in electricity. It also better supports investment, and hence dynamic efficiency. We also argue that integration—for both electricity and telecommunications—is a preferable contracting solution to interventions such as regulating for contracts . Short-term efficiency gains may be realised from separation, but at the expense of long-term investment and with the risk of unsustainable retail competition. Hence, while the aims of separation are sound, integration may in fact better serve their achievement.

The paper is structured as follows. Section 2 discusses economic theories of ownership and the boundary of the firm. Section 3 summarises the aims and experience of structural separation and contracting in a sample of restructured electricity sectors, highlighting the features of electricity systems that have complicated contracting. It then discusses the re-emergence of vertical integration in response to these complications, emphasising the features of integration that make it preferable to contracting. Section 4 applies these lessons in the context of selected telecommunications sectors. Common features shared with electricity—as well as those distinguishing telecommunications from electricity—are surveyed. Arguments both for and against vertical integration, as an alternative to contracting, are presented. Section 5 discusses the resulting policy implications.

2. Separation versus Integration—the Theory

Following Coase (1937) and Williamson (1985), transaction cost economics offers insights into why economic activities are organised internally (within firms) or externally (mediated by transactions in markets).[1] Under this approach, economic activities are presumed to be undertaken through market transactions (either spot trading, or longer-term contracting) unless the costs of such transactions favour internal organisation within firms. The costs of market transacting include:

- transaction costs (especially with repeated transactions),
- contractual incompleteness and bounded rationality (e.g. when it is hard to predict uncertain demand growth),
- costs of contractual hold-up (parties renegotiating or reneging on commitments, and stranding long-term and/or relationship-specific investments of their counterparties),
- costs of market power imbalances between transacting parties (especially in the presence of asymmetric information), and
- costs of regulation (such as compliance costs, costs of distorted investment incentives, regulatory hold-up risks, and possibly inefficient pricing).

The transaction costs economics literature also sheds light on why some firm patrons—such as capital providers, suppliers, and customers—are more natural owners of a given firm (Hansmann, 1996). Ownership of a firm naturally falls to those patrons enjoying the lowest combined costs of

[1] For a fuller presentation of our analytical framework, the problems of contracting in electricity sectors, and reasons why vertical integration is emerging as a solution to these problems, see Meade and O'Connor (2009). Related discussions can be found in Finon and Perez (2008), and Chao, Oren & Wilson (2005).

ownership and market contracting. Thus, firms integrate—either vertically (upstream or downstream) or horizontally (across activities in different supply chains)—when the costs of market contracting exceed those of ownership. Ownership costs include agency costs, the costs of collective decision making, and the costs of risk bearing (i.e. diversification and capital access in imperfect capital markets).

Of course, how firms integrate or de-integrate (vertically separate) *in practice* involves additional considerations of political economy.

3. Lessons from Electricity Sector Reforms

Historically, electricity sectors in many developed economies were based around either state-owned (e.g. United Kingdom, New Zealand) or privately-owned, regulated (e.g. United States) monopolies, integrating generation, transmission, distribution, and energy retailing. Increasing dissatisfaction with the performance of such integrated firms, combined with a wider shift towards market-based organisation (e.g. through privatisation) and fiscal imperatives, resulted in a re-evaluation of the traditional model. The development of a new model was aided by technology changes that reduced the minimum efficient scale of generation, as well as by a new economic understanding of how the electricity sector could be re-organised along competitive lines. Such re-organisation would involve some parts of electricity sectors (i.e. generation and retailing) being organised along competitive lines so as to induce efficient pricing and investment decisions, while "natural monopoly" (and "enduring bottleneck") elements such as transmission and distribution would continue to require regulation or other measures to constrain market power or induce efficiencies. The upshot of these developments was a period of electricity sector restructuring in many countries (see Wolak, 1999, and Politt, 2007, for reviews).

Often, sector restructuring took the form of both horizontal and vertical separation. The former required transmission and distribution activities to be ring-fenced from the potentially competitive activities, to avoid

these "natural monopoly" elements being used to foreclose competitive entry in generation and retailing. More controversially, and of note for this paper, was the forced separation of generation and retailing activities (i.e. vertical separation, mirroring that increasingly undertaken in telecommunications reforms). This separation was predicated on a belief that a combination of real and financial contract markets (including real-time spot and forward wholesale electricity markets, as well as futures and other derivative markets) would develop to support competitive entry by energy retailers and generators alike. Such contracts would supposedly enable industry participants to manage wholesale price risks, possibly countervail against residual market power (especially in oligopolistic generation), and provide investors with the revenue security required to support long-term, sunk generation investments. The benefits of vertical integration—in this case between generation and retailing—were not given much consideration, beyond mere reference to economies of scope, information sharing, and internal coordination.

Experience with contracting

The experience of contracting in reformed electricity sectors has fallen well short of expectations (see Meade & O'Connor, 2009, Anderson, Hu & Winchester, 2006, Chao, Oren & Wilson, 2005, and Hansen, 2004). Even in sectors with relatively liquid contract markets (e.g. Australia—see Simhauser, 2008, Anderson et al., 2006, Chester, 2006—and the United Kingdom—see Pollit 2007, Thomas, 2004, Roques, Newbery & Nuttal, 2005), contract durations are commonly of not more than about three years, well short of the term required to underwrite long-term generation investments. Additionally, hold-up problems from "hit and run" retail entry have emerged, given divergences in the contracting preferences of generators and retailers.

Generators face relatively high entry costs and prefer long-term contracts to support investments. In contrast, retailers face relatively low entry costs and prefer short-term contracts, because contracting at fixed prices

for a long term creates a risk of being undercut by new entrants (or bypassed by large customers) if wholesale prices fall during the life of the contract. The temptation for a retailer who holds a high-priced long-term contract in such circumstances is to renege, or possibly face bankruptcy. Anticipating such hold-up risks, generators offer to supply fewer contracts. They also invest at less than the efficient level, all other things being equal. Cascading hold-up risks then lead to the inducement of inefficient investment upstream of generation—for example, in fuel exploration (e.g. gas) or supply (e.g. coalfields or uranium mines).

Other mismatches between the contracting preferences of generators and retailers—and also between generators and large energy users with whom they contract in wholesale markets—may also arise. For example, industrial customers may have load profiles (e.g. seasonal or daily demand variations) that do not align with generators' production profiles (e.g. base-loaded coal-fired generators with ramp-up/down costs). Similarly, mismatches in fuel and demand uncertainty can cause a misalignment of contracting preferences. Retailers or industrial customers may desire assured supply security, whereas generators with uncertain fuel supplies (e.g. hydro generators exposed to uncertain hydrology) may prefer force majeure supply clauses to avoid penalties in the event of non-supply. Where large customers contract directly with oligopolistic generators and have inferior information regarding generators' fuel supplies and availability, they face adverse selection costs when entering into long-term contracts (i.e. they might contract at disadvantageous terms, placing them at a competitive disadvantage in their own output markets). Finite contract durations expose all parties to renegotiation risks.

These problems combine to thin contract markets, making prices more prone to market power abuse and adverse selection (amongst other complications), and undermining the role of contracts in inducing investment, managing risks, mitigating market power, and inducing competitive retail entry. Critically, deficiencies in contracting have resulted in inadequate

wholesale price risk management, reduced investment, and even bankruptcies. For example, in California (and also in the United Kingdom) many investors relied on high wholesale prices to finance investments in the absence of long-term contracts to provide security, which proved to be to their detriment when wholesale prices fell and gas prices rose (Joskow, 2006).

Some authors suggest that the natural response to such problems in contracting is to regulate for contracts (e.g. Willems and De Corte, 2008), or to re-instate retail franchise areas—i.e. retail monopolies (e.g. Chao et al., 2005, Roques, 2008, Newbery, 2002, 2002a). Under these "solutions" greater contract market liquidity would be induced (albeit artificially), or the problem of "hit and run" retail entry would be resolved with the blunt instrument of imposed monopolies. Such solutions are likely to involve welfare loss, and should only be preferred if they involve less loss than other possible alternatives.

Vertical integration as a "natural" solution

However, vertical integration may circumvent the need for harsh (regulatory) interventions. Such integration (between generation and retailing) is now re-emerging in various electricity systems—in particular, in the United Kingdom, Australia, European Union, and New Zealand (Simhauser, 2008, European Commission, 2007, and HMDSG, 2005)—not as a consequence of policy, but rather *endogenously,* in systems where it is allowed.[2] In New Zealand, for example, it emerged as an unintended consequence of simultaneous reforms which horizontally separated the then dominant generator (Electricity Corporation of New Zealand) into three smaller firms, and which independently separated the ownership of retailing and distribution activities.[3] Previous constraints on integration between generation and retailing were lifted at the same time that retailers were made available for sale, with the consequence that the newly-formed generators and their competitors quickly set about acquiring retail bases. This process was

[2] As a consequence, regulators and politicians/reformers in such jurisdictions often view such a change with suspicion.

[3] See Evans and Meade (2005) for a discussion.

largely completed when the main non-integrated retailer suffered substantial losses when faced with sticky retail prices but soaring wholesale prices in a time of tight hydro reserves in a hydro-dominated system. It was forced to divest itself of its retail customers to generators—the only parties with a natural hedge against surging wholesale prices—in order to stem its losses.

Vertical integration of generation and retailing appears to be a more self-sustaining alternative to contracting—induced or otherwise. Critically, integration internalises wholesale price risks and the risks of market power abuse to the firm. As shown by Hogan and Meade (2007), so long as integrated firms have balance between their generation and retail load, they do not face incentives to exert market power over wholesale prices. This is because any extra profits they secure at the wholesale level translate into reduced retail-level profits, given that the wholesale price is an input cost to their own retail arm. Conversely, non-integrated generators with market power, or integrated generators with unbalanced generation and load, do face incentives to manipulate wholesale prices.

Since integrated generators have a natural hedge against changes in wholesale prices through self-generation, they can reduce wholesale price risk markedly, facing wholesale volatility only in respect of their relatively small need to transact on wholesale markets to remedy short-term imbalances in their own supply and load. Furthermore, by internalising wholesale electricity price risks to the firm, integrated generators are not as exposed as non-integrated generators to investment-distorting regulations such as wholesale price caps.[4] They tend also to be larger and more diversified than non-integrated generators and retailers, further enhancing their advantages in managing price and quantity risks, securing finance, and undertaking large-scale investments. Finally, integrated generators face favourable ownership

[4] While price caps in systems reliant on wholesale markets and contracting are often regarded as a necessary constraint on generator market power, despite their obvious suppression of investment signals, their rationale is reduced in integrated systems where the incentives to exercise such market power are lower.

costs relative to smaller, non-integrated competitors, and much reduced market transacting costs.

Together, such considerations mean integrated generators are more "bankable" ventures, with greater financial substance, more secure profit margins over longer time-frames, and natural means to hedge their financing and investment risks. This in turn supports their ability to expand generation and then competitively enter into retail markets.

Integration can be argued to increase entry barriers in retailing, in that it reduces the volume of contracts offered by generators to third parties (i.e. thins contract markets), and means that retailers also need to invest in generation capacity if they are to compete with integrated generators. However, this presupposes that retail entry should begin at the retail level. The counter to this argument is that, by thinning contract markets, integrated generators are less exposed to "hit and run" retail entry (since less contracts are available to such entrants) and the resulting hold-up. Reducing such exposure enhances the generators' ability to underwrite long-term and large, sunk generation investments. This in turn enables them to expand downstream into retail on a more sustainable basis.

The re-emergence of vertical integration in electricity sectors—where it has been allowed, and albeit only in respect of generation and retailing—raises important questions about the optimal degree of competition in both retail and wholesale markets. Cut-throat competition in retailing has been regarded as a useful device to reduce retail energy costs. However, the experience in electricity sectors is that such competition results in complications at the wholesale level, where long-term investments and oligopolistic generation are the norm. These problems have served to undermine investment and supply security, thin contract markets, potentially worsen problems of wholesale market power, and undermine the viability of stand-alone retail entry.

Vertical integration, by contrast, does not rely on retail competition to redress any persistent problems of wholesale market power. Instead, it side-

steps these problems by reducing the incentives for generators to exercise market power. More importantly, integration contributes to dynamic efficiency by supporting more efficient levels of investment, and thereby more sustainable retail entry (by generators expanding downstream) and hence retail competition. In turn it supports more efficient levels of investment in upstream activities, such as fuel exploration or supply, where similar problems of long-term investment arise.

Thus, too much competition in retailing can be detrimental to welfare, and oligopoly in generation need not be sub-optimal (given the relevant production technologies) provided generation is balanced with load. Where vertical integration naturally emerges in response to deficiencies in contracting in structurally separated (i.e. de-integrated) sectors, this should give cause to carefully consider policy initiatives that impose artificial structural separation. The belief that contract markets will efficiently provide the necessary means to mitigate market power, support investments, sustain retail competition and manage price and quantity risks—and do so more efficiently than in integrated markets with a much reduced role for contracting—does not appear to have been borne out in electricity reforms.

4. Applying the Lessons from Electricity Reforms to Telecommunications

As noted in the introduction, the telecommunications and electricity sectors share many similar features. Some such features are structural—for example, both sectors have "natural monopoly" elements (local access networks in telecommunications are akin to electricity transmission and distribution lines). Much of the current literature on telecommunications focuses on potential problems with—and proposed remedies for—these structural features. For example, some commentators note that an integrated incumbent with natural monopoly power may foreclose competitive retail entry, giving rise to arguments in support of separation as a means of increasing competition (e.g. Cave, 2002, 2006; Xavier & Ypsilanti, 2004; de Bijl, 2005). As noted in section 3, similar arguments have been presented for the

electricity sector. These arguments propose that vertical separation makes competitive retail entry feasible for new firms, as it removes the necessity of duplicating the bottleneck asset. Such entry may ultimately (via a "ladder of investment") allow new retailers to consolidate market shares (Cave, 2006a), and may extend to upstream competitive entry in facilities (such as backhaul and unbundled local loops in the telecommunications sector, or retailers investing in generation in electricity). Theoretically, any activities that occurred under vertical integration could be replicated by contractual agreements between the (separated) access provider/lines company and either downstream customers or upstream firms (Cave, 2006). Such arrangements increase efficiency so long as the additional costs of both ownership and contracting imposed under separation are exceeded by the gains from increased competition (assuming that, in the absence of any mandatory requirement for separation, firms in the sector tend towards vertically integrated because this is the most economically efficient form of organisation given the combined costs of both ownership and market contracting).

However, it may be more illuminating to focus on a different set of features that the telecommunications and electricity sectors share—namely, those surrounding asset ownership, contracting, and risk management (see Table 1). These features present additional costs of unbundling that the pro-separation arguments outlined above fail to take into account.

As Table 1 identifies, significant contractual risks arise in both electricity and telecommunications from a mismatch in investment horizons. Upstream firms (network operators) have long-lived assets, comprising substantial proportions of fixed and sunk costs, which expose them to risks associated with investment in and ownership of such assets. In contrast, retailers have a shorter-term focus, and can (and indeed via regulation and/or structural reforms are incentivised to) enter the industry with minimal asset holdings and hence minimal investment risk exposure. Under these conditions, a key contractual challenge emerges when new investment is

required to increase network capacity (increase generation capacity) and both network (generation) and retail operations face competition.

Of course, as Table 1 also indicates, the two sectors do not face identical contracting challenges. Although the mismatch of investment horizons is a problem for both, in electricity the requirement for additional capital investment in more technologically stable distribution networks (where risk of bypass is negligible as these are truly enduring bottleneck assets) is much lower than currently in the more volatile telecommunications market. A closer parallel in investment horizon mismatches occurs in the electricity generation–retail dimension, where continually increasing demand for electricity necessitates ongoing investment in increased generation capacity, akin to the current increases in telecommunications consumer demand for more and faster bandwidth. The contractual challenges related to new investment in a competitive environment are particularly salient in the telecommunications sector, where traditional fixed-line network operators face competition from mobile, wireless, and cable network operators and (under convergence of end user applications) consumers can access the same end applications over multiple network platforms.

Table 1: Features that Complicate Separation and Contracting, and Favour Integration in the Electricity and Telecommunications Sectors

	Electricity Sectors	**Telecommunications Sectors**
Hold-up Risks	▪ Long-lived, large, and sunk investments in generation ▪ Low entry costs allowing hit and run retail entry, undermining wholesale-retail contracting ▪ Finite contract durations → renegotiation risks ▪ Load profile and risk preference mismatches between generators and customers ▪ Retailers can be bypassed by large customers ▪ Cascading hold-up risks to generators' upstream suppliers with own long-lived, large and sunk investments (e.g. coal, gas, uranium)	▪ Long-lived, large, and sunk investments in networks ▪ Low entry costs allowing hit-and-run entry, plus additional risk of horizontal competition by non-telcos (e.g. by mobile or power companies) ▪ Finite contract durations result in renegotiation risks, with regulatory complications ▪ Retailers can be bypassed *if permitted* under wholesale regulation ▪ Rapidly changing technologies lead to network investment hold-up risks
Wholesale Risks	▪ Fuel and demand uncertainty ▪ Wholesale price uncertainty ▪ Forward market illiquidity due to non-storability of electricity and asynchronous transmission markets	▪ Retail demand uncertainty ▪ Short term contracts exacerbated by regulatory uncertainty arising from with repeated adjustments to access prices as technology prices fall
Regulatory Uncertainty	▪ Contracting exposed to competition authority intervention ▪ Wholesale price caps introduce risk of regulatory time-inconsistency	▪ Short term dictated by regulatory provisions ▪ Contracting exposed to regulatory time-inconsistency

	Electricity Sectors	Telecommunications Sectors
Asymmetric Information and Strategic Bargaining	▪ Generators have informational advantages regarding fuel and plant availability/outages, and market power asymmetry relative to retailers ▪ Retailers struggle to forecast long-term supply-demand balance	▪ Retailers have informational advantages regarding demand growth and customer technology preferences characteristics ▪ Network operators struggle to forecast long-term supply-demand balance, exacerbated by regulations encouraging over-much retail entry ▪ Retailers have market power asymmetry relative to wholesalers and network operators → Risk of adverse selection as integrated, less efficient competitors can enter and gain market share from a separated more efficient incumbent facing higher costs of ownership and contracting
Market-Power	▪ Contestable retail level and large customer output markets ▪ Concentration at wholesale level due to scale economies in production, investment and diversification	▪ Contestable retail level under access regulation ▪ Concentrated wholesale market due to small number of platforms
Ownership Costs	▪ Favour large, diversified and integrated generator-retailers	▪ Favour large, diversified and integrated network operator-retailers
Contracting Costs	▪ High, due to limited contract durations and hence and regular renegotiation, differences in load-profile and risk (e.g. force majeure) preferences, as well as asymmetric information and strategic bargaining risks (increasing search and negotiation costs).	▪ High, due to regulatory overheads, asymmetric information, forecast errors, artificial governance arrangements
Initial Conditions	▪ Excess capacity leads to depressed wholesale prices and low contracting, but often large legacy contracts in place at time of liberalisation	▪ High retail demand uncertainty leads to natural tendency towards consumer ownership as a means of overcoming contractual uncertainty; artificial separation prevents this from occurring

Hold-Up, Wholesale and Regulatory Uncertainty Risks in Telecommunications

As in electricity markets, a mismatch of investment horizons leads to increased risk of investment hold-up when telecommunications retailers and network operations are separated. In order to justify investment in new network capacity, telecommunications network owners require either established demand from their own retail arm or long-term contracts with separated retailers. Separated telecommunications retailers face few incentives to enter into long-term contracts with network operators, as they too can be undercut by subsequent new entrants negotiating a better access deal. Howell (2007) notes an example of such behaviour from the New Zealand telecommunications market: entrants awaited potentially more favourable terms from a regulatory agreement rather than entering pre-emptively into commercial bitstream access agreements with the incumbent. As a result, end consumers were denied the dynamic competitive benefits of earlier bitstream access during the nine months of regulatory negotiations.

Telecommunications markets have not developed the financial markets and contracting instruments anticipated to emerge for wholesale electricity, in part due to the differences in time-dependency—telecommunications capacity, whilst constrained, does not require instantaneous consumption or balancing of supply and demand as in electricity. Thus, there is no direct parallel in telecommunications to the wholesale price risk factors of separated electricity markets.

However, historic patterns of regulatory intervention in access and retail markets have exacerbated hold-up risk problems and resulted in similar behaviour and contractual artefacts. Regulated access agreements encourage 'hit and run' entry by retailers with low entry costs in the first place (Hausman, 2002; Crandall, 2005), regardless of whether the network operator is integrated with or separated from its retail arm. Whilst regulatory agreements reduce the costs of a network operator contacting with multiple

separated retail firms (e.g. using standard terms contracts), unless those contracts adequately compensate the network operator for the options granted to retailers to enter and exit (Guthrie, 2006), then similar contractual weaknesses associated with separation of network operation and retail services in electricity markets will prevail also in telecommunications markets.

In order to induce retail entry, telecommunications regulatory access contracts typically enable entrants to buy network services on a very short-term basis, replicating the renegotiation risks observed in the electricity market and reducing incentives to invest. Renegotiation risk is further exacerbated by retail regulatory obligations facilitating end-consumer switching, which prevent longer-term customer agreements with retailers that would be necessary for retailers themselves to enter into longer-term contracts with network operators. Constantly decreasing regulated prices based upon hypothetically efficient current (decreasing) network costs further bias entrants towards preferring short-term rather than long-term contracts. When demand for new network services is already highly uncertain, or there is a very real risk that entrants will use the existing (separated) network to build up market share that is subsequently shifted to their own networks bypassing the incumbent, the incentives for the incumbent to invest in new capacity are even further reduced (Bourreau & Dogan, 2005).

The imminent risk of technological bypass in telecommunications markets as fibre-optic cable (or even mobile or wireless) becomes the broadband technology of choice poses additional contractual and strategic behaviour risks for separated telecommunications operators with copper-based technologies. On the one hand, with new technologies imminent, retailers will prefer increasingly shorter-term contracts with the copper network operator, as they await either that firm's investment or competitive entry by another investor. On the other hand, both the incumbent and entrant require either long-term contracts or vertical integration with a retail operation to ascertain demand and therefore justify investment in the first

place. If both entrant and incumbent must be vertically separate, increasingly shorter retail contract preferences will inevitably exacerbate delays in investment occurring, regardless of the identity of the investor.[5]

However, if the entrant can be vertically integrated, but the incumbent cannot, then all else being equal, the entrant faces lower costs than the incumbent to build the new network, placing the incumbent at a competitive disadvantage with respect to investing in the new technology. At worst, the entrant may actually have a higher cost of investing in the new technology than the incumbent (e.g. a higher cost of capital), but by carefully selecting the areas where investment occurs (e.g. geographical or commercial market segments) to mirror existing retail patterns (e.g. where the entrant is a retail customer of the incumbent), the additional advantages of integration may enable entrant deployment of the new technology at a retail price lower than that of the incumbent.

Under such circumstances the more efficient provider would lose market share to the less efficient provider, leading to adverse selection and lower welfare. To restore efficient entry incentives, mandatory separation applying only to the incumbent must therefore also be accompanied by additional regulation imposing a tax (as per Armstrong, 2001) on vertically integrated entrants, leading to separation increasing (rather than reducing) regulatory overheads. Given the complexity and extent of transaction costs involved in compensating even for simple universal service distortions (Howell, 2007), it may be simpler and more efficient to forego vertical

[5] With respect to the current debate about providing incentives for new fibre networks to be deployed, it is worth noting that historically, following Hansmann (1996), both new electricity and telecommunications utilities were initially built because end consumers effectively internalised the risks associated with retail demand uncertainty by assuming ownership of the fixed and sunk assets. Many utilities were constructed as consumer-owned co-operatives with consumers providing the initial capital (Howell and Sangekar, 2009; Evans and Meade, 2005). Where governments funded initial development from taxation revenues, this was in effect the ultimate form of a consumer-owned co-operative with mandatory consumer-taxpayer ownership rather than optional consumer-only participation. When governments allocated regulated monopoly franchises to private firms, once again the residual risks were borne ultimately by consumers, via retail prices that might be higher than costs (with the regulatory contract negotiated by government as the collective representative of end-consumer taxpayer/risk-bearers). This suggests that ultimately, new investment in such assets requires some means of involving the consumer directly in the risks of asset ownership, via either a retail contract or a direct ownership stake. Vertical separation artificially breaks this natural nexus, so is best reserved for mature networks with minimal extension or development requirements.

separation altogether and instead focus upon providing better incentives to induce competition between more competitively equivalent vertically integrated networks in these circumstances.

Additional regulatory risk accrues in separated telecommunications markets when the network operator is required to offer services on equal terms to all customers, regardless of the identity of the end consumers. Large end consumers (e.g. businesses) may wish to contract directly with the network operator for services, bypassing a retail operator, in the same manner as large commercial electricity consumers may prefer to contract directly with generators. However, this imposes a further level of regulatory intervention/separation in telecommunications markets between network and wholesale services, increasing both the costs of co-ordination and attendant regulatory risk as these contracts too become subject to the same hold-up and gaming risks exhibited in retailer-network contracts.

Vertically integrated firms can internalise hold-up, wholesale risks, and regulatory risks with respect to their own retail operations—the larger the retail market share, the lower the risks and the more likely it is that some (but not fully efficient) investment will occur.[6] However, mandatory separation of retail and network operations precludes any such internalising from occurring. Separation thus increases the investment hold-up risk over access regulation alone, suggesting that, when imposed, separation must also be accompanied by compensatory changes in the terms of regulatory access contracts (e.g. higher returns on capital allowed, locking in entrants to longer-term purchase obligations, imposing bonds on entrants) in order to ensure equivalent investment incentives are offered vis-à-vis the vertically integrated counterfactual.

[6] Although vertically integrated firms arguably face increased risk of regulatory intervention by virtue of their large size and monopoly position (making them a target for regulators), these risks are offset by their limited contracting volumes (and hence limited regulatory exposure).

Information Asymmetry Risks in Telecommunications

Again in a parallel with electricity generators, telecommunications network operators face information asymmetries that are exacerbated by separation from retail operations. End consumer demand for new telecommunications technologies (e.g. fibre-optic cable broadband), applications, and bandwidth is highly uncertain, and likely more so than in the more technologically stable electricity market. A network operator needs access to retail demand information to determine not just which technology to build, but where to place it and when to deploy it. Electricity generators are less reliant on consumer information as energy source uncertainty (e.g. gas supplies) is independent of consumer preferences. Because of complementary investments and consequent switching costs, telecommunications consumers care about upstream network technology type (e.g. DSL or fibre-optic cable). Hence, the timing of deployment of new technologies at the retail level takes on a co-ordination importance for telecommunications network operators and retailers. This does not occur in electricity, as retail customers can cheaply switch between retailers without changing appliances or configurations. Together, these characteristics suggest important co-ordination costs arising from information asymmetries are greater in telecommunications than in electricity markets, and may be efficiently dealt with by retail-network integration.

Regardless of technology types, both generators and network operators face uncertainties as retail demand increases. Retailers have active engagement with end consumers that is denied to separated network operators (or generators). A separated network operator must rely solely upon the forward orders placed by retailers to guide network investment patterns, without any ability to cross-check the accuracy of the estimates, as can be done by an integrated operator against its own retail projections. The rapid technological development in upstream telecommunications applications means that the problem of downstream demand uncertainty is exacerbated in telecommunications relative to the more stable pattern of retail

demand increases in electricity. In both industries, separation encouraging increased competitive retail entry increases information asymmetry risks and hence costs relative to the vertically integrated case. Notably, ownership separation lowers the incentives for retailers to take due care in making demand forecasts—the lower the costs of retail entry, the less the retailer has at risk, so the less important it is that the retail forecast is accurate, relative to an integrated operator. Moreover, separation inducing low-cost retail entry magnifies individual retailer forecast error effects due to the risk of substantially more entry than is efficient (characteristic of differentiated product monopolistically competitive markets—Carlton & Perloff, 2005). Even if all entrants are responding individually to the same aggregate market demand projection, the ensuing demand estimates (to which the network operator must generally respond at the level of each contract in order to meet regulatory agreements) will be systematically biased upward as the entrants fail to adequately estimate the effect of other competitive entry decisions on their likely market share. Smaller the entry costs, lead to larger numbers of entrants, greater aggregate forecast errors and thus higher risk of inefficient over-investment (and asset stranding). A network operator anticipating such occurrences faces even greater incentives to withhold or delay initial investment in new technologies, exacerbating the potential hold-up problem. Such costs can be efficiently mitigated by contractually sharing some of the risks borne by network owners with retailers (e.g. binding entrants to long-term contracts with penalties for reneging).

Extending the logic of ownership risk sharing via contracts, however, ultimately returns the separation debate back on itself. Separation is often proposed as a means of inducing entry by removing the costs of ownership from potential entrants; but it fails to send correct investment signals unless access contracts transfer sufficient ownership risks to entrants. If new investment were unnecessary, and future demand reasonably stable, then it would be easier to price ownership risk into access contracts. However, when new investment *is* needed and demand is increasingly uncertain, it becomes

harder to contractually apportion these risks, and the more likely it becomes that the most efficient arrangement lies in ownership (i.e. vertical integration) rather than contracting.

A key lesson for telecommunications is thus that inherent uncertainties, especially at the current point in time of technological uncertainty, suggest very real contractual risks associated with separation of network and retail operations. These risks exacerbate many of the problems already induced by access regulation, and will likely impede deployment of new technologies. With new bypass technologies available, the 'natural' tendency in telecommunications industry structure appear to be towards competition between vertically integrated network-retail operators, just as has emerged in those electricity markets where vertically integrated generator-retailers have been allowed to become the norm.

5. Policy Implications and Conclusions

Reforms in both electricity and telecommunications sectors have been based on the laudable aim of encouraging competition where it has historically been absent, at least in those parts of the sectors amenable to competition. As a means to an end such competition should induce more efficient pricing and investment decisions, at least in a static neoclassical sense. The vertical separation of potentially competitive and non-competitive parts of each sector has often been at the centre of such reforms, relying on contracting and other market transacting between industry components where ownership was no longer permitted. Through such separation greater competition—at least in retail parts of the sector where entry costs are relatively low—is facilitated, and indeed, allowing vertical integration between even the competitive parts of the sector could raise entry barriers that are apparently at odds with reform aims.

The experience of electricity reforms, however, highlights problems in this approach. Not only has the approach failed to perform as expected, but it potentially requires the pursuit of an inferior aim. Indeed, encouraging atomistic competition in retailing when there are scale economies and long-

lived, sunk investments in upstream generation has served to undermine both parts of the sector. Hit and run retail entry undermines contracting between retailers and generators, which serves to reduce both retail entry and investment in generation. Vertical integration, by contrast, overcomes the difficulties of contracting and thereby supports both investment, and retail entry. Importantly, it supports downstream entry by generators, rather than the non-integrated retail entry often assumed necessary for successful reforms. In so doing it overcomes the criticism that integration raises entry barriers by forcing retail entrants to have upstream generation—in effect the criticism is misplaced, being predicated on a faulty expectation of how competition durably arises in sectors with oligopolistic upstream competition.

There are key similarities between electricity and telecommunications sectors, as well as telecommunications-specific features which reinforce the problems of contracting in electricity sectors. This suggests that the aim of policy in both sectors should be to support durable competition at both wholesale and retail levels, with realistic expectations as to the extent of likely competition given technological constraints. Indeed, the aim of policy should be to maximise the prospects of such constraints being relaxed, which necessarily requires incentives to be maintained for investments in competing technologies in those parts of the sectors subject to oligopolistic competition. Technical uncertainty in a non-integrated system can be a source of the problems of contracting; in an integrated system, with competing integrated providers, it can instead be the source of evolving competition.

At the heart of these trade-offs—between encouraging retail competition at the expense of upstream investment (and hence both upstream and retail competition)—are important issues of risk-management. Reforms have often emerged against the experience of investment risks being unduly borne by consumers or taxpayers. The danger now is that reforms have shifted the balance of risk-sharing too far towards investors, which only exacerbates any inherent problems of contracting in separated systems. In turn this excessive imposition of risk on investors undermines investment

(and hence the long-term evolution of competition), and creates short-term problems of supply security/adequacy.

Hence, any policies which encourage or result in intense retail competition—at the expense of internalising the problems of investment, risk management and market power mitigation between retailing and upstream activities—may be self-defeating. They risk confusing the means (i.e. competition) with the end (efficient sector evolution). They potentially also undermine efficient risk sharing between investors and consumers, for short term benefits at the expense of longer-term gains. The fact that non-integrated systems based on contracting tend to be imposed, whereas integrated systems often emerge endogenously where permitted, further highlights the inherent attractiveness of integrated over separated structures for both electricity and telecommunications.

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