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# Network Sharing: Cooperating, Co-opting and Competing

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## Network Sharing: Cooperating, Co-opting and Competing

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Network sharing arrangements are common between mobile operators in Europe. There is also increasing interest in “co-investment” between fixed networks. Such arrangements have generally been cleared by anti-trust authorities. However, with the industry continually evolving and new types of sharing arrangements being proposed, it is important to review the competition implications of such deals.

The conventional foci of interest in such deals are the collective market shares of the participants in the agreement, and the potential for the agreement to incrementally facilitate coordinated behaviour downstream in the retail market, particularly through facilitating information flows and engaging in other activities that make it easier to agree on a strategy regarding downstream prices. But there may be more subtle and profound ways in which an upstream JV can impact downstream competition.

That the partners of a JV or “sharing” deal have high market shares in a concentrated relevant market is an obvious precondition for greater scrutiny of such agreements under a competition law regime. But even in such cases, fierce retail competition between the JV partners may, on the surface, invite the inference of no harm to competition. As our paper and the theoretical literature shows, however, the conventional focus on market shares and retail competition in assessing the impacts of proposed sharing deals is not quite sufficient. Instead, the parameters of the upstream cooperation can substantially steer downstream competition to produce merger-like or cartel-like outcomes. There can also be circumstances where an input joint venture can produce higher profits and lower welfare than a merger.

Economic theory can yield useful insights into the competitive implication of different commonly-found upstream pricing and sharing structures. When the downstream arms of the partnering firms face transfer prices that have a per-user or per-connection element, such prices can be used to replicate monopoly or merger-like outcomes even if the downstream arms compete as before. Conversely, “rights of use” models that might feature only lump-sum charges or fixed monthly lease charges are less straightforwardly supportive of the upstream price as a tool for implicit market cartelization. However, especially in the case of more-readily-congestible mobile networks, a JV can be used to control the capacity offered to the market, and thus elevate final prices. Reciprocal access agreements, holding all else equal, can more readily be adapted than true joint networks to the use of access pricing to facilitate cartel-like outcomes, in this case via geographic market allocation. Given that most telecom JVs will face some degree of “outside” competition, it is possible that the JV’s input pricing can be used strategically to soften the impact of such competition.

## 1 Introduction and Overview

### 1.1 Network Sharing and Co-Investment

1. The antitrust analysis of agreements between competitors or potential competitors has increasing salience in the telecommunications industry. In Europe, Canada, and numerous other jurisdictions, mobile network sharing agreements—sometimes involving the creation of special purpose entities or Joint Ventures—have been commonplace for years.<sup>3</sup> Regulators and antitrust authorities have seen network sharing arrangements that involve sharing “passive” infrastructure (sites, poles, towers etc.) as achieving operating cost efficiencies, and economizing on spectrum.<sup>4</sup> While there have been antitrust concerns around the use of such network sharing agreements to soften competition in the retail market or to exclude smaller competitors.<sup>5</sup> But the prevalence of

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<sup>2</sup> The views expressed in this paper are the views of the authors alone, and not Berkeley Research Group.

<sup>3</sup> For instance, Vodafone and O2 in the UK have had an agreement known as Project Cornerstone, involving the sharing of sites and passive infrastructure. Likewise, the Canadian firms Bell and Telus have operated a tower and site sharing arrangement for several years.

<sup>4</sup> In the mobile sector, it could be argued that governments’ focus on using auctions to raise revenues has restricted the supply of spectrum and thus encouraged operators to share networks.

<sup>5</sup> AGCM, 9 February 2017, *Fiber Optic Network Telecom-Fastweb Investigation For Possible Agreement In Restraint Of Competition*, <http://www.agcm.it/stampa/comunicati/8577-i799-rete-in-fibra-ottica-telecom-fastweb-istruttoria-per-possibile-intesa-restrittiva-della-concorrenza.html>.

sharing or collaborating on network construction has now spread beyond the mobile segment of the telecommunications industry. Lately, the issue of “co-investment” arrangements— involving the joint construction of very high-speed “fibre-to-the-premises” (FTTP) networks—has become highly topical in the fixed-line segment of the industry.<sup>6</sup>

2. European telecoms regulators have consistently expressed concern about a seeming lack of progress in investing in next-generation fixed-line networks.<sup>7</sup> These “very high capacity” or VHC<sup>8</sup> networks typically involve the installation of fibre-optic strands all the way to end-user premises, or at least very close to them. Investments in such networks involve significant sunk expenditure and also significant demand uncertainty, given that legacy fixed-line broadband infrastructure has proven robust to evolving demand. As U.S. experience generally suggests, even in the absence of wholesale access regulations on incumbent networks, and in the presence of robust inter-platform competition, telecom firms’ investment in fibre has been uneven. This indicates the high-risk, uncertain-return nature of such investments.

3. In Europe, where cable networks are much more unevenly present, telecoms regulators have been correspondingly less eager to offer incumbent telecom firms the “carrot” of deregulation—i.e., removing mandated access obligations—in order to achieve next-generation investment. Co-investment projects that reduce the sunk cost exposure of individual investing firms, while also potentially increasing the number of full-fledged facilities-based competitors besides the incumbent, are thus of understandable interest.

4. This piece aims to highlight the more subtle and complex competition or antitrust issues that arise from the fact that co-investment and network sharing are agreements between actual or potential competitors. As these agreements are agreements only to jointly supply wholesale “inputs” that both parties will need to have access to in order to produce a retail product, one understandable focus of competition policy has been on the preservation of retail competition. The other focus of enforcement has been on the collective market shares of the parties to the agreement.

5. Both foci are appropriate. Wholesale competition is relevant only to the extent that its absence impinges upon retail competition. Agreements at wholesale between small competitors are hardly likely to result in substantial adverse impacts on competition in the retail market. But in a wide variety of relevant circumstances, market shares may not provide clear-cut evidence of the potential for anti-competitive effects to arise. And a focus on the paraphernalia of coordinated effects— cooperation between competitors at retail—such as information flows, agreements on pricing, focal points, retaliation mechanisms and cost commonalities may also miss an important point. Both fixed line and mobile communications are inherently concentrated industries, where firms have access to similar technologies and may have similar marginal costs. The potential for coordination would exist even absent the collaboration with respect to provision of the upstream input. The most obvious way in which this collaboration creates incremental potential for coordinated conduct is through the enhanced possibilities for the exchange of information and for reaching and formulating agreements on prices. But one would presume that avoiding such obvious red flags for competition enforcement would be one of the first pieces of legal advice that managers of the collaborating firms will receive.

6. More subtle mechanisms exist through which the upstream input collaboration can influence competition in the downstream market. The managers of the upstream collaboration can certainly

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<sup>6</sup> Telecom Italia and Fast Web in Italy have created a joint venture, which sells FTTP services primarily to the JV partners downstream. Fastweb, 26th July 2016, “Fastweb and Telecom Italia sign a strategic partnership to build a national FTTH network,” [http://company.fastweb.it/wp-content/uploads/2016/07/2016\\_07\\_26\\_PR\\_FTTH\\_Fastweb-e-TIM-Agreement\\_ENG.pdf](http://company.fastweb.it/wp-content/uploads/2016/07/2016_07_26_PR_FTTH_Fastweb-e-TIM-Agreement_ENG.pdf).

<sup>7</sup> Commissioner Kroes stated “Operators need to expand the capacity of their wireless broadband networks in cost-efficient ways. Consumers and businesses want to wirelessly use their fixed lines: Wi-Fi or 4G cells will do the trick. We are not forcing end-users to share their Wi-Fi, but giving them a choice.”

<sup>8</sup> The EC, in its COM(2016) 587 final, defines “very high-capacity network” as an electronic communications network which either consists wholly of optical fibre elements at least up to the distribution point at the serving location or which is capable of delivering under usual peak-time conditions similar network performance in terms of available down- and uplink bandwidth, resilience, error-related parameters, and latency and its variation.

agree on upstream prices.<sup>9</sup> In doing so, they can and will consider downstream profits. Economic theory shows that upstream prices—the prices at which the downstream arms of the collaborating parties purchase inputs from the upstream venture—can be set in ways that replicate the outcome of a merger *between the parties at the retail or downstream level*. Constraints on independent decisions on expanding capacity can also be used to soften downstream competition. Further, the economic literature suggest that requiring the upstream collaboration to have only an “arms-length” relationship (i.e., independent pricing) with the downstream parties may actually result in worse outcomes still.

7. From a competition enforcement perspective, these forms of softening competition are hard to detect. Firms will typically have much better information on marginal costs than an investigating agency will, so it may be difficult to establish that a given transfer price for the input is somehow anti-competitive. Restrictions on independent capacity expansions by parties to a network collaboration may also have efficiency rationales that justify them. But economic theory does say useful things about the structure of upstream prices, and about the potential for capacity to be used as a tool to set output and thus prices in the downstream market. This paper reviews some of the relevant economic theory and applies it to some plausible sharing structures.

8. Our most important conclusions are:

- Co-investment or allegedly joint network construction deals that amount to geographic “swaps” have relatively greater likelihood of fostering market allocation (or effective non-competition) than deals in which the network is truly a “joint” endeavour.
- Deals where wholesale prices have per-user or per-connection elements to them can affect marginal pricing in the market, whereas deals where the parties simply rent capacity for fixed monthly or annual payments (for example) cannot affect marginal pricing in the market. The former type of arrangement can result in the replication of a merger-like outcome. The anti-competitive potential of the latter type of arrangement is much less clear to us.
- Mobile networks arguably violate some of the theoretical assumptions—that inputs and outputs are in fixed proportions—that drive the result that an upstream collaboration can replicate a downstream merger. Nonetheless, even if the theoretical assumptions of the basic model we describe are not entirely satisfied, capacity restrictions can effectively be used to soften competition and increase prices, and thus resemble an implicit agreement to not compete at retail.

## 1.2 Implications for Regulation

9. Finally, it is worth considering that in the fixed-line telecommunications industry, joint network construction or sharing deals are forged against the backdrop of ex-ante sector regulation. In this case, offers by incumbent firms to enter into network sharing or joint network construction deals with new entrants should not automatically trigger deregulation. The magnitude of sunk entry costs relative to demand makes facilities-based entry into the fixed-line market economically challenging. This facet of the industry serves both to insulate incumbent firms against competitive facilities-based entry, while exposing them to the prospect of regulation. From a regulator’s perspective, “Joint Venture” or JV agreements between incumbents and entrants can be attractive alternatives to a regime of mandated access to incumbent networks. They can potentially result in effective end-to-end competition between the parties, which may in itself produce superior outcomes to competition based on mandated access to incumbent networks. But, as the literature shows, an input JV can also be used to steer the downstream industry towards a merger-like or cartel-like outcome.<sup>10</sup>

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<sup>9</sup> This would be true unless upstream agreements between downstream competitors were ruled out *per se*.

<sup>10</sup> There is a related literature on facilities sharing by incumbents as a means to co-opt would-be entrants. See Chen, Z and T.W. Ross, “Strategic Alliances, Shared Facilities and Entry Deterrence”, *Rand Journal of Economics*, Volume 31, No.2, 2000, pp.326-344. This theory is most applicable when the “sharing” pertains to

## 2 Background and Assumptions of the Paper

### 2.1 Focus on Competition Policy Assessment

10. In other work,<sup>11</sup> we have pointed out the far reaching regulatory implications of fixed-line co-investment projects in Europe. This piece instead adopts the perspective of competition analysis. From this perspective, network sharing agreements might well be viewed as a type of “joint production” arrangement: two or more would-be competitors in a downstream market agree to joint or reciprocal provision of an input. The relevant legal and economic framework for the analysis of horizontal agreements is well developed, so our focus is on specific aspects of network sharing agreements that have implications for competition analysis. However, since these investments invariably happen with the legacy and shadow of regulation in the background, the prospect of further regulation or a relaxation of existing regulation fundamentally influences firms’ incentives for participating in co-investment or sharing agreements.

11. The competitive effects of network sharing agreements will depend greatly on the specifics of the agreements themselves, and also on the wider market context in which the agreements take place.<sup>12</sup> We do not discuss the full range of analytical issues that would need to be considered in an actual competition case under Article 101 of the European legal framework, or its counterparts in other countries.<sup>13</sup> As discussed previously, our focus is on two specific aspects of sharing or co-investment deals in the telecommunications sector: (a) the treatment of exclusivity provisions, and (b) the relationship between upstream structure and downstream competition.

12. Another important piece of context is warranted here. The ultimate assessment of the anti-competitive effects of an agreement depends on an analysis of the entire context in which that agreement operates. Even if a JV or sharing arrangement mimics a merger, it will only raise competition issues if competition from outside the JV is significantly limited. In the fixed telecommunications setting, a “new” broadband network could well face competition from cable networks, as well as providers who make use of wholesale access to copper-based “legacy” networks to compete in the provision of retail services. If “sharing” or “co-investment” results in new networks then, of course, the efficiency gains to consumers from such new networks will need to be considered against any anti-competitive effects. But these efficiency gains should be assessed against the “but-for” world, which is not necessarily co-incident with the status quo.<sup>14</sup> Our discussion of the

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the sharing of existing facilities, when there is not a natural monopoly such that competitive facilities-based entry might be viable, and when congestion-adjusted marginal costs are increasing with output. We will discuss this theory in future versions of this paper.

<sup>11</sup> See Berkeley Research Group, “Co-Investment and Commercial Offers”, <https://www.vodafone.com/content/dam/vodafone-images/public-policy/reports/pdf/co-investment-commercial-offers-100417.pdf>. This report was commissioned by Vodafone.

<sup>12</sup> For instance, the anti-competitive potential of such an agreement is likely to be greater when the parties to the agreement have higher market shares in a relevant market defined around the product that the agreement supplies. In the telecom context, the presence of cable competition and the speed at which consumer demand for higher-speed services evolves will be other important factors suggestive of the ability for the parties to the agreement to exercise market power, jointly or unilaterally.

<sup>13</sup> We note that such agreements may well raise issues under Abuse of Dominance (i.e., Article 102) provisions in various countries too. For example, exclusivity provisions or restrictions on wholesaling of capacity by partners to the agreement may well be scrutinized under Article 102, in the event of a complaint. As also noted above, joint ventures can also be analysed as mergers or concentrations. Our focus in this paper is decidedly not on these jurisdictional and legal issues.

<sup>14</sup> The Guidelines on the Applicability of Article 101 of the TFEU to Horizontal Co-Operation Agreements 2011/C 11/01, ¶47. The relevant comparison should be of the effects of the joint venture agreement relative not to the status quo, but to the alternatives achievable absent the agreement. The reality is that in a regulated industry, one “alternative” will be the outcome that regulation would achieve. Even if the JV results in appreciable market power for the JV participants, incumbent firms may not make the investment under the threat of regulation. Thus social surplus and consumer surplus may still be higher with the unregulated JV, even if that JV has market power. This might be the case if the technology introduced to the market via the JV is much superior to existing technology, and even with monopoly prices, the JV is unable to appropriate a reasonable chunk of the social surplus created.

relationship between upstream pricing and capacity restrictions on the one hand, and downstream market outcomes on the other hand, is relevant only when there is the potential for anti-competitive effects to arise, i.e., some threshold level of collective market share in a relevant market is exceeded.

## 2.2 Relevant Facets of “JV” Agreements

13. It is also important to stipulate the type of agreement or “JV” we have in mind. Our default structure—following the economic literature—is as follows:

- Two or more parties agree to construct the network, and share in the costs. For ease of exposition, we generally describe a two-party sharing deal. In the subsequent sections (III and IV), which draw upon economic theory, we provide the economic intuition in the context of a symmetric JV.
- The deal can be structured as a JV or special-purpose entity that operates the network and leases capacity out on the network. The rationale behind this type of arrangement may be to keep the new network entity separate from the rest of the retail operations of the respective firms.
- Note however that the JV is not “separate” in that decisions about JV pricing and capacity leasing—the “rules of the game”—are still decided upon by representatives of the two firms. These representatives may be walled off from the retail arm or there may be restrictions on the flow of information between them and other parts of the firms. We do not need to make very precise assumptions in this regard: just need to say that the founding members of the JV/network venture have the ability to make the decisions that count.

14. However, three other structures that we review in the course of our analysis are: (a) a true “arms-length” wholesale entity, that perhaps because of competition law scrutiny, does not take the interests of the downstream firms into account; (b) a “cost-sharing” structure, where network construction costs are directly funded by the sharing parties, and the “JV” simply bills for operating and maintenance costs; (c) reciprocal sharing arrangements or “swaps.”

15. Based on our discussions with experienced industry observers, many mobile network sharing deals (at least initially) involve the pooling of existing resources rather than the construction of a joint network. However, here too there is typically a JV that is responsible for running the network. Mobile JVs can charge wholesale prices on a per-unit-of-traffic basis, but such JVs may sometimes simply entail the payment by the partners of a (volume-invariant) monthly fee for capacity to the JV along with operating and maintenance costs. Mobile JVs may also take the form of geographic swaps. With respect to both mobile and fixed JVs, we do not consider all the possible structures for the JV, but instead focus on ones that we think illustrate the economic logic best.

## 2.3 Economic Assumptions and Relevant Literature

16. Our focus is on the competition implications of agreements on upstream prices and capacity levels on downstream market outcomes. The literature that discusses these effects makes certain assumptions:

- To illustrate the intuition, firms are assumed to be symmetric in costs and demand.
- The JV provides an input that is consumed in fixed proportions to output. In the simplest case, one unit of input is required to produce one unit of output. Alternatively, inputs and outputs are also referred to as upstream and downstream goods, respectively.
- The ability of upstream pricing arrangements to impact downstream competition is generally modelled by assuming Nash-Bertrand competition in the downstream

market. This type of “differentiated Bertrand” competition is the standard assumption of much of the merger-related literature on unilateral effects analysis in recent years.

### **2.3.1 *Chen and Ross (2003)***

17. Our paper substantially draws upon the work of Chen and Ross (2003).<sup>15</sup> Chen and Ross use the assumption of symmetry between two JV partners. The assumption of symmetry (in costs and demand) means that a 50/50 split of profits of the JV is always optimal. A 50/50 split both aligns incentives of the downstream firms on the choice of the optimal upstream input price and maximizes joint profits. Two other critical factors in their model are (a) the own-price elasticity of demand for each firm, and (b) the cross-price elasticity of demand between the two firms’ downstream products. The lower is the own-price elasticity, the higher is the mark-up that each firm imposes on the wholesale price set by the input JV. The higher is the cross-price elasticity, however, the greater is this retailers’ mark-up. The intuition behind this is very similar to the intuition behind upward pricing pressure in merger analysis: a higher cross-price elasticity implies a higher diversion ratio between the two downstream firms. The higher this diversion ratio between the merging firms, the greater is the incremental upward pricing pressure from the merger. This is because the merged firm internalizes the diversion of customers from one of its “divisions” to another in the event of a price increase. Here, this process of internalizing the other parties’ profits is obviously less direct and less strong, but arises because each party extracts profits via the upstream JV (50% of the profits of the JV, to be precise). Finally, a critical assumption in the model (and other models) is the assumption of fixed proportions. Although Chen and Ross’ results are arrived at in the context of an assumption of Nash-Bertrand competition downstream, their results are also robust to the alternative assumption of Cournot competition (with constant marginal cost).

18. In other, more recent literature, the assumption of differentiated Bertrand competition downstream is more critical to driving the result that an input JV can sometimes do “worse” than a full merger. These results are driven by the strategic complementarity in prices which follows from the assumption of Bertrand competition, i.e. the incentive for a JV to set a high wholesale price which in turn exerts upward pricing pressure on the downstream price is greater when the JV anticipates that the price increase will be reinforced by firms outside the JV.

19. Chen and Ross’ basic results are unsurprising when one considers the similarity between their set-up and the set-up of the well-known “single monopoly profit” theorem.<sup>16</sup> In their model, when the products of the downstream firms are perfect substitutes, and there are no competing firms downstream, the upstream JV sets wholesale prices to replicate a downstream monopoly. This monopoly price is the marginal cost of the downstream firms. The downstream firms—which are in perfect Bertrand competition with each other—simply pass on this marginal cost to their own customers. This is exactly similar to the simplest version of the single monopoly profit result, which assumes perfect competition downstream and a fixed proportions production process. Conversely, when the products of the downstream firms are completely independent (in completely separate markets), the upstream firm prices at marginal cost.

20. The more interesting case is when there is a high but not perfect substitutability between the products of the downstream firms. In this case, there will be mark-ups at both retail and wholesale. Chen and Ross show that the profits obtained in this case are identical to a horizontal merger between the two firms, for the same values of the key elasticity parameters. From another perspective, extensions of the single monopoly result show that even with imperfect competition

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<sup>15</sup> Chen, Z., & Ross, T. W. (2003). “Cooperating upstream while competing downstream: a theory of input joint ventures.” *International Journal of Industrial Organization*, 21(3).

<sup>16</sup> For a discussion of the single monopoly profit theorem, see Riordan, M.H. (2005), “Competitive Effects of Vertical Integration”, Columbia University Department of Economics Discussion Paper No 0506-11.

between downstream firms, non-linear pricing can be used to extract the profits of the entire downstream industry, i.e., an upstream tariff can be used to replicate a downstream merger.<sup>17</sup>

21. Chen and Ross also suggest that a JV that was forced to price with no regard to downstream profits could produce an even less efficient outcome than the “internalizing” JV described above. Where the downstream firms produce perfect substitutes, there will be no difference in the outcome—the JV has monopoly power upstream and will charge the monopoly price. But it will also charge the monopoly price to each downstream firm in the case of independent demands. This is in contrast to the “internalizing” JV which would, in this case of independent demands, price at marginal cost. Thus there are now two sets of mark-ups rather than one. The extent of the mark-up would also increase in the intermediate case of imperfect competition.

22. The previous discussion points to a critical factor: the importance of there being a per-unit or marginal wholesale price, or at least a two-part tariff. Absent such a marginal price, wholesale prices cannot generally be used as an instrument to steer the downstream market outcome. Chen and Ross also point out, however, that not all JVs take the form that they model. In many cases, JV members have production “draws” or quotas from the JV and pay a corresponding share of operating costs to the JV (presumably they also assume shares of the capital of the JV). In this case, anti-competitive effects are achieved by setting capacity or output at the monopoly level. This is relevant to the telecommunications industry.

### ***2.3.2 Applicability of Key Assumptions to Telecommunications Services***

23. The key assumptions made in the literature are broadly applicable to the telecommunications industry, or at a minimum, to the fixed-line industry. In the fixed-line context, the upstream JV provides an input such as (virtual) “local loops”, or lines. These can be priced on a per-unit basis. To serve an additional customer, downstream firms need to provision a corresponding “loop” or input. The question of whether competition downstream is Bertrand or Cournot in nature is not critical to the Chen and Ross result, although Bertrand competition is required for the result in the recent literature (discussed subsequently) that suggests an input JV could produce adverse welfare effects relative to a full merger in the case where we allow for an outside firm in the market.

24. One potentially valid characterisation of competition in this industry is the two-stage theory of Kreps and Scheinkman (1983).<sup>18</sup> In this model, firms begin by setting capacity a la Cournot, but once capacity is set, firms compete in prices. The paper shows that where capacity constraints are binding, final prices are marked up above marginal cost, and the outcome is similar to Cournot competition. The unique equilibrium that they model is the Cournot equilibrium: firms should set capacity equal to the Cournot level of output in the first stage, anticipating that second-stage competition in prices will see prices whittled down until the initial capacity is exhausted.

25. In telecommunications markets, however, firms set initial capacities to serve both current and future demand. A reasonable interpretation is that capacity in fixed-line networks will take many years to exhaust, so firms will continue to compete in prices and quality-adjusted prices will continue to fall significantly. Finally, most models of the industry used in merger reviews and merger simulations have, to our knowledge, relied on the assumption of differentiated products Bertrand competition. In all, assuming Bertrand-style competition in prices seems a reasonable assumption.

26. In the mobile case, the validity of the fixed proportions assumption is not clear. Certainly, there is no tidy relationship between incremental output (an additional subscriber) and incremental

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<sup>17</sup> See Riordan (2005), *supra.*, for a proof of this proposition. Mathewson and Winter (1984) show that provided sufficient vertical instruments are available to it, the upstream monopolist can extract all the profit of an imperfectly competitive downstream industry. See Mathewson, G.F. and R. Winter (1984), “An Economic Theory of Vertical Restraints”, *RAND Journal of Economics*, Volume 15, No.1, pp. 27-38.

<sup>18</sup> Kreps, D.S. and Scheinkman, J. (1983), “Quantity Pre-Commitment and Bertrand Competition Yield Cournot Outcomes”, *Bell Journal of Economics*, Volume 14, No.2, pp. 326-337. A discussion of this theory in the context of telecommunications can be found in Shelanski, H. (2007), “Adjusting Regulation to Competition: Toward a New Model for U.S. Telecommunications Policy”, *Yale Journal on Regulation*, Volume 24, No.1, pp.54-105.



input (an additional line or loop). One could reformulate the measure of output to be an additional unit of capacity, in which case a unit of capacity sold upstream equates with the same capacity provided to a downstream user. However, although such pricing is used in mobile roaming arrangements, it is unclear to us whether it is widespread in mobile network sharing deals. However, mobile networks are inherently more congestible than their fixed-line counterparts, and capacity on such networks has tended to be substantially more strained by the increase in demand of recent years than has capacity on fixed networks. This certainly suggests that even if wholesale pricing is not a tool that can, or is, used to guide downstream market outcome, restrictions on capacity expansion certainly can be. The same potential may arise in fixed networks, of course, but not in the presence of substantial excess capacity.<sup>1920</sup>

27. The symmetry assumption that informs the models in the theoretical literature is clearly an unrealistic description of most real-world arrangements. In most real-world arrangements, there will be at least some degree of asymmetry in costs and demand between the JV partners. This asymmetry creates a number of potential complications for the model. Chen and Ross point out that with asymmetries in cost, ownership shares will need to be adjusted in order to align the incentives of the partnering firms. But aligning incentives of the two parties by adjusting ownership shares may not achieve the joint profit-maximising outcome for the two parties. However, this does not doom asymmetric JVs to the prospect of unravelling. For “small enough” asymmetries between JV partners—which may be quite a realistic characterisation of many telecom JVs—the partnering firms might find that an even split of JV profits at an agreed-upon common JV price is preferable to the alternative of the profits otherwise available to them. Even if the lower-cost firm<sup>21</sup> gives up something (since it should receive a more-than-even share of profits, corresponding to the fact that it would enjoy a higher share of the market were it competing with its partner) and the higher-cost firm gains something, this may be better than the alternatives available to them outside the JV. Only if the asymmetry grows large might the alternative become attractive. Thus the basic model we have discussed above may be a good predictor of outcomes for a large number of JVs in the telecom industry, even if it is not totally realistic as a descriptor of the industry.

28. Finally, it is worth remembering that in both fixed and mobile telecommunications, sunk set-up costs are relatively significant. Standard economic theory suggests that the number of firms in these markets will be relatively limited—as it is determined by the size of these costs relative to the demand available to be served.<sup>22</sup> This raises the potential that even without marginal or per-unit prices, a sunk entry fee could be used to ensure that (for example) two firms cannot be sustained in the market. However, such an arrangement would require agreement on who stays in or stays out; alternatively, it would involve an agreement to cartelize the market by setting the collusive level of the retail price. But this second possibility implicates the retail market—which is expressly not the focus of this paper

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<sup>19</sup> The Canadian Competition Bureau made a similar argument in a recent (2014) submission to the Canadian Radio-Telecommunications Commission (CRTC). The Competition Bureau argued for the need to encourage more entry into mobile networks in Canada, where there are 3 incumbent mobile operators with most of the market share. The Bureau reconciled this argument with previous submissions where it had suggested that competition between cable and traditional incumbent telecom networks was sufficiently strong that it did not warrant mandated access regulation of either cable or telecom networks. The justification the Bureau offered was that substantial excess capacity on fixed networks would ensure strong incentives to price keenly. In discussions with industry participants, similar views have been expressed, with some participants suggesting that end-to-end network competition will produce a race to the bottom, given that most costs are sunk, marginal costs are low, and capacity is far from being exhausted.

<sup>20</sup> Chen and Ross discuss the possibility of requirements contracts between the input JV and downstream firms as an alternative to the fixed proportions assumption.

<sup>21</sup> Here the cost asymmetry refers to an asymmetry in the marginal costs that firms incur in self-supplying the wholesale input, rather than sourcing it from a JV.

<sup>22</sup> See Sutton, J. (1991), *Sunk Costs and Market Structure: Price Competition, Advertising and the Evolution of Competition*, Cambridge, Massachusetts: MIT Press. With homogenous Bertrand competition, sunk costs always lead to a monopoly. With Cournot and differentiated Bertrand competition, the equilibrium number of firms depends on the relationship between the magnitude of set-up costs and the demand available to be served. However, when there is vertical differentiation in qualities, the number of firms in the market need not expand with demand.

for reasons set out above. Experimental economics literature and industry folklore, however, suggest that high sunk entry costs might induce softer ex-post competition.<sup>23</sup>

29. We next describe a handful of plausible JV structures (some of which we have encountered in past and recent work) pertaining to both fixed “co-investment” and mobile “sharing” arrangements. Using the theory discussed above, we evaluate the potential for these arrangements to produce a cartel-type outcome downstream.

### 3 Upstream JVs and Downstream Market Outcomes

#### 3.1 The Basic Model and Variants

30. The basic model that we describe is a JV agreement that resembles agreements that we are familiar with in (particularly) fixed-line telecommunications. The key features are (a) relative symmetry between JV partners, (b) the JV provisions lines or loops or strands of fibre to the downstream parties, (c) the JV charges per-unit fees or two-part tariffs.

31. We start with the simplest case that maps to the Chen and Ross model discussed previously. In this case, we assume that the JV has significant market power in a relevant market (as that term is used in competition policy practice), so that the basic idea of the JV replicating the merger to monopoly applies. A key underpinning of this case is that the prices set by the JV can give regard to the profits of the downstream firm. As per the discussion above:

- Given that the two firms are in the same relevant market, there is some significant degree of substitutability between their downstream offerings. This is a realistic assumption for telecommunications services: the technical dimensions of the products offered by the two firms are relatively but perhaps not entirely homogenous, and there is also some differentiation on the basis of brand or customer service. Thus products are imperfect but strong substitutes.
- In this case, the upstream or wholesale tariff can be set to effectively replicate the monopoly outcome in this narrow downstream market. This follows both from the Chen and Ross model, but also from the familiar logic of the “single monopoly” result.

32. *Arms-length pricing:* One natural response to this situation is to require the JV to not take into account the interests of its parent companies when setting prices. This response is “natural” given that the existence of the JV helps to partly internalize customers diverted to the partner firm’s downstream operation. But as Chen and Ross have pointed out, and we have discussed previously, the result of this arms-length pricing is a greater degree of double marginalisation, and thus higher downstream prices than if the JV were taking downstream profits into account. Thus arms-length pricing is not a panacea for the potential for a JV to replicate a downstream merger.

33. *Introducing outside competition:* What if the JV (which we assume is not at arms-length to its parents) faces some degree of outside competition in the relevant market? In this case, a recent paper by Aguelakakis and Yankelevich (2015) suggests that the results can be worse than those achieved through a horizontal merger between the JV partners.<sup>24</sup> Consider a 3-firm industry, in which two of the firms either (a) merge, or (b) enter into an input JV. Assume that competition is differentiated Bertrand competition, i.e., prices are strategic complements. An input JV can, as discussed, be used to influence upwards the downstream price of the JV partners. The assumption of strategic complementarity with the outside firm’s prices, however, alters the upstream JV’s profit-maximising calculus. Price increases by the JV partners’ downstream arms will induce price

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<sup>23</sup> See Offerman, T. and Potters, J. (2006), “Does Auctioning of Entry Licenses Induce Collusion? An Experimental Study”, *Review of Economic Studies*, Volume 73, pp.769-91. The industry folklore that we refer to is also cited in this paper—some observers believe that high auction payments have softened competition ex-post.

<sup>24</sup> Aguelakakis, N. and Yankelevich, A. (2015), “Collaborate or Consolidate: Assessing the Competitive Effects of Production Joint Ventures”, available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2432916](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2432916).

increases by the outside firm too. This strategic response will be factored into the wholesale prices set by the JV. This will tend to elevate the JV's price further above marginal cost. By contrast, when the firms merge, the input is transferred to the downstream arms at marginal cost. In essence, the upstream JV recognizes that higher input prices to its customers will not only induce higher downstream prices by those customers, but will also induce higher downstream prices by the outside firm. In a merger, this elevated input price cannot be used to soften competition with the outside firm. Importantly, if instead Cournot competition were assumed, then the JV arrangement produces lower prices than the merger (as the outside firm's actions are now strategic substitutes for the JV partners' actions).

34. The basic model and its variant with outside competition are exemplified by some European co-investment or network sharing arrangements in the fixed line market. For example, one can readily imagine future versions of the UK's "Openreach" in which multiple fixed-line operators have ownership stakes in what is effectively an upstream monopolist or dominant firm.<sup>25</sup> One can imagine that the firms co-invest in the civil works and other network upgrade costs required to upgrade this network to "next-generation" status. They then lease the last-mile infrastructure from the upstream entity. As discussed, efforts to separate the JV's pricing from downstream pricing might even prove counter-productive. This type of JV may face outside competition from cable networks or other infrastructure. Regulators may feel that this jointly owned and operated upstream monopoly is preferable to the traditional solution of a regulated upstream monopolist since more firms have ownership stakes in the infrastructure. This may give them more opportunities to differentiate their product offerings.<sup>26</sup> As long as these firms appear to be competing vigorously at retail, and there is no evidence of coordinated behaviour in the retail market, it may be tempting to conclude that the arrangement improves upon the status quo.

35. One can also imagine per-unit pricing arrangements applying in the context of mobile network sharing arrangements. For instance, prices can be charged per unit of traffic (as they are in roaming deals).

### 3.2 JVs with no Per-Unit Fees

36. *IRUs*: However, one can also readily imagine—and indeed such JVs exist—JVs where per-unit fees are not charged. For example, there are arrangements in which the JV partners get Indefeasible Rights of Use (IRUs) that give them access to a given amount of network capacity. These IRUs might either be acquired via paying a lump-sum at acquisition, or amortized via a monthly capital charge. However, this arrangement need not involve any marginal price attached to acquiring an additional customer or even an additional unit of output. Such arrangements resemble those seen in the submarine cable industry.

37. *Pooling of sites*: Such arrangements also sometimes apply in the context of mobile network sharing where the parties pool together resources, such as sites and passive network infrastructure. The resources are pooled into a JV, which can charge the JV partners a monthly service fee. Each JV partner can have access to all of the sites within the JV.<sup>27</sup>

38. In both the cases described above, it is difficult to see how upstream prices can be used to steer downstream competition. Perhaps if fixed monthly fees or IRU payments can be viewed as sunk entry costs, they might (per the discussion in the previous section) soften competition between the partners. But this is certainly not a robust prediction of mainstream economic theory. However,

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<sup>25</sup> The premise for regulation in the UK is that cable would not impose a significant enough constraint on the hypothetically unregulated wholesale pricing of Openreach such that Openreach would lack significant market power.

<sup>26</sup> Again, we would suggest that such differentiation is modest.

<sup>27</sup> The assumption here is that there is a monthly service fee for the right to use all the sites in the network. JV can and do also charge site rental fees. But such site rental fees would not really be in the spirit of per-unit fees as we have described them. For one thing, at the point that the JV is formed each partner already has access to all of its own sites. Site rental fees might, in theory, be used to deter partners from using additional sites, but this would not produce a worse outcome than the status quo.

as discussed above, restrictions on capacity or the ability to independently expand capacity could ensure that output is restricted and competition duly softened. This may be an appealing prospect in the context of congestible mobile networks. Using the JV as a type of commitment device to restrict how much capacity is offered allows capacity to be rationed between users—this type of arrangement would be conducive to the pricing structure of data caps and overage charges that has characterised many developed-country mobile markets during the recent period of very fast growth in data traffic.

39. *End-to-End arrangement:* Within this class of arrangements, one can also imagine a JV structure in which the JV undertakes civil works and lays parallel fibres to each user premise. In this case, the potential for anti-competitive outcomes is minimized. It does not make sense for the JV partners to agree to build parallel paths, at additional cost, for the purpose of suppressing output. It would make far more sense to use the “basic” JV structure described above for this purpose. This type of arrangement lends itself naturally to the JV partners effectively running their own end-to-end networks, and the JV itself perhaps only administering and maintaining the “commons” (ducts, poles, civil works etc.) This type of arrangement also offers maximal potential for quality differentiation and variety of products, which could be beneficial to consumers.

### **3.3 Geographic Swaps**

40. Many “JVs” in the telecom industry are effectively just reciprocal access arrangements. These “swaps” involve the use of the partner’s infrastructure in geographies where the other partner has no or limited network presence. These types of swap arrangements are observed in both fixed-line and mobile markets. Although many such arrangements are perfectly benign in the circumstances in which they actually arise—because the parties to the swapping agreement face substantial competition— these swaps do carry the potential for turning into agreements to not compete in each other’s’ territories.

41. This potential exists even absent the paraphernalia of the formal analysis of the economic literature. Even absent per-unit pricing, a swap or reciprocal access agreement can be used to ensure a commitment to not enter. For instance, if acquiring capacity on the partner’s network attracts a high enough upfront or fixed monthly rental fee, this may suffice to ensure that the other partner never enters. After all, if it does choose to enter, it may face a punishing race to the bottom, and thus will not be able to recover its cost of entry. Thus relative to the alternative of geographically overlapping partners, there is a larger set of circumstances wherein swaps or reciprocal access agreements can be used to allocate markets or ensure competition is softened downstream.

### **3.4 Summary**

42. The discussion in this section shows that the closer the JV arrangements come to end-to-end competition between competing infrastructures, the less likely they are to be anti-competitive. The “end-to-end” JV discussed above can save on the duplication of civil works and can share certain common assets, and thus reduce the sunk entry costs to JV participants (relative to them building go-it-alone networks). But beyond this, it allows for fully parallel infrastructures, with decisions on marginal pricing resting solely in the hands of each competing partner. By contrast, swapping arrangements carry the most potential for market allocation or cartelisation since they permit these possibilities even without per-unit fees or capacity restrictions. We next discuss the policy implications of our review.

## **4 Policy Implications and Conclusions**

### **4.1 Implications for Competition Policy**

43. Network sharing and co-investment agreements have not, thus far, attracted significant opprobrium from competition authorities. One potential explanation for this—particularly perhaps in the fixed-line segment of the industry—is that many JVs are not between firms that have dominant market shares. This is true at least of four-player mobile markets, and of many fixed co-investment deals. Many of the co-investment deals in the fixed market are either between non-incumbent firms

that do not have significant market power, or pertain to fibre-optic networks which are part of a wider relevant market and may face competition at the retail level from cable networks and from players who own or have regulated access to current-generation access networks. However, as demand for higher speeds evolve, it is possible that some of the benign co-investment deals pertaining to fibre-optic networks, could confer significant market power in a relevant market at some future point in time.

44. As a general matter, the potential for such agreements to generate anti-competitive effects has, however, been recognized. The purpose of this paper is to foster a greater awareness of the ways in which the details of the JV and particularly the marginal pricing incentives that the JV creates can also have profound consequences for competition. This is the case even when the parties' retail arms may be competing fiercely. There may be some merit in considering pricing structures as one of the factors in an antitrust scrutiny of such agreements. For example, an IRU-type model maintains the type of marginal pricing incentives that one sees with full end-to-end competition. Some industry observers that we have talked to similarly believe that a high sunk-cost or even high fixed-cost structure, combined with low marginal costs, might create a "race to the bottom" where prices fall towards short-run marginal costs. This concern is most potent in the fixed-line context.<sup>28</sup> Similarly, there is to our minds, a case for caution when it comes to reciprocal access deals. Certainly, one should be sceptical of claims that such deals boost competition—they only do so if, in the alternative, it was infeasible to arrive at a deal in which the parties genuinely shared networks.

45. Capacity restrictions are a particularly tricky issue for competition enforcement. There is little doubt that a JV that involves firms with collectively very high market shares, and which restricts the capacity available to these firms, can have significant anti-competitive effects. However, restrictions on each JV partner's ability to independently expand capacity may routinely and legitimately feature in many agreements. Rey and Tirole (2001), recognise that certain types of restrictions such as provisions that ensure that each partner will remain exclusive to the co-invested network and not seek out other partners in the same market can foster commitment and participation in the joint project. They argue that reducing the exit options of the parties is conducive to the success of collaborative projects such as JVs.<sup>29</sup> At the time the JV was forged, the parties may have lacked significant market power, and restraints on independent capacity expansions may have been seen as a way of limiting the outside options of the parties to the JVs. Equally, even if the JV partners collectively have very high market shares, there may still be substantial efficiencies associated with the JV, and the commitment created by the restriction on independent capacity expansion may have been vital to securing the JV and achieving the associated efficiencies.

46. This type of dilemma, however, is familiar in the context of the analysis of restraints on competition under Article 101 of the TFEU. The anti-competitive effect of these restraints is weighed against the efficiency associated with the JV as a whole. More generally, the analysis of efficiencies created by the JV— whether in the form of marginal cost reductions or in the form of new products that were otherwise unachievable—is a significant factor against which any anti-competitive effects must be weighed.

47. Finally, Chen and Ross make the point that an offer to partner in a JV can be a way for an incumbent, threatened by entry, to co-opt a would-be entrant. The JV may offer a split of monopoly profits, rather than each firm earning duopoly profits. From a policy perspective, the relevance of this factor depends upon the likelihood of entry by a firm which will not suffer from too great a cost asymmetry with the incumbent. The prospects for such new entry in telecommunications are probably limited.

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<sup>28</sup> Our own observation is that in markets which actually do feature end-to-end infrastructure competition between entirely separate networks, such as the USA and Canada, quality-adjusted prices for fixed broadband services have fallen rapidly. But it does not seem to us that prices have fallen to marginal cost.

<sup>29</sup> Tirole, J. and Rey, P. (2001), "Alignment of Interests and the Governance of Joint Ventures", Working Paper, IDEI, University of Toulouse.

## 4.2 Implications for Regulation

48. However, a variant of this co-opting point may be quite relevant. The previous discussion has largely set aside the fact that the fixed telecommunications market is significantly regulated. The form of regulation that applies is access regulation, i.e. regulated access to the network facilities of a dominant incumbent firm, at a regulated price, typically some measure of long-run incremental cost. The “alternative” that the incumbent firm may have in mind is not facilities-based entry, but the prospect of regulation of its future network investments.

49. The regulatory regime in Europe and other geographies is often a mishmash—the general intention is to regulate where the presumption of significant and enduring market power cannot be relaxed. But the impact of such regulation on the incentives of regulated firms to innovate and invest in next-generation networks has been a major issue, including at a political level. Regulators thus have an incentive to promote such investment, and a JV or “co-investment” project between an incumbent firm and one or more entrants might seem attractive—the investing incumbent firms get the carrot of deregulation, the regulator can claim that competition has been preserved, and the entrant firms get the benefit of owning their own infrastructure.

50. Of course, the result may be that relative to the regulated mandated access alternative, competition in the downstream market may be substantially reduced. The tricky question is whether this reduction in competition necessarily reduces social welfare relative to the alternative. It only does so if the incumbent firm would have built the network even under the threat of regulation. The incumbent firm may have reasons for not doing so. This may be for the justifiable fear that no regulated formula could adequately compensate the firm for its sunk investment in a risky network asset with uncertain future demand. On the other hand, it may reflect the fact that the incumbent firm has a certain amount of bargaining power with respect to the regulator, since it can choose not to build a next-generation network if threatened with regulation.

51. However, we would suggest that the possibility of “sharing as co-opting” offers a reasonably good reason to avoid using the existence of such offers as an automatic cue for deregulation. It may still be possible to incentivise network construction by committing ex-ante to deregulation provided certain market outcomes are satisfied ex-post: these market outcomes may relate to service prices and penetration levels, as well as market shares of the parties.

## 4.3 Conclusions and Remarks

52. Joint ventures in telecommunications raise important competition (and regulatory) issues. These issues are set to become more pressing in the future. There are many reasons that JVs themselves are set to become more popular. In the fixed market, the risk associated with large-scale sunk investments and uncertain future demand causes firms to balk at investing in next-generation networks. Co-investment JVs are one way of sharing and reducing this risk. Regulators, perhaps facing political pressure, have strong incentives to show progress in constructing next-generation networks. Many policy makers also believe that the social benefits from such next-generation networks are large. However, despite these attractions, closer examination of the details of co-investment JVs may be warranted, particularly if the parties to these vehicles are likely to gain a substantial collective market share as a result of the JV. Care should also be taken to ensure that regulation does not mechanically link the creation of JVs to offers of deregulation.

53. Mobile network sharing JVs have been around for many years. The congestible nature of mobile networks, however, raises the possibility that restrictions on independent capacity expansions by JV partners can become competitively problematic. The possibility that once-efficient restrictions on independent capacity expansions can now serve the purpose of committing the JV partners to keeping capacity low should not be ignored. Given that capping capacity can facilitate data caps and high “overage” charges to data-hungry mobile customers, partnering firms may well incentives to maintain restrictions on capacity expansions. It is worth noting that the use of network sharing JVs in

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the U.S. mobile industry seems minimal in comparison to other countries. It is also worth noting that in the last year or so, the major U.S. carriers have begun to offer unlimited data plans again.

54. All this being said, the overarching lesson from our reviews of JVs and the economic literature is that there is no “one size fits all” prescription for the competition policy analysis of JVs in the telecommunications sector. Indeed, it is precisely the highly case-specific nature of the potential competitive effects from JVs that makes a “rule of reason” analysis (as under competition law) the appropriate vehicle for evaluating of these JVs. While the intersection with sector-specific regulation cannot be ignored, we would caution against the creation of “hard-wired” regulatory rules (or deregulatory rules) pertaining to JVs.

55. In extensions to this work, we plan to examine (a) the competitive effects associated with restricting access to joint ventures in fixed-line telecommunications, and (b) examine the potential for sharing of existing infrastructure to be used to co-opt or forestall entry, perhaps especially in the mobile segment.