Competitive Neutrality in Interconnection Pricing

A Report on behalf of AAPT Ltd

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Executive Summary

We analyse the impact of a requirement of competitive neutrality on the desired regulated access price for a bottleneck infrastructure provider who is vertically integrated downstream. We argue that competitive neutrality in this setting requires that the access price be set so that the fact of integration does not drive any differences in competitive behaviour between the integrated provider and its non-integrated rivals. This is done using a general model of oligopolistic competition rather than specific 'winner-take-all' models that have, recently, been used to argue policy positions regarding access pricing.

Applying this definition to access pricing demonstrates first, that the marginal access price must be the same for each non-integrated firm. Second, it requires that the marginal access price must be no different from the actual marginal cost facing the integrated access pricing. Thus, to uphold the principle of competitive neutrality requires the regulator to set a marginal access price equal to the short-run marginal cost of the access provider. As has been noted extensively elsewhere such an access price is not inconsistent with full cost recovery of the provider so long as non-linear pricing (e.g., a two part tariff) is employed.

What this means in the current debate regarding the level of the marginal access price for PSTN interconnection is that it is not possible to simultaneously argue for competitive neutrality to be maintained while at the same time proposing a marginal access charge that is above the short-run marginal costs of the PSTN provider. The only circumstance under which a competitive neutrality access price could be above marginal cost is if the access provider is vertically separated from the downstream markets. If this is not possible, then competitive neutrality necessitates a PSTN interconnection charge equal to short-run marginal cost. In this respect, recovery of so-called access deficit contributions (or fixed CAN costs) through PSTN interconnection charges violates competitive neutrality.

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1   Introduction

> The term 'competitive neutrality' (a.k.a. 'level playing field', 'competition on equal terms', *etc.*) has been increasingly bantered around in regulatory and antitrust proceedings. In these debates, the term is usually used (but not always) to characterize one's preferred regime and to disparage the opposition's proposals Yet these exchanges often fail to define exactly what is meant by the term. Definitions of the term are at best implicit, used inconsistently, and certainly not agreed upon (Tye, 2002, p.1).

In January 2003, Telstra submitted its proposed undertakings for PSTN interconnection pricing to be evaluated by the Australian Competition and Consumer Commission (ACCC). In Telstra's Submission in Support of its Undertakings dated 9 January 2003, Telstra states that:

> [c]harges set on the basis of Efficient Costs ought to be determined in such a way as to ensure that the hypothetical access provider would be no worse off constructing and operating the hypothetical new build PSTN than it would be merely seeking access to it as an access seeker. This is the principle of competitive neutrality. If this principle is not respected, an otherwise efficient provider of the service being modelled would choose not to provide it, and no retail PSTN Services would be provided to the community. (p.5)

Telstra appears to argue that the prices proposed in its undertakings satisfy this definition of competitive neutrality.

Telstra also refers to the concept of competitive neutrality in its paper "The need for an Access Deficit Contribution for PSTN Access Service Pricing: Telstra's submission on the ACCC discussion paper," 2003 (hereafter referred to as Telstra-ADC). Telstra states that "[t]he principle of competitive neutrality ensures that any regulatory arrangements should not confer an unfair advantage or disadvantage towards any of the firms competing in a market." (Telstra-ADC, p.72)

In its Discussion Paper on Telstra's Undertakings (March 2003), the Australian Competition and Consumer Commission (ACCC) note that "Telstra argues that the principle of competitive neutrality implies that charges set on the basis of efficient costs should be

determined such that an access seeker would be no worse off building a new PSTN network than it would be purchasing the service from Telstra. In effect, Telstra appears to define competitive neutrality in terms of a build-buy decision. The Commission is interested in the industry view on this interpretation of competitive neutrality, or any alternative interpretations." (p.30)

We have been asked by AAPT to review the concept of competitive neutrality as it has been used in the context of the Australian debate on telecommunications access pricing. We have also been asked to provide an economic analysis of the concept of competitive neutrality in order to aid the Commission in its deliberations on the Telstra Undertakings.

In this report, we consider the concept of competitive neutrality from the perspective of symmetry between the competitive conduct of an integrated and a non-integrated access seeker. In other words, what access arrangements confer neither a competitive advantage nor disadvantage on an integrated carrier relative to otherwise identical non-integrated carriers in the relevant retail market? Thus, we develop a formal concept of competitive neutrality that is consistent with the use of this term in the telecommunications debate in Australia, including the use of this term by Telstra.

In section 3 we show that a general approach to competitive neutrality that does not rest on highly specific assumptions about the nature of competition has strong implications for access prices. In particular, competitive neutrality has two key requirements for PSTN originating and terminating access pricing:

1. All non-integrated downstream firms face the same marginal price for interconnection; and

2. The interconnection price for all non-integrated downstream firms is set equal to the true marginal cost of the access services.

In section 4 we consider a number of arguments made by Telstra relating to competitive neutrality, particularly those presented in Telstra-ADC. Section 5 concludes while the formal analysis is presented in the appendix.

2 The Concept of Competitive Neutrality

The approach to competitive neutrality presented in Telstra's Submission in Support of its Undertakings appears to be closely aligned with Tye's notion of weak competitive neutrality. Tye (2002, p.16) notes that "[a]n interconnection regime achieves weak competitive neutrality if ownership of the accessed facility confers neither an advantage nor a disadvantage with respect to prospective competition on the basis of incremental costs." This said, Telstra appear to only consider 'one side' of Tye's test. In other words, Telstra appears only to consider if the access regime will make Telstra, as an integrated carrier, worse off than a separated access seeker. However, any sensible definition of competitive neutrality must be symmetric, involving the principle that the integrated carrier is neither better off nor worse off than an otherwise identical non-integrated carrier. After all, an interconnection regime that provides significant asymmetric benefits to the integrated carrier relative to its non-integrated competitors can hardly be called competitively neutral.

While Telstra's approach to competitive neutrality appears closely related to the underlying principle of weak neutrality, as presented by Tye, this concept as developed by Tye has some important caveats. Tye's notion of weak competitive neutrality evolved out of the debate surrounding the Efficient Component Pricing Rule (ECPR) and assumes a particular form of 'winner takes all' competition. This limits its applicability. In particular, the type of retail competition envisaged by Tye (Bertrand competition) only has a well defined outcome if all downstream firms sell homogeneous products and have constant marginal costs.[1] Thus, as Ergas (2002, p.3) notes, "it is not apparent that the concept [Tye] has set out is at all well defined when you go from Bertrand competition, and the other assumptions underpinning ECPR, to other characterisations of the competitive process."

Equating the concept of competitive neutrality with interconnection prices that neither systematically discriminates in favour of or against the integrated access provider seems both reasonable and consistent with the general debate in Australian telecommunications. But the concept will only be useful if (a) 'systematic discrimination' is formally

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[1] More formally, unless all firms sell homogeneous goods, have constant marginal costs and face no capacity constraints, a well-defined pure strategy equilibrium will generally fail to exist for Bertrand competition.

defined and (b) the concept is not tightly linked to particular assumptions about the nature of the retail telecommunications products and the nature of retail competition.

To see this, consider Tye's concept of weak competitive neutrality. The concept of competition used by Tye is 'winner takes all' Bertrand competition. Under the strict confines of this form of homogeneous goods competition, Tye defines 'systematic discrimination' in terms of the more efficient firm. In particular, an access regime will only be defined as weakly competitively neutral if a firm with a lower (constant) marginal cost for the relevant retail services is able to win all retail customers in Bertrand competition.

> In practice, what this means is that the interconnection regime should always permit the most efficient firm to compete successfully via price competition – there should always be a price available to the lowest-cost carrier that will permit it to succeed in a "winner take all" competition and that price should be profitable. (Tye, 2002, p.16)

While Tye's approach provides a useful starting point, as Tye himself points out, the concept of weak competitive neutrality that he develops has little analytical power. "[W]eak competitive neutrality is a rather permissive standard for judging interconnection regimes, as it is satisfied by a wide variety of interconnection prices in a regime of price competition." (Tye, 2002, p.16) In fact, it could be argued that Tye's approach is not simply permissive but is not particularly useful as it is satisfied for any interconnection prices between zero and those associated with a monopoly retail price!

The problem with Tye's approach is that it starts from a particular narrow notion of competition and tries to infer a definition of systematic discrimination from this notion of competition. In our opinion, this approach provides little insight. Rather, the concept of what it means for firms to be 'treated equally' needs to be defined first and then a notion of competition can be used to link equal treatment and access pricing.

To consider the concept of equal treatment, consider two retail telecommunications carriers. Assume that these carriers are alike in every possible way except for the fact that one of the carriers is vertically integrated with the upstream provider of access services. In other words, both retail carriers have access to the same technology, have the same initial commercial opportunities and have the same competitive strategies available to them in the marketplace. From the perspective of these two otherwise identical carriers, equal treatment would mean that competitive behaviour of these carriers was not influenced solely by the fact that one of the carriers is vertically

integrated. In other words, there would not be systematic discrimination in favour of or against the integrated carrier if the retail operations of that carrier behaved in exactly the same way as an otherwise identical retail carrier that was not integrated.

This approach to systematic discrimination and competitive neutrality can be seen from a slightly different approach. Suppose that a number of identical retail carriers compete with each other and that none of these carriers is vertically integrated. The carriers all operate under an access regime and each receives the exact same prices under this access regime so that there is no asymmetric treatment of these carriers. They are identical and this is reflected in their behaviour in the retail market. Note that this does not mean that the carriers engage in perfect competition. They may engage in imperfect competition with homogeneous products as exemplified by the Cournot model of competition. Or they may engage in imperfect retail competition with differentiated products (for example, as under the Salop 'circular city' model). The only constraint is that the firms face identical strategic opportunities and choices in the retail market.

Now suppose that one of these identical retail carriers merges with the upstream access provider to create an integrated carrier but that nothing else changes. In particular, integration results in no changes to the technology used by the integrated carrier in the retail market and there is no change in the access regime faced by any of the remaining non-integrated carriers. Then if the interconnection regime is designed so that it neither systematically discriminates in favour of the integrated carrier nor systematically discriminates against the integrated carrier, then the fact of integration should have no effect on the retail behaviour of the integrated carrier.

Technically, this notion of equal treatment means that the first order conditions for profit maximising behaviour for each of the downstream firms will be identical if those firms only differ by their integration. Thus, competitive neutrality will only be satisfied if the optimising behaviour of otherwise identical downstream carriers does not depend on the presence or absence of integration.

In general, analysing the behaviour of both vertically integrated and vertically separated retail carriers requires a particular model of competition. But an approach to competitive neutrality that depends on a particular model of competition will have little use if it fails to remain valid for other forms of competition. Retail telecommunications carriers can compete in a wide variety of ways – through price, range of product offerings, quality of service, advertising and image, to mention just a few. A general approach to competitive neutrality should be able to encompass all these alternative forms of competition.

In the appendix, we derive an approach to competitive neutrality that (1) respects the concept of neutrality as meaning that there is no systematic bias either for or against an integrated carrier and (2) applies to a wide variety of forms of competitive interaction. While we initially use Cournot competition to explain the basic features of our approach, we then show how our basic conclusions remain valid regardless of the form of competitive behaviour.

Put simply, in the appendix we derive a highly applicable approach to analysing competitive neutrality in the context of regulated access and the presence of both integrated and non-integrated carriers.

Our modeling leads to two simple, practical criteria that must be satisfied for competitively neutral access pricing. Access pricing can only be competitively neutral if:

1. All non-integrated downstream firms face the same marginal price for interconnection; and

2. The interconnection price for all non-integrated downstream firms is set equal to the true marginal cost of the access services.

The concept of competitive neutrality developed in the appendix encompasses and generalises Tye's notion of weak competitive neutrality.

It needs to be stressed that our main results do not depend on any assumptions about the nature of competition. Rather, the analysis presented in the appendix looks at the strategic incentives facing both integrated and separated retail carriers and considers when these incentives will be aligned regardless of integration. To the best of our knowledge, this is the first time that such a formal analysis of competitive neutrality and vertical integration has been undertaken in the regulatory literature.

Because our approach is highly general, the two key criteria for competitively neutral access prices are widely applicable. In particular, if access prices satisfy the two practical criteria presented above then access prices will satisfy competitive neutrality regardless of the nature of retail competition.[2] Note that, as in the case of Tye's 'weak

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[2] There is a slight caveat to this result presented in the appendix. In particular, the strategic opportunities of a retail carrier must not alter simply as a result of integration. If, in contrast, integration allows a retail carrier to exploit strategic opportunities that are simply unavailable to its non-integrated competitors, then competitive neutrality may fail even if our two practical criteria are met.

competitive neutrality,' less restrictive conditions may be appropriate under particular competitive circumstances. However, these same criteria will fail under other competitive scenarios. In contrast, the practical criteria developed in this paper are widely applicable and hold for any competitive scenario. In this sense, they do not require the ACCC to attempt to 'guess' the exact nature of retail competition when trying to assess whether or not access prices are competitively neutral.

3 Criteria for a Competitively Neutral Access Price

In this section, we present the intuition that underlies our practical criteria for competitively neutral access prices. In particular, we explain why access prices that satisfy these criteria will be competitively neutral and why prices that fails to satisfy these criteria will not be competitively neutral.

3.1 The requirement for equal access prices

The requirement for equal access prices is both intuitive and simple. Consider two access seekers who are identical in all aspects except for the (marginal) access prices that they face. In particular, suppose that one carrier tends to face higher access prices at the margin than the other carrier. The carrier facing the higher marginal access prices will clearly face a competitive disadvantage when competing for customers. The high-access-price carrier will not have as great an incentive to gain customers as the low-access-price carrier because it will not make as great a level of profit from those customers. More of its profits will be taken up by the purchase of access, muting competitive incentives for the carrier facing the high access prices.

To see this, consider a simple example. Suppose that there is a new customer seeking a particular telecommunications service. The customer is willing to pay up to $100 per month for this service. There are two vertically separated carriers who can provide the service to the customer. For simplicity denote these carriers by *A* and *B*. The fixed cost to either vertically separated carrier of supplying the customer is the equivalent of $20 per month with additional retail costs of $30 per month. But the carriers face differential access charges. Carrier *A* has a lower price of access than carrier *B*. Thus, while carrier *A* will only pay $20 per month to provide the relevant retail service to the customer, carrier *B* will have to pay $25 per month. This means that the lowest price at which carrier *B* would be willing to sell the service to the new customer is $75. Such a price only just covers the carrier's costs, including the cost of access. In contrast, carrier *A* could price the new service down to $70 while making a profit from the new customer. Clearly, in any competition between the two carriers for the new customer, carrier *A* will tend to

be more aggressive than carrier *B* and is more likely to win the customer's business. But this competitive advantage does not reflect any innate efficiencies relating to carrier *A*. Rather, carrier *A* has a competitive advantage solely because it receives a lower access price.

If otherwise identical vertically-separated carriers do not receive identical access prices, then this can lead to inefficiencies. Suppose that in the above example carrier *A* was actually less efficient than carrier *B* in the sense that its retail costs of serving the new customer were $33 per month compared to only $30 for carrier *B*. Given carrier *A*'s $5 per month access price advantage we would still expect carrier *A* to bid more aggressively for the new customer. Carrier *B* can only set a profitable price down to $75 while carrier *A* remains profitable as long as the retail price does not fall below $73. So even though carrier *A* is less efficient and has higher costs than carrier *B*, we would expect carrier *A* to win the business of the new retail customer due to the asymmetry in access prices.

3.2   The requirement that marginal access prices must equal marginal cost for competitive neutrality

The requirement that all non-integrated carriers face a marginal access price equal to the marginal cost of access is less obvious. To understand this requirement it must be remembered that competitive behaviour is always carried out for marginal customers. If a carrier has a customer that has strong loyalty to that particular carrier for some reason, and who is unlikely to switch carriers even if their favourite carrier significantly increases its price, then there will be little competition for that customer. It is sometimes stated in antitrust issues that such a customer is 'captive.' Gaining captive customers is rarely the realm of active competition. Rather active competition focuses on those customers who are marginal to any particular carrier and who would be willing to switch carriers given a small but significant economic reason.

Because competition occurs 'at the margin,' the strength of competition associated with an individual carrier will depend on that carrier's marginal costs, including the marginal access price. As noted above, if one non-integrated carrier faces a higher marginal access price than other non-integrated carriers then the high-cost carrier will be less competitive.

One carrier, however, does not face a regulated access price. The integrated carrier simply produces 'its own' access services. This

carrier will always operate on the basis of the true marginal cost of this access and will compete accordingly. Unless all other carriers explicitly face an access price equal to the true marginal cost of access then they will not compete on 'equal terms' with the integrated carrier.

This result raises a number of questions. The first relates to the claim that an integrated carrier will not distort retail competition even if marginal access prices exceed marginal cost, because access profits are an opportunity cost for the integrated carrier. The second relates to the use of transfer prices. The third deals with the desirability of 'aggressive' behaviour by the integrated carrier. We deal with each of these in turn.

3.2.1   Access prices and opportunity cost

If the integrated carrier takes account of the profits that it makes from access sales to non-integrated carriers as an 'opportunity cost' of its own competitive retail behaviour, then won't this mean that competitive neutrality is maintained even at access prices that exceed true marginal cost?

This is essentially the claim made by Tye (2002) when considering weak competitive neutrality. Tye shows this claim to be true in 'winner takes all' competition when customers only ever demand a constant amount of the retail product. Unfortunately, it does not generally hold true for other forms of competition and other assumptions on consumer demand. Formally, this is shown in the appendix. But to see the reason for this, consider a slight modification on the example presented above.

As before suppose that there is a single new customer interested in a specific retail telecommunications service. This customer has a very simple demand curve that involves the customer buying more of the relevant retail product as the price of that product falls. If the price exceeds $100, then the customer buys none of the product. If the price is between $65 and $100 then the customer buys one unit of the product per month. If the price is $65 or less then the customer buys two units of the product per month. Again assume that the retail costs associated with serving this customer are equal to $50 per unit of retail product per month. But now, assume that the true marginal cost of supplying upstream access to produce the retail service for the customer is equal to $5 per unit of retail product. Initially, the access price is set so that the non-integrated carrier *A* pays an access price of $20 per unit of retail output per month for this customer. Carrier *B* however is now integrated with the upstream access provider.

In this situation, the cost to carrier *A* of serving the new customer is $70 per unit per month, including the price of access. We maintain the strong assumption of 'winner takes all' competition used by Tye (2002) so that carrier *A* will be forced to set a price of $70 per unit for the retail product. If carrier *A* is, in fact, the lowest priced retailer then the customer will buy one unit of the product, carrier *A* will make no profit but the access provider will make $15 profit from the sale of access.

In this situation, would the integrated carrier prefer its downstream division to undercut carrier *A*? The answer to this is not *a priori* obvious. After all the integrated carrier makes $15 from letting carrier *A* make the retail sale. When considering its own retail strategy, the integrated carrier will take those access profits into account. If it steals the customer, then the integrated carrier will forgo the $15 access profits that it makes from carrier *A*. These profits become an opportunity cost of carrier *B* stealing the retail customer. In these circumstances, won't carrier *B* act as if its faces an access price of $20 (the same as carrier *A*)? After all, if it sells one unit itself to the final customer then carrier *B* will bear the true marginal cost of access of $5 and face the loss of access profits of $15. In total, doesn't this mean that the integrated carrier will act *as if* it faces an access price of $20, the same as carrier *A*?

This argument about opportunity cost is seductive. It is presented in Telstra's Submission regarding the access deficit contribution (Telstra ADC at p. 29 to 31). The argument, however, is wrong.

What alternatives face the integrated carrier *B*? As per the opportunity cost argument, it could sell one unit of the retail product to the customer, either through carrier *A* or directly. If it sells the retail product through carrier *A* the integrated firm makes all its profits on access. It makes $15 profit from the customer. Having its downstream firm undercut the price of carrier *A* and sell *one* unit to the final customer will only lower the integrated carrier's profit. So carrier *B*, if it seeks to maximise the profits of the integrated carrier as a whole, will never want to undercut *A* to just sell one unit of the retail product.

But recall that here (and unlike the example used by Telstra) retail demand 'slopes down.'[3] If carrier *B* lowers its retail price below that of carrier *A* it does not simply steal the one unit of retail sales, but it can also raise retail sales. And, in fact, it is profitable to do this. Given

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[3] This says that demand is *not perfectly inelastic* but otherwise will apply regardless of the price elasticity of demand. Indeed, it would be highly implausible for demand to in fact be perfectly inelastic in any general market context.

the true marginal access cost of $5, the cost of providing each retail unit for carrier *B* is $55. If carrier *B* sets a price of $65 then the customer will buy two units of the retail product. The integrated carrier will make $20 profit (two units sold with $10 profit per unit) by undercutting carrier *A* and selling two units of retail output. Taking the opportunity cost of the lost access sales to carrier *A* into account, carrier *B* makes an additional $5 profit from aggressively undercutting carrier *A* in the retail market.

This example involves a simple downward sloping demand that is designed to show the failure of the Telstra 'opportunity cost' argument. More generally, whenever demand is smoothly 'downward sloping,' the Telstra opportunity cost argument fails. In this sense, the Telstra claim (in Telstra-ADC) that its internal prices will reflect the prices it charges other carriers for PSTN access services (including any ADC), at best, is misleading, and more generally, is wrong from the perspective of competitive neutrality.

Tye (2002) notes a caveat to his claims about weak competitive neutrality relating to the 'monopoly price.' If the retail price under winner-takes-all competition would exceed the integrated firm's monopoly price then the opportunity cost argument fails. But our example here is not driven by this effect. It is easy to see that an integrated monopoly carrier would prefer to set a price of $100 to the new customer, making profit of $45 rather than a price of $65 with profit of $20. In other words, Tye's 'monopoly price' caveat is not driving our result here. Rather, we have simply assumed that, in line with standard economics, the quantity of retail telecommunications products sold rises as the price of those products falls.

In summary, if the retail demand for telecommunications products slopes down then an integrated carrier will tend to be 'more aggressive' than a non-integrated carrier whenever the marginal access price faced by non-integrated carriers exceeds marginal cost.[4]

3.2.2   Internal transfer prices

The second issue raised by our analysis relates to internal transfer pricing. If the integrated carrier requires that its downstream subsidiary pay an internal price for access equal to the access price for non-integrated carriers won't this restore competitive neutrality?

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[4] The failure of the 'opportunity cost' argument when strategic actions lead to new retail sales rather than simply 'swapping' sales is also noted by Farrell (2003).

While internal transfer prices may reinstate competitive neutrality even when the access price exceeds marginal cost, we are highly sceptical of this. In particular, the integrated carrier's retail division would not only have to behave as if the internal transfer price were a true cost, it would also have to deliberately avoid profit maximising behaviour for the carrier as a whole. If the retail division recognises that the transfer prices are merely moving money within the carrier and it seeks to maximise total carrier profits then it will behave aggressively in the retail market.

It is sometimes argued that 'accounting separation' would create enough separation to force the retail division of the integrated carrier to behave as if internal transfer prices were 'real costs.' But again we are sceptical. If the retail division head reports to the CEO and board of the integrated carrier, it will be difficult for that division head to undertake actions that deliberately lower total carrier profits.

We have addressed the issues of vertical integration elsewhere (Gans and King 2003a). In summary, we believe that internal transfer prices are unlikely to make an integrated carrier behave in a competitively neutral fashion if third-party marginal access prices exceed the true marginal cost of access. Further, we note that Telstra does not even set these internal access prices for its own retail operation.

3.2.3   But isn't the aggressive behaviour good?

Another way to interpret the above result is that it casts doubt on the efficacy of competitive neutrality as a standard for evaluating economic behaviour. After all, in the simple example above, the aggressive behaviour of the integrated carrier led to lower retail prices for the customer and greater economic surplus.

This conclusion, however, misses the point. If access prices are set too high – in the sense that the marginal access price exceeds the marginal cost of access – then having at least one carrier (the integrated carrier) who makes decisions on the basis of true costs can be economically desirable. This is formally shown in King (1999). But this is (at best) a second-best result. Rather, the optimal access price should be set so that all carriers face a marginal access price equal to the true marginal cost of access. This will lead to vigorous competition and reinstates competitive neutrality.

We can see this from the simple example above. Suppose that carrier *A* had its access price lowered to the true marginal cost of $5 per unit per month. Then retail competition would force the retail price for both carrier *A* and the integrated carrier down to $55. This is less than the retail price of $65 that arose under the distorted access

prices. Thus, reinstating competitively neutral access prices benefits the end-users.

3.2.4   Summary

For competitive neutrality, the interconnection price for all non-integrated downstream firms must be set equal to the true marginal cost of the access services.

This simple proposition is often confused in the regulatory literature on telecommunications. This confusion stems from the special examples used to illustrate competition. These examples usually involve (a) customers with perfectly inelastic demand so that customers buy a fixed number of retail units regardless of the retail price and (b) a Bertrand competition model of competition. This confusion has led to incorrect arguments being presented to regulators, such as the argument presented by Telstra in its ADC Submission.

In this paper we show formerly in the appendix and explain intuitively above, that competitive neutrality does indeed require marginal access prices to be set equal to true marginal access costs.

4   Analysing Telstra's claims about competitive neutrality

It its Submission to the ACCC titled "The need for an access deficit contribution for PSTN access pricing services," Telstra makes a number of claims regarding competitive neutrality. One of these relating to opportunity cost and internal transfer pricing is considered in the previous section. We have dealt in detail with issues relating to the Access Deficit Contribution and access pricing in Gans and King (2003b, 2003c). In this section, however, we briefly consider the arguments presented in attachments 12, 13 and 16 of Telstra's submission and how they relate to competitive neutrality.

4.1   Competitive neutrality and fixed costs

In attachment 12 (Telstra-ADC), Telstra refers to a number of quotes from the ACCC relating to the ADC and competitive neutrality. Telstra argues that including an ADC in PSTN interconnection prices is necessary to ensure competitive neutrality.

Telstra does not provide any modelling of competitive neutrality that underlies either its claims or the quotes it presents from the Commission. In this sense, it is difficult to evaluate the statements as they are not substantiated by formal economic analysis.

The ADC relates to what are largely fixed network costs. Our analysis in this report shows that marginal access prices must be set equal to marginal access costs for competitive neutrality. This does not prevent access charges involving fixed fees or the recovery of the ADC through some industry based levy such as the USO scheme. But it does mean that fixed costs associated with Telstra's upstream operations must not be included as variable access charges if competitive neutrality is to be maintained.

Put simply, if fixed costs associated with Telstra's upstream operations are included as variable access charges, and as such raise the marginal cost of access above true marginal costs, then this is completely inconsistent with the notion of competitive neutrality.

The argument that fixed sunk costs of upstream operations should relate to downstream behaviour is, in itself, an odd claim. On one

interpretation, Telstra appears to argue that by not including an access deficit in variable access charges, Telstra's own downstream operations are artificially hampered. However, this is clearly wrong as a matter of economics. Given the (competitively neutral) access prices, Telstra's retail operations should seek to maximise profits. The existence or absence of an Access Deficit or any other fixed sunk cost should not alter this profit-maximising behaviour. Telstra's retail operations are not hampered by the existence of fixed sunk upstream costs. Rather, these costs are irrelevant for Telstra's downstream behaviour.

Alternatively, we could interpret Telstra as arguing that access prices should *not* be competitively neutral in order to distort retail competition in favour of Telstra's own downstream operations and to raise Telstra's total profits. This additional profit is justified by the need to 'fund' certain fixed sunk costs.

If this is the basis of Telstra's claim, then it should be clearly made. If Telstra wishes to claim that competitively neutral access pricing is inappropriate because of the existence of fixed sunk upstream costs then it should not pretend otherwise.

In summary, at best, any claim that there are fixed costs of upstream operations that need to be recovered from retail carriers is really an argument for some fixed retail fee or industry fund such as the USO. It does not provide a reason to distort retail competition by discarding competitive neutrality.

4.2   Competitive neutrality and the local call deficit

In Attachment 13 (Telstra-ADC), Telstra discusses competitive neutrality and the local call deficit using an example of tennis courts, energy bars and mineral water. These examples, however, are all based on unit demands' and rely on Tye's concept of 'weak competitive neutrality.' As explained above, and as formally shown in the appendix, these examples fail as soon as the normal economic assumption that demand 'slopes down' is introduced. In this sense, the conclusions drawn from the examples do not generalise and, at best, are of dubious worth.

We discuss the local call surcharge and other ADC issues in Gans and King (2003c). At this point, it is worth noting that many of the upstream costs that Telstra argues need to be recovered through distorted access prices are fixed costs. To recover fixed upstream

costs through increased variable access prices means that competitive neutrality will generally fail to be achieved in the retail telecommunications markets.

4.3   Competitive neutrality and Ramsey pricing

Attachment 16 of the Telstra-ADC provides a Ramsey pricing approach to setting retail and access prices. It is not our intention here to critique this exercise, but rather to note how it relates to competitive neutrality.

If fixed costs *cannot* be recovered through fixed charges, then it may be necessary to raise marginal access prices. The optimal way to do this is through what is termed Ramsey pricing. Such pricing tries to minimise the social loss associated with the distorted pricing subject to raising sufficient revenue to cover the relevant fixed costs.[5]

If marginal access prices have to be distorted in order to raise revenue to cover upstream fixed costs, then an appropriate Ramsey pricing approach is the desirable way to approach this task. But, as our analysis here show, when such 'mark ups' are placed on marginal access prices, competitive neutrality will be lost. Put simply, one of the costs of distorting access prices to recover upstream fixed costs, even if this recovery is as efficient as economically possible, is the loss of competitive neutrality.

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[5] Ramsey prices can also be applied to fixed charges where entry and exit are possible. However, our attention here is on competitive neutrality and the marginal access prices.

5 Conclusion

While there have been numerous definitions of competitive neutrality put forward to justify interconnection pricing methodology, none has fully respected the economic environment that currently applies in telecommunications in Australia. Put simply, demand for downstream telecommunications services is downward sloping for both individuals and, by implication, the market. Hence, simple comparisons involving fixed levels of sales for the purpose of considering 'winner-take-all' competition are not applicable.

We instead build a framework of competitive neutrality as it would apply to a vertically integrated access provider competing with access seekers in downstream markets. Using this approach we can provide a consistent, general and practical definition of competitive neutrality and demonstrate that it implies that access prices should be the same across downstream firms. In particular, as the implicit access price for vertically integrated access providers is marginal cost, the regulated access price should also equal marginal cost if it is to be competitively neutral. Deviations from this, say to require recovery of past investment costs or on-going fixed costs, should be regarded as violations of competitive neutrality.

6   Appendix

In this appendix we develop an economic model to formally define and analyse the concept of 'competitive neutrality.' Our aim is two-fold. First, we cast light on the alternative definitions of competitive neutrality that have been presented in the economics literature. Second, we analyse the competitive neutrality claims made by Telstra.

Competitive neutrality is a widely used but rarely defined term in economics. One reason for this is that what is or is not 'competitively neutral' can depend on the exact structure and circumstances of the industry being analysed. For this reason, we focus our attention on the analysis of competitive neutrality within the context of telecommunications in Australia with the explicit objective of critically analysing Telstra's PSTN undertakings. As such, our focus is on a vertically integrated supplier of telecommunications products who is required to provide its retail competitors with access to specific 'upstream' services. The focus here is on the competitive neutrality of the upstream access prices and we believe that this focus is most appropriate in the context of Telstra's undertakings.

The appendix proceeds as follows. In the next section we present a relatively simple model of competitive neutrality. This model includes a variety of simplifying assumptions. In particular, it is based on Cournot competition in the relevant retail market and constant marginal costs of access upstream. While simple, this model is still significantly more complex and realistic than any existing model of competitive neutrality that we are aware of in the economics literature. It also can subsume the type of informal analysis made by Telstra in its ADC paper. As such, we can use this relatively simple model to highlight the assumptions implicit in Telstra's claims and to show that those claims are not generally valid.

In the second section of this appendix, we develop a more general model of competitive neutrality. This second model does not require any explicit form of competition in the retail market and accommodates both increasing marginal costs of access for the integrated firm and firm specific access prices. This more general model achieves two goals. First, it shows that the basic results from the simple model are generally applicable and do not alter significantly in a more general framework. Second, the results highlight additional factors relating to access pricing and competitive neutrality.

6.1   A simple model of competitive neutrality

6.1.1   The structure of the model

The basic simple model focuses on a single telecommunications product that involves a two-stage vertical production process. The first stage (the 'upstream' stage) produces an essential input. The second (downstream) stage involves adding value to the upstream essential input and selling the final retail product to end-users. The final product is a well defined telecommunications product. The true (short run) marginal cost of access is constant and given by c_a. The regulated price of access is given by p_a. There might be fixed costs of providing access and fixed access charges. The relevant fixed costs of providing the access service are denoted by A while the fixed access charge is denoted by F.

Downstream production technology involves a fixed ratio of access input to final product output. For simplicity, we normalise units so that one unit of access input is required for one unit of output. The downstream technology can be quite general but we assume that there is no natural monopoly in downstream production. We assume that all downstream firms have access to the same technology unless otherwise stated. We represent the variable costs of downstream production by $C(q)$ where q refers to the output of an individual downstream firm. We assume that costs are increasing and convex in output. There may also be downstream fixed costs denoted by R. Including the access charges, a (non-integrated) downstream firm, i, faces production costs $R + C(q_i) + F + p_a q_i$.

Assume that the upstream access provider is also integrated into the downstream (retail) market and competes against the access seekers in that market. We will refer to the integrated access provider as firm T. There will be n access seekers who compete with T in the downstream market.

There are two alternative ways to consider the costs of the integrated firm. First, suppose that the integrated firm as an access provider must treat its own downstream operations at 'arms length'. This means that the internal transfer prices of access within the firm are identical to the prices charged on the open market. The costs of the integrated firm's downstream operations in this case are identical to those of its downstream competitors and these costs are given by $R + C(q_T) + F + p_a q_T$. The integrated firm must also produce access for all firms (including its own subsidiary). Let Q denote the total downstream output. Then the cost of producing access is given by

$c_a Q + (n+1)A$. However, to avoid double counting the internally supplied access services, we need to subtract the revenues created by the internal transfer of access, $F + q_T p_a$, from the integrated firm's costs. The total costs that face the integrated firm are:

$$c_a Q + (n+1)A + R + F + C(q_T) + p_a q_T - (F + q_T p_a) \qquad (1)$$

Alternatively, suppose that the integrated firm does not treat its downstream division at arms length. Then the production decisions of the integrated firm will reflect the true costs of its actions rather than internal transfer prices. In this case, the downstream division of T is charged the true cost of any access services that it uses, given by the fixed cost A and the marginal cost c_a, rather than the regulated prices F and p_a. Let Q_{-T} denote the total output of all non-integrated downstream firms. In other words $Q = Q_{-T} + q_T$. The integrated firm's costs when it does not mirror regulated access prices through its own transfer prices are given by:

$$c_a Q_{-T} + nA + R + A + C(q_T) + c_a q_T \qquad (2)$$

Note however that equations (1) and (2) are identical and equal to $c_a Q + (n+1)A + R + C(q_T)$. In other words, the total costs of the integrated firm are simply the total costs of producing access plus the additional costs generated by its participation in the downstream market. Accounting separation by the use of internal transfer prices that mirror the regulated prices simply alters the distribution of these costs within the firm, not their size.

In addition to bearing their costs, firms will generate revenues. These revenues will depend on the exact nature of downstream competition. The basic cost structure presented above is flexible and can be adapted to a variety of forms of competition.

6.1.2   Competitive neutrality

Competitive neutrality has been defined in a variety of ways that are discussed in the main text of this report. However, a key element of all of these approaches in the context of regulatory pricing context is that such pricing creates neither a systematic bias in favour or against one firm relative to another firm.

To analyse competitive neutrality, we need to analyse the behaviour of the relevant firms. A regulatory scheme will create biases if it results in otherwise identical firms behaving in a non-identical fashion due to the regulation. In the context of our model, there are $n + 1$

identical downstream firms, one of which is owned by the upstream access seeker. Regulatory pricing will then be competitively neutral if there is no systematic difference in behaviour between these firms. In other words, regulatory pricing will be competitively neutral only if the integrated downstream provider faces the same market-based incentives as the non-integrated downstream firms and as a consequence if all identical downstream firms behave in the same way regardless of their vertical integration or lack of vertical integration.

It should be noted that this approach to competitive neutrality appears to be implicitly accepted by Telstra-ADC. In Attachment 13 of that paper Telstra presents an analysis where it argues that if it does not receive an ADC competitive neutrality would not be satisfied.

The approach taken here does not require that all downstream firms always act in an identical fashion. Such an approach to competitive neutrality would be absurd. In our approach, downstream firms can behave differently as a result of having access to different technologies, having different quality of management or by virtue of a range of other factors. The only constraint on behaviour required for competitive neutrality is the requirement that downstream firms, who are alike in all possible aspects except that one firm is owned by the upstream access provider, do not behave in a systematically different way in the downstream market.

More formally, we define competitive neutrality as follows:

> *Competitive neutrality* will hold when, for a given number of firms in the downstream market, the behaviour of the integrated firm in the downstream market does not differ from that of its competitors solely as a consequence of its integration.

To analyse competitive neutrality, we must first impose some form of competitive interaction on the downstream firms. For convenience we use a standard Cournot model of imperfect competition between homogeneous final products with linear pricing.[6] The (inverse) demand curve for the final product is denoted by $P(Q)$. The profits for each non-integrated downstream firm are given by their revenues less their costs:

$$\pi_i = q_i P(Q) - R - F - C(q_i) - p_a q_i$$

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[6] In the next section of the appendix we remove this assumption and allow for market behaviour involving any relevant strategic variable.

The profits of the integrated firm are given by the downstream subsidiaries revenues plus the access revenues less total production costs:

$$\pi_T = q_T P(Q) + p_a Q_{-T} + nF - c_a Q - (n+1)A - R - C(q_T)$$

Rearranging, the profits of the integrated firm are given by:

$$\pi_T = (p_a - c_a)Q + (n+1)(F - A) + q_T P(Q) - R - F - C(q_T) - p_a q_T$$

The non-integrated downstream firms will individually set their output to maximise π_i. The first order condition for the profit maximising output decision of a non-integrated downstream firm is given by:

$$P(Q) + q_i P'(Q) - C'(q_i) - p_a = 0$$

In other words, marginal cost less marginal revenue equals zero for profit maximisation, where the marginal cost includes the marginal cost of access. Note that this means that if p_a is increased, this will reduce the output choice of non-integrated firms; regardless of the level of output chosen by the integrated firm.

The integrated firm has no control over the access prices which are fixed and must supply access on demand to the downstream competitors at the fixed prices. But it will set its own downstream output to maximise π_T. The first order condition for profit maximisation is given by:

$$P(Q) + q_T P'(Q) - C'(q_T) - c_a = 0$$

Again, profit maximisation requires that marginal revenue less the marginal cost equals zero. But the integrated firm considers the real marginal access cost rather than the regulated cost in its decision making. Notice that, all other things equal (in particular, holding the output of non-integrated firms as fixed), the level of marginal access charge, p_a, does not impact on this first order condition and hence, on the output choice of the integrated firm. Indeed, in equilibrium its impact on integrated firm output will only be indirect; through its impact on the output of non-integrated firms.

Comparing the first order conditions for the integrated and non-integrated firms, demonstrates potentially different incentives in their respective output choices if $p_a \neq c_a$. If this is the case, then there will not be competitive neutrality between integrated and non-integrated downstream competitors. If $p_a > c_a$ then non-integrated firms will

face higher marginal costs than the integrated competitor and will be at a competitive disadvantage. If $p_a < c_a$ then non-integrated firms will be artificially advantaged.

This result has an immediate consequence for competitive neutrality:

> *Competitive neutrality will only be satisfied if the marginal price of access equals the true short run marginal cost of access.*

This result clearly is the exact opposite of that claimed by Telstra-ADC. In that paper, Telstra (pp.29-31) claims (1) even if the marginal access price is set above the true marginal cost of access and (2) even if it does not use internal transfer prices that are equal to the regulated access interconnection prices, it will still act as if it faced those regulated prices. The reason presented by Telstra is simple – *if Telstra's own downstream division uses one unit of the access product and this reduces the demand for the access product from other non-integrated firms by one unit*, then Telstra faces the opportunity cost of any foregone access profits. By selling the one unit of access, Telstra could make upstream profits of $(p_a - c_a)$. By using the unit of access itself and not selling it to a downstream competitor, Telstra foregoes those upstream profits. So those foregone profits are an opportunity cost of Telstra's downstream production and Telstra will make decisions based on costs that include those foregone profits. Thus, according to this argument, the true cost of using the downstream access product internally for Telstra is the true cost of that access product, c_a, plus the foregone profits from not selling that unit of access to another firm, $(p_a - c_a)$. But these sum to the regulated access price, p_a.

However, this argument rests on a critical assumption: that when Telstra produces one more unit of the final product, then this will be perfectly offset by a reduction in sales by exactly one unit for all other downstream firms. But this critical assumption will not hold in a market where aggregate demand for the product slopes down. In other words, whenever final customers satisfy the 'law of demand' and tend to buy less of a relevant final telecommunications products whenever its price rises, and more when its price falls, then Telstra's assumption will be false.[7]

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[7] Note that the requirement here is that aggregate demand for the final telecommunications product slopes down, not that each individual firm faces a downward sloping demand. Thus, Telstra's assumption is even violated under standard models of perfect competition in the downstream market. In fact, Telstra's assumption is only generally valid if demand for the relevant final telecommunications product is vertical; i.e. completely price insensitive.

Telstra's argument is wrong because, in general, when Telstra produces an extra unit of the downstream product then this will crowd out less than on full unit of downstream production from non-integrated producers. When Telstra produces an extra unit, this will tend to reduce the final product price in the downstream market. This will cause some 'crowding out' of production by non-integrated producers but will also cause a reduction in price that stimulates demand for the downstream product. Overall, as Telstra expands its output by one unit, the final product price falls, consumers increase total consumption and non-integrated production falls by less than one unit.

Mathematically, we can see why Telstra's underlying assumption is false whenever demand 'slopes down' by totally differentiating the first order condition for profit maximisation of the non-integrated firms. The first order condition can be rewritten as $P(Q) + P'(Q) - C'\left(\frac{1}{n}Q_{-T}\right) - p_a = 0$. Totally differentiating gives:

$$\frac{dQ_{-T}}{dQ_T} = -\frac{nP' + Q_{-T}P''}{(n+1)P' + Q_{-T}P'' - C''} < 0$$

and this will lie between -1 and 0 whenever the second order conditions for profit maximisation are satisfied. In other words, when Telstra increases its downstream production by one unit this leads to an increase in total downstream output. Telstra's analysis of competitive neutrality is false in such a situation.

What is the intuition that drives the failure of competitive neutrality whenever the regulated marginal access price exceeds marginal cost? In such circumstances, all non-integrated firms face inflated marginal costs. These inflated costs cause them to reign in their downstream production for any level of competition. But from Telstra's perspective, these downstream firms are not being aggressive enough. Telstra makes profit from the sale of access whenever the downstream firms sell one more unit, and so Telstra wishes to expand total industry output. It can only do this by its own downstream subsidiary. By raising its own downstream output, Telstra increases total industry output and Telstra finds this profitable as it reaps both the downstream *and the upstream* profits from this total output expansion. Thus, Telstra will tend to be more aggressive in the downstream product market whenever $p_a > c_a$.

In summary, Telstra's argument that it will not violate competitive neutrality even if $p_a > c_a$ and it also fails to internally price the access product at the regulated price, is incorrect as a matter of economics. An inflated access price creates an asymmetry between the

competitive incentives of otherwise symmetric firms; directly violating competitive neutrality.

It is important to emphasise here that whilst a high access price makes the integrated firm relatively more competitive than its downstream rivals, such high access prices do not translate into lower retail prices downstream.[8] Instead, a higher access price reduces the competitive incentives of non-integrated firms. The first order impact of this is for those firms to cut back on their output. A second order effect occurs when the integrated firm expands its output. However, in equilibrium, total output falls below the level that would be achieved with a low marginal access price.

How can competitive neutrality be restored without resorting to marginal cost access pricing? One approach would be to require Telstra to set internal transfer prices for the access product equal to the regulated access prices. But as our analysis in this appendix shows, such an approach can easily be ineffective. Even if Telstra uses appropriate internal prices, if Telstra's downstream division operates to maximise Telstra's overall profits then the internal pricing will not alter Telstra's behaviour. The downstream division will simply 'undo' the transfer prices and produce on the basis of the true costs faced by Telstra. Thus, the simple use of internal transfer prices cannot by itself restore competitive neutrality.

There are only two ways to restore competitive neutrality. The first, as noted by our analysis is to set the marginal price for interconnection equal to the true marginal cost. This does not mean that Telstra will operate at a loss. Rather, it will require Telstra to recover fixed interconnection and network costs through appropriate fixed charges. However, the key point for competitive neutrality is that the marginal incentives facing both Telstra's downstream operations and its non-integrated competitors must not be distorted by the regulated access price. This distortion can only be avoided if the marginal interconnection price is set equal to marginal cost.

The second way to restore competitive neutrality is to allow $p_a > c_a$ but to impose vertical separation on Telstra. This separation must go beyond internal transfer prices. In fact, the separation must mean that the downstream division of Telstra operates as if it were a separate entity and ignores the implications of its own actions for the profitability of other Telstra divisions. Elsewhere we have expressed

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[8] This is in contrast to a special case of Telstra's dominant firm model that it uses in Attachment 14 of Telstra-ADC that is based on an apparently unrealistic model of the demand for telephone services.

scepticism that accounting separation alone could create the necessary internal incentives for competitively neutral behaviour by Telstra (Gans and King, 2003a). However, a full discussion on the merits and costs of structural separation is beyond the scope of this report.

6.1.3   Summary

In this section we have presented a simple, tractable model of the competitive interaction between an integrated telecommunications firm and non-integrated downstream competitors. We have developed a formal definition of competitive neutrality that can be applied to industries, such as the Australian telecommunications industry, where integrated firms provide inputs for non-integrated competitors at regulated prices. We note that *Competitive Neutrality* will hold when, for a given number of firms in the downstream market, the behaviour of the integrated firm in the downstream market does not differ from that of its competitors solely as a consequence of its integration.

We have then applied this definition of competitive neutrality to the formal economic model and shown a key result for competitive neutrality and regulated interconnection prices. *Competitive neutrality will only be satisfied if the marginal price of access equals the true short run marginal cost of access.* In other words, interconnection prices are only consistent with competitive neutrality if the marginal interconnection price reflects the true marginal cost of interconnection.

We compared our approach to the approach advocated by Telstra (Telstra-ADC). We noted that the Telstra approach was based on a critical assumption that will be violated whenever customers have any price sensitivity for the relevant final telecommunications products. In other words, if demand for final telecommunications products 'slopes down' then Telstra's analysis of competitive neutrality will be incorrect.

Finally, we highlighted the implications of our analysis. If interconnection prices exceed the true marginal cost of interconnection, then Telstra will be relatively aggressive in the downstream markets. Competitive neutrality of interconnection prices can be restored by setting the marginal interconnection price equal to the true marginal cost. Lowering the access price down to marginal cost will both restore competitive neutrality and lower the price of retail telecommunications services.

6.2   A full model of competitive neutrality

We now generalise the model presented above to allow for general imperfect competition, increasing marginal access prices and firm-specific access prices. We retain the same notation as above and assume that all downstream firms are identical as before. This assumption is necessary if competitive neutrality is to have any economic basis as it requires a comparison of firms that only differ with regards to their access treatment or their degree of integration. To allow for increasing access costs, we assume that the cost of access to the upstream firm is $c_a(Q)$ where Q is the total output of all downstream firms, including the integrated firm. We require that $c_a' \geq 0$ and $c_a'' \geq 0$ for all Q. The fixed costs of access are still equal to A per downstream firm but their may be firm specific access prices F^i and p_a^i.

Each firm can set a strategic variable s_i. We place no restrictions on this variable except requiring that price and quantity are twice continuously differentiable in this variable. Thus, we assume that the quantities sold by each downstream firm q_i can depend on the level of strategic variable set by all firms. Similarly, the retail market price of the downstream product depends on both the total output of the downstream product and on the vector of strategic variables. We denote this vector by s where $s = [s_1, s_2, \ldots, s_n, s_T]$. Thus, the problem for a non-integrated downstream firm i is to set s_i to maximise profits given the level of strategic variable set by all other firms. In other words, we seek a Nash equilibrium in the relevant strategic variables. Thus firm i will set s_i to maximise:

$$\pi_i = P(Q,s)q_i(s) - C(q_i) - p_a^i q_i(s) - F^i - R$$

The integrated firm will set s_T to maximise:

$$\pi_T = P(Q,s)q_T(s) - C(q_T) - R - (n+1)A + \sum_{i=1}^{n} p_a^i q_i(s) - c_a(Q)$$

The first order conditions for a non-integrated firm are given by:

$$\frac{\partial P}{\partial s_i}q_i + \frac{\partial P}{\partial Q}\left[\sum_{j=1}^{n}\frac{\partial q_j}{\partial s_i} + \frac{\partial q_T}{\partial s_i}\right]q_i + P\frac{\partial q_i}{\partial s_i} - \frac{\partial C}{\partial q_i}\frac{\partial q_i}{\partial s_i} - p_a^i\frac{\partial q_i}{\partial s_i} = 0$$

The first order condition for the integrated firm is:

$$\frac{\partial P}{\partial s_T} q_T + \frac{\partial P}{\partial Q} \left[\sum_{j=1}^{n} \frac{\partial q_j}{\partial s_T} + \frac{\partial q_T}{\partial s_T} \right] q_T + P \frac{\partial q_T}{\partial s_T} - \frac{\partial C}{\partial q_T} \frac{\partial q_T}{\partial s_T}$$

$$+ \sum_{i=1}^{n} p_a^i \frac{\partial q_i}{\partial s_T} - \frac{\partial c_a}{\partial Q} \left[\sum_{j=1}^{n} \frac{\partial q_j}{\partial s_T} + \frac{\partial q_T}{\partial s_T} \right] = 0$$

First, consider the non-integrated firms. Otherwise identical non-integrated access seekers will only face the same incentives and behave the same way in the retail market if the first order conditions for profit maximisation are the same for each firm. But this requires that for all non-integrated firms i and j, $p_a^i = p_a^j$. Thus, we gain an additional requirement for competitive neutrality in this extended model. *Competitive neutrality can only be achieved if identical downstream access seekers face identical marginal access prices.* Put simply, competitive neutrality means that otherwise equal downstream firms must also be treated equally with regards to the per unit access prices that they are charged.

Secondly, consider the integrated firm. For there to be competitive neutrality, a pre-requisite will be that integration provides no innate strategic benefits or costs on the integrated downstream firm. In particular, the effect of each firm's strategic variable on that firm's own sales needs to be independent of the degree of integration so that for all i and all values of s, $\frac{\partial q_T}{\partial s_T} = \frac{\partial q_i}{\partial s_i}$.

If integration provides no intrinsic strategic advantages or costs then the strategic incentives facing an integrated downstream firm will only be the same as the strategic incentives facing a non-integrated downstream firm if the first order conditions for both types of firm are always identical. In other words, if competitive neutrality is to hold we require that for all firms i, $p_a^i = \frac{\partial c_a}{\partial Q}$. This can be easily verified by substitution into the integrated firm's first order condition.

Note that this second result verifies and generalises the result presented for the simplified model above. For competitive neutrality to hold not only must all (otherwise identical) non-integrated firms receive the same marginal access price, this access must be set equal to the true upstream marginal cost of providing access services.

6.3   Conclusion

In this appendix, we have considered both a simple and a generalised model of competitive neutrality. The models are based on the precept

underlying Tye's notion of weak competitive neutrality. In other words, we consider when an interconnection regime ensures that ownership of the accessed facility confers neither an advantage nor a disadvantage with respect to prospective competition. However, unlike Tye's notion of weak competitive neutrality, our analysis does not rely on Bertrand price competition. Rather, our analysis allows for a wide variety of forms of imperfect competition including Cournot competition, differentiated goods price competition and, in fact, any form of strategic interaction that leads to imperfect competition. As such our notion of strategic competitive neutrality is considerably more general than Tye's notion of weak competitive neutrality. Because strategic competitive neutrality applies to far more general settings than weak competitive neutrality, its requirements are far more specific.

Our analysis shows three key elements are required for strategic competitive neutrality. Ownership of the infrastructure facility being accessed will not provide any competitive benefits or constraints to the integrated firm only if

1. Integration by itself does not provide a strategic benefit or cost relative to non-integrated downstream firms; and

2. All non-integrated downstream firms face the same marginal price for interconnection; and

3. The interconnection price for all non-integrated downstream firms is set equal to the true marginal cost of the access services.

If *any* of these three conditions is violated then competitive neutrality will not hold.

Finally, we assessed Telstra's argument that it would automatically 'account' for any interconnection prices in its own decision making as such prices would become opportunity costs for its integrated downstream operations. We showed that this conclusion only held true under extreme and unrealistic assumptions, such as when consumers have no price sensitivity for retail telecommunications products. While Telstra's claim is theoretically possible, it is unlikely to hold true in any real-world telecommunications market.

7   References

Ergas, H. (2002) "Discussant remarks on 'Competitive neutrality: regulating interconnection disputes in the transition to competition'," *Paper presented to the ACCC Regulation and Competition Conference*, Manly Beach, Australia, July 25-26.

Farrell, J. (2003) "Integration and Independent Innovation on a Network," *American Economic Review*, 93, 420-424.

Gans, J.S. and S.P. King (2003a) "Investigating the Benefits and Costs of the Structural Separation of Telstra," *Submission to House of Representatives Inquiry into the Structure of Telstra*, 31st January.

Gans, J.S. and S.P. King (2003b), "The Access Deficit Contribution for PSTN Interconnection Pricing," *Submission to the ACCC Inquiry on the ADC*, February.

Gans, J.S. and S.P. King (2003c), "Evaluating Telstra's Undertakings for CAN Cost Recovery," *Submission to the ACCC*, June.

King, S.P. (1999), "Price Discrimination, Separation and Access: Protecting Competition or Protecting Competitors?," *Australian Journal of Management*, 24 (1), June, pp.21-35.

Tye, W. (2002) "Competitive neutrality: regulating interconnection disputes in the transition to competition", *Paper presented to the ACCC Regulation and Competition Conference*, Manly Beach, Australia, July 25-26.