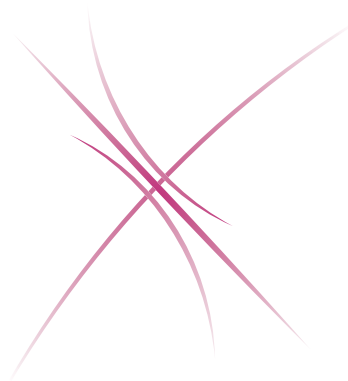


# Policy Challenges in Two-Sided Network Industries

Ricardo Gonçalves

May 2003



Europe Economics

STAFF WORKING PAPER



## **FOREWORD**

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Europe Economics Staff Working Papers are intended to provide a complementary channel for making available economic analysis undertaken by individuals within the firm.

The present paper has been prepared by Dr Ricardo Gonçalves, a consultant at Europe Economics. This paper reviews recent economic research into two-sided network industries, and provides a critical analysis of some regulatory decisions in that context.

It is hoped that this work will provide a relevant technical contribution to an important area of current debate.

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## 1 INTRODUCTION

Some industries possess two peculiar characteristics which make them particularly interesting.

First, they provide a good or service which increases in value with the number of persons who consume it (a so-called “network externality”).

Think about telecommunications, or credit cards, and you will immediately understand that the value to any given consumer of using a telephone or credit card network increases with the number of people already connected to the telephone or credit card network, as more transactions become possible. In both cases, your phone or credit card gains wider acceptance and increases the number of opportunities you can make use of them by the fact that more people connect to the telephone or credit card network. These industries are often referred to as network industries.

Railways is another example of a network industry. At a given time of day, as more people use trains, train companies will usually increase the number of services per hour to accommodate demand, and therefore benefit all existing users by giving them more flexibility when choosing a train time for their trip.<sup>1</sup>

Second, these network industries often face a two-sided demand, in so far as the transactions which they enable are demanded by two separate (and uncoordinated) types of consumer, whose participation is essential. Again, think of credit cards and you will realise that in order to enable a transaction a cardholder must present his card as a means of payment to a merchant who also accepts credit cards.

Therefore, two-sided network industries face the celebrated “chicken-and-egg” problem, and they must be careful to “get both sides on board”. Of what use is a credit card if it is widely held by consumers, but not accepted by merchants, or vice-versa? What is the point of attracting many potential buyers to an auction internet portal, if you fail to attract sellers? Moreover, you will never actually be able to attract much demand from one side (say credit card holders or potential buyers) without actually attracting the other side (say merchants or potential sellers).

There are many other examples of two-sided network industries besides those already mentioned above. The videogame industry is another such example. Videogame consoles from different manufacturers are usually designed to be incompatible, i.e. games designed for a given console will generally not work in another.<sup>2</sup> Therefore, when choosing a console, final consumers will look for the console price as well as the range and prices of games which can be played with that console. The console manufacturer then has the incentive to guarantee that a wide range of popular games are designed to be played with their console.<sup>3</sup> This console manufacturer faces a

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<sup>1</sup> As we will see, railways are an example of a one-sided network, with an indirect network externality.

<sup>2</sup> It is debatable whether this incompatibility is technically necessary or a strategic choice by the console manufacturers. However, this discussion is beyond the scope of this paper.

<sup>3</sup> In practice, the price charged to videogame designers is negative, i.e. the console manufacturer usually sells at low prices a software development kit which allows game designers to design games for that console, and designers then receive royalties on the games actually sold. For example, the demise of Nintendo’s N64 system has been linked to lack of third party software support, i.e. video games.



two-sided demand: on the one hand it must charge a price to videogame programmers such that it is in their interest to design games for that console; on the other hand, it must charge a price to final consumers so that they purchase the console and the games. The industry is also a network industry: the more people buy the console, the more likely it is that more types of games (to accommodate the tastes of all consumers) will be available, and therefore benefit existing users.<sup>4</sup>

Computer operating systems, such as Microsoft Windows, also face a two-sided demand. The operating system sits in the middle between final users, who wish to make use of Windows as a tool to access other useful applications, such as word processors, and application programmers, who see Windows as the means to reach final users. Microsoft must balance demand from these two sides, by guaranteeing that a sufficient number of applications is indeed designed to run on Windows, and therefore that Windows becomes appealing as an operating system to final users. This example is very similar to the videogame industry just described.

In the media sector, some newspapers may have business models which resemble two-sided network industries, although this business model may not apply to the industry as a whole. Some newspapers increase their circulation by financing part of their activities through adverts and/or classifieds (and therefore charging lower prices to the readers). While doing this, the newspaper must charge advert prices which attract potential advertisers, and a newspaper price which attracts readers, i.e. the newspaper faces a two-sided demand. By choosing this business model, the newspaper also faces a two-sided demand: as the number of readers increases, companies will be more willing to advertise in the newspaper. Newspapers which choose not to finance their activities through ads (e.g. news-only newspapers) and only charge a final price to the reader may be seen as network industries, but not two-sided ones. Increased readership generates the financial means to produce higher quality news, therefore benefiting all existing readers, but demand in this case is one-sided (final reader only).

Other less obvious examples of two-sided networks are TV networks, speaker meetings, shopping centres and Internet websites. TV networks face a similar problem to newspapers which use adverts to finance their activities, and therefore also face a two-sided demand. The sponsor of a speaker meeting will also face a two-sided demand. On the one hand it must attract celebrity speakers (with speaker willingness to participate often dependent on the size and nature of the audience) and on the other hand it must attract attendance (whose size and nature may depend on the quality of the speakers). Such meetings usually pay speakers for their appearance and charge the audience for their presence there. Shopping centres must on the one hand attract shops and on the other hand consumers, and therefore also face a two-sided demand. Finally, standard commercial Internet websites are partly financed through advertising on their web pages, and therefore fit into the business model of newspapers financed through advertising.

Recent economic research in this topic has highlighted some interesting results (Evans (2002), Schmalensee (2001), Rochet and Tirole (2000, 2001)). First, in its attempts to attract demand from both sides, a two-sided network may charge different prices to each type of consumer or

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<sup>4</sup> As we will see below, the externality in this industry is indirect.



more generally to each side of the market, depending on costs and elasticity of demand. The ratio of prices charged to each side of the market is referred to as the price structure (we will define this more carefully below). Second, the overall price level (the sum of prices charged to each side of the market) also depends essentially on costs, the elasticity of demand and competition. Note that competition does *not* affect the price structure, i.e. the way in which a given network allocates the overall price level between the two sides of the market. Applying this to say, the credit card industry, implies that the interchange fee (the fee which is usually paid by the acquirer bank — the merchant's bank — to the issuer — the cardholder's bank) does *not* depend on the degree of competition in the market. The novel result from this recent economic research is that *competition affects the price level* (a textbook result in economics) *but not the price structure*.

Additionally, under some assumptions (linear demands), the price structure defined by the network is actually socially optimal. In other words, a network, in its attempts to set prices so as to maximise its profits, actually produces a socially optimal outcome, because the objectives of the network exactly coincide with those of society. In these circumstances, *regulation of the price structure as defined is unlikely to produce an outcome which is better than the market outcome*. However, depending on the degree of competition between the networks, the price level may not be socially optimal, i.e. networks may be charging too high a combined price to both sides of the market, and lowering those prices would leave everyone better off. In the absence of competition, regulation which facilitates competition in the market (as opposed to direct price regulation) might be desirable, and more intrusive direct regulation of the *price level* might be seen as a mechanism of last resort to achieve the optimal outcome.

From the point of view of public policy, two-sided network industries raise some challenges. First, one has to be careful in the analysis of these issues, because mere observation of a high price in one market does not necessarily mean that the price is too high, and therefore market power is being exercised. Markets may need to be defined individually (in which case a two-sided network would perhaps operate in two separate markets) but the interactions between the two must not be neglected. In some cases, it can even be argued that the relevant market is that of the platforms, i.e. the relevant market may be the provision of a “matching” service to the two sides of the market. Demand and supply side substitutability of the network as a whole heavily depends on the interdependencies between those two sides of the market. Looking and considering each side of the market in isolation is likely to lead to sub-optimal policy conclusions and/or recommendations. For example, a high interconnection fee in the credit card industry should not suggest the exercise of market power. Individual market prices must be looked at from a more general (network-level) perspective.

Second, what at first sight appear to be abuses of a dominant position, for example, predatory prices (i.e. prices below cost) or unfair cross-subsidies which distort competition, may be no more than the reflection of the fact that the price structure of a two-sided network is not necessarily geared to costs. Instead, the price structure is a tool to balance the demand from the two sides. In these circumstances, attempts to direct prices towards costs, in the hope of increasing social welfare, may backfire, and reduce it instead. As we will describe, it is possible that prices which are geared to costs will produce a much lower number of transactions in the network, and therefore lead to lower social welfare.



Third, remedial action based on a misunderstanding of the underlying features of two-sided networks is unlikely to produce any welfare improvement, and in many occasions no such remedial action may be necessary. The regulation of the interchange fee of credit card networks in Australia may be an example of such inappropriate regulation.

Fourth, and consequently, competition authorities and regulators should abide by their traditional methods and look at price level rather than price structure. On this subject, and interestingly, the public policy implication of two-sided network industries is that nothing is really new. Socially optimal outcomes are obtained when there is competition at the network level, i.e. at a general level encompassing the network's activities in both sides of the market.<sup>5</sup>

This paper is organised as follows. Section 2 briefly summarises the recent economic research in the subject and highlights the most important aspects; Section 3 then looks at the public policy implications of this research and Section 4 concludes.

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<sup>5</sup> In some cases, it may not be socially desirable to have more than one network, for example, if the industry has natural monopoly characteristics. In this case, competition between networks would not maximise social welfare.



## 2 THE ECONOMICS OF TWO-SIDED NETWORK INDUSTRIES

This section provides a more in-depth description of the underlying economic issues raised by two-sided network industries.

Section 2.1 highlights the main characteristics of two-sided networks, and in particular the features which make them different from other industries.

In Section 2.2 we focus on the operation of a two-sided network monopoly. Recent literature on the subject suggests that such a *monopoly would charge a different price to each side of the market*, and in particular it would charge a higher price to the more elastic side — *such prices bear no relationship to costs*. If demands are linear, and given a profit level, a *network monopolist will charge prices to each side of the market which actually results in the maximisation of social welfare*. For example, in the credit card market, given a profit level, the network will charge prices to each side of the market which maximise the number of transactions, and when demands are linear this also maximises social welfare.

Section 2.3 focuses on potential competition between proprietary (for profit) and not-for-profit networks. *When proprietary networks compete, the prices charged to each side of the market are reduced proportionally*, thus increasing social welfare. *A comparison between proprietary and not-for-profit networks highlights the fact that both adopt the same price structure (which is socially optimal when demands are linear)*, i.e. both choose to maximise the number of transactions (by charging the same relative prices to each side of the market) given a price level. However, *it is not clear whether proprietary networks are preferable (from a social welfare perspective) to not-for-profit networks*. It is possible that a not-for-profit network may charge higher prices than a proprietary network, depending on the level of competition between the members of the not-for-profit network.

Finally, Section 2.4 summarises the results when demands are assumed to be linear. In this case, *the price structure (the relative prices charged to each side of the market) is independent of the type of network governance (proprietary or not-for-profit) or indeed the level of competition between networks*. *Moreover, such a price structure is socially optimal*. For a given price level, and independently of competition, any network will choose to maximise the number of transactions, and therefore maximise social welfare.

### 2.1 Characteristics of Network Industries

The pioneering work of Katz and Shapiro (1985, 1986) and Farrell and Saloner (1985, 1986) initiated a strand of research focused on network industries. These industries possess a particular characteristic: positive consumption externalities (or network externalities), i.e. the consumption value of a unit of the good increases with the total number of units sold.

Following Economides (1996), the network externality may be direct or indirect. The direct externality is easily understood in local telephone networks (which, as we will shortly see, is a two-sided network). Suppose the network has  $n$  customers connected to the network. The total possible number of unique telephone calls is given by  $n(n-1)$ , and this may be regarded as the



total value of the network (number of potential goods it has to offer). An additional customer (the  $(n+1)$ th customer) will add  $2n$  potential new goods to the network. For example, if the network has 2 customers, an additional customer will increase the number of potential phone calls three times.<sup>6</sup>

An indirect externality exists to the extent that network members benefit indirectly from additional customers. Consider, for example, two complementary products, A and B, which are horizontally differentiated into  $m$  varieties of product A and  $n$  varieties of product B (but all  $m$  varieties of product A can be matched with all  $n$  varieties of product B). Customers demand combinations of A and B. In this case, an additional customer will increase the demand for both A and B, thereby (because of economies of scale in production) potentially increasing the number of varieties of each product available in the market. An example of such an industry is (compatible) DVD players. The more people buy or rent films on DVD and buy DVD players, the wider will be the variety of films on DVD as well as types of DVD player available in the market.

Following Rochet and Tirole (2001), it is also important to understand the difference between one-sided and two-sided network industries. In one-sided network industries, the network operator cannot cross-subsidise between different categories of end users which are parties to the transaction. Therefore, its profits (and the volume of transactions) depend solely on the total price charged for the transaction, and not on its decomposition/structure. Take the example of a debit card platform which negotiates with the government for the handling of inter-agency financial transactions. In this case, the platform or network does not profit from charging different transaction fees to different governmental agencies (cross-subsidisation), because it is effectively dealing with a single party (the government) whose internal cross-payments cancel out the effects of any differences in the transaction fees. In this case, what is important is to propose a single competitive transaction fee which allows the network to win the contract.

Railways are another example of one-sided networks. A train operator may practice price discrimination between various categories of consumers, but there is no interaction between demand from each type of consumer. For example, the demand for student fares on trains is not generally dependent on the demand for business or first class tickets.<sup>7</sup> Therefore, for a train operator, the underlying economics suggests that the most important factor behind the operator's profits is the (average) total price charged to consumers and the total number of people purchasing train tickets.

On the other hand, in two-sided network industries, not only is the price level important, but also its decomposition. Credit cards are a good example of two-sided industries. The credit card platform must design a pricing scheme which attracts both merchants and card users to the platform. The value of the platform will depend on the price level it chooses for credit card transactions, as well as the share of total price paid by each side of the transaction. In two-sided network industries, it is important to get both sides on board. The "chicken-and-egg" problem

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<sup>6</sup> Let  $C_1$ ,  $C_2$  and  $C_3$  denote three (potential) network customers. If  $C_1$  and  $C_2$  are network clients, two products (potential phone connections) are available:  $C_1$  can call  $C_2$  and  $C_2$  can call  $C_1$ . If  $C_3$  joins the network, on top of the two possible connections between  $C_1$  and  $C_2$ , four other connections become possible:  $C_1$  and  $C_2$  can now call  $C_3$  (two more connections) and  $C_3$  can call  $C_1$  and  $C_2$  (a further two possible connections), thus raising the total number of potential connections to six.

<sup>7</sup> An exception might be if the provision of a service depended substantially on sales of one kind of ticket.



arises. Merchants will only accept the card if there is a sufficient number of issued credit cards, but consumers will only want a credit card to the extent that it is widely accepted.

As Rochet and Tirole (2001) suggest, two-sided network industries are a cross between the economic literature on multiproduct oligopoly or monopoly and the literature on network industries. In the former (see Baumol *et al* (1982) or Wilson (1993)), the externality is fully internalised by final consumers. For example, the same consumer who buys a razor will also buy the razor blades.<sup>8</sup> Multiproduct pricing decisions focus essentially on the cross-elasticities of demand, i.e. the sensitivity of a product's demand to the other product's price. In the latter, the interaction between the two sides of the market generates strong complementarities, which are not fully internalised. For example, in the decision to start accepting credit cards, a merchant will not take into account the fact that his decision increases the value of the network as a whole, and therefore makes it more likely that more people will decide to apply for a credit card. Instead, his decision will be based on a cost-benefit analysis of card acceptance at the shop level.

There are several reasons why the externality may not be fully internalised (Rochet and Tirole (2001)). First, transaction costs may make it too costly for one side of the market to pass through its charges to the other side. Such costs include devoting time to analysing the problem, writing a contract, advertising the contract to the other side and enforcing it. In the credit card example, a merchant may find it difficult if not impossible to obtain a rebate on his costs for the value added he provides to all card holders, because of the difficulty associated with writing a contract with card holders stipulating the amount they should pay the merchant for the benefit of being able to use the card at his shop.

One side of the market may also bear volume insensitive costs, i.e. costs which are either influenced by the platform or network or costs which are not proportional to the transaction volume on the network, and this may also prevent the internalisation of the externality. In the credit card industry, merchants must pay a fixed cost for the installation of a credit card swiping device, and this cost may be influenced by the technology used by the credit card platform. These fixed costs may be large enough to affect the decision of accepting credit cards (and hence the total number of credit card transactions), but are not necessarily reflected in the terms of transactions for card users (e.g. a fixed annual charge). And merchants would find it difficult to recover these costs from card users because of transaction costs.

Finally, the network itself may take appropriate steps to limit the extent to which one side of the market can charge the other side for the externality. For example, an e-marketplace may prevent a buyer and a seller from communicating before they complete a transaction (e.g. by not revealing their identities). This effectively prevents the parties from writing a side contract which fully internalises the externality.<sup>9</sup>

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<sup>8</sup> In other words, the sale of the complementary products is made to the *same* final consumer, and therefore it is equivalent to the case where a network deals with a single party.

<sup>9</sup> At the start of its operations, Lastminute.com, an online travel agency, only revealed the identity of the airline which a particular customer would be flying after the transaction was complete. Although not stated, this acted as a deterrent for the customer to call the airline directly, negotiate a side contract and by-pass the platform altogether. Lastminute.com has discontinued this practice.



Surprisingly, two-sided network industries have not yet received much attention in the economic literature since the original insights of Baxter (1983). Recent publications (Doyle and Smith (1998), Kim and Lim (2001)) and working papers (Caillaud and Julien (2001), Hermalin and Katz (2001), Jeon, Laffont and Tirole (2001), Rochet and Tirole (2000, 2001), Schmalensee (2001), Wright (2001)) have laid the ground analytical models to analyse this type of industries. Evans (2002) addresses some antitrust issues raised by two-sided markets.

These models generally analyse the optimal pricing schemes adopted by networks in two-sided markets, in cases where there is a single (monopolist) network or competing networks. Networks are also assumed to operate under a variety of models. Rochet and Tirole (2001) and Schmalensee (2001) note that these two models are not that dissimilar. A proprietary network will choose the pricing scheme which maximises its profits, whereas a not-for-profit network operates constrained to earn zero profits, and sets its prices accordingly. Under some assumptions, Rochet and Tirole (2001) and Schmalensee (2001) find that the price decomposition is identical across models, and only the price level differs.

## 2.2 A Network Monopoly

Let us initially focus our thoughts on the network externality and the way in which it affects the network's decisions. Assume, as in Schmalensee (2001), that there exists a monopoly on each side of the market, i.e. a bilateral monopoly. For example, Hermalin and Katz (2001) suggest two telephone operators, each of which enjoys a monopoly in their local market.<sup>10</sup> In this case, for any given termination charge, each operator will set a price in its market which is higher than the price which would be set if the two monopoly operators merged into a single entity.<sup>11</sup> A form of double marginalisation occurs. There is market power in both markets. Therefore, each operator will charge a price which does not reflect the network externality, i.e. it ignores the benefit that its clients derive from being able to receive or make phone calls to the other network. A single merged operator would internalise the externality, charge a lower price in both markets and increase joint profits (Doyle and Smith (1998)).

What pricing scheme would a merged operator adopt in each market? Rochet and Tirole (2001) find that such a monopolist would charge a price level (the sum of prices in each individual market) in accordance with the classical Lerner formula, i.e. a price above marginal cost (the sum of marginal costs in each market) which varies inversely with the total elasticity of demand (the sum of demand elasticities in both markets). The novel result is the price decomposition or price structure. Price decomposition or structure is the ratio of the price charged in market A to the price charged in market B, or equivalently, it is the share of market A's price over the total price level (the sum of prices in markets A and B). In equilibrium, the more elastic market (i.e. the market which reacts more to changes in price) gets a higher share of the total price. This implies

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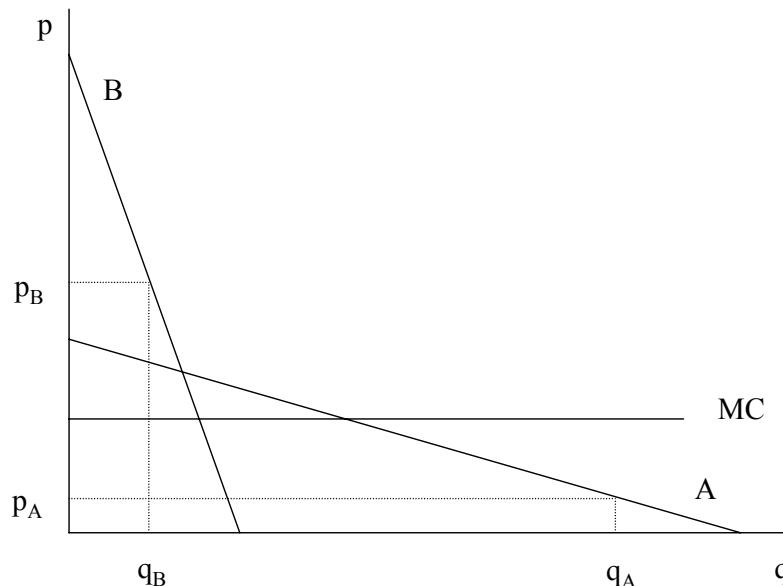
<sup>10</sup> Mobile or fixed telephone services are another example of a two-sided network. Jeon *et al* (2001) or Rochet and Tirole (2001) observe that for any given communication, users on both sides (caller and receiver) are affected by the price structure as well as the price level. Hence, the determination of the level and decomposition of a termination charge to both the caller and receiver affects the network's profits.

<sup>11</sup> The termination charge is the charge paid by the network on which the call terminates to the network on which the call originates. It is similar to the interchange fee charged by credit card issuing banks to acquirer (merchant) banks for enabling a credit card transaction.



that the price in the more elastic market is higher than the price in the less elastic market. Figure 1 illustrates an example of optimal pricing in two markets with linear demands.

**Figure 1: Optimal pricing for a network monopoly**



Note that for any price level market A is more elastic than market B. However, the equilibrium price in market A is lower than the equilibrium price in market B, which might appear to contradict the result stated above. Note that the elasticity at each point of a linear demand curve varies from zero to infinity, and this applies to both demand curves shown above. *At the equilibrium prices*, the elasticity of market A is in fact lower than the elasticity of market B, and therefore *at the equilibrium point* the elastic market does in fact face a higher price than the less elastic one. As Schmalensee (2001) notes, the monopolist finds it optimal to subsidise price cuts where they will do most good, and maximise output for the network as a whole. In this case, the monopolist finds it optimal to reduce prices in market A (which is more elastic than B at any given price level) and increase them in market B, as this arrangement maximises output and profits for the network monopoly.

The analysis of Rochet and Tirole (2001) rests on the assumption that marginal costs in both markets are identical. Schmalensee (2001) and Wright (2001), however, assume that the network monopolist may face different marginal costs in each market. A higher marginal cost in one market will have two effects. On the one hand, it will increase the overall price level. On the other hand, with equal market elasticities, it will increase the price in the costlier market proportionally to the less costly market, i.e. it will not charge proportionally more to the costlier market. In this way, the monopolist effectively subsidises (charges a lower price than he would have without the network externality) the side of the market which finds it more difficult (costlier) to stimulate total demand, and thus increases the output of the network as a whole. Schmalensee (2001) shows that, with equal demand elasticities, the (identical) price charged by the network



monopolist in each market is the price he would set if he were facing a single market with marginal costs equal to the average marginal costs of each market.<sup>12</sup>

The critical issue in the economic analysis of such a network monopolist is whether the prices set in each market are socially optimal. When operating in a single market, a monopolist would charge a price which is too high compared to the socially optimal price, i.e. the price which would be obtained in a perfectly competitive market. The monopolist takes advantage of his market power to increase profits at the expense of consumers. Society is worse off because the increase in the monopolist's profits is (generally) more than outweighed by the loss in consumer surplus, i.e. the monopolist generates a "deadweight loss". In other words, if the monopolist lowered his price from the monopoly level, social welfare would increase.<sup>13</sup> Generally, any deviation from the perfectly competitive market entails some sort of welfare loss, and this loss is increasing with the market power across the industry. Thus, in the absence of perfect competition, an oligopoly is not as bad an outcome as a monopoly. Or, generally, more competition is better than less.

However, *a network monopolist facing (linear) demands in both markets will, surprisingly, not exert its monopoly power and will generally set a price structure which is optimal for society as a whole* (Rochet and Tirole (2001), Schmalensee (2001), Wright (2001)). In these models, the (monopoly) network's objectives (profits) are perfectly aligned with the interests of society regarding the network externality. The intuition is as follows. In a single market, by charging a price higher than marginal cost, the monopolist restricts output and guarantees a high price for each unit of output sold and maximises its profits. In a two-sided network, charging too high a price in one market is a self-defeating strategy. The reduction of output in one market may raise profits in that particular market, but because of the network externality, it reduces profits in the other market proportionally more, thus reducing overall profits. Perhaps surprisingly, the optimal price structure which maximises total network profits is the price structure which also maximises total output and thus social welfare, and this would *not* depend on the particular demand (e.g. elasticities) and cost conditions in each market. The network monopolist would internalise the network externality in a socially optimal way.

Note, however, that although the price structure is socially optimal, this does not imply that the price level is as well. And in fact, as we will describe, a network monopolist maximises profits by setting its price level above its marginal cost, just a standard monopolist would. But while doing so, it will penalise both markets equally by increasing their individual prices proportionally, so that the price structure is the same as that which would be obtained in a perfectly competitive market.

### 2.3 Competition Between Different Types of Networks

The two-sided network monopoly framework can be extended in a variety of ways. Rochet and Tirole (2001), for example, analyse competition between profit-maximising (proprietary) and not-for-profit networks. When networks compete, it might be possible for a customer in one of the

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<sup>12</sup> Which is logically higher than the monopoly price set individually in the market with low marginal costs, but lower than the monopoly price which would be set individually in the market with high marginal costs. Thus, there is subsidisation across markets.

<sup>13</sup> Social welfare is defined as the sum of consumer and producer surplus.



markets to be affiliated with more than one network, i.e. a customer may be able to “multihome”.<sup>14</sup> This is certainly the case in the credit card industry, in telecommunications, or in the media market.<sup>15</sup> In other cases, such as computer operating systems, compatibility issues may restrict multihoming in at least one of the markets.<sup>16</sup>

### 2.3.1 Competition between proprietary networks

Take the case of the credit card industry, and let market A denote merchants and market B cardholders. Rochet and Tirole (2001) assume that there might be a proportion of cardholders who are loyal to their network, say American Express, and these customers would be lost if merchants stop accepting American Express cards. This loyalty is defined as the singlehoming index. At a symmetric equilibrium, when both networks charge merchants the same price, merchants who decide to accept credit cards will accept both types of card. In Rochet and Tirole’s (2001) model, the incentives for multihoming in the merchant market do not depend on the singlehoming index in the cardholder market, i.e. in equilibrium, the merchant market will always multihome independently of the singlehoming index in the cardholder market.<sup>17</sup>

In order to understand how the *modus operandi* of networks affects the market outcome, note that if networks compete with each other, undercutting the price of a rival (say the price charged to merchants in market A) has two effects. On the one hand, the lower price might attract new customers (merchants) into the platform, i.e. customers who would not use any network at the previous price level. On the other hand, it attracts customers who were previously also affiliated with a rival platform (“steering”), i.e. customers who were previously multihoming. The more customers from market B (cardholders) are loyal to the rival platform, the less effective will steering be.<sup>18</sup> In other words, merchants who were previously multihoming (when prices charged

<sup>14</sup> It is easier to think of the network as the means to enable a transaction between market A and B. The transaction only takes place if the participants in market A and B are affiliated with at least one common platform. Therefore, it might make sense for a participant in market A to affiliate himself with the two platforms, in case some participants in market B only subscribe to one.

<sup>15</sup> In the credit card industry, merchants may accept more than one type of credit card (American Express, Visa, Mastercard), and consumers may hold more than one type of credit card. In telecommunications, a customer may receive calls from fixed lines, mobile phones or even Internet-based telecommunications companies, using Voice over IP; he may also subscribe to more than one type of telecom operator. In the media market, a content-provider, say a TV channel, may provide its content to more than one type of network, e.g. cable, satellite or terrestrial TV. Consumers may also subscribe to more than one platform.

<sup>16</sup> The operating system manufacturer, say Microsoft, is keen to attract application developers who create software running on Windows. Apple, with its Macintosh operating system, faces a similar situation. However, particular characteristics of the operating system may restrict an application provider from supplying its product to both platforms. Similarly, technological requirements of each operating systems imply that a Windows-based computer is not fully compatible with the Macintosh operating system, and vice versa. Similarly, electrical equipment suppliers may choose to specialise in only one electrical standard (say, the American standard, rather than the European), and it is not possible for European consumers to buy American-standard electrical equipment and use it in European countries.

<sup>17</sup> If all cardholders are loyal to their network, say American Express, then declining to accept American Express cards is an unprofitable strategy for the merchant — the cost to the merchant of enabling the transaction is the same as for the Visa network, but declining the transaction will forego the benefit. If all cardholders multihome and hold both types of cards, the merchant is indifferent between singlehoming and multihoming. However, Rochet and Tirole (2001) assume a slight asymmetry in the model, by letting the cardholder choose the card network on which they want the transaction to take place. In this case, the merchant always prefers to multihome when all cardholders multihome, just in case the cardholder presents the card which he does not accept.

<sup>18</sup> “Steering” may be thought of as offering a sufficiently low price for a merchant in market A to prefer singlehoming to multihoming. For merchants, note that as the price of using one platform decreases, the benefits from multihoming decrease as well, as the rival platform now offers a relatively high price for the same service. If all cardholders in market B are loyal to the (expensive) rival platform, the effectiveness of steering is equal to zero — price cutting does not attract merchants operating in the rival platform. Although the rival platform offers a more expensive service, its customers (cardholders) are loyal, and therefore multihoming is still preferable to singlehoming. If no cardholders are loyal to the (now expensive) platform, steering is very effective, and the cheaper platform attracts all of its rival’s merchants.



by networks were identical) now face a trade-off. If they continue multihoming, they will pay a relatively high price to enable transactions in the expensive network but retain the volume of transactions; if they choose to singlehome, they pay a lower price for each transaction but will probably lose some transaction volume (from cardholders who remain loyal to the rival network). If no cardholders are loyal to the rival network, there is no loss in transaction volume when a merchant decides to singlehome with the least expensive network — and all merchants do so in equilibrium; if all cardholders are loyal to the rival network, singlehoming would be foolish — merchants would lose all transactions with the (loyal) customers of the rival network.<sup>19</sup> In the latter case, price cutting can only succeed in attracting new customers (merchants) into the market.

*At a symmetric equilibrium, competition between proprietary platforms (potentially) leads to lower prices in both markets than in the network monopoly case, i.e. an overall lower price level.*

If all customers (cardholders) in market B singlehome (i.e. are loyal to their network), price cuts in market A are (always) an unprofitable strategy, because they do not attract additional customers from rival platforms.<sup>20</sup> Hence, each platform has no incentive to deviate from the network monopoly price level, and effectively acts as a network monopolist, taking advantage of the fact that all of its market B customers (cardholders) are loyal. If some customers (cardholders) in market B are not loyal to their platform (i.e. the singlehoming index is lower than one), the *effective* demand elasticity in that market is higher than when there is singlehoming. This happens because a price cut does not merely attract new customers (cardholders) into the platform (i.e. customers who would otherwise choose not to be affiliated with any platform); it also attracts customers (cardholders) from rival platforms.

The same reasoning applies to market A. If some market B customers (cardholders) are not loyal to their platform, market A's *effective* elasticity of demand (merchants) is higher than when there is singlehoming in market B. A price cut in market A not only attracts new customers (merchants) into the market, but it may also attract customers (merchants) from rival platforms. If there is a network monopoly, (lower) demand elasticities in both market A and B account only for the possibility of attracting new customers (merchants or cardholders) into the market, as no competing platforms exist from which to attract customers. In this case, competition between platforms forces each platform to offer lower prices in both markets (i.e. lower than the network monopoly level) up to the point where an additional price cut would not attract a sufficient number of customers from rival platforms to make it profitable. In the limit, if no market B customers (cardholders) are loyal to their network (i.e. no cardholder singlehomes), competition between networks drives the price level (the sum of prices in both markets) towards marginal cost (the sum of marginal costs in each market).

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<sup>19</sup> Therefore, the non-corner solution implies that if some cardholders are loyal to the rival network, price cutting will result in some merchants singlehoming with the least expensive network, and others multihoming (thus continuing to serve the loyal customers of the rival (expensive) network, as well as customers from the cheap network).

<sup>20</sup> A lower price in market A would attract no customers (merchants) from rival platforms because in market B customers (cardholders) are loyal to those rival platforms, i.e. they singlehome. A switch to the (now) cheaper platform in market A would imply losing faithful customers (cardholders) of that platform.



### 2.3.2 Competition between not-for-profit networks

Some networks operate as not-for-profit associations owned by member operators in both sides of the market. Credit card associations such as Visa or Mastercard are an example of such not-for-profit networks. Members compete with each other in the two markets, the merchant and the cardholder market. The network's pricing scheme is decided collectively by all market operators so as to maximise their own individual profit, subject to the network earning zero profits. Note that the network's pricing scheme involves access charging: the price in each market is the access charge levied by the network to enable a transaction, and this access charge is decided collectively subject to a zero-profit condition for the network. This implies that the charges levied in both markets must exactly off-set each other, i.e. the price paid in one side of the market is received by the other side.

Rochet and Tirole (2001) analyse a simple model of competition between not-for-profit networks. They make the simplifying assumption that intraplatform competition results in constant equilibrium margins in each of the networks' markets.<sup>21</sup> Under this assumption, all members' interests are aligned: their individual profit is a fixed proportion of the volume of transactions on their association's network. The collectively agreed pricing scheme maximises the volume of transactions in the network, subject to the constraint that each operator must earn a constant margin in each market.

*In a symmetric equilibrium, because each operator exercises some market power in the market where it operates, the overall price level (the sum of prices in each market) may or may not exceed the price level of a network monopoly, even if networks compete with each other.*<sup>22</sup>

If competition is fierce in each market (and profit margins are driven to zero), a not-for-profit network will charge a lower price level than a proprietary network. If profit margins are large, double marginalisation occurs, and each operator is ignoring the fact that his attempt to secure higher individual profits (through a higher price) affects negatively profits on the other side of market (because of the network externality) and therefore the volume of transactions in the network as a whole. Schmalensee (2001) refers to this double marginalisation as "uncoordinated pricing of complements". The access charges negotiated collectively cannot solve this double marginalisation problem, which affects the overall price level and which may yield a higher price level than under a network monopoly. Note that the network is not-for-profit, and therefore the overall price level it sets may not be obtained by maximising joint profits (in which case it would replicate a network monopoly), hence the double marginalisation problem.<sup>23</sup>

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<sup>21</sup> This assumption implies that competition between members on one side of the market takes the number of members on the other side of the market as given, and determined solely by the access charges levied by the network.

<sup>22</sup> Rochet and Tirole (2001) assumed an arbitrary constant profit margin in each market. The exact value of this profit margin will affect the extent to which a not-for-profit association supports a lower price level than a proprietary platform.

<sup>23</sup> Schmalensee (2001) notes that the access charge can only help mitigate *differences* between the two sides of the market, e.g. different costs or different demand elasticities. Therefore, if there is market power in both sides of the market, the access charge will reduce the price in the market with more market power up to the point where a marginal price increase has the same impact on output in both markets (thus maximising output for the network as a whole). But the final price in both markets will still include the profit margin accruing from the exercise of market power (see Rochet and Tirole (2001)).



However, Rochet and Tirole (2001) show that *the price structure under proprietary platform competition is identical to the not-for-profit platform price structure*. In other words, both proprietary and not-for-profit platforms maximise total transaction volume *given a price level*. Only the price level is different between the two cases, as also noted by Schmalensee (2001).<sup>24</sup>

For example, Rochet and Tirole (2000) analyse the prices charged in each market by a proprietary platform and a not-for-profit platform, assuming different forms of competition in one market under the latter.<sup>25</sup> They find that a not-for-profit association will not charge a higher price level (the sum of prices in both markets) than a proprietary platform. Therefore, the double marginalisation problem referred to earlier leads to a price level which is nevertheless lower than the price level set by a proprietary platform (which also fully internalises the network externality, but maximises profits). Schmalensee (2001), assuming linear demands, reaches the same conclusion as Rochet and Tirole (2000). If one of the markets is perfectly competitive, and the other is not, a not-for-profit network will charge a lower price level across markets than a proprietary platform, and thus the quantity of transactions on a not-for-profit platform is higher than on a proprietary platform.<sup>26</sup>

## 2.4 Welfare Implications

The most surprising result of the literature on two-sided network industries is that if demands in both markets are linear, then from the point of view of welfare, it is indifferent to have a (proprietary) network monopoly, competition between proprietary networks, a single not-for-profit network or competition between not-for-profit networks in what concerns the price structure (Rochet and Tirole (2001), Schmalensee (2001), Wright (2001)). *The price structure is independent of the type of network governance or number of networks, and such a price structure is socially optimal. For a given price level, all four market structures maximise social surplus.* However, note that each might yield a different price level.

The proprietary platform's price structure depends essentially on demand elasticities (under the assumptions of identical marginal costs in both markets), and in the case of competing proprietary platforms, it also depends on the singlehoming index, i.e. consumer loyalty to a given platform. The profit maximising price structure is designed to steer customers from both sides of the market. In other words, for a given (profit maximising) price level, the proprietary platform's price structure is designed to maximise total output. Finally, a not-for-profit platform's price structure is equivalent to a proprietary platform's price structure and depends on demand elasticities (if the not-for-profit network is a monopoly) and the singlehoming index (if there is competition between not-for-profit networks). Given a (individual operator profit maximising) price level, the not-for-profit platform levies access charges which maximise total output.<sup>27</sup> In the latter case, only the price level differs from that of (possibly competing) proprietary platforms. Therefore, as Rochet

<sup>24</sup> Schmalensee (2001) reaches this conclusion assuming linear demands. Rochet and Tirole's (2001) result is more general and does not depend on the functional form assumed for the demand.

<sup>25</sup> Rochet and Tirole (2000) focus on the credit card industry, and assume that competition between merchant banks (acquirers) is perfect, whereas competition between credit card issuers is oligopolistic. The three types of oligopolistic competition analysed are Hotelling's duopoly model of product differentiation, Bertrand competition and Cournot competition.

<sup>26</sup> Schmalensee (2001) assumes Bertrand competition in the not perfectly competitive market.

<sup>27</sup> Rochet and Tirole (2001) assume that each individual operator on each side of the market might have a degree of market power. This market power does not affect the optimal access charges levied by the network; it only affects the overall price level.



and Tirole (2001) note, it is surprising that all of these price structures are socially optimal when demands are linear.

The rationale for the result is the following (Rochet and Tirole (2001)).<sup>28</sup> When proprietary platforms compete, and demands are linear, the steering effect is particularly powerful when most consumers in market B multihome (i.e. when the singlehoming index is low). Therefore, if most consumers multihome, undercutting the rival platform in market A steers many merchants, i.e. many merchants who previously multihomed now prefer to affiliate themselves only with the cheapest platform. This leads to lower prices in market A (merchants). However, if most consumers in market B multihome, competition is more intense in that market as well, and this leads to lower prices. For linear demands, these two effects exactly off-set each other, and therefore the profit maximising price structure (i.e. the individual market's share of total price) does *not* depend on the singlehoming index, and only on demand elasticities (exactly as if only a network monopoly operated in the market). Competition between not-for-profit networks leads to exactly the same outcome, i.e. the price structure depends on demand elasticities only.

For a given overall price level, the interests of proprietary platforms, not-for-profit platforms are perfectly aligned with social welfare. Either governance structure finds it optimal to maximise total output (number of network transactions) given a price level. And this implies charging prices to each individual market which reflect that market's contribution towards total network output. With linear demands, the price structure which maximises total output also maximises social surplus, i.e. social surplus increases proportionally to total network output, and therefore if for a given price level total output is maximised, so is social surplus. *When demands are linear the governance structure only affects the price level, not the price structure, and this price structure is socially optimal.*

Schmalensee (2001) also analyses two-sided network industries under more general (i.e. non-linear) demands. Although the price structures emerging from non-linear demands in both markets are not necessarily socially optimal, the underlying rationale for them is that of output maximisation. However, in two-sided network industries, output and welfare are necessarily correlated: the higher the number of network transactions, the higher is social welfare. Therefore, under more general demand functions, the emerging price structures which aim for output maximisation contribute to an increase in social welfare, albeit not necessarily the highest achievable level of social welfare (the social optimum).

However, the governance structure does lead to different price levels, even under the assumption of linear demands (Rochet and Tirole (2001)). The socially optimal price level (the sum of prices in each individual market) which would be set by a central planner maximising total social surplus is equal to the sum of marginal costs in each individual market, a result which is equivalent to the economics textbook result of price equals marginal cost in the context of two-sided markets. A

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<sup>28</sup> The functional form of the linear demands is given by a variant of the Hotelling model, where consumers choose their platforms as a function of their location along a line.



*network monopoly will charge a strictly higher price level than the socially optimal one unless the demand elasticities in both markets are infinitely large.<sup>29</sup>*

*Also, competition between proprietary platforms leads to a price level which is strictly lower than that charged by a network monopoly unless all consumers are loyal to their network.<sup>30</sup> Additionally, competition between proprietary platforms leads to a higher price level than the socially optimal price level unless consumer loyalty tends towards zero.<sup>31</sup>*

*Finally, competition between not-for-profit networks may or may not yield a higher price level than a network monopoly, depending on the degree of market power enjoyed by the market operators on each side of the market. Moreover, this price level will be higher than the socially optimal price level unless there is perfect competition between operators in both markets.<sup>32</sup>*

These results suggest that linear demands yield a socially optimal price structure, independently of the type of network governance or degree of competition between networks, but generalisations outside the linear demand case are not easily made (Schmalensee (2001)). However, results on the overall price level are not as critically dependent on that assumption, and resemble much more the standard economics textbook analysis of socially optimal market outcomes.

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<sup>29</sup> In which case small increases in prices have a large impact on the quantity demanded, and therefore attempting to charge a higher than marginal cost price would not be profitable.

<sup>30</sup> i.e. unless the singlehoming index equals one. In this case, no proprietary network has incentives to undercut its rival because it will not attract any of its rivals' customers (which are all loyal to the rival network). Therefore, even with competition, all proprietary platforms charge the monopoly price level.

<sup>31</sup> i.e. unless the singlehoming index equals zero, in which case no consumer is loyal to any network and is willing to change networks immediately following a price cut.

<sup>32</sup> If market operators compete fiercely, their profit margins are driven towards zero and therefore the overall price level converges towards the sum of marginal costs. In effect, each operator acts as a price taker in its market, and the network's access charges, which Rochet and Tirole (2001) show to be socially optimal with linear demands regardless of the degree of market power in each market, are accepted as the relevant market prices. In that case, because the access charges levied by the network are socially optimal, so is the overall price level.



### 3 PUBLIC POLICY CHALLENGES

The recent economic models of two-sided network industries discussed in Section 2 have already highlighted some interesting implications for regulators, competition authorities and public policy practitioners in general. These industries may be (and in some cases, already are) “regulated” in a variety of ways. Some network industries, such as telecommunications or media, are already regulated by sector-specific regulators in Europe and the United States. Others, such as the payment systems industry (which include debit and credit cards), are (generally) not overseen by sector-specific regulators but may fall prey of competition law and competition authorities and even attract the introduction of sector-specific regulation where none existed.<sup>33</sup> In the light of the particular characteristics of two-sided network industries, the main public policy challenge is first to understand the underlying economic mechanisms and incentives driving them. Misconceptions and misinterpretations are likely to lead to the wrong regulatory decisions, wrong legal decisions and generally speaking misguided public policies.

Therefore, two-sided network industries present a challenge in terms of public policy which does not necessarily imply a radical new approach. Rather, it involves careful consideration of the facts of the matter. Appropriate remedial action should be proposed only when necessary and only if effective. Public policy considerations in network industries should be no different from any other industry. Only the issues are slightly more complex.

#### 3.1 Competition Law and Not-For-Profit Networks

In the case of not-for-profit networks, such as Visa or Mastercard, collective determination of prices might, at first sight, appear to constitute an anticompetitive agreement under competition law in several countries. In the recent times, competition authorities have begun investigating credit card association such as Visa (in the UK, Cruickshank (2000), in Europe, European Commission (2000) and in Australia (Reserve Bank of Australia/ACCC (2000)). However, the *Nabanco v Visa* (1984) decision, partly based on the arguments raised by Baxter (1983), has ruled it to be legal in the US.<sup>34</sup> Recently, the European Commission (2001a, 2001b) has also decided to adopt a favourable position with respect to the collective agreement on which the Visa network is based.

As we have seen earlier, the rationale for the collective determination of prices at the network level (price structure) is to charge a price in each market such that network output is maximised. Market power in each market plays no role in the optimal *price structure* which is decided at the network level. Moreover, under the assumption of linear demands, the collectively determined price structure is actually socially optimal.

This is not to say that *all* collective agreements in two-sided network industries should be allowed to proceed by the relevant authorities. Although the collectively determined price structure is

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<sup>33</sup> European Commission (2000) and the complaint filed on October 7, 1998 by the United States in *United States v Visa U.S.A., Inc.*, Case No. 98 Civ. 7076 (S.D.N.Y.). In Australia, the Reserve Bank of Australia has recently brought credit card schemes under its regulatory oversight, effectively introducing sector-specific regulation in a previously unregulated sector (Reserve Bank of Australia (2001)).

<sup>34</sup> *National Bankcard Corp. v Visa USA, Inc.*, 596 F. Supp. 1231 (S. D. Fla. 1984).



socially optimal (under linear demands), the price level is not.<sup>35</sup> In particular, *when more than one not-for-profit networks compete, the existence of market power in the two markets might lead to a price level which is not socially optimal.* Any agreement clause which is likely to increase the market power of member operators in each market will almost certainly contribute towards an increase of the price level, and therefore towards a decrease in social surplus. The *USA v Visa/Mastercard* (2001) decision effectively corroborates this conclusion, by forbidding Visa or Mastercard member banks from exclusively issuing/accepting Visa or Mastercard credit cards, thus effectively curtailing the exercise of market power by all member banks in their markets and reducing the overall price level.<sup>36</sup> An earlier decision in Europe by the European Commission (1996) (Point 41) had already deemed this exclusivity clause to be anticompetitive. Gans and King (2001) make a similar point, arguing that the introduction of regulation in the credit card industry in Australia is poorly founded, and that not-for-profit networks should only raise competitive concerns if competition between member operators is relatively weak.

Therefore, in the context of not-for-profit networks, the relevant authorities should be focusing more on the potential detrimental effect of collective agreements between member operators on the price level, rather than the price structure (i.e. the way the network allocates the overall price level between the two sides of the market).

### 3.2 (Apparently) Anticompetitive Practices by Two-Sided Networks

As we have described in Section 2, the price structure in two-sided networks does not necessarily bear any relationship to costs. For competition authorities, this presents a challenge, in so far as traditional economic theory usually points to prices which generally follow costs as welfare maximising.

Therefore, it might become relatively common to hear of allegations of abuse of dominant positions against two-sided networks. Such abuses might be claimed to materialise in the form of predatory prices (i.e. charging a price below cost to one side of the market) or unfair cross-subsidies which distort competition (i.e. using one side of the market to finance the other side). Whereas competition authorities will have to analyse each complaint on its own merits, it must be stressed that such apparently competition-distorting price structures may indeed have significant pro-competitive effects at the network level.

Recent decisions by the European Commission (2002) and the OFT (2003) in the context of credit card networks' price structure suggest that the only prices which will be accepted as not having anti-competitive effects are prices which somehow reflect costs. Such conclusions somehow fail to look at the broader picture of how credit card networks operate, and in particular they fail to bring into the reckoning how any price changes in the direction of costs might have a negative impact on the total number of transactions enabled by the network, and consequently, as suggested by Schmalensee (2001), on total welfare.

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<sup>35</sup> Moreover, the assumption of linear demands may not hold in many markets, and this leads to a price structure which is not necessarily socially optimal.

<sup>36</sup> *United States v. Visa U.S.A., Inc.*, 163 F. Supp. 2d 322 (S.D.N.Y. 2001).



### 3.3 Implications for Price Regulation

For non-linear demands, Schmalensee (2001) and Rochet and Tirole (2001) suggest that the price structure set by the network (either proprietary or not-for-profit) may not be socially optimal. And in fact there appears to be no reason why it should be. The socially optimal price structure reflects each market's contribution towards social surplus. The price structure of a proprietary (not-for-profit) platform reflects each market's contribution towards total profits (output). Except in very special cases, these price structures should not be expected to coincide.<sup>37</sup>

The question, obviously, is whether regulation is likely to be a solution rather than an additional problem. In the context of two-sided network industries, Rochet and Tirole (2001) and Schmalensee (2001) suggest that a regulator will only succeed in bringing about a welfare improvement in the credit card industry by chance.

Other authors, such as Small and Wright (2000), show that forcing members of a not-for-profit network to engage in bilateral negotiations has an unpredictable impact on output and welfare. A more intrusive type of regulation, such as cost-based regulation suggested by the Reserve Bank of Australia (2001) is also unlikely to generate a noticeable (if any at all) welfare improvement. Schmalensee (2001) argues that regulators are unlikely to have enough information to implement the socially optimal price structure (as of course is true in many regulatory situations).

In fact, even if they did have such information, cost-based regulation would only generate a welfare improvement in very special cases. As we have already seen, in a two-sided network industry the price structure is used as a transfer mechanism between the two markets. *A priori*, prices should only be equal across markets if the markets are totally symmetric (i.e. equal costs and demand elasticities) (Schmalensee (2001), Rochet and Tirole (2001), Wright (2001)), a point which Balto (2000) fails to address. A profit-maximising price structure transfers money away from the less costly and more elastic market to the more costly and less elastic market, so as to increase total network output. The socially optimal price structure elicits a similar type of transfer, with the ultimate objective of maximising total welfare. Schmalensee (2001) shows that generally the profit-maximising and socially optimal price structures move in the same direction, but do not almost surely exactly coincide except for special cases (such as assuming linear demands).

If markets are asymmetric, cost-based regulation will impose too high a price in the costlier market, and too low a price in the less costlier market, and social welfare (and profits) will be below the optimum. On the other hand, cost-based regulation, if successful, will push the price level towards marginal cost, therefore bringing about a welfare improvement if there is a network monopoly or if member operators in a not-for-profit network have significant market power. Overall, such cost-based regulation will deter the growth of network usage as a whole (by charging too high a price in one market, which, through the network externality, implies that the potential number of network transactions is not maximised), but will guarantee that the consumers making use of the network pay a socially optimal price level for the transactions.

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<sup>37</sup> There has been no attempt so far to analyse welfare considerations beyond the linear demand case. This is very likely to be a future topic for research.



Whether the overall welfare effect of cost-based regulation is positive will depend on the circumstances.

It is now easy to understand the grounds on which Schmalensee (2001), Gans and King (2001) and Evans (2002) fiercely criticise any attempt to introduce cost-based regulation (or any other type of price regulation) in the credit card industry, which is (arguably) highly competitive in both markets (issuing and acquiring markets). In this case, cost-based regulation will almost certainly not bring about any noticeable welfare improvement in what concerns the price level, and will lead to a price structure which will coincide with the socially optimal price structure only by chance. Moreover, cost-based regulation of not-for-profit networks is likely to put these at a disadvantage *vis a vis* (more expensive) proprietary networks, such as American Express, whose price structure appears immune from antitrust attack (Schmalensee (2001)).<sup>38</sup> Large institutions (typically with lower costs) will have incentives to set up their own proprietary network, as they find their attempts to increase network usage frustrated by the high prices induced by cost-based regulation charged on the costlier side of the market. As Schmalensee (2001) and Rochet and Tirole (2001) show, a move from a not-for-profit network with effective competition between member operators to a proprietary network is likely to lead to a higher price level and lower output, and thus induce a decrease in social welfare. This is a clear example where regulation is likely to lead to a worse situation than that which it attempted to solve.

### 3.4 Welfare-Improving Regulatory Intervention

Intrusive regulation at the price structure level, therefore, is unlikely to produce a desirable outcome, and one common thread in the papers reviewed above is that the relevant authorities should seek to avoid it whenever possible. However, as suggested in section 2, regulation may sometimes be desirable, especially when the price level is too high compared to the social optimum. Such situations are likely to occur when there is a network (proprietary) monopoly, when more than one proprietary networks compete but customers in at least one side of the market find it difficult to switch networks, or when member operators of a not-for-profit network enjoy substantial market power in their relevant markets.

In these cases, the relevant authorities should be better off by generating the market conditions favourable to achieving the socially optimal price level, and steer clear of more intrusive price regulation. In other words, authorities should follow their standard approach when looking at markets other than network industries, and resort to price regulation only when all other types of remedial actions have been considered.

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<sup>38</sup> The price structure in a proprietary system is effectively an internal money transfer, and therefore it cannot be challenged by antitrust laws.



For example, if only one proprietary network operates in the market, the relevant authorities should create conditions for entry to occur, especially when the incumbent has made it harder for other companies to enter the market. Most two-sided network industries are not natural monopolies, and therefore entry is socially desirable.<sup>39</sup> If proprietary networks compete in the marketplace, authorities should pay particular attention to any (possibly network-driven) restrictions for customers to switch to another network (or use two networks concurrently). Some mobile phone networks only sell “network-blocked” mobile phones, i.e. mobile phones which can only be used with the network which made them available. Customers who might consider switching to an alternative network will have to incur the cost of another handset, or pay a fee to “unblock” their handset. The economics underlying two-sided network industries suggest that this might lead to a higher price level than when handsets are not “network-blocked”, because users are more likely to switch to another network or use two SIM cards (from competing networks) with the same handset, and price level competition is more effective.

If not-for-profit network’s member operators enjoy a degree of market power in their relevant markets, the consequent welfare loss is driven by that market power and not the collective pricing agreement with the network. Therefore, the relevant authorities should focus their attention on each market individually and apply any remedial action to the “local” market power enjoyed by operators. Again, whenever possible, such remedial action should avoid whenever possible price regulation. Competition is generally the best guarantor of social optimality, and should be incentivated whenever possible.

### 3.5 Welfare-Improving Regulatory Re-Evaluation

In the telecommunications sector, the standardised view is that the network on which the call originates imposes a cost on the called party’s (terminating) network, which must be compensated (the termination charge). This is referred to as the calling party pays principle (CPP), and is usually motivated by the reluctance of call-receiving subscribers to pay for phone calls which they do not value (so-called nuisance calls).

Laffont, Rey and Tirole (1998) and Laffont and Tirole (2000) discuss some of the implications of this principle on termination charges. They note that non-cooperative price setting by operators, in conjunction with the CPP, is likely to lead to termination charges which exceed marginal costs, because the terminating network is effectively a monopolist of the calls received by its subscribers.

Telecommunications regulators (and sometimes competition authorities) throughout the world are therefore keen to see termination charges which are geared to costs, and elaborate cost models

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<sup>39</sup> Fixed-line telephony might be seen as an exception. If the backbone network is owned by an operator, as is the case in the UK and in most European countries, regulation of access charges might be socially desirable. However, the economic literature on two-sided network industries suggests that, if possible, the backbone network should be an independent entity, and access charges should be negotiated collectively by all member operators. This would lead to the socially optimal price structure (although not necessarily to the socially optimal price level).



which attempt to isolate the incremental cost of the interconnection on the called party's network, and therefore regulate the interconnection charges directly.<sup>40</sup>

However, the interconnection pricing principle cannot be based on the assumption that the calling party enjoys all the benefits from the phone call, whereas the called party enjoys none. Whilst this might be true in a number of occasions, it is certainly not the case for the majority of phone calls. The less restrictive assumption that both the calling party and the called party benefit from the phone call has substantial implications for the most efficient pricing scheme. DeGraba (2001) argues that the party which benefits the most from the phone call should pay a proportionally higher share of the cost. This result echoes that of Rochet and Tirole (2001) for general two-sided network industries, Schmalensee (2001) and Wright (2001) for the credit card industry, and Doyle and Smith (1998), Jeon *et al* (2001), Hermalin and Katz (2001) and Kim and Lim (2001) in telecommunications.

If two interconnecting networks are symmetric (i.e. face the same technology and hence the same marginal cost) and the calling parties benefit equally from the phone call, this would suggest that the optimal price structure is to have each network recovering its costs from its customers, irrespective of whether the call originated in their network or not. If there is a cost asymmetry, and originating a call is cheaper than terminating it, but the calling parties benefit equally from the phone call, efficiency implies that the costlier (terminating) network should be compensated by the cheaper (originating) network. However, if the opposite is true, the interconnection charges should flow the other way round. On the factors reviewed so far, CPP is the efficient outcome only if the calling party fully benefits from the phone call. However, it remains true that CPP also reflects the fact that the caller has the option whether or not to make the call, and it would be hard on the receiver to have to pay for something he does not value.

Individual peering agreements between Internet Service Providers (ISPs) (a thus far unregulated area in terms of price regulation) are a good example of the above argument. Lleida (1998) notes that such agreements are individually negotiated, and that generally when two ISPs have similar sizes (i.e. symmetric networks), no interconnection charge is set; instead, a so called *revenue neutral point* is established. By contrast, when two ISPs vary substantially in size, the smaller ISP pays the larger one to interconnect. The intuition for such a fact may be that when two networks are symmetric, they (and their customers) benefit equally from interconnection, and therefore each recovers its total costs from its own customers; no interconnection charge is set. However, when one ISP is much smaller in size, then it (and its customers) benefit more from interconnection than the larger ISP (and its customers); therefore, the smaller network pays the larger one for interconnection.

Doyle and Smith (1998) and Kim and Lim (2001) show that relaxing the CPP might lead to an overall decrease in the price level. Under the CPP, operators enjoy a degree of market power in call termination, which they exercise by charging too high termination charges on other networks

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<sup>40</sup> DeGraba (2001) notes that in the US, incumbent local exchange carriers have little incentives to reach agreements on interconnection arrangements with entrants, as this would facilitate entry by competitors. Therefore, intervention by regulators becomes necessary to determine those interconnection rates. Even if such a failure to reach agreement did not occur, there is no reason to believe that the negotiated interconnection rates would be efficient, and again regulatory intervention might be deemed necessary.



— the problem of double marginalisation in two-sided network industries. By having each operator pay a share of the total cost of the phone call, the problem of double marginalisation is alleviated, and therefore the overall price level will decrease.

The particular economic characteristics of two-sided network industries suggest that telecommunications regulators should re-evaluate the efficacy of the current regulatory framework. In particular, with regard to the regulation of interconnection charges, regulators should focus more on the underlying causes of such high charges. If regulators do want to guarantee efficiency (and a low price level), they should focus their efforts on alleviating the underlying causes of inefficiency (market power in call termination generated by non-cooperative price setting and the CPP), rather than simply attempting to regulate the product of these inefficiencies (high interconnection/termination charges).



## 4 CONCLUSION

Recent economic research in two-sided network industries has provided important insights, and a tool with which to analyse these issues. From the point of view of competition authorities and regulators, these industries may be seen as just another market, and the peculiar characteristic that they face a two-sided demand may be seen as a purely internal problem. *Price level rather than price structure is the fundamental variable in the decision problem faced by the relevant authorities.* In addressing the issue of the overall price level, the relevant authorities will be navigating in familiar waters.

From another perspective, however, rather than attempting to correct the *effects* of market power (a high price level), authorities should attempt to correct the *causes* — market power itself. Notwithstanding potential limitations (e.g. natural monopoly characteristics), competition is generally the best means to achieve the maximisation of social welfare. Direct and intrusive price regulation should be used only in the last resort.

This shows how important it is to understand the incentives facing two-sided networks, and how these interact not only in the relevant market where the network operates, but also with other markets which might be directly or indirectly related. This would certainly contribute towards avoiding unnecessary regulation in these industries.



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