Two-sided platforms and airports

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Discussion paper

An introduction to the concept of two-sided platforms, their application to airports and some potential implications

Introduction

Two-sided platforms\(^1\), also referred to as two-sided markets, are present in a number of diverse industries. It is only relatively recently that economists have formalised their existence, with a body of work emerging since the pioneering work of Rochet and Tirole.\(^2\) Industries identified in the economic literature as being two-sided platforms include credit cards, financial exchanges, advertising supported newspapers and television, shopping centres, mobile telecommunications and computer software platforms.\(^3\) Airports are also two-sided platforms, although these have not been identified or discussed in the economic literature to any great extent.\(^4\)\(^5\).

This paper explains what two-sided platforms are and why they are important. It then goes on to explore why airports are two-sided platforms and draws out some potential implications from this for the CAA’s forthcoming market analysis in terms of market definition, market power and remedies.

Two-sided platforms

What are two-sided platforms?

A platform is two-sided when there are two different sets of customer which need each other, in the sense that each side values the service more if the other type of customer also buys the service. It also means in terms of the platform, that there are two different groups of customers that the platform business needs to get on board to be successful. From the example industries listed above it is clear to see how this is the case:

- For credit cards (e.g. Mastercard, Visa, American Express), merchants (those that sell products and services to end customers, shops, restaurants etc.) value when there are a large number of cardholders and cardholders value when there are a large number of stores and outlets where they can use their credit cards for payment:

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\(^1\) Some platforms have more than two sides, but two-sided is used throughout to refer to those platforms also.
\(^2\) Jean-Charles Rochet and Jean Tirole, “Platform competition in two-sided markets” 2003
\(^3\) For example David Evans and Michael Noel “Defining antitrust markets when firms operate two-sided platforms” 2005.
For financial exchanges (e.g. the London Stock Exchange), buyers of a wide range of stocks and shares value when there are lots of sellers of a wide range of stocks and shares and the sellers value when there are lots of buyers;

For advertising supported newspapers and television (e.g. the Times, the Financial Times, Metro, ITV, Sky), advertisers value being accessible to a large number of readers/viewers and readers/viewers value access to information/entertainment at a low or zero financial cost;

For shopping centres (e.g. Bluewater, Westfield), shoppers value a wide range of shops and retail outlets value being located where a large number of shoppers will be present;

For mobile communications (e.g. Vodafone, Orange, 3), subscribers value being able to access all other subscribers, not only on its own network, but also on other networks and network operators value being able to interconnect with other mobile operators so that all subscribers on all network can access each other; and

For computer software platforms (e.g. Microsoft Windows 2007, Apple Mac, iPhone), software/application developers value there being a large number of end users that might be interested in using the applications that they develop and end users value having access to a wide range of applications to meet their needs.

In economic terms, this means that there are indirect network externalities present in two-sided platforms. It also means that there are interdependencies between the two different customer groups on either side of the platform which it is important to appreciate and understand when conducting economic analysis of the markets.

Two-sided platforms versus one-sided platforms

When conducting economic analysis for competition law or regulatory purposes, some of the main considerations are the definition of the relevant economic market, whether a particular firm or group of firms have market power in the market and whether an abuse of that market power has taken place (or is likely to take place if left unregulated). Whether a market is one-sided or two-sided can have implications for each of these issues.

Implications for market definition

Market definition is concerned with identifying the constraints present on pricing and other business decisions such as investment and innovation. Once the relevant market is defined, then market power can be assessed within that market. However, if the economic analysis does not recognise the interdependencies between both sides of the platform then there is a risk that the market is defined too narrowly with constraints from the second side omitted from the analysis. For example, in the case of store cards if there is a price change on the amount charged to merchants this will reduce the number of merchants participating in the scheme. This in turn will have a negative impact on the number of cardholders, which in turn will reduce the number of participating merchants and so on (there is a multiplier effect). Therefore, intrinsic to the merchant side of the platform is the response of the cardholder.

Therefore, where there is a two-sided platform, the relevant economic market will tend to be broader, all other things remaining equal.
Implications for market power

As the relevant economic market will be broader where there is a two-sided platform due to a wider source of constraints, market power will be weaker than under a one-sided platform analysis, all other things remaining equal. Again, this can be illustrated by looking at the case of store cards. A platform operator (e.g. Mastercard) has less pricing flexibility when viewed under a two-sided analysis than under a one-sided analysis due to the interactions between the two sides outlined above. That is not to say that the platform operator will not have market power, but only that the economic analysis has to properly understand the constraints on its market power and take full account of the interactions between the two sides of the platform. Whether there is market power is an empirical question to be informed by available data.

Implications for abuse of market power

Common concerns about abuse of dominance are related to the level at which the price of a product of service is set. In particular, concerns arise as to whether prices are excessive (too high) and whether prices are predatory (too low). There is a lot of debate about what the precise definition of too high and too low might be and we do not concern ourselves with that discussion here. What is important in the context of two-sided platforms is that the consideration of price levels needs to acknowledge and take into account the interdependencies between the two sides.

In a one-sided market, the profit maximising output is where marginal revenue equals marginal cost and then setting the price at the corresponding point on the demand curve. However, for a two-sided platform, this relationship will not necessarily hold. This is because of the interdependencies between the two sides. This means that the profit maximising pricing strategy across both sides of the market might be to have zero or negative prices on one side of the market and prices on the other side of the market well above cost. The economic literature identifies three robust general pricing results:

- The optimal prices depend in a complex way on the price elasticities of demand on both sides, the nature and intensity of the indirect network effects between each side, and the marginal costs that result from changing the output of each side;
- The profit-maximising, non-predatory prices may be below the marginal cost of supply for that side or even negative; and
- An increase in marginal cost on one side does not necessarily result in an increase in price on that side relative to price on the other. More generally, the relationship between price and cost is complex, and the simple formulas used in single-sided markets do not apply.

Examples of such pricing practices include free to air advertising supported television where the programming is offered free to viewers and advertisers are charged a value-based, rather than a cost-based price for an advertising slot within a programme. Another example is shopping centres, where shoppers are often given free parking which is in effect a negative price for access to the shopping centre. Similar pricing practices can be observed for credit card services where merchants are charged a fee for each transaction, whereas card holders are not (although some such as American Express do levy a cardholder charge) and in fact gain from having a monetary advance.

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Therefore, price-cost tests which are appropriate for assessing abuse of market power in one-sided markets are not necessarily appropriate where there are multi-sided platforms. The Evans and Noel paper summarises typical payment structures in a number of different industries. A + indicates a positive charge, a 0 indicates a zero charge and a – indicates a negative charge.

Table 1 - Examples of two-sided platform payment structures

<table>
<thead>
<tr>
<th>Industry</th>
<th>Side</th>
<th>Access to platform</th>
<th>Usage of platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterosexual dating clubs</td>
<td>Men</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>US real estate brokers</td>
<td>Seller</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Buyer</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Magazines</td>
<td>Reader</td>
<td>+ (=MC)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Advertiser</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Shopping malls</td>
<td>Shopper</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Store</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>PC operating systems</td>
<td>User</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Developer</td>
<td>+ (&lt;MC)</td>
<td>0</td>
</tr>
<tr>
<td>Video game consoles</td>
<td>Player</td>
<td>+ (=MC)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Game developer</td>
<td>+ (&lt;MC)</td>
<td>+</td>
</tr>
<tr>
<td>Payment card systems</td>
<td>Merchant</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Cardholder</td>
<td>+ (&lt;MC)</td>
<td>0</td>
</tr>
</tbody>
</table>

Airports as a two-sided (multi-sided) platform

In terms of airports, it is clear that the same network externalities and interdependencies identified above are present. In the case of airports as a platform, airlines value the airport being popular amongst travellers and passengers value the airport being able to offer a wide range of airlines and destinations. In fact an airport is a multi-sided, not a two-sided platform. For example passengers also value a wide-range of retail outlets and hotels while retailers and hotels value being located where a large number of potential customers are present.
In the case of airports, if the price of aeronautical services to airlines were to increase, this would reduce demand from airlines, with a resultant loss of routes, frequency and airline variety. This in turn would reduce demand from passengers whether or not the increase in aeronautical charges was passed through to passengers by the airlines. Passengers would reduce their demand in response to the resultant reduction in routes, frequency and choice of airlines that emerge. As noted above in the general discussion of two sided platforms, this in turn, through the multiplier effect, would reduce demand from airlines and so on.

Similarly, if charges by the airport operator to, for example retailers, were to increase, this would reduce demand from retailers reducing the number and variety of retail outlets. This might make the airport less attractive to passengers, some of which will choose a different airport to travel from instead. This reduction in passengers will reduce the viability of routes to airlines, with resultant service reductions. Again, due to the multiplier effect this will feed back into passenger demand and so on.

Passengers also generally have to pay a surface access cost to access the airport. Many of these costs are not within the control of the airport, such as train fares or local buses. However, the airport does have control over some car park fees (although there are competing non-airport providers of long term-car parks). If the airport increases it charges for car park fees this will reduce the volume of passengers using this form of access, with some passengers deciding not to use the airport at all (perhaps switching to another substitute airport or deciding not to use air travel at all). This reduction in passengers will have similar impacts as noted above: there will be less demand for retail outlets and less demand from airlines, with the resultant feedback loop due to the multiplier effect.

All of this is not to say that there should not be a change in the structure or level of charges in the event of price controls being removed or relaxed. Such a conclusion would imply that the structure and level of charges between the different sides of the market were currently optimal, which is not necessarily the case.

Implications for market definition

As noted above, market definition is concerned with identifying relevant potential constraints on the market power of a firm. In one-sided platforms, this is done by looking at demand-side and supply-side substitution using the hypothetical monopolist test. However, in two-sided platforms, as discussed and illustrated above, constraints on market power on one side of the platform can arise from the other side, even though the two sides are not substitutes. It is somewhat a moot point whether the market is technically broadened to include the two-sides. What is more important is that the assessment of market power takes these constraints fully into account, although this suggests that the market should be defined to be broader than a strict substitutability analysis would suggest.

Implications for market power

As noted above in the general discussion of two-sided platforms, as the relevant economic market will be broader where there is a two-sided platform due to a wider source of constraints, market power will be weaker than under a one-sided platform analysis, all other things remaining equal.

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7 All of these impacts would not necessarily arise.
the context of airports, this is clear to see from the discussion of implications for market definition above.

The constraints on the second side of the platform act as an additional constraint from the direct constraint from the first side. In the example of aeronautical services, the ability to raise prices is constrained on the first side of the market by the response to the price increase by the airlines and by passengers to the extent that the price rise is passed through. However, there are additional constraints from the second side of the market from the response of passengers reacting to a reduction in routes, frequency and airline variety which is a result of the price rise.

The assessment of market power at airports will also have to take into account the multi-sided nature of the platform. For example, not only will a rise in aeronautical charges impact passenger demand for the airport due to a reduction in routes, frequency and airline variety, this reduction in passengers will also impact retailer demand for outlets within the terminal buildings. Also, changes in car parking fees will have additional impacts outlined above, which will constrain pricing flexibility in such areas.

All of this is not to say that the airport will not have market power, only that there are constraints over and above the constraints arising from the first side of the market directly from the price rise. It might be that these additional constraints are relatively weak and do not materially impact the market power finding. Whether or not an airport has market power is largely an empirical question. However, it is important that the analysis takes into account all relevant constraints, from whichever side of the market they arise. The risk of omitting these constraints from the analysis is that the airport is erroneously found to have market power or that erroneous competition problems are identified with resultant inappropriate regulations imposed.

**Implications for abuse of dominance**

As set out in the general discussion of two-sided platforms, care has to be taken when assessing whether any abuse of market power has taken place. In particular, the price-cost tests that are applicable in one-sided platforms will not necessarily be appropriate when assessing conduct in a multi-sided platform. It might be that the price of the provision of a service is not related to the cost of its provision, depending on how the different sides of the platform interrelate with each other. The pricing structures at airports can be summarised in the same format as set out above for other industries. Again a+ indicates a positive charge, a 0 indicates a zero charge and a – indicates a negative charge.

**Table 1 – Airport two-sided platform payment structures**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Side</th>
<th>Access to platform</th>
<th>Usage of platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport</td>
<td>Airlines</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Passengers</td>
<td>0&lt;sup&gt;9&lt;/sup&gt;</td>
<td>0</td>
</tr>
</tbody>
</table>

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<sup>8</sup> Market power can manifest itself in other ways, such as a reduction in service quality. However, for simplicity we use price rises here to refer to all manifestations of market power.

<sup>9</sup> + if use car parking facilities
In the context of airports it is also the case that there is a history of price regulation which will have distorted pricing decisions in the past. Therefore, it will not necessarily be appropriate to consider the structure and level of prevailing prices as being optimal and what might be expected in a competitive market. One way of assessing pricing decisions might be to look in detail at pricing practices at non-regulated airports to assess how prices for different services relate to the costs of provision. To the extent that common patterns and behaviours exist this might provide some information on what optimal price structures in a competitive market might be. However, as ever care would need to be taken when making comparisons between different airports.

Fallacies that arise from applying one-sided analysis to two-sided platforms

David Gillen identifies six fallacies that arise from applying conventional one-sided analysis to two-sided platforms and discusses these in relation to airports.\(^\text{10}\)

**Fallacy 1:** Efficient price structures should reflect relative costs. ICAO, IATA and the airlines have always taken the position that airport rates and charges should be cost based. However such pricing principles ignore the externality that exists between the customer groups on either side of the platform (airport), therefore rather than have cost based prices there should be externality based prices; relative costs are merely significant but not deterministic.

**Fallacy 2:** Marginal cost pricing is efficient. The problem is two-fold here; first, non-assignable costs are allocated in some way, perhaps based on relative demand elasticities, but any assignment must consider the combination of elasticities. Second, the externality is not internalized. Subsidizing one side of the markets may significantly impact utility on the other side of the market. Consequently, the overall value of and to both sides’ increases.

**Fallacy 3:** High price-cost margins indicate market power. In one sided markets competition generally drives prices to costs and conventional indexes of market power are price cost margins (e.g. Lerner Index). However, two-sided market thinking suggests that competition between platforms (airports) may lead to prices above costs since the competitive structure of fees will generally not reflect costs but rather the value placed on each side of the platform by participating in the market. To draw sensible inferences about harmful market power through price cost margins would need to demonstrate that the sum of prices to airlines and passengers can be profitably raised above permanently above the costs of supplying airport services to passengers and airlines.

**Fallacy 4:** A price below marginal cost indicates predation and possibly cross-subsidy. Setting prices below marginal cost may be used to generate greater surpluses by attracting those users that provide the greatest benefits to the network. For example, setting lower fees for certain types of carriers may make all carriers better off because the lower priced carriers attract more passengers to the airport.

If one side of the market receives services at below marginal cost, the view is it must be receiving a subsidy; but this thinking is it ignores the fact that the service being provided to each type of user depends on whether it is provided to the other type of used. As an example total efficiency may rise

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if airlines were not charged, or minimally charged, for using airports and passengers paid a fee for airside services. The removal of one side or the other could result in revenues falling to zero.

A good example is the provision of check in kiosks at airports by airports. The airport does not charge the passenger a fee for using the kiosk because the value to the airline is higher the more passengers use the kiosks since it results in lower costs to the airlines. It is also more sensible for the airport to provide these services because the IT platform is common for all carriers and the cost of providing the service is lower for all carriers.

**Fallacy 5:** In mature markets price structures that do not reflect costs are no longer justified. One might argue that on start up a firm (an airport with a new runway) may set prices below marginal costs or even zero or the airport may provide free (or very low priced) parking; e.g. Frankfurt Hahn. But once the market is mature it may still be beneficial to keep prices low for one side and higher prices for the other side if the incremental value of the low priced side provides greater surplus to the higher priced side.

**Fallacy 6:** More competition may result in a more balanced price structure. Competition may or may not lead to more balanced prices. The outcome will depend on how competition interacts with each type of user. If certain airlines tend to go to particular airports, greater competition may mean passengers could be subsidised by underpricing access, resulting in even more imbalance in the prices.

**Conclusions**

The relatively recent academic work on two-sided platforms potentially has important implications for the future regulation of airports. In particular, the fact that airports are multi-sided platforms will potentially impact the definition of the relevant economic market and the subsequent assessment of market power. To the extent that the additional constraints present in a multi-sided platform undermine an airport’s market power this needs to be taken fully into account in the competition assessment. This may also have implications for the future regulation of airports, depending on the precise impacts on market power and the resultant competition problems that remain, if any.