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I. INTRODUCTION

Digital markets are becoming an increasingly important feature of every economy. Online platforms are now commonly used to compare goods and services ranging from hotels to insurance, as well as to purchase diverse goods and services. Many of these platforms can be described as multi-sided, and understanding the nature of competition in such markets is crucial for competition authorities. This article² focuses specifically on the market power aspect of the nature of competition and provides practical and pragmatic suggestions on how to measure market power in such multi-sided markets. The paper draws operational conclusions on how to adapt existing enforcement and merger assessment tools to address some of the challenges posed by multi-sided markets.

The first section of the paper sets out some important features of multi-sided markets, including indirect network externalities, single-homing and multi-homing, price structure and tipping. The second section provides some practical steps in assessing market power in multi-sided markets and the final section sets out some measures of market power, and how they may need adaptation in multi-sided markets.

II. FEATURES OF MULTI-SIDED MARKETS

Multi-sided markets are platforms that match two or more groups of customers. Evans & Schmalensee (2007) define multi-sided platforms as having (a) two or more groups of customers; (b) who need each other in some way; (c) but who cannot capture the value from their mutual attraction on their own; and (d) rely on the catalyst of the platform to facilitate value creating interactions between them.

This section sets out some key features of multi-sided markets that may be important to an assessment of market power.

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A. Indirect Network Externalities

As the definition makes clear, indirect network externalities (“INE”) are an important feature of multi-sided markets. The benefit one side of the market derives from being on the platform depends on the number of customers on the other side of the market, and vice versa.³ As a result, the demands of each group of customers are interlinked and this generates feedback loops between them.

INE distinguish multi-sided markets from other markets such as a vertical supply relationship. These INE go in both directions, but are not necessarily equally strong in each direction. When there are strong INE in both directions, the interaction between these INE on both sides can create a feedback loop that may have second and third and fourth order effects. For instance, the ultimate effect of a price increase to one side of the market could be much greater if it led to further feedback loops with participants increasingly leaving both sides of the market as the market becomes less valuable to each group of customers. The strength of these feedback loops may enhance or constrain the platform’s market power and should be taken into account in any assessment.

B. Single-Homing and Multi-Homing

The extent of single-homing and multi-homing by customers on each side of the market is a key competitive aspect of multi-sided platforms (Rochet & Tirole, 2003). If customers on one side only join one platform, then customers on the other side can only access those customers by joining the same platform. Armstrong (2006) shows that this creates “competitive bottlenecks,” with single-homing customers on one side and multi-homing customers on the other, the platform competes aggressively for the single-homing customers and once they are on board it earns profits from customers on the other side who multi-home.⁴ Below, we suggest some practical ways to identify the extent of single- and multi-homing and thereby assess market power.

C. Price Structure

In a multi-sided market, the price structure reflects the interlinked demands of the two groups of consumers and the need to get both sides on board. This often results in complex pricing where the price to each group of consumers does not reflect the marginal cost of supplying them.

To see the importance of price structure in multi-sided markets, consider the example of a platform supplying businesses on one side of the market and consumers on the other side. Assume that in this example consumers are more sensitive to price than businesses. In order to get consumers on board, the platform allows them to use the service without charge, but the businesses pay (a fixed fee and/or commission) to be present on the platform. The platform needs to set a fee to businesses that ensures their participation and takes account of the feedback loops between both sides of the market. Fewer businesses will choose to use the services of the platform at higher prices and this will reduce the attractiveness of the platform to consumers on the other side of the market, etc.⁵

As this example shows, the platform must be able to use the price structure to internalize the externalities arising from the INE. Platforms will always be able to control the price structure in markets where the two sides do not transact. However, in markets where the sides do transact, one side of the market can reflect some of the increased costs of doing business on the platform in the price charged for transactions. Businesses on one side of the market may pass-through the fees they are

³ For example, the more businesses that join a platform, then the more consumers find that platform to be attractive; and the more consumers join a platform, then the more businesses find that platform to be attractive. In addition, the platform may allow advertisers to promote themselves to consumers (or businesses, or both), which may be a third side of the market.

⁴ Firms compete aggressively on the side that uses a single network in order to charge monopoly prices on the other side that is trying to reach them. Armstrong, 2006, “Competition in Two-Sided Markets,” *The RAND Journal of Economics*, 37(3): 668-91. As a result, competition between platforms can have large price effects on the side of the market that uses a single platform and little or no effect on the side that uses multiple platforms. Rysman, 2009, “The Economics of Two-Sided Markets,” *Journal of Economic Perspectives* – Volume 23, Number 3: 125-143.

⁵ The platform may operate at a loss-making level for some time while it seeks to build up participation on both sides of the market.

charged by the platform to the consumers on the other side of the market when transacting with those consumers through the platform. This may undermine the platform's price structure and limit its ability to internalize the externalities by facilitating value creating transactions between the two sides. For example, when a business passes through platform commissions to consumers, it will not consider how this may reduce consumers' demand for the platform's services, which then affects the demand of all business customers for the platform's services. It is only the platform which can take these externalities into account in its pricing to both sides of the market.

Therefore, in addition to the complex pricing that can be a feature of multi-sided markets, it will also be important to consider the degree of pass-through when considering the extent to which multi-sidedness affects the behavior of the platform.⁶

D. Tipping

Network externalities can lead to markets tipping to one, or a few, providers. The feedback loops that can arise when there are strong INE mean that multi-sided markets tend to be relatively concentrated. A multi-sided market may be less likely to tip the more differentiated the offering from competing platforms are and the more that customers on one or more sides multi-home. Scale economies and having a critical mass of consumers may also be important in determining the concentration of a market with platforms because they influence their financial viability.

Once a market tips, the joint behavior of consumers and businesses may mean that the market power of the platform becomes well-established. It may take considerable coordination by both consumers and businesses to switch to another platform to restore competition. Such coordination may be unlikely in the absence of major technological changes in the sector. For these reasons, establishing whether there is a "first-mover-advantage" may be important in identifying current market power and the potential longevity and sustainability of this market power.

E. When the Multi-Sided Nature of the Market is Relevant to Assessing Market Power

This discussion suggests that any assessment of market power in multi-sided markets should take account of these features. The standard results from one-sided markets do not apply directly to multi-sided markets and any assessment of market power needs to take this into account explicitly (as we show below). Many of our standard tools for assessing market power are more complex to apply in multi-sided markets and may need to be adapted. At a minimum, this may involve simply taking into account the impact multi-sidedness has on the platforms' business strategy and decisions.

III. MEASURING MARKET POWER IN MULTI-SIDED MARKETS

In this section, we identify some practical approaches which authorities should consider when measuring market power in multi-sided markets. We discuss these practical approaches before going on to identify measures of market power.

A. Understand the Nature of Competition and Identify the Market(s) Where Market Power Relevant to the Theory of Harm is Expected to Arise

As a first step, an assessment of market power should start from a solid understanding of the nature of competition in the market under consideration. It should then proceed with an analytical framework that takes account of any important features arising from the multi-sidedness of the market.

When thinking about market power and the effect of the conduct, it is important to identify clearly the nature of competition, including understanding the extent to which multi-sidedness with multiple consumer groups and interlinked

⁶We note that there is a debate as to whether a further distinction might be made between those markets where a platform is closely involved in the transaction (such as online travel agents or Amazon Marketplace), and those markets where the platform is less closely involved. Where a platform is closely involved in the transaction, it might be possible to define the market as the supply of the underlying product or service to consumers/customers, rather than as the supply of intermediation services. This would have consequences for the way in which market power were assessed. See BKartA, B6-113/15, Working Paper – "Market Power of Platforms and Networks," June 2016.

demand affects market power. This is most likely to be where there are (strong) INE. In addition, in multi-sided markets, competitive constraints on market power may come directly or indirectly from any and all sides of a competing platform. For example, if a platform tries to engage in exclusion on one side, a rival may be able to respond with strategies on the other side. This suggests the need to look at all sides of the market when assessing market power.

The market power we are interested in also depends on the conduct or agreement that we are interested in. Therefore, measuring market power will be specific to the conduct under investigation. It is important, at least from an economics perspective, that market power is not considered in isolation from the conduct and the theory of harm.⁷

B. Take a Sequential Approach to Measuring Market Power in Multi-Sided Markets

Given the potential feedback loops between different sides of a market, a purist approach may suggest measuring market power by assessing all sides of the market simultaneously. However, this is likely to be a very challenging task and may not be practical, or even possible. When the multi-sided nature of the market appears important, then a reasonable and pragmatic approach is to start by using standard tools to assess market power for each side of the market separately and then factor in the indirect network effects by using a range of evidence and judgement. As we discuss below, care will be needed when using and drawing inferences from our standard tools.

IV. MEASURES OF MARKET POWER

In this section, we focus on identifying different measures of market power and explain how these relate to the conduct considered. These measures of market power are not exclusive to multi-sided markets. However, we explain how they may need to be adapted when used in multi-sided markets and we identify some additional challenges that may arise in this context and where care will need to be taken when interpreting the results of standard measures.⁸

Any assessment of market power should be based on a thorough assessment of the competitive constraints and, in multi-sided markets, it will often be necessary to use multiple sources of evidence and always consider the linked nature of demand.

A. Market Shares and Concentration

Shares of supply can be a useful indicator of concentration and therefore market power, particularly for homogenous products or services. Their usefulness depends on how well the market is defined in the first place. There are challenges to using market shares as an indicator of market power in multi-sided markets, particularly for platforms.

The first challenge is how to measure market share. It is not always clear how shares should be computed to take account of the multi-sidedness of the market. The pragmatic solution would be to follow the sequential approach outlined above and to measure market shares on all sides of the platform. Market shares can then be evaluated within the overall analytical framework that takes account of the nature of the linked demands and the feedback loops. This flexible approach allows for more weight to be attached to high market shares on one side of the market if the evidence suggests, for example, that that side is prone to single-homing.

7 Some questions that one might ask include: (i) How does any potential market power arise in a market that has indirect network effects and aspects of multi-sidedness? (ii) How is the behavior under investigation related to the market power in the relevant market? (iii) Are the network effects and multi-sided nature of the market important to the market power? (iv) Are the network effects and multi-sided nature of the market important to the behavior being investigated? (v) Is the behavior being investigated important for the network effects in the market (e.g. foreclosure which may lead to the market tipping permanently or preventing some potentially important innovation)?

8 As an aside we note that the cellophane fallacy presents a particular challenge when measuring market power in multi-sided markets, outside of the context of mergers. This standard problem may arise in any market because, in the presence of market power, prevailing prices would not equate to competitive prices and the application of the hypothetical monopolist test to prevailing prices is likely to lead to the relevant market being defined too broadly (i.e. including products which are not close substitutes at competitive prices).

As with all markets, it will be necessary to think through which shares one wishes to measure. For example, it will not be possible to compute value shares on both sides if one side does not pay for using the platform. It may then be necessary to measure the number or value of transactions to calculate market shares. The standard problem of interpretation also arises with, for example, concerns regarding the relevance of market shares as measures of market power in markets where services/products are differentiated.

In multi-sided markets, it may be challenging to distinguish between customers and competitors because customers on one side of the market may also be competitors to the platform. For example, hotels that list on an online travel agent platform might also compete directly for bookings. To take another example, third party sellers are customers on Amazon Marketplace and might also compete with Marketplace to attract direct sales. Care will be needed to ensure that customers and competitors are correctly identified and captured in measures of market shares.

Authorities typically aim to identify longer term measures of market power (e.g. sustained high levels of market share) rather than measures which take a snapshot of a market in flux or out of equilibrium. However, a multi-sided market with network externalities may be prone to tipping and authorities may wish to intervene earlier. In that context, care will be needed to identify whether indications of market power at a relatively early stage in the development of the market may lead to long term market power.

The challenges outlined above indicate that care needs to be taken when interpreting what market shares and, more generally, concentration indicate about market power in multi-sided markets.

B. Margins, Profitability and Pricing

As with market shares, measures of margins and profitability can be used to assess market power. Alongside the usual pitfalls of using such measures, multi-sided markets present additional problems given the existence of feedback loops and the complexity of pricing structures. Theoretical models have been developed that explicitly take account of the linked nature of demand in multi-sided markets and could provide a basis for measuring margins or profits. However, these models are complex and may not be practical to implement.

Following the sequential approach described above, it may be more pragmatic to measure margins or profits to each group of consumers and then take account of the strength of feedback loops and the implications for inferences regarding market power. This would need to be done carefully and recognizing that examining margins on one side of the market alone could give false indications of market power.

It may also be informative to consider changes in margins or profits over time. For example, it may be possible to examine whether commission levels have increased with concentration in the market, while service or quality levels, or marketing to the other side of the market, has not increased concurrently. This might provide an indication of market power.

C. Single-Homing vs Multi-Homing

The extent to which customers on one side of the market single- or multi-home affects the single- or multi-homing choice of customers on the other side of the market. Examining the extent of single- or multi-homing on each side can provide an indication of likely market power on each side.

Businesses will benefit from listing on more than one platform if they can play-off the platforms against each other or if listing on more than one platform expands the number of consumers in the aggregate. For example, a platform may be good at bringing consumers to the market who would otherwise not participate. If, on the other hand, some consumers single-home to platform A and others single-home to platform B, then businesses will find it necessary to use both platforms to reach both sets of consumers). However, single-homing by different groups of consumers, and multi-homing by none, can lead to market power for each platform.⁹

⁹ There is an open question as to whether it makes sense to find all platforms as having market power. Furthermore, do they have market power in the supply of services

In markets where INE are strong it will be important to measure the extent of single- or multi-homing on each side of the market before considering any feedback loops. In practice, this can be done by gathering information on the following questions:

Competition in the Paid Side of the Market

- **What proportion of customers on the free side of the market single-home?** This will partially determine the extent of multi-homing on the paid-for-side. If there is single-homing by at least some consumers, then businesses have a strong incentive to list on that platform. Therefore, single-homing may give rise to the platform having market power.
- **What proportion of customers on the paid-for-side of the market single-home?** If all businesses single-home on one platform, it may be an indication of market power. However, multi-homing by the paid-for-side of the market does not imply the absence of market power if consumers single-home. This is because businesses may need to list on more than one platform to attract single-homing consumers.
- **How important is the platform for attracting customers to the paid side?** If a business on one side of the platform could attract consumers directly, without listing on the platform, then the platform is less likely to have market power.

Competition in the Free Side of the Market

- **How important is the platform for a consumer when choosing the product it wishes to purchase and the supplier it uses?** A platform is less likely to have market power if consumers can easily find and purchase their preferred product through other channels.
- **How loyal are consumers to one platform?** A platform is more likely to have market power if it has a loyal set of customers who are less willing to switch away from it.
- **How easy is it for consumers to search across competing platforms?** A platform is more likely to have market power the harder it is for consumers to search and compare deals across competing platforms.

Information on customer behavior and the extent of single- or multi-homing can be obtained from several sources:

- **Membership data** from market participants can be used to measure the extent of overlap of consumers, or businesses, between the different platforms.
- **Transaction data** from market participation can be used to measure the extent of overlap and the volume of transactions involved.
- **A survey** may provide a better understanding of customer behavior on all sides of the market and may provide insights into how they use the platforms to search for products and therefore the true extent of multi-homing. It may also provide insights into out of market constraints, where data may be unavailable.
- **Web server data** might be used to analyze user behavior within a specific domain or how consumers search across platforms. This could help the agency to understand:¹⁰ how many platforms a consumer visits and how often; whether the consumer considers direct sales from businesses, and their websites, and in what order this search occurs; how

to businesses (on one side of that platform) due to the single-homing of the consumers (on the other side of that particular platform); or do they have market power in the supply of services to the single-homing consumers? Finally, potential market power due to consumers single-homing on platforms may not arise if some/many consumers use tools to search across platforms – effectively multi-homing without necessarily visiting each platform. For example, metasearch sites used in the online travel industry would appear to support this form of multi-homing (although they appear to account for a rather small proportion of bookings).

¹⁰ We would expect platforms to collect an array of data internally to monitor how it is performing against internal targets and against rivals. Therefore, internal documents and management information collected during the normal course of business are likely to provide useful insights.

much time the consumer spends on the search and whether the level of engagement indicates more or less market power.

- **Search engine optimization (“SEO”)** For online platforms, a good understanding of the platforms’ SEO strategy may help assess market power. This might include the use of keywords and search terms and how they affect activity on the platform. In theory, the greater the overlap in search terms, the more likely the platforms are to target the same customers, and therefore the more likely they are to be competing closely.

D. Conduct

Sometimes the ability to engage in the conduct may be seen as an indicator of market power, particularly for conduct that would be unachievable or unprofitable in the absence of market power.¹¹

Clearly an important factor to consider is how the conduct may lead a market to tip when a market is already prone to tipping due to the INE.

E. Barriers to Entry and Expansion, Including Switching Costs as a Source of Market Power

As a final comment on measures of market power, we note that any assessment of market power should include an analysis of barriers to entry and expansion. A firm is unlikely to have market power in the absence of material/substantial barriers to entry, and barriers to large-scale expansion by fringe competitors.

The relevant types and extent of barriers to entry may depend on the context, but these are fairly well established. For example, one may consider the costs of entry and the extent to which these costs are likely to be sunk following entry. One may also consider how the costs of entry compare to the likely benefits of entry and how risky profitable entry would be. Profitable entry may be risky due to exogenous demand and supply shocks and/or due to strategic responses to entry by incumbents. None of these factors are unusual to multi-sided markets, but are likely to be relevant to them.

A consideration in multi-sided markets is the need for platforms to establish and market themselves to all sides of the market. The importance of this will depend on the strength of INE on the different sides of the market. The platform will need to attract all groups of customers and entry costs may differ for each side of the market. For example, it may be relatively easy to get businesses to join a new platform when they only pay usage fees and so are willing to multi-home. However, the platform may need to make significant sunk investments in advertising and content in order to attract consumers to the platform.

Switching costs may also be important in multi-sided markets. Switching costs can create barriers to entry and expansion and, if there is a first-mover-advantage, can establish and strengthen a position of market power.

Switching costs may arise between platforms, or between platforms and direct sales, due to customer habits and convenience. For example, cookies used by the platform may mean that it is likely to show a consumer a selection closer to the consumer’s preferences. The platform may hold the consumer’s payment card details, meaning that these do not need to be re-entered every time a purchase is made. The platform has the contact details of the consumer and knows other personal information, so that the platform can contact the consumer with targeted promotions. Also, the nature of platforms is to reduce search costs and aid comparability. Therefore, consumers may be expected to prefer this to direct search across businesses’ own websites.

¹¹ For example, the use of wide most favored nation clauses (“MFNs”) by some platforms might provide some indication of market power. Wide MFNs (also known as wide price parity clauses) state that the business’s price in all other sales channels (including other platforms) will never be lower than the price on the platform with which the business is contracting. This contrasts with narrow MFNs which state that the business’s price on its own website (or retail outlet) will never be lower than the price quoted on the platform. On the other hand, it may be that the conduct itself impacts upon other measures of market power. For example, a wide MFN reduces the incentive of businesses to pass-through a commission increase into their prices on that platform and, to the extent that it is passed through, it will be matched on other platforms. This means that the initial ‘feedback loop’, which one might consider in assessing market power, is no longer operational due to the wide MFN.

Technological developments may weaken switching costs as they may lead to periods of intense innovation and businesses responding to technological changes, which can be destabilizing to established market power. On the other hand, technological developments may also enhance market power. For example, consumers may be less willing to shop around through organic browser searches when they have a convenient app on their phone. Moreover, consumers may not be willing to have numerous apps on their phones supporting similar services.

V. ASSESSING THE STRENGTH AND IMPACT OF INE AND FEEDBACK LOOPS

In this final section, we provide practical suggestions for assessing the strength and impact of INE and feedback loops. We have proposed a sequential approach, looking first at the market power on each side of the market separately, and second looking at constraints from the other side via the feedback loops. This second step requires us to assess the strength of feedback loops to examine whether competition from one side of the market constrains the platform in its price setting to the other side of the market. This will help establish whether market power on one side of the market exacerbates market power on another side or whether competition from one side might constrain the other.

This second step is important because, in the presence of strong INE, simple one-sided measures of market power potentially underestimate the market power of the platform. For example, if the conduct in question undermined the ability of other platforms to compete effectively, then the presence of strong INE could lead to rapid concentration of the market and the exclusion of rivals. In this example, if the conduct leads to single-homing customers on one side of the market switching, the INE may simultaneously act to strengthen one competitor rapidly and weaken another rapidly. This could be the case even though static market shares, or other measures, may not indicate a position of significant market power or dominance.

It is also important to recognize that the potential benefits that a platform may gain from additional customers on one (or more) side(s) of the market may not always be large. The incremental value of gaining an additional customer is likely to vary depending on the number of customers already on the platform. Where a platform already has many potential members of the market on board, adding one additional business will not increase the value of the platform to the consumer as much as when the platform had fewer businesses on board. A platform might therefore put less effort into recruiting customers once it is more mature. This implies that the pricing structure on the platform is likely to evolve to reflect the benefit to the platform of additional customers and how this may change with the total number of customers on the platform.¹²

There are two key elements of an assessment of the strength and impact of INE and feedback loops. The first is the elasticity of demand (on all sides), which provides an indication of the sensitivity of that group of customers to a change in the relative price. The stronger the reaction to a change in price, the greater the impact the feedback loop can have. The second element is the responsiveness of demand (on all sides) to participation rates on the other side(s), which provides an indication of how a response from one side of the market to a change in price will affect demand on the other side of the market.

In some circumstances, it may be possible to assess the strength of the INE by simply looking at the rate of growth of the platform and considering how growth in one side of the market appears to give rise to growth in the other side of the market.

In practice, it may be difficult to measure these elements directly. However, the following are three potential sources of evidence that may provide information on the strength and impact of the INE and feedback loops:

- **Customer data.** If it is possible to collect transaction data for market participants, it may be possible to use econometric techniques to examine past customer responses to changes in, for example, platform prices that reveal their preferences. This data would allow for the direct measurement of both the elasticity of demand and the responsiveness of demand to participation rates on the other sides. There are a number challenges with using such evidence, one being that it may be hard to ascertain the extent to which customers respond by choosing an off-platform “outside option.”
- **Econometric techniques.** A combination of evidence on revealed and stated preference could be used to model choice

¹² In other words, at the margin, the strength of the INE is unlikely to remain constant.

or estimate demand econometrically. It may also be possible to measure INE directly using econometric techniques.¹³ At present, the theoretical models we are aware of appear to make several simplifying assumptions and we do not know of any attempts by any competition authorities to do this.¹⁴

- **Survey evidence.** Surveys provide a promising source of information on the strength and impact of feedback loops. Although surveys suffer from the drawback of using stated preferences, they may have the benefit of not only providing useful insights into both elasticity of demand and responsiveness of demand to participation rates, they may also allow for the assessment of preferences for off-platform options. A survey of businesses, or customers on the paid side of the market, would allow an authority to gather information on a range of questions, including: the extent to which the businesses would pass through increases in the cost of transacting on the platform in the form of higher prices to consumers on the platform; the value to businesses of consumer participation and willingness to pay for different rates of participation; the availability of alternatives and the existence of any switching costs. This could be complemented with a survey of customers on the other side(s) of the market (i.e. consumers), which could include questions on how they would react to changes in the relative price of transactions on the platform, the value to these consumers of business participation and how different business participation rates would affect their willingness to use the platform.

These sources of information are unlikely to provide all the evidence required to assess the strength and impact of INE and feedback loops. The authority will need to make an assessment in the round and using multiple sources of evidence, including internal business documents.

VI. CONCLUSION

The advent of the digital economy and the prominence of online platforms makes understanding the nature of competition in multi-sided markets crucial. This article has sought to give pragmatic suggestions for practitioners seeking to measure market power in multi-sided markets.

As a first step, it is necessary to assess the importance of INE. Where these are strong, the multi-sided nature of the market will be relevant to the conduct under investigation. As a second step, the pragmatic approach of assessing market power in each side of the market and then taking into account feedback loops will capture the multi-sided nature of the market and its relevance to the conduct under investigation.

We have suggested several practical ways of measuring market power in the different sides of the market, taking account of the added complexity and potential biases that arise in using these measures in multi-sided markets. We have also suggested ways of directly measuring the indirect feedback loops. We recognize that it will not always be possible to measure the feedback loops directly. Where this is not possible, thinking through how these loops are likely to work in practice will provide a good qualitative way of capturing the impact INE will have on market power.

¹³ Through simultaneous demand estimation it may be possible to model demand on all sides of the market and back out the cross elasticities in order to measure the INE.

¹⁴ See, for example, Song, 2015, "Estimating platform market power in two-sided markets with an application to magazine advertising." Working Paper.