**Introduction**

The definition of the relevant market is a basic prerequisite for any political decisions about possible market interventions. It is not an approach developed by microeconomic theory. Rather, it is a competition policy concept aimed at identifying the comptetitive environment within an industry (Argentesi & Ivaldi,2005). In case of a wrong understanding of the relevant market, regulatory interference might worsen the market situation, if for instance an antitrust authority imposes a socially inefficient regulation on an incumbent that in fact faces sufficient competition or blocks a welfare-enhancing merger.

Market definition plays an important role in EU antitrust policy and even though **US merger guidelines** seem to move away from market definition and propose to replace it by the measurement of the Upward Pricing Pressure (UPP), it remains to be seen the extent to which, US courts will adopt this new concept and allow antitrust agency to block a merger without a previous market definition (Filistrucch, 2013).

The objective of market definition is to determine the smallest set of products competing between them. It therefore analyzes substitutional relationships between products or product groups to identify competitive constrains faced by a firm or a group of firms. If consumers can easily switch between two products, a firm will be constrained regarding the ability to raise prices (Filistrucci, 2013).

The reasoning of demand substitution is implemented in the conceptual tool of the **so-called SSNIP** (Small but Significant Non-transitory Increase in Price) test. According to this test, the narrowest market is defined as a set of products for which a hypothetical monopolist could sustainably raise prices above the current level by a given amount (usually 5-10%).[[1]](#footnote-1)

Yet this test is designed for single-sided markets, using absolute prices on the potential market. Drawing from the economic literature on market definition with interdependencies in demand, it can be shown that this test cannot be easily applied in case of two-sided platform competition (Evans & Noel (2008), Filistrucchi et al. (2013)). We will show that for two-sided markets it is rather the relative prices between two market sites, which define a firm ability to set prices without losing consumers to potential competitors.

* Two-sided markets are characterized by intermediaries or platforms that sell two different products to two different groups of agents.[[2]](#footnote-2) These two groups are interconnected as they mutually influence each other’s demand. The platforms recognize the interconnection and choose prices according to the relative size of the indirect network effects.
* The consequences of applying analytical tools (SSNIP, UPP, Lerner Pricing) that were developed for single-sided firms to define markets for a product offered on one side of a two-sided market are, between others, analyzed for UPP (Filistrucchi, Affeldt, Klein 2013) and Lerner-Pricing (Evans & Noel 2008).
* With the SSNIP test being the most important analytical tool for regulatory and antitrust cases in the EU, we limit our analysis on it.
* Although two-sided markets are not invented by the digital revolution, digital markets very often demonstrate a market structure with two or more consumer-groups that are related via indirect network effects and are connected by platforms. A very prominent example can be found within the search engine market, where Google connects at least two market-sites: the demand for search query and the demand for placing advertisement. It can easily be seen, that advertisers value a big group on the other market site, as their scope and therefor the effectiveness of advertisement grow. The value of the search query on the other market site might be influenced negatively or positively by the amount of advertisement. This indirect network effect pretty much depends on the quality of the advertisement and on the consumers demand on personalized advertisement.
* Two-sided markets can also be found within more traditional markets like credit cards, newspaper or shopping mal. These markets play an important role when analyzing the nature of two-sided markets as they offer an explicit market structure and available data. Requirements that cannot easily be found within digital markets due to rapidly changing market dynamics. Nevertheless, the rapid growth of digital markets calls for an analytical tool that can be applied for the definition of these markets. In this paper we present a tool that offers a way to analyze market structure by looking at the cross correlations of quantities of potential competitors.
* Note that the delineation of relevant markets is a competition policy notion aimed at identifying the competitive constraints faced by a firm or a group of firms. It is not a concept developed or employed by microeconomic theory. The objective of market definition is to search for the smallest set of products competing between them in order to guide the antitrust investigation. In the search process, three competitive constraints can play a role: demand substitution, supply substitution and potential competition (see European Commission (1997)).
* Unser Wettbewerbsrecht beruht etwa noch immer auf dem Gradmesser Umsatz. Aber Digitalunternehmen können auch Marktmacht erlangen, ohne gleichzeitig viel Umsatz zu machen. Dies ist vor allem in den Anfangsjahren der Unternehmen häufig der Fall.

**Literature Review**

This paper is related to different fields of economic literature. We add to the body of work analyzing two-sided markets as well as to the existing literature of market definition, much of which has examined traditional industries. In recent years those two researched fields has been considered conjointly as antitrust agencies started to focus more on two-sided markets. Evans (2003), Wright (2004), Evans and Noel (2005) are examples of papers that hace focused on competition policy on two-sided markets.

1. Definition of a relevant market and the implications for competition policy
2. Theory of two-sided markets. Optimal pricing in media markets: Rysman (2004), Kaiser and Wright (2006), and Argentesi and Filistrucchi (2007)

* Merger in two-sided markets: **Chandra** et al. (2009), **Evans** (2002) describes how potential mergers in two-sided markets may not give rise to the same antitrust concerns as those in traditional markets. Even if prices were to rise for both sides of the market as a consequence of the merger, consumers, on both sides, may still see an increase in surplus. Evans and Noel (2007) point out the difficulties associated with using conventional methods to analyze mergers in two-sided markets. As they show, the Lerner Index does not hold in such markets, and merger simulation models, which are nowroutinely used in traditional markets, are misspecified when applied to two-sided or multi-sided markets. Evans and Noel also perform an analysis of the merger between Google and DoubleClick—perhaps the first empirical analysis of mergers in two-sided industries. They show that relying on conventional methods would have led to significantly different results than using methods that explicitly incorporate the two-sided nature of this market. Neverheless, they are limited to a calibration exercise due to lack of data.
* Market Definition of 2sm

**SSNIP and 2SM**

The actual handling of antitrust issues regarding two-sided markets often lack the identification of indirect network effects. Even if indirect network effects are detected, the definition of the relevant market still remains a challenging task. This is mainly attributable to the fact that available analytical tools of market definition are not applicable for markets with interconnected demands. The analysis of substitutional relationships is a well-established practice to define the relevant market. The European Commission uses the hypothetical monopolist test (the SSNIP test) which identifies the smallest relevant market through demand-substitutability of a certain product. If a small but significant, non-transitory price increase (5% - 10%) is profitable for the hypothetical monopolist then there is a relevant market. (see Motta, 2004 or Schmidt ,2013.) There are other tools to define a relevant market (UPP, Lerner Price Index) that are used by antitrust agencies. But as they also consider prices, the following reasoning on the SSNIP test shall also apply.

Using this analytical tools to define markets for a product offered on one side of a two-sided market can result in significantly overstating or understating the breadth of the market. (Evans & Noel, 2008: The Analysis of Mergers That involve Multisided Platform Business). Due to the fact that platforms need to balance the interest of two (or more) different groups of consumers, they often behave in a way that would not be efficient for traditional firms (e.g. they set prices < marginal cost) (Chandra et al. (2009)).

Example:

*Suppose a small but significant, non-transitory price increase is profitable on one side under the assumption that nothing changes on the other side of the platforms included in the hypothetical monopoly. Therefore one could conclude that the products considered constitute a relevant antitrust market. However, a price increase on one side results in a reduction of demand by customers for that side and, through positive feedback effects, a reduction in the demand for the other side; the decline in demand on the other side further reduces the demand on the first side. Consequently, one might conclude after considering the positive feedback effects that the price increase is unprofitable. In that case the market is defined too narrowly.*

The existence of positive feedback effects between demands of the two market sides calls for an optimal strategic behavior that varies widely from profit maximization on conventional one-sided markets. The SSNIP test might be applied in a modified way as shown by Filistrucchi et al., 2014 as well as Evans & Noel, 2008, who include the profit change in consideration of demand elasticity and indirect network effects. Although these models are correct in theory, they show various problems when implemented in practice.

First of all, it must be clear if the market under consideration is a symmetric or an asymmetric market. Affeldt, Filistrucchi & Klein, 2013 propose to distinguish between transaction and non-transaction markets as for transaction markets a symmetric definition can be applied. If this is the case, the increase of the sum of prices on both market-sides can be analyzed. Within non-transaction markets on the other hand, the price increase must be evaluated individually. However, as transaction markets might exhibit asymmetric relationships in exceptional cases, this distinction cannot easily be applied.

One well-known problem of most of those analytical tools is the procurement of necessary information. Due to the complexity of the two-sided market this task is particularly difficult, as the scope of the indirect network effects has to be known for this analysis. A SSNIP test requires both qualitative data on substitutional behavior of consumers and quantitative market data. The data collection always is challenging, costly and time expensive and this is all the more true in case of two-sided markets as data has to be collected for two market sides. Even though the data required is available, two-sided markets poses special analytical challenges not allowing reliable conclusions about the market size.

One reason is the fact that in some cases one market side has no observable monetary price. This is the case, if one market side benefits from a strong positive indirect network effect affecting the other market side, while the consumer group that receives the strong positive indirect network effect has to pay for the value gain. One market side therefore subsidizes the other depending on the relation of network effects. The absence of monetary prices is not a rare phenomenon in digital markets where the search market is subsidized by the advertiser market. Without monetary prices it will be impossible to analyze a hypothetical precentral price increase. To assign a value to the hedonic price (Filistruchhi, Geradin, Van Damme, & Affeldt, 2014), a quality benchmark is needed which itself is a difficult task.

Furthermore the consideration of prices does not capture the dynamic nature of a two-sided market, where firms rather use innovation and quality as strategic parameters (vgl. Evans & Schmalensee, 2001; Gual, 2003).

The presence of relatively high fix cost and low marginal cost is another reason why the evaluation of prices does not represent an adequate measure, especially for online markets. In case of declining average cost due to fix cost degression, the conventional SSNIP-test would define the relevant market to narrowly (Gual, 2003). The same is true for endogenous sunk cost. In both cases there are other relevant strategic parameters beside the prices.

Beside the problems that arise when the SSNIP test is applied for two-sided markets, there are several general difficulties with this tool. The so called *Cellophane-Fallacy*[[3]](#footnote-3) presents one well-known problem of the SSNIP-test. If the observed market price already exceeds the competitive price level, substitutional relationships between products are overestimated and market definition will be too broad. This problem is even more true for two-sided markets where a price on one market side seems to be “too low” (price is lower than monopoly price without feedback effects) while it is “too high” on the other market side (price is higher than monopoly price) (vgl. Dewenter & Rösch, 2015).

A modified SSNIP test has to take into account all of these particular challenges when defining a two-sided market. Additional to this demanding task, the extensive data requirements hinder the application of a SSNIP test as an analytical tool for antitrust agencies when defining a two-sided market.

* Special requirements for search engines

The problems described make it evident that the SSNIP test – even in a modified way – is not an adequate tool when it comes to the task to define a relevant market that shows indirect network effects between two market sides, especially in the case of digital markets. This also applies for other analytical tools that analyze cross-price-elasticities. The reason is that market prices in two-sided markets cannot be interpreted in the conventional way as they reflect the relation of indirect network effects between the market sides. However, quantity measures offer an alternative approach to analyze substitutability of relevant goods. In the following chapter we present the concept dynamic cross-correlations of quantities as a measure for substitutability of differentiated products.

**Dynamic Cross-Correlation of Quantities**

**Benchmark Model**

Discrete choice model

**Empirical Analysis**

We test our benchmark model with an empirical application involving newspaper markets. In general, media industries are good examples of two-sided markets.2 This is because the media owner has two sets of consumers: media subscribers such as radio listeners and television viewers, and advertisers. Advertisers’ willingness-to-pay increases in the number of media subscribers. However, it is not always clear how the number of advertisements affects subscribers’ valuation of the media. Although it is safe to assume that subscribers in television and radio markets value advertisements negatively, the same may not necessarily hold in newspaper markets. Nevertheless, it is always the case that the media owner needs to keep the interests of both sets of consumers in mind when setting prices.

We address the empircial question of market definition of a two-sided market by estimating a demand model of differentiated products for the German magazine market. Discrete choice assumptions are reasonable for models of magazine demand. Argentesi (2009) and Kaiser (2006) use a similar approach.

In addition to the standard instrumental variables approach, we use both a control function approach where we include the generalized residuals from a first step probit estimation in the second step demand estimation, and we estimate a model where the predicted probabilities from a first step is used as instruments in the demand estimation (Woolridge, 2002).

**Econometric Method**

Structural influences may bias the analysis of substitutability by means of sales so that we will have non-stationary variables which cause spurious regression. If the quantity variables are non-stationary (that is, they are I(1) ) it may be possible to detect the true relationship between them if the variables are cointegrated. To test this assumption we can run a OLS Regression we can find a parameter so that they are cointegrated. In a first step we have to test if they are cointegrated with an OLS estimation similar to the first stage of engle-granger procedure.

**Data / Descriptive**

The quantities seem to correlate rather positively than negatively 🡪 common structural trend.

**Model**

The goal of our model is to measure the magnitude of indirect network effects between two market sites. Due to data and computational limitations the model is stylized. We make assumptions that we judge to be economically logical.

In the next subsections, we define the model and characterize its quilibrium. Following we explain the main assumtions giving evidence that supports them and discussing their limitations as well as their importance for our main results.

## Setup

We model a differentiated Cournot duopoly where two platforms chose quantity simultaneously. There are two groups of consumers, A and B, which demand different products from a platform i=1, 2. The platform enables the two groups to interact and each group values the number of users of the opposite group on the same platform. The inverse demand functions for the two market sites are

|  |  |
| --- | --- |
| ; , | (1) |

Where are the respective quantities offered by the platform i on the two market sides.

The parameters d and g describe the magnitude of the indirect network effect between the two consumer groups. are the product differentiation parameters for the two market sides that describe the competitiveness. If or the two competing platforms offer perfect substitutes on the respective market side.

Assumptions:

* Singlehoming (Armstrong 20059)

2 groups of agents, r and a (reader and advertiser), and there are two platforms, 1 and 2 which enable the two groups to interact. Groups r and a obtain the respective utilities u(i,r); u(i,a) if they join platform i.

We assume an underlying discrete choice utility model in characteristics space. Lancaster (1966) and Gorman (1980) were the Örst studies that use traceable models of di§erentiated products. Later McFadden (1981) showed how to implement the approach in discrete choice models. The consumer $i gets utility $uij from consuming product $j which is a function of the characteristics of the product (xj) and the price (pj). Furthermore, we make the standard assumption that the utility is linear in characteristics and prices.

To determine possible substitutional relationships among the sales, all series from the same market segment are used to generate pre-whiten residuals, which are adjusted for structural trends.

Control for other possible magazines in the market (wide substitutes): regress sales of magazine A on: constant, sales of magazine B, sales of further substitutes

**Instruments**

**Assumption**: (Unobserved) cost factors are common across magazines published by a magazine pblisher and that other (demand-side) shocks specific to the magazine are not correlated with these factors (Hausmann and Taylor (1981), Hausmann et al. (1994), Berry et al. (1995).

Use current and lagged values of the instruments, to instrument the explanatory variables (which are differenced).

* **Average cover price of a publisher´s other magazines:** assumed to be driven by common underlying costs associated with a publisher´s production, distribution and marketing of its magazines to readers.

🡪 Determine the particular magazine´s cover price, but uncorrelated with demand.

* **Average rate of publisher´s other magazine ad price**
* **Average content Pages per copy of publisher´s other magazines**

**Additional Cost-Side Instruments** (for cover price, ad rates and content pages per Copy):

* **Natural log of Number of magazines titles** published by the own publisher in a given year (proxy variable for returns to scope in production)
* **Natural log of the total number of pages** printed by the own publisher in a given year (a proxy for returns to scale in production).
* **Average circulation** of publisher´s other magazines
* **Average ad sites** of publisher´s other magazines.

1. For a discussion on the SSNIP test and its implementation, see Motta (2004), ch. 3. See also, for an econometric application, Ivaldi and Lörincz (2005). [↑](#footnote-ref-1)
2. There might exist markets with more than two market sides, but for simplicity we will refer to two-sided markets. [↑](#footnote-ref-2)
3. Der Name geht zurück auf den *Du Pont*-Fall, in dem dieser Effekt übersehen wurde (U.S. vs. E.I. du Pont de Nemours, 1956) [↑](#footnote-ref-3)