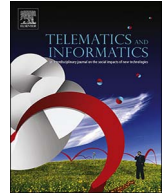


Contents lists available at [ScienceDirect](#)

Telematics and Informatics

journal homepage: www.elsevier.com/locate/tele

The effect of online platform maturity on the efficiency of offline industry

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ARTICLE INFO

Keywords:

Platform
Two-sided markets
Information gatekeeper
Intermediaries
Meta-frontier analysis
Technical efficiency

ABSTRACT

The role of platform as an information mediator has been becoming more vital by satisfying buyers' needs for a reasonable purchase and sellers' need for more exposure to buyers within the copious information flood. For the platform service provider, increasing the network externality is important to induce both sides while platforms can cause sellers to invest more and create severe competition among sellers, which take a toll on sellers' surplus. Therefore, this study investigates whether platforms yield benefits for sellers as the platform matures, securing the network externality. Thus, this study divides the seller side industry into 3 periods based on the level of platform maturation. The efficiency in each period is measured using stochastic frontier analysis and efficiencies of each period are compared using meta-frontier analysis. The results show the overall industry efficiency improves with securing the network externality as the platform matures. However, if the individual firm is resistant to innovation, the firm's efficiency might not be far behind compared to the firm which led the innovation.

1. Introduction

In the development of a new computer- and internet-based economy (Shapiro and Varian, 2013, p. 173–175), anything can be information with digitalization. Thus, the new economy has started to involve abounding information by including a wide array of offline goods such as food and hotels. There is almost zero cost to reproduce digitalized information after its creation (Shapiro and Varian, 2013, p. 3), so the speed of information diffusion through the internet has been increasing at an astronomical rate. However, now people must spend time and money to find the proper information within the copious information flood.

The platform mediating information between sellers and buyers came to the forefront of society because customers need to find proper information. This platform has been called several things, such as intermediation (Edelman and Wright, 2015), a search platform (Wang and Wright, 2016), and an information gatekeeper (Baye and Morgan, 2001) and it has been studied as a part of platform study primarily from the viewpoint of network externality. It provides information about existing goods depending on buyer preferences rather than producing goods. Buyers reap benefits from using the platform because it reduces their search costs (Baye and Morgan, 2001) and allows them to make rational purchases (White and Weyl, 2016). Sellers use platform services for exposure to more buyers (Edelman et al., 2016). For example, Priceline provides information and the price of hotels to people preparing to travel and creates an online link between sellers and travelers.

As the information provided through the internet becomes more diverse and enormous, platforms that provide information based on buyer preferences and suggest rational prices for goods have been growing gradually. As one example, the sales of the hotel

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<http://dx.doi.org/10.1016/j.tele.2017.10.003>

Received 14 March 2017; Received in revised form 20 August 2017; Accepted 10 October 2017

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booking platform Priceline increased more than 6 times, from 1.41 billion dollars in 2007 to 9.22 billion dollars in 2015 (Statista, 2016). Moreover, platforms such as Amazon and eBay have grown continuously. For the past 10 years, the overall net income of the S & P 500 companies has increased 16%, while the net income of platform companies in the S & P 500 has increased 330% (Moazed, 2017 and Yardeni et al., 2017). Furthermore, according to Moazed (2017), 50% of the overall S & P 500 companies' net income will come from platform companies 25 years later. In addition, the effect of platforms already settled in a market tend to grow increasingly over time because the market mediated by the platform is two-sided; an increase in the number of sellers on the platform engenders an increase in information, stimulating a new increase in buyers, which makes the platform more attractive to sellers.

On the other hand, there is a possibility that platforms reduce the benefits to sellers and buyers (for example, see Edelman and Wright (2015) and Wang and Wright (2016)). To be profitable, it is indispensable for the platform service provider to require a fee and the lowest prices from sellers to compete with other platforms. This burden is transferred from sellers to buyers, which can make the average final price for buyers higher than it will be without the platform. Thus, the platform might have a detrimental effect on both sellers and buyers surplus (Edelman and Wright, 2015). However, Hunold et al. (2016) shows the opposite result by analyzing data; sellers use platforms more without a narrow best price clause (BPC) than with a BPC. Also, taking into account the drawbacks of the platform (increase in input cost for sellers because of the fee and BPC), sellers can still benefit from the positive effect of the platform with market size accreting due to more buyers accessing to information of sellers (Edelman et al., 2016) by platform service reduces the search costs of buyers (Baye and Morgan, 2001).

Therefore, this study investigates whether the advent of platforms leads to positive changes in a specific industry by comparing the efficiencies of sellers in that industry. The time-considered diffusion of a platform is divided into 3 periods following the diffusion theory suggested by Gort and Klepper (1982); (1) before the platform interferes in a specific industry (pre-platform period), (2) while the platform is forming the market in a specific industry (transitioning period), and (3) a period of stabilization of the platform (stabilizing period). Also, the efficiencies of each period are measured using stochastic frontier analysis (SFA) and compared using meta-frontier analysis (MFA). To study the effects of platforms on an industry, the hotel industry is chosen because the platform, including companies such as Priceline and Hotels.com, is stable now. To measure efficiency, data on net sales, number of employees, total assets, and cost of goods sold (COGS) was analyzed from 1986 to 2015.

The second section of this study describes previous studies on platforms and the 3 periods of diffusion. Section 3 discusses the methodologies, SFA and MFA, for measuring and comparing efficiency, respectively. The results section presents the overall efficiency results. The last section discusses the conclusion and implications of this study.

2. Literature review

2.1. Previous literature

Unlike the competition in an existing industry whose goods carry production costs, the success of a platform whose product (information) costs almost nothing to produce is decided based on network externality; the value of a platform increases as the number of participants on both sides increases (Rochet and Tirole, 2003). A myriad of studies place weight on network externality to convince sellers and buyers to join a platform, (e.g., Rochet and Tirole (2003), Armstrong (2006), Armstrong and Wright (2007), Caillaud and Jullien (2003), and Parker and Van Alstyne (2005)).

Platforms divide markets into two sides (sellers and buyers), and the size of one side determines whether the other side will join the market (Armstrong, 2006). However, not only do sellers and buyers want to join to more than one platform, but also sellers share zero profits because of severe competition (Caillaud and Jullien, 2003). Thus, it is paramount that platform service providers focus on increments in the number of buyers, which is the base for sellers' profits, instead of using direct competition to induce sellers to join (Armstrong and Wright, 2007). Strategies among platform service providers to attract buyers differ from those of existing industries. Parker and Van Alstyne (2005) claims that offering a service for free to either sellers or buyers can increase profits for all based on externality, in contrast to old-fashioned strategies such as bonding and lock-in. However, it is essential for platform service providers to require a BPC to sellers to attract buyers (Wang and Wright, 2016), which adversely affects consumer welfare because sellers transfer the burden of their fee and BPC to buyers (Edelman and Wright, 2015). Nevertheless, sellers' surplus can increase if the market grows with the expansion of buyers (Edelman and Wright, 2015) using the platform to reduce their search costs (Baye and Morgan, 2001). Although a platform can become attractive by reducing the search costs of buyers, it can be better for sellers not to join it because of the severe competition with other sellers (Loginova and Mantovani, 2015). Thus, companies must decide strategically whether to join a platform (Galeotti and Moraga-González, 2009).

Sellers adapt to the changes created by the advent of platforms with their own strategies. There is no consensus among scholars on the effect of platforms on sellers' utility, so that this study analyzes whether the advent of a platform positively affects sellers.

2.2. Hotel industry and its platforms

The hotel industry has a long history, and online booking platforms are in the last stage of diffusion according to Gort and Klepper (1982)'s diffusion theory of new products. Also, a plethora of research has considered the effects of the internet on tourism from the customer side (for example, see Lang (2000)) and industry side (for example, see Buhalis and Law (2008), Koo et al. (2011), Lu et al. (2015) and O'Connor and Frew (2002)). Of the firms active in developing and making a sector's products and in generating and utilizing a sector's technologies as the perspective of sectoral innovation systems (SIS) (Breschi and Malerba, 1997; Gort and Klepper, 1982), innovation types can be categorized into 5 in tourism; product or service, process, managerial, marketing, and institutional

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