



Contents lists available at ScienceDirect

Telecommunications Policy

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

The effects of spectrum allocation mechanisms on market outcomes: Auctions vs beauty contests

Toshifumi Kuroda^{a,*}, Maria del Pilar Baquero Forero^{b,1}

^a Faculty of Economics, Tokyo Keizai University, Japan

^b Graduate School of Economics, Kyoto University, Japan

ARTICLE INFO

JEL classification:

L10
L50
L96
D44

Keywords:

3G mobile diffusion
Beauty contests
Spectrum auctions
Treatment effects

ABSTRACT

This paper compares the evolution of seven key market outcomes in 47 countries after the allocation of mobile phone spectrum by auctions and beauty contests held from 2000 to 2008. Traditional auction theory predicts the merits of auction versus “beauty contests”. However, recent theoretical research shows that auctions impose selection and debt effects on the after-market competition that could harm consumers. We employ two semi-parametric estimators to determine the treatment effects and find that 3G mobile phone penetration rates among auctioning countries are 1.04–8.95% lower. Findings suggest that auctions, when used to raise public revenues, not only transfer profits to government but also sacrifice consumer surplus.

1. Introduction

The use of auctions to allocate mobile phone frequencies has been widely adopted in both developed and developing countries. Traditional economic theory favors auctions over other allocation mechanisms, such as lotteries or beauty contests, because well-designed auctions allocate spectrum to firms that have a lower cost or higher service quality that lead higher bids and results in the lower price or higher penetration rate in the aftermarket outcomes. The auction payment transfers firm's profits to government to support public finances without charging a cost on consumers.

In contrast with traditional economic theory, recent theoretical studies that analyze auctions with after-market competition suggest that the selection effect of spectrum auctions affect the choice of strategic variables in after-market competition (Janssen & Karamychev, 2009) and debt-financed spectrum bid leads to compete more or less aggressively (Haan & Toolsema, 2011). Both the selection mechanism of auctions and the debt effect on the firms' attitudes toward competition may lead to higher equilibrium prices under specific conditions. Therefore, it is not possible to conclude whether spectrum auctions have a positive or negative effect based only on after-market theory.

Recent empirical analyses have attempted to evaluate allocation processes by analyzing market outcomes after the spectrum award (Gruber, 2007; Park, Lee, & Choi, 2011; Zaber & Sirbu, 2012). These papers simply regress the auction dummy on outcome variables including revenue per minute, launch date, and adoption rate. Contrary to traditional theoretical expectations, there is no positive market outcome achieved by using spectrum auctions.

The regression results of the above studies are valid only if auction is randomly assigned to countries. However, if the spectrum auction is introduced to raise public income, it is more likely to be introduced by the governments that expect higher bidding prices

* Corresponding author.

E-mail address: kuroda@tku.ac.jp (T. Kuroda).

¹ Present address: Commission for Aviation Regulation, Alexandra House, Earlsfort Terrace, Dublin 2, Ireland.

<http://dx.doi.org/10.1016/j.telpol.2017.01.006>

Received 7 November 2016; Received in revised form 15 January 2017; Accepted 19 January 2017

0308-5961/ © 2017 Elsevier Ltd. All rights reserved.

as a consequence of high market demand or high market concentrations. Such simple regression analyses may lead to incorrect conclusions because they do not correct the selection bias caused by a non-random adoption of spectrum policies.

This study tries to assess the impact of spectrum auctions in the mobile communications industry. We use a quarterly unbalanced panel data set of mobile phone services in 47 countries from 2000 to 2008, from which 27 countries conducted auctions and 20 countries employed beauty contests to assign licenses. Our methodology consists of two semiparametric models—the bias-corrected matching estimator and the double robustness method. Both methods comprise of non-parametric models (matching estimators and propensity score weighting, respectively) and parametric regression.

Semiparametric models allow us to evaluate the impact of the spectrum auction on market outcomes in different countries and to address three types of biases. First, we control for unobservable or difficult to measure factors such as countries' geography and national preferences by using an annual first-difference equation. Second, we handle selection bias, derived from the tendency to adopt a given spectrum allocation method by countries with certain characteristics, by means of nonparametric models – matching methods or propensity score weighting. Third, we minimize small-sample-bias by using parametric regression in combination with the models above, because nonparametric models need large samples to asymptotically achieve consistent estimates and our data covers only 47 countries.

Estimation results obtained by these semiparametric models indicate that spectrum auctions had a negative impact on the diffusion rate of third generation (3G) mobile phones. In addition, we measure the influence of spectrum price on the above-mentioned market outcomes using the Heckman two-step estimator. The Heckman method is employed because annual first-differences used in the semiparametric models do not permit the inclusion of the spectrum price as an explanatory variable. It also generates consistent estimators when an auction dummy is included as an endogenous variable of after-market outcomes. According to the Heckman model results, auctions have a negative effect on 3G mobile phone diffusion rate and the ratio of 3G subscribers to total mobile subscribers.

Our result differs from [Park et al. \(2011\)](#) or [Zaber and Sirbu \(2012\)](#), mainly because of the differences in data source and research methods. Our study employed quarterly unbalanced panel data of mobile phone services in 47 countries from 2000 to 2008 obtained from the Wireless Intelligence consultancy database.² Even if we use observations of only OECD countries, our study employs a larger number of countries and periods than [Park et al. \(2011\)](#) and shows the significant negative effect of auction on the diffusion rates of both total and 3G mobile telephony, and 3G share. In contrast with [Zaber and Sirbu \(2012\)](#), we find a significant effect on 3G diffusion from a smaller sample but using recently developed semi-parametric approaches that provide more efficient estimators than traditional linear regression models.

This article is organized as follows. [Section 2](#) describes the policy and economic debate over spectrum allocation methods. [Section 3](#) describes our data and empirical strategy. [Section 4](#) reports the regression results. [Section 5](#) concludes.

2. Spectrum allocations

The use of auctions to allocate the radio spectrum was first suggested by [Coase \(1959\)](#). However, introducing spectrum auctions in practice is a lengthy process ([Hazlett, 1998](#)). In the US, the simultaneous ascending auction proposed by [Vickrey \(1976\)](#) was introduced to allocate the Personal Communications System (PCS) frequency spectrum in 1993–94. In Europe, because of fears of higher consumer prices and delayed innovation (European Commission, 1994), initiating spectrum auctions took longer. Although some European countries introduced them for 2 G mobile technology at the end of the 1990s ([Damme, 2002](#); [Grimm, Riedel, & Wolfstetter, 2003](#)), others have not done so for either the 2G or the 3G mobile spectrum. However, by the end of the 2000s, almost all European countries introduced spectrum auctions. In particular, the process of awarding the 3G mobile phone spectrum received considerable attention because it was expected that the 3G mobile phone market would be integrated and harmonized globally. This expectation was supported by the Internet boom at that time, the achievement of a wide consensus for an international technological standard set by the International Telecommunication Union (ITU), and the outlook for value creation stemming from new high-speed wireless data transmission services.

[Binmore and Klemperer \(2002\)](#) argue that spectrum auctions have three advantages over beauty contests. First, a well-designed auction efficiently allocates the spectrum wherein resources are assigned to those who most value them. Second, contrary to beauty contests and lotteries, spectrum auctions are neither time-consuming nor opaque and do not generate political or legal controversy through accusations of favoritism and corruption. Third, auctions can raise substantial capital to support public finances.

Popular objections to auctions concern the unfair treatment to small or entrant firms, the rise of consumer prices, and the reduction of investment. [Cave and Valletti \(2000\)](#) refute such objections based on the economic theory that the auction bidding price is a sunk cost and the market's conduct following the auction depends only on the projected future income. Although [Binmore and Klemperer \(2002\)](#) accept the possibility of delayed infrastructure investment because paying a license fee may increase operators' credit constraints, they do not consider that as a sufficient reason to allocate the mobile phone spectrum with a lesser or no fee structure because credit constraints may delay several other kinds of investments allocated by the auction mechanism. [Gruber \(2007\)](#) analyze market data from 17 Western European countries and find that license fees determined by auction are higher than those compatible with the market structure based on the $n+1$ rule. Therefore, overbidding³ resulted in less competitive markets and slower introduction of 3G services. In [Gruber \(2007\)](#) study; however, auctions have no significant effect, although the number of

² The database was used by [Madden and Ahmad \(2013\)](#), [Madden, Bohlin, and Tran \(2013\)](#), and [Madden, Saglam, and Hussain \(2015\)](#).

³ [Pagnozzi \(2007\)](#) shows bidders may overestimate the value of the prize and subsequently regret winning in sequential auctions.

Download English Version:

<https://daneshyari.com/en/article/4973285>

Download Persian Version:

<https://daneshyari.com/article/4973285>

[Daneshyari.com](https://daneshyari.com)