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Baojiao Wang
Jiangsu University, Zhenjiang 212013, China

Zhiwen Li
Jiangsu University, Zhenjiang 212013, China, zhiwenli@ujs.edu.cn

Thomas Le Texier
University of Rennes1, Rennes, 35065, France

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Multimarket Competition of Platforms: Cross-market User Data Sharing and Pricing Structure

Baojiao Wang[1], Zhiwen Li[1] and Thomas Le Texier[2]

[1] Jiangsu University, Zhenjiang 212013, China

[2] University of Rennes1, Rennes, 35065, France

zhiwenli@ujs.edu.cn(Zhiwen Li,corresponding author)

1. INTRODUCTION AND RESEARCH QUESTIONS

Two-sided platforms with cross-group network externalities represent a business model that connects two (or more) group members [1], providing a marketplace for interactions and transactions. Examples include *Tmall* in China, *Amazon* in the US, and soon. As a two-sided market, platforms gain competitive advantage by attracting as many as possible users on board. Pricing is a key mechanism for achieving this. However, pricing structures vary among platforms. Some use unilateral pricing, charging only one side of users while offering free access to the other side of users; others adopt bilateral pricing, charging both sides of users. Pricing is thus one of the important issues in platform operation and competition [2].

In recent years, platforms have increasingly pursued cross-market operations to enhance their competitive edge [3]. This inevitably results in multimarket competition. For instance, *Meituan*, the dominant food delivery platform in China, decided to enter the car-hailing market in 2018. As a response, *Didi*, the dominant car-hailing platform in China, decided to venture into the takeout market in the same year. This led to direct competition between the platforms in multiple markets. Additionally, platforms have started sharing user data across different markets. For example, *Meituan* shared user account and transaction order information between its takeout and car-hailing markets through interface transmission, allowing targeted promotions or discounts in both markets.

This leads to three research questions: (1) *What factors influence the multimarket competition strategies of platforms?* (2) *Does cross-market user data sharing benefit platforms in multimarket competition?* (3) *How does price structure affect the multimarket competition strategies of platforms?*

2. THEORY AND RESEARCH MODEL

Based on the two-sided market theory, this study constructs a theoretical framework with the Hotelling model, establishing a multimarket competition system including platforms ($J = \{A, B\}$), two types of users--sellers (s) and consumers (b) in two markets ($i = 1, 2$).

To broaden their market reach, each platform aims to penetrate the other's market, thereby initiating multimarket competition (i.e., A enters market 2, and B enters market 1). A crucial decision during this expansion is whether to share user data across markets. Each platform independently decides whether and how to develop multimarket competition, leading to four different situations: (1) No multimarket competition (*MON*); (2) Multimarket competition with no data sharing across markets (*MCN*); (3) Multimarket competition with one platform sharing data (*MCO*); (4) Multimarket competition with both platforms sharing data (*MCT*). These multimarket competition scenarios are depicted in Figure 1.

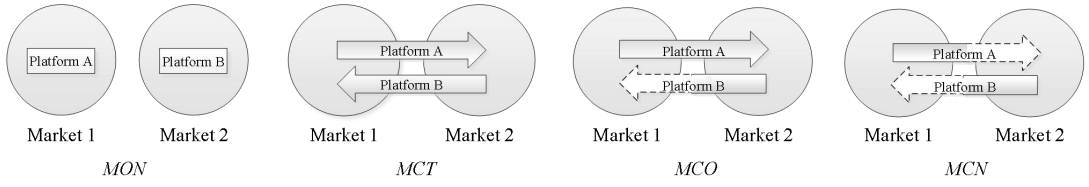

Figure. 1. Platform multimarket competition scenarios

Based on the different multimarket competition scenarios above, the decisions of platforms, sellers, and consumers build a three-stage game. In the first stage, platforms decide whether and how to engage in multimarket competition; In the second stage, platforms determine their optimal prices; In the third stage, the sellers and consumers decide which platform to join.

3. MATERIALS, RESULTS AND MAJOR FINDINGS

This study explored multimarket competition strategies of platforms under different pricing structures including unilateral pricing and bilateral pricing. Platforms determine the optimized prices to maximize their profits. Through backward induction, we solve the equilibrium of platforms under unilateral pricing and bilateral pricing, as shown in Table 1 and Table 2, respectively.

Table 1. Equilibrium of platforms multimarket competition with unilateral pricing

Equilibrium-- unilateral pricing	*MON* Platform *J*	*MCT* Platform *J*	*MCO* Platform *A*	*MCO* Platform *B*	*MCN* Platform *J*
$p_{Js}^{MON}, p_{Js_i}^{MCT}, p_{As_i}^{MCO}, p_{Bs_i}^{MCO}, p_{Js_i}^{MCN}$	$\frac{v+\alpha}{2}$	$t-\frac{4\alpha^2}{t}$	$t+\frac{\alpha}{6}-\frac{2\alpha^2}{t}$	$t-\frac{\alpha}{6}-\frac{5\alpha^2}{2t}$	$t-\frac{\alpha^2}{t}$
$n_{Jb}^{MON}, n_{Jb_i}^{MCT}, n_{Ab_i}^{MCO}, n_{Bb_i}^{MCO}, n_{Jb_i}^{MCN}$	1	$\frac{1}{2}$	$\frac{2t^2-2t\alpha-\alpha^2}{2t(2t-3\alpha)}$	$\frac{2t^2-4t\alpha+\alpha^2}{2t(2t-3\alpha)}$	$\frac{1}{2}$
$n_{Js}^{MON}, n_{Js_i}^{MCT}, n_{As_i}^{MCO}, n_{Bs_i}^{MCO}, n_{Js_i}^{MCN}$	$\frac{v+\alpha}{2}$	$\frac{1}{2}$	$\frac{3t-4\alpha}{3(2t-3\alpha)}$	$\frac{3t-5\alpha}{3(2t-3\alpha)}$	$\frac{1}{2}$
$\pi_J^{MON}, \pi_{J_{12}}^{MCT}, \pi_{A_{12}}^{MCO}, \pi_{B_{12}}^{MCO}, \pi_{J_{12}}^{MCN}$	$\frac{(v+\alpha)^2}{4t}$	$t-\frac{4\alpha^2}{t}$	$\frac{(3t-4\alpha)^2(2t+3\alpha)}{9t(2t-3\alpha)}$	$\frac{(3t-5\alpha)^2(2t+3\alpha)}{9t(2t-3\alpha)}$	$t-\frac{\alpha^2}{t}$

Table 2. Equilibrium of platforms multimarket competition with bilateral pricing

Equilibrium-- bilateral pricing	*MON* Platform *J*	*MCT* Platform *J*	*MCO* Platform *A*	*MCO* Platform *B*	*MCN* Platform *J*
$p_{Jk}^{-MON}, p_{Jk_i}^{-MCT}, p_{Ak_i}^{-MCO}, p_{Bk_i}^{-MCO}, p_{Jk_i}^{-MCN}$	$\frac{v}{2}$	$t-2\alpha$	$\frac{3t-4\alpha}{3}$	$\frac{3t-5\alpha}{3}$	$t-\alpha$
$n_{Jk}^{-MON}, n_{Jk_i}^{-MCT}, n_{Ak_i}^{-MCO}, n_{Bk_i}^{-MCO}, n_{Jk_i}^{-MCN}$	$\frac{v}{2t-2\alpha}$	$\frac{1}{2}$	$\frac{3t-4\alpha}{3(2t-3\alpha)}$	$\frac{3t-5\alpha}{3(2t-3\alpha)}$	$\frac{1}{2}$
$\Pi_J^{MON}, \Pi_{J_{12}}^{MCT}, \Pi_{A_{12}}^{MCO}, \Pi_{B_{12}}^{MCO}, \Pi_{J_{12}}^{MCN}$	$\frac{v^2}{2t-2\alpha}$	$2(t-2\alpha)$	$\frac{4(3t-4\alpha)^2}{9(2t-3\alpha)}$	$\frac{4(3t-5\alpha)^2}{9(2t-3\alpha)}$	$2(t-\alpha)$

where v denotes the intrinsic value users derived by accessing to platforms, α denotes the cross-side network effect on platforms. In addition, we assume that the unit transportation cost incurred by either consumers or sellers for transactions via platforms is t, symbolizing their sensitivity to platform differentiation.

By comparing the equilibrium of platforms multimarket competition in different cases: *MON*, *MCN*, *MCO*, and *MCT*, this study analyzed the strategy of each platform to engage in multimarket competition and share user data across markets. Our research observed some findings: (1) The strategic decision of each platform to engage in multimarket competition is driven by two significant effects—the market expansion effect and the price competition effect. With certain cross-side network effect and the intrinsic value, relinquishing the monopolistic position in only one market and engaging in multimarket competition can be the optimal choice for platforms. (2) In multimarket competition, *MCN*, *MCO*, and *MCT* may also become the equilibrium. Platform strategies vary depending on the pricing structure. With unilateral pricing, sharing user data across markets in multimarket competition can be beneficial or detrimental, which results in either both or only one platform sharing user data across markets in multimarket competition as the Nash equilibrium. The Nash equilibrium is illustrated in Figure 2. However, the Nash equilibrium in the context of bilateral pricing is neither of the platforms choosing to share user data across markets in multimarket competition.

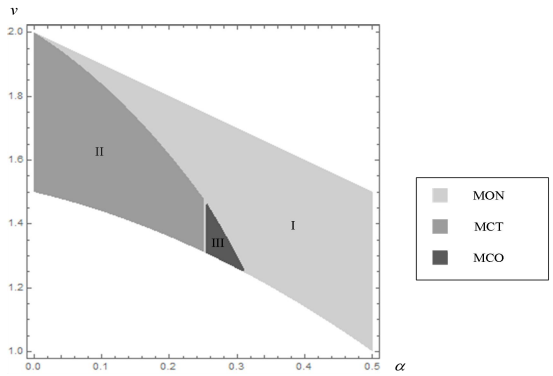

Figure. 2. Nash equilibrium of platforms' cross-market user data strategy ($t = 1$)

4. MAIN CONTRIBUTIONS

This study differs from previous studies in the following respects. First, in the decision-making of developing multimarket competition, previous studies on multimarket competition predominantly concentrate on one-sided market firms [4; 5], and the present study focuses on two-sided market firms. Second, the bulk of research on platform competition is confined to the one market context [6], this paper explores the situation of platforms engaging in multimarket competition. Thirdly, most studies on data sharing have focused on platforms sharing data with various users or other platforms [7], the present study examines platforms' data sharing across different markets.

Our research provides the following managerial implications. First, platforms should examine the cross-side network effect and the intrinsic value that platforms provide to users. Second, sharing user data across markets in multimarket competition is not always optimal for platforms. This study provides a theoretical framework for platforms to enhance their competitive advantage by making appropriate competition strategies. Thirdly, our research offers practical recommendations for the supervision and governance of anti-monopoly agencies, thereby fostering a healthy market competition environment. In addition, future work can extend to consider platform differences, such as brand or service differences.

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