様　式　Ｃ－１９、Ｆ－１９－１、Ｚ－１９　（共通）

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研究課題名（和文）Theory and Experiment of Efficient Multi-item Auctions with Financial Constraints

研究課題名（英文）Theory and Experiment of Efficient Multi-item Auctions with Financial Constraints

研究代表者
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研究者番号：４０８０７４５０

交付決定額（研究期間全体）：（直接経費）　　3,100,000円

研究成果の概要（和文）：本プロジェクトは順調に進み、2つの成果を得られた。1つ目は、5本の論文を完成させたことで、うち5本は査読付きの国際的なトップ経済紙に掲載され。2つ目は、研究成果を国内外の様々なセミナーや会議で発表したことである。発表中には、世界的に有名な研究者から意見を得ることができ、研究成果の改善に繋がった。またこういった交流により、本プロジェクトの重要性を広めることが出来た。本プロジェクトで得られた研究成果は、国際的学界において広く認知されたと考える。

研究成果の学術的意義や社会的意義
(1) My work is published in peer-reviewed international top journal;(2) My seminar and conference presentations obtain wide recognitions of international academia;(3) The obtained results can be patented in the near future; (4) I got two international acedemic awards

研究成果の概要（英文）：This project is aimed at providing a systematical analysis of a systematic study of efficient multi-item auctions with financial constraints. During the four-year research period (including one-year carry-over due to the Covid-19), the project went on well and I obtained several research achievements. The first achievement is that I published five papers in peer-reviewed international top economic journals. The second research achievement is that I presented my research results in a variety of important domestic and international seminars and conferences. In my talks, I intersected with international famous researchers and collected comments from them to improve my results. Such communications also helped advice the importance of this project. I believed that results generated by this projects have obtained wide recognitions of international academia.

研究分野：理論経済学

キーワード：Auction and matching　Financial constraints　Mechanism design　Competitive equilibrium　Stability and core

１．研究開始当初の背景

Governments worldwide conduct auctions to allocate public assets such as 3G spectrum licenses in OECD countries, public land in Hong Kong, and car licenses in Shanghai and Singapore. Those auctions contribute a lot to regional development by raising huge government revenue for public services. For example, the 2000 U.K. spectrum licenses generated enormous government revenue (2.5 percent of U.K. GNP). All was spent on the maintenance and construction of public utilities.

In above government auctions, there are typically multiple items to be sold in one auction, e.g., spectrum licenses with various frequencies. Achieving efficiency, i.e., obtaining efficient outcomes, is one of the most important government goals of the auctions. It means that items are given to bidders who value them the most or the auction revenue cannot be increased without reducing bidders' welfare.

At the same time, empirical works, e.g., Illing and Kluh (2003), found that, in these auctions, bidders, the firms or citizens, often face financial constraints. Financial constraints result in inefficient auction outcomes, failing to achieve the efficiency goal of the auctions.

Financial constraints generally consist of two types: (i) hard constraint: due to credit or liquidity constraints, bidders' affordability, i.e., the ability to pay, is less than their valuation (or willingness to pay) for items, or (ii) soft constraint: to enable bidders to afford their valuation for items they need additional borrowing from outsiders and suffer high borrowing costs.

The study of efficient multi-item auctions is a most important research direction in auction theory, attributed to its large potential practical implications.

Assuming that bidders have no financial constraints and the winning bids have no income effects, i.e., affording the item will not reduce expenditures for other things, the Walrasian equilibrium (WE) exists and achieves efficiency. Thus, auctions that find WEs obtain efficient outcomes, as those proposed by e.g., Demange et al. (1986) and Gul and Stacchetti (2000). Andersson et al. (2013) study the experimental performance of above auctions. However, with hard financial constraints, the WE generally fails to exist and so the above proposed auctions fail to obtain efficient outcomes.

Preserving the assumption that winning bids have no income effects, in the presence of hard financial constraints, Ausubel and Milgrom (2002), Talman and Yang (2015), and Zhou (2017) propose another equilibrium notion, i.e., the (weak) core allocation, which achieves a weak version of efficiency. Besides, these works also propose auctions that find core allocations, so the efficient outcomes are obtained. Nevertheless, when applying to the situations where bidders may face soft financial constraints or the winning bids exhibit income effects, e.g., spectrum license and car license auctions, the above proposed auctions fail to obtain efficient outcomes. Moreover, whether there is a core allocation is unknown. Note that the current theoretical results are also lacking experimental tests.

Thus, a systematic study of efficient multi-item auctions with financial constraints is necessary.

２．研究の目的

Motivated by the empirical observation and the limits of current theory, this project aims to theoretically and experimentally study efficient multi-item auctions with financial constraints.

３．研究の方法

This project uses results and methods from the general equilibrium theory of incomplete financial market, auction theory, graph theory, experimental economics, and numerical simulations.

４．研究成果

My research achievements are as follows.

- **Publication in top international peer-reviewed economic journal**

(1) Multi-object Auction Design beyond Quasi-linearity: Leading Examples. **Games and Economic Behavior** 104, 210-228, **2023**. (with Shigehiro Serizawa) (**SSCI**)

(2) Menu Mechanisms, **Journal of Economic Theory** 204, 105511, **2022.** (with Andrew Mackenzie) (**SSCI**)

(3) Competitive Equilibria in Matching Models with Financial Constraints. **International Economic Review** 63, 777-802, **2022**. (with P. Jean-Jacques Herings) (**SSCI**)

(4) A Characterization of the Vickery Rule in Slot Allocation Problems. *International Journal of Economic Theory*, A Special Issue in Honor of William Thomson, **2021**. (with Youngsub Chun, Shigehiro Serizawa) (**SSCI**)

(5) An assignment model with local constraints: Competitive equilibrium and ascending auction. *Economics Letters* 108905, **2020**. (with Lijun Pan, Linyu Peng) (**SSCI**)

- **Two international academic awards**

(1) Menu Mechanism (Co-authored with Andrew Mackenzie), 2021 Finalists for Young Economists' Essay Awards, European Association for Research in Industrial Economics (EARIE)

(2) Crowding in School Choice (Co-authored with William Phan, and Ryan Tierney), Best Paper Award, 2021 Delhi Winter School, Econometric Society

- **Conference and seminar presentation**

2022

the 21st annual SAET conference (VIRTUAL)

2022 Conference on Mechanism and Institution Design (VIRTUAL)

the 6th Spain-Japan Meeting on Economic Theory (VIRTUAL)

2021

EEA-ESEM Meeting of the Econometric Society (VIRTUAL)

The China Meeting of the Econometric Society (VIRTUAL)

Asian Meeting of the Econometric Society (VIRTUAL)

North American Summer Meeting (VIRTUAL)

2020

2020 Conference on Mechanism and Institution Design (VIRTUAL)

2019

Modern Economics Seminar at Yokohama National University

International Conference "Economic Design and Algorithms"

Economic Theory Workshop, Hitotsubashi University

５．主な発表論文等

〔雑誌論文〕　計5件（うち査読付論文　5件／うち国際共著　5件／うちオープンアクセス　4件）

１．著者名 Yu Zhou; Shigehiro Serizawa	４．巻 140
２．論文標題 Multi-object auction design beyond quasi-linearity: Leading examples	５．発行年 2023年
３．雑誌名 Games and Economic Behavior	６．最初と最後の頁 210-228
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.geb.2023.03.011	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 該当する

１．著者名 Andrew Mackenzie; Yu Zhou	４．巻 204
２．論文標題 Menu Mechanisms	５．発行年 2022年
３．雑誌名 Journal of Economic Theory	６．最初と最後の頁 1-43
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.jet.2022.105511	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 該当する

１．著者名 P. Jean-Jacques Herings; Yu Zhou	４．巻 63
２．論文標題 COMPETITIVE EQUILIBRIA IN MATCHING MODELS WITH FINANCIAL CONSTRAINTS	５．発行年 2022年
３．雑誌名 International Economic Review	６．最初と最後の頁 1-26
掲載論文のDOI（デジタルオブジェクト識別子） 10.1111/iere.12550	査読の有無 有
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１．著者名 Yu Zhou, Youngsub Chun, Shigehiro Serizawa	４．巻 Not decided
２．論文標題 A Characterization of the Vickery Rule in Slot Allocation Problems	５．発行年 2021年
３．雑誌名 International Journal of Economic Theory	６．最初と最後の頁 Not decided
掲載論文のDOI（デジタルオブジェクト識別子） 10.1111/ijet.12306	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 該当する

１．著者名 Lijun Pan, Linyu Peng, Yu Zhou	４．巻 188
２．論文標題 An assignment model with local constraints: Competitive equilibrium and ascending auction	５．発行年 2020年
３．雑誌名 Economics Letters	６．最初と最後の頁 1-4
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.econlet.2019.108905	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

〔学会発表〕　計11件（うち招待講演　3件／うち国際学会　9件）

１．発表者名 Yu Zhou
２．発表標題 Equilibria in Matching Markets with Soft and Hard Liquidity Constraints
３．学会等名 the 21st annual SAET conference（招待講演）（国際学会）
４．発表年 2022年

１．発表者名 Yu Zhou
２．発表標題 Multi-object auction design beyond quasi-linearity: Leading examples
３．学会等名 the 6th Spain-Japan Meeting on Economic Theory（招待講演）
４．発表年 2022年

１．発表者名 Yu Zhou
２．発表標題 Multi-object auction design beyond quasi-linearity: Leading examples
３．学会等名 2022 Conference on Mechanism and Institution Design（招待講演）（国際学会）
４．発表年 2022年

１．発表者名
Yu Zhou

２．発表標題
Menu mechanisms

３．学会等名
The 48th Annual Conference of the European Association for Research in Industrial Economics (VIRTUAL)（国際学会）

４．発表年
2021年

１．発表者名
Yu Zhou

２．発表標題
Serial Vickrey mechanisms

３．学会等名
EEA-ESEM Meeting of the Econometric Society (VIRTUAL)（国際学会）

４．発表年
2021年

１．発表者名
Yu Zhou

２．発表標題
Menu mechanisms

３．学会等名
2021 China Meeting of the Econometric Society（国際学会）

４．発表年
2021年

１．発表者名
Yu Zhou

２．発表標題
Serial Vickrey mechanisms

３．学会等名
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2021年

１．発表者名
Yu Zhou

２．発表標題
Competitive Equilibria in Matching Models with Financial Constraints

３．学会等名
2020 Conference on Mechanism and Institution Design（国際学会）

４．発表年
2020年

１．発表者名
Yu Zhou

２．発表標題
Competitive Equilibria in Matching Models with Financial Constraints

３．学会等名
Economic Theory Workshop, Hitotsubashi University

４．発表年
2019年

１．発表者名
Yu Zhou

２．発表標題
Competitive Equilibria in Matching Models with Financial Constraints

３．学会等名
The international conference Economic Design and Algorithms, Higher School of Economics, St. Petersburg, Russia（国際学会）

４．発表年
2019年

１．発表者名
Yu Zhou

２．発表標題
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３．学会等名
2019 Asia-Pacific Industrial Organization Conference（国際学会）

４．発表年
2019年

〔図書〕　計0件

〔産業財産権〕

〔その他〕

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６．研究組織

	氏名 （ローマ字氏名） （研究者番号）	所属研究機関・部局・職 （機関番号）	備考

７．科研費を使用して開催した国際研究集会

〔国際研究集会〕　計0件

８．本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関