UNIVERSITY OF CALIFORNIA, BERKELEY
DEPARTMENT OF ECONOMICS

PLACEMENT SERVICE: Patrick G. Allen
place@econ.berkeley.edu

TING-HAO JORDAN OU
jordanou@econ.berkeley.edu
https://sites.google.com/site/jordanou178/

BUSINESS ADDRESS:
Department of Economics
530 Evans Hall, #3880
Berkeley, CA 94720-3880
Mobile: (510) 725-5409

DESIRED RESEARCH AND TEACHING FIELDS:

PRIMARY	SECONDARY
Industrial Organization	Contracts and Institutions
Psychology and Economics	Economics of Digitization

FIELDS OF CONCENTRATION:
Industrial Organization, Psychology and Economics

DISSERTATION TITLE: *Essays in Industrial Organization and Behavioral Economics*

Expected Date of Completion:	May 2017
Principal Advisors:	Professors Stefano DellaVigna and Benjamin Handel
Other References:	Professors Kei Kawai and Steven Tadelis

PRE-DOCTORAL STUDIES:	**DEGREE**	**DATE**	**FIELD**
Brown University	Sc.B. w/ Honors	2011	Applied Mathematics-Economics

PROFESSIONAL EXPERIENCE:

RESEARCH:

Economist Intern, eBay Research Labs (Summer 2013, Summer 2014)
Testing implications from Industrial Organization theory in the online marketplace

Research Assistant, Department of Economics, UC Berkeley (2012-2013)
Empirical research with Professor Stefano DellaVigna on the role of market power in media coverage
Structural estimation with Professor Stefano DellaVigna on social preferences in the workforce

Research Assistant, Department of Economics, Brown University (2009-2011)
Empirical research with Professors Kenneth Chay and Kaivan Munshi on labor networks in the Reconstruction Era

TEACHING:

Teaching Assistant, Department of Economics, UC Berkeley (2012-2016)
Graduate Game Theory, Undergraduate Game Theory, Undergraduate Industrial Organization, Intermediate Microeconomics

Teaching Assistant, Department of Economics, Brown University (2009-2011)
Undergraduate Environmental Economics, Principles of Economics

ADMINISTRATIVE:

Seminar Assistant, Department of Economics, UC Berkeley (2014-2016)
Industrial Organization, Psychology and Economics

PAPERS:
Firm Beliefs and Dynamic Decision-Making: Evidence from the Online Retail Industry (Job Market Paper)

WORK IN PROGRESS:
Entry and Exit in Online Marketplaces

FELLOWSHIPS AND AWARDS:

2015, 2017	Doctoral Completion Fellowship, UC Berkeley
2015	Outstanding Graduate Student Instructor Award, UC Berkeley
2012, 2016	Graduate Division Summer Grant, UC Berkeley
2011-2014	Departmental Fellowship, UC Berkeley
2009-2011	Chase Manhattan Undergraduate Research Grant, Brown University
2007-2011	Sidney Frank Scholarship, Brown University

OTHER INFORMATION:

Languages:	English (native), Mandarin (advanced)
Citizenship:	United States, Taiwan (dual)

Research Statement

Ting-Hao Jordan Ou

I am an applied microeconomist with primary research fields in industrial organization and behavioral economics. My secondary research interests include contracts and institutions, digitization, retail, and energy and transportation. My current research incorporates insights from behavioral economics and firm governance to explain firm behavior and their impacts on welfare, equilibrium, and platform design.

I briefly highlight my job market paper, which investigates how online retailers on eBay value their products and make supply decisions, and an extension from the job market paper, studying the impact of problem complexity on the entry and exit decisions of retailers. I conclude by discussing areas I am actively exploring ideas in.

"*Firm Beliefs and Dynamic Decision-Making: Evidence from the Online Retail Industry*" (Job Market Paper)

The rise of the information economy has significantly transformed the retail industry in the past two decades. In particular, retailers now have access to more productive tools for managing their operations and face lower barriers in reaching new customers, allowing them to enter new markets, expand the number of sales channels, and increase their product offering variety. However, by expanding the retailer's options, the Internet has also significantly complicated its operations: decisions like choosing the optimal sales channel for a particular product (or multiple channels, as "multihoming" products is now a common strategy) and the timing of a product release are potentially more complex and more likely to be affected by other decisions and factors. As a result, the move towards a more frictionless landscape has raised the importance of both understanding the retailer's option values and their impacts on the future.

This paper studies the retailer's fundamental process of valuing their products and making intertemporal supply decisions. Using a rich panel of internal data on high-volume sellers on eBay, I analyze the timing of their product listings, which incur fees from the online platform. I additionally exploit a unique feature of the eBay marketplace: all sellers make contract choices at the beginning of each month from a menu of plans, locking in the fee schedules for listing and selling items on the platform for that month. Moreover, eBay changed the fee schedule design in the middle of the time frame, adding a monthly allowance of free listings to each plan and shifting the fee schedules from linear to nonlinear designs. This regime change altered all contracts from a two-part tariff to a three-part tariff and defaulted all sellers onto the new plans. In doing so, the cost of listing now impacts the costs in the future, adding a dynamic component to the seller's within-month objective.

The setting and contract design have a number of distinct advantages for studying this question. First, the unique setting allows for comparison of a large number of firms at once (75k in my sample), significantly higher than the literature in industrial organization and firm governance, which typically rely on a few large firms in a market or individual case studies. Combined with granular data on seller decisions, I can empirically analyze and back out important characteristics of the seller. Second, having a history of each seller's interactions means I can investigate how

experience plays a role in learning over time. Third, the change from linear to nonlinear contracts allows for identification of separate behaviors that would otherwise be unidentified with just one contract design. Finally, the relative simplicity and ease of switching contracts lower the likelihood of such impediments from interacting with the sellers' decisions. This is in contrast with other menu choice settings such as health insurance and retirement accounts, where both switching and research costs can significantly impact a consumer's contract choice (see for example Handel (2013) and Madrian and Shea (2001)).

My results show that 37% of sellers hold persistently biased beliefs about their products' values: beliefs do not significantly change after three months, 19% of sellers consistently overestimate the value of their products, and 18% underestimate. Furthermore, sellers shifted their listing behavior within the month, distorting the supply thickness of items on the platform. 11% of sellers list much more items early in the month now, while 44% hold back on their listings, only listing near the end of the month before the allowance expires. Moreover, I find the biases to be more likely among sellers with higher numbers of products, which may suggest agency problems and other organizational issues. An important consideration is whether to debias consumers through information treatments and reminders. In a counterfactual exercise, I calculate the welfare impact of debiasing sellers, finding substantial impacts on their surpluses, the revenue stream for the platform, and aggregate supply on the platform. Overall, I find that seller surplus can increase by 6.3% on average with a debiasing policy, while platform revenues from listings decrease by 26.4%. Finally, if the platform's objective is to maximize listings, which is a common goal due to many platforms generating the majority of revenue from percentage fees on listing values, by specifically targeting a subset of sellers that would increase their listings, the platform can increase its supply of items by 4.8% at a loss of 5.5%.

"Entry and Exit in Online Marketplaces"

This project studies how standard entry and market structure models hold up in the context of online platforms and seeks to quantify the effects of entry determinants on contract take up rate, competition, overall supply of listings on the platform, and implications for optimal platform design. As in my job market paper, the main policy change is a contract design change, switching from a linear fee schedule to a nonlinear schedule with a monthly allowance of free listings. However, in this paper I focus on the entry and exit decisions of inexperienced sellers and leverage three additional pieces of data and policy change. First, I incorporate the change in the fee schedule for auction listings, which went from being based on a starting price to a flat rate. Second, I use the changes in revenue percentage fees, which vary across categories and are applied only when listings are sold. Finally, I incorporate demographic and retail category data.

There are empirical advantages that I can use to address the typical challenges of the literature. First, the contract design change exogenously shifts the variable costs and fixed costs of the sellers. Second, observations of full histories of buying and selling behavior, including before and after entry and exit, allow me to relax typical assumptions on profit and market conditions. Taken together, I can dynamically analyze the seller's entry and exit decisions.

My preliminary evidence suggests that both risk and fee aversion are factors in the entry and exit decisions, which are currently defined by listing at least ten items per month for at least three

months. First, I find a particular trajectory of listings that is consistent with an aversion to marginal fees. However, I also find higher rates of entry in the month of the contract change when the contracts included additional monthly allowances. Moreover, risk aversion may be taking place among inexperienced sellers. Conditional on total fees paid, retail categories with a higher percentage of the fees coming from the marginal listing fee, which is paid regardless of whether the item is sold, experienced lower growth rates of listings than categories where the percentage fee is higher, which is only paid if an item is sold.

This project potentially highlights the importance of individual preferences and bounded rationality as online platforms decrease the barriers to entry, resulting in a larger share of the supply and competition coming from individual agents and small firms. In this setting, both risk and fee aversion seem to play a role in entry and exit decisions, and similar to my job market paper, the fee aversion may be a result of using a heuristic when facing more complex problems.

Concluding Remarks

My job market paper and extension use a particular set of contracts to study sellers on eBay but rely only on a selected set of sellers (those using posted price listings) and a portion of the fee schedule. There are at least two additional areas I am investigating with this feature. First, auction listings have a completely different fee schedule, involving their reserve and final prices. Leveraging the fees in this dimension, I hope to provide insight on sellers' preferences on listing characteristics. Second, I hope to incorporate retail category data into my investigation and see how seller behavior changes as a function of the category it operates in.

References

Handel, Benjamin R. 2013. "Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts." *American Economic Review*, 103(7): 2643–2682.

Madrian, Brigitte C., and Dennis F. Shea. 2001. "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior." *The Quarterly Journal of Economics*, 116(4): 1149–1187.

Ou, Jordan. 2016. "Firm Beliefs and Dynamic Decision-Making: Evidence from the Online Retail Industry." *Working Paper*, November.

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF ECONOMICS
548 EVANS HALL #3880
BERKELEY CA 94720-3880
TELEPHONE: (510) 642-0822
FAX: (510) 642-6615

BENJAMIN R. HANDEL
ASSISTANT PROFESSOR OF ECONOMICS
EMAIL: *handel@Berkeley.EDU*
TELEPHONE:(510) 643-0708

November 1, 2016

Dear Colleague:

It is my pleasure to recommend **Jordan Ou,** a graduate student completing his dissertation in the department of Economics at the University of California at Berkeley, for assistant professor and professional economist positions. Jordan's primary fields are industrial organization and behavioral economics. Jordan's research and expertise also relates to topics in marketing and management.

I am Jordan's dissertation committee co-chair (along with Stefano DellaVigna) and have known Jordan since he arrived at Berkeley approximately five years ago. Jordan entered the program with demonstrated interests in industrial organization and behavioral economics, and has pursued those interests vigorously during his time at Berkeley. Over that time, I have had frequent meetings with Jordan to discuss his research, especially in regards to his job market paper studying firm behavior on the eBay platform. In addition, Jordan has stood out as a stellar participant in both the monthly industrial organization reading group and weekly industrial organization seminar.

As a result, I have gotten to know Jordan and his research quite well. Jordan should be an attractive candidate to economics departments and business schools searching for a candidate with a strong background in either industrial organization and / or behavioral economics. Within business schools, Jordan could be a good match for economics, marketing, or management groups. In addition, Jordan should be strongly considered for professional economist positions outside of academia, e.g. at firms looking for economist expertise in IO / marketing / IT platforms. For all of these positions, he brings a sophisticated economic toolkit to the table and would be a fantastic colleague.

Jordan's job market paper performs an in-depth investigation of retailer behavior on eBay, with a specific focus on how retailers engage with the seller platform as a function of the fees eBay charges them. Jordan's paper is a great example of "behavioral industrial organization" in action: he studies both the broad choices sellers make, in terms of what contractual relationship to enter into with eBay, and also the micro-level choices they make in regards to day-to-day sales, given the way they are charged for those sales by eBay.

To understand the many contributions of Jordan's paper it is important to understand his context and data. The environment Jordan studies is retail sales at eBay, across a wide range of products. The sellers in his environment choose between retailer contracts that stipulate a fee schedule the maps total monthly listings on the platform into a fee the seller pays to eBay. The context has quite interesting variation in these contracts: in the early part of Jordan's study, sellers choose from a menu of three contracts (two-part tariffs) that vary in terms of (i) a fixed up-front fee and (ii) a linear fee per item listed. In the middle of his study, eBay switched the types of contracts, such that sellers could then choose from a menu of

three contracts (three-part tariffs) that vary in terms of (i) fixed up-front fee (ii) free item listing up to some capacity Q and (iii) a linear fee per item sold above capacity Q. In these contracts, a higher up-front fee is associated with a higher capacity Q, so that if you pay more up front you get more free listings. One of the three contracts offered in this latter phase of the study has a high up-front fee and infinite listings for free. This environment presents a nice opportunity to study the two questions that Jordan focuses on:

1) How do sellers respond to multi-part tariffs where, within a month, they have to take into account the impact of current listings on the price of future listings (seller listing/fee dynamics)?

2) How well do sellers choose from the contract menu, both in the simpler earlier phase with two-part tariffs and the more complex latter stage with three-part tariffs?

Note that while similar questions have been asked in a series of papers on consumer choice in (i) health insurance markets (ii) electricity markets (iii) cell phone markets and (iv) broadband markets there are very few papers studying these questions in the domain of seller behavior.

Within this context, Jordan collected a fantastic dataset directly from eBay. These data contain a lot of details about seller behavior, including their contract choices and granular sales behavior. The data on sales includes, e.g., date of sale, volume of sale per seller, and type of sale, and help Jordan reconstruct primitives that are crucial for assessing the contract and sales choices that retailers make. The data include over 70,000 distinct sellers and over 30,000,000 listings. I have great admiration for the work Jordan put in to collecting these data: convincing a major corporation to share data for research is never easy, especially when you are going to write about some of their core business strategies. I have been impressed with Jordan's ability to collect these data, and navigate his relationship with eBay. His success on this front is a great sign for his likelihood of success in future research / work.

So what does Jordan do to answer these questions? His paper has two primary sections. The first presents descriptive evidence to show both (i) that sellers often choose sub-optimal contracts and (ii) that sellers respond sub-optimally to the dynamic incentives embedded in their contract each month. Neither of these tasks is simple, and Jordan's paper is a nice example of how to clearly present descriptive analysis for complex questions.

For the descriptive evidence on plan choice, Jordan first shows many sellers move away from the default contract option within a few months of joining eBay, and, that after they switch once, the rate of subsequent switches is quite low. This sets up a scenario where (i) sellers have made at least one active contract choice and (ii) they are not changing that choice over time. Jordan then presents a very nice chart showing that sellers are quite heterogeneous in terms of number of monthly listings, but that *within seller* over time this heterogeneity is not so substantial. Taken together, these facts suggest that *if sellers are not in the highest-value contract in the data over time* it is likely this constitutes a mistake, rather than some specific realization of ex post outcomes given good ex ante choices. Jordan finishes this by clearly showing that approximately 37% of sellers are enrolled in an ex post sub-optimal plan, and that these sub-optimal enrollments are typically correlated within an individual over time, suggesting persistent mistakes. 20% of sellers oversubscribe, in the sense they choose plans that assume sales that are too high ex ante, while 17% of sellers undersubscribe.

Next, Jordan presents a set of descriptive figures to show that, under the three-part tariffs, sellers respond to the marginal fees contained in those contracts in a way consistent with within-month dynamic behavior. First, Jordan shows bunching near the monthly allowance once three-part tariffs are introduced, a phenomenon that he clearly shows did not exist in the pre-period with two-part tariffs. Next, he follows consumers over time within a month and shows that sellers respond both to "spot price" incentives and expected future costs in the three-part tariffs. First, consumer within-month sales

exhibit higher variance across the weeks within a month, suggesting that sellers are varying their listings in response to the changing marginal prices. Next, and even more convincingly, Jordan shows that sellers who end the month well below the allowance conditionally list fewer items near the beginning of the month, *but more near the end of the month* given the fact that all of those listings are clearly free. Conversely, consumers who pass the threshold by the end of the month exhibit conditionally higher sales up front in a month, and conditionally lower at the end of the month. Jordan fleshes out these results in detail, clearly showing seller responses to the (i) spot or current listing price and (ii) the shadow price, or expected end of month price for a listing given a seller's type and the contract they are in.

After presenting this descriptive evidence, Jordan moves on and estimates a complex dynamic econometric model to precisely model the key micro-foundations of seller behavior. The goal of this modeling and estimation is to precisely understand (i) seller mistakes (ii) dynamic seller behavior and (iii) simulate how sellers would behave under counterfactual, or alternative platform contract designs. In addition, Jordan uses the primitives he estimates to conduct welfare analysis with respect to different contract designs, a valuable addition to the analysis.

The main components of the model are:

1) A first-stage where sellers choose a contract, anticipating their future listing behavior as a function of their type and the contract.

2) A second-stage model that investigates dynamic within-month listing behavior, as a function of seller type, seller preferences, and the features of the contract they are enrolled with.

Both of these parts constitute substantial exercises, especially part 2) where Jordan estimates a dynamic Bellman equation model for within-month seller behavior. Sellers listing types in the model are characterized by (i) inventory size and (ii) value distribution of potential listing. Their behavior in the choice phase is governed by expected utility (given their uncertainty about potential listings) and a parameter than allows for their beliefs about their future listings / inventory to be mis-specified. Behavior in the within-month listing phase is governed by (i) actual realized potential listings (ii) expectations about future listings in the months and (iii) a parameter that specifies how much sellers weight the current spot price in the contract vs. their evolving expected end of month marginal price. For the within-month model, Jordan splits up the month into 5 periods, and sellers dynamically optimize throughout the month in each of these five periods.

Jordan has a very careful identification section where he discusses, following the descriptive analysis, how he identifies each of the parameters in this structural model, and how they relate to one another. He estimates the model with a multi-stage method of moments approach for dynamic problems proposed in the IO literature and used most prominently in a recent paper on broadband markets by Nevo et al. (2016). I bring up the estimation because it is quite complex, and Jordan implemented this very effectively in this study.

The model shows that approximately 40% of sellers make persistent mistakes in contract choice. 11% of sellers respond too heavily to the spot price within-month, relative to the true shadow price of a listing, while 44% respond *too heavily* to the potential end of month price (i.e. they mis-estimate the shadow price as being too high). This latter result is quite interesting, and differs from the literature on consumer choice, where consumers typically overweight spot prices only. Jordan performs a number of robustness checks and model fit exercises, which are all sensible and show the value of the specific way in which he implements the model.

Jordan uses these estimates to conduct a counterfactual where sellers are debiased, in order to understand the implications for seller welfare and platform profits. When debiasing belief errors, Jordan finds that sellers are not substantially better off on average, though profits for the platform decrease by 16%. Debiasing intertemporal heuristics increases seller surplus by 6.3% on average, improving the way they list products and manage their inventory. Platforms profits decrease by 26% in this case. This illustrates a tension between efficient seller listings and platform profits. Finally, Jordan shows that by targeting certain sellers for debiasing of intertemporal heuristics, market thickness on the platform could be increased by 5% (an important objective for such platforms).

Taken in sum, this is a nice paper with micro-data studying seller behavior in an online platform environment. While Jordan is continuing to make progress on it, I think this version already contains quite a lot of interesting material and nicely bridges both descriptive and structural work. The results should be important, especially to platforms that engage a wide range of sellers digitally.

I have no doubt that Jordan would be both a successful teacher, for all types of students. He is well organized, thoughtful, and cares a lot about his work. While I have not supervised him as a teacher, I have no doubts about this.

I also have no doubts that he would make a great colleague writ large, whether in academia or professional economist positions. Jordan is quite skilled, and can implement a broad range of econometric / analytical techniques with ease. He is always conscientious and extremely dependable. He is a very productive and fun person to have around: we are going to really miss having him as a contributor to the IO community at Berkeley. While I feel this way about most students that come through our program, I especially feel this way about Jordan.

Please do not hesitate to contact me with questions about Jordan: I believe he would make a great and energetic addition to your group, and you will benefit a lot from hiring him.

Best regards,

Benjamin Handel
Assistant Professor of Economics
University of California at Berkeley

