TOBIAS FELIX WERNER

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CURRENT POSITION

Doctoral Researcher–Düsseldorf Institute for Competition Economics *04/2019 - present*

Research interests: Economics of Artificial Intelligence, Competition Economics, Cooperation and Experimental Economics

EDUCATION

University of Düsseldorf, Germany *04/2019 - present*
Ph.D. Candidate in Economics at the Düsseldorf Institute for Competition Economics (DICE)
Advisor: Matthias Hunold and Hans-Theo Normann

University of Bonn, Germany *10/2016 - 03/2019*
Master of Science in Economics

Instituto Tecnologico Autonomo de Mexico, Mexico *01/2014 - 06/2014*
Exchange Semester

University of Cologne, Germany *04/2012 - 09/2015*
Bachelor of Science in Economics (Minor: Political Science)

WORKING PAPERS AND WORK IN PROGRESS

Algorithmic and Human Collusion: Experimental Evidence *(Most recent version available upon request)*

Algorithmic Price Recommendations and Collusion (with Matthias Hunold)

Gaming or Gambling? On Selection Neglect and Loot Boxes (with Simon Cordes, Markus Dertwinkel-Kalt and Mats Köster)

Volunteering at the Workplace under Incomplete Information: Team Size Does Not Matter (with Adrian Hillenbrand and Fabian Winter), *MPI Collective Goods Discussion Paper 2020/4*

CONFERENCE PRESENTATIONS AND INVITED TALKS

ESA Global Meeting, Verein für Socialpolitik Jahrestagung *2020*

Max Planck Institute for Research on Collective Goods *2019*

KEY COURSEWORK

Econometrics I, Econometrics II, Experimental Economics, Behavioral Industrial Organization Experimetrics, Econometrics for Experimental Economics (Summer School), Bayesian Machine Learning (Summer School) *Ph.D.-level*

Mathematics (Analysis), Microeconomics, Econometrics, Microeconometrics, Project on machine learning methods in econometrics and others *Master-level*

Numerous online classes on reinforcement and deep learning

SKILLS

Computer Languages	Python, R, Stata, Java, Javascript (Node.js)
Experimental Economics Frameworks	o-Tree and z-Tree
Other IT Skills	Git, SQL, LaTeX, Most MS Office products
Languages	German (Native), English (Fluent), Spanish (Basic)

Research statement: Tobias Werner

I am a microeconomist interested in the interaction between AI and humans in digital markets. In my research, I use a combination of tools from experimental and computational economics to understand the influence of algorithmic market participants on market outcomes and the effects that algorithms have on human decision-making.

In my single-authored project, I investigate how collusion between pricing algorithms compares to human collusion. While there exists first evidence that self-learning algorithms can collude on non-competitive prices (Calvano et al., 2020; Klein, 2021), it is still unclear how this algorithmic collusion compares to human collusion if both are observed in the same market environment. Furthermore, in various markets, like product sales on amazon.com (see Chen et al., 2016) or the gasoline market (Assad et al., 2020), algorithmic and human sellers interact with one another at the same time in the same market. Findings on algorithmic or human collusion in isolation might not be indicative for outcomes in markets with a mixed composition.

My project aims at providing first evidence whether and how large of a problem self-learned algorithmic collusion is compared to traditional markets with human sellers. Moreover, I study how pricing algorithms and humans interact with each other if they populate the same market. To answer those questions, I use a two-fold approach.

In the first step, I use a simulation approach that closely follows Calvano et al. (2020) for a different market environment, in which firms face a demand function commonly used in experimental market games (e.g. Fonseca and Normann, 2012).

In the second step, I conduct a laboratory market experiment, where firms are represented by human participants or by an algorithm. The market environment in this experiment closely mimics the setup from the simulation study in the first part. Within different treatments, I consider variations in the number of firms and the share of firms that use a self-learned algorithm for their pricing decision.

References

Assad, Stephanie, Robert Clark, Daniel Ershov, and Lei Xu (2020). "Algorithmic Pricing and Competition : Empirical Evidence from the German Retail Gasoline Market".

Calvano, Emilio, Giacomo Calzolari, Vincenzo Denicolò, and Sergio Pastorello (2020). "Artificial intelligence, algorithmic pricing, and collusion". In: *American Economic Review* 110.10, pp. 3267–3297. ISSN: 19447981. DOI: 10.1257/aer.20190623.

Chen, Le, Alan Mislove, and Christo Wilson (2016). "An empirical analysis of algorithmic pricing on amazon marketplace". In: *25th International World Wide Web Conference, WWW 2016*, pp. 1339–1349. DOI: 10.1145/2872427.2883089.

Fonseca, Miguel A. and Hans-Theo Normann (2012). "Explicit vs. tacit collusion-The impact of communication in oligopoly experiments". In: *European Economic Review* 56.8, pp. 1759–1772. ISSN: 00142921. DOI: 10.1016/j.euroecorev.2012.09.002.

Klein, Timo (2021). "Assessing Autonomous Algorithmic Collusion: Q-Learning Under Sequential Pricing".