Curriculum Vitae: Nicolas A. Klein
April 2020

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Education:

November 2010: Ph.D. in Economics (*summa cum laude),* University of Munich; Dissertation Prize of the Economics Department at the University of Munich and Volkswirte Alumni Club

January 2007: M.A. in Economics, University of Munich; Alumni Prize for Young Economists from Volkswirte Alumni Club

September 2005: B.A. in Economics, University of Munich

Research Interests:

Microeconomics; economic theory; strategic information acquisition and transmission; dynamic incentive problems

Academic Positions:

Since June 2019: Associate Professor, Department of Economics, University of Montreal; Researcher at CIREQ (since September 2012)

July 2012—May 2019: Assistant Professor, Department of Economics, University of Montreal; Researcher at CIREQ (since September 2012)

July 2010 – July 2012: Postdoctoral researcher, Chair of Economic Theory (Prof. Benny Moldovanu), Department of Economics, University of Bonn

September 2009 – May 2010: Visiting Assistant in Research, Department of Economics, Yale University

February 2008 – December 2009: Researcher in Project Area A8 (Strategic Information Generation and Transmission) of SFB-TR 15 (German Science Foundation)

February 2008 – August 2009: Research Assistant, Chair of Dynamic Economic Theory (Prof. Sven Rady), Department of Economics, University of Munich

(Longer) Research Visits:

September 1 – December 20, 2019: University of Bonn

May 27 – June 22, 2019: Université Paris-Dauphine

September 25 – October 19, 2018: Université Paris-II Panthéon-Assas

July 3, 2017 – January 4, 2018: University of Bonn

May 15 – June 9, 2017: Université Paris-Dauphine

May 16 – June 17, 2016: Université Paris-Dauphine

August 15 – September 30, 2011: Yale University

Grants & Scholarships:

2019 : Travel grant, Université de Montréal

2017: Scholarship under the programme *Research Stays for University Academics and Scientists*, Deutscher Akademischer Austauschdienst (DAAD)

2016-2018: *Insight Development* Grant of the *Social Sciences and Humanities Research Council of Canada*

2016 – 2017 : Grant *Subvention institutionnelle du CRSH-Université de Montréal*

2016 : Travel grant, Université de Montréal

2013 – 2016: Grant *Établissement de nouveaux professeurs-chercheurs* from *Fonds de recherche Société et culture Québec*

2013 : Travel grant, Université de Montréal

January 2010 – June 2010: Doctoral scholarship, National Research Fund of Luxembourg

October 2006 – February 2008: Doctoral scholarship, Research Training Group GRK 801 (German Science Foundation)

Papers:

Relational Contracts with Private Information on the Future Value of the Relationship: The Upside of Implicit Downsizing Costs (with Matthias Fahn; *American Economic Journal: Microeconomics*, 2019, 11 (4), 33-58)

We analyze a relational contracting problem, in which the principal has private information about the future value of the relationship. In order to reduce bonus payments, the principal is tempted to claim that the value of the future relationship is lower than it actually is. To induce truth-telling, the optimal relational contract may introduce distortions after a bad report. For some levels of the discount factor, output is reduced by more than would be sequentially optimal. This distortion is attenuated over time even if prospects remain bad. Our model thus provides an alternative explanation for indirect short-run costs of downsizing.

Strategic Experimentation with Asymmetric Players (with Kaustav Das and Katharina Schmid; *Economic Theory*, 2019, available at
https://link.springer.com/article/10.1007/s00199-019-01193-9)

We examine a two-player game with two-armed exponential bandits à la Keller, Rady, Cripps (2005), where players operate different technologies for exploring the risky option. We characterise the set of Markov perfect equilibria, and show that there always exists an equilibrium in which the player with the inferior technology uses a cutoff strategy. All Markov perfect equilibria imply the same amount of experimentation but differ with respect to the expected speed of the resolution of uncertainty. If and only if the degree of asymmetry between the players is high enough, there exists a Markov perfect equilibrium in which both players use cutoff strategies. Whenever this equilibrium exists, it welfare dominates all other equilibria. This contrasts with the case of symmetric players, where there never exists a Markov perfect equilibrium in cutoff strategies.

Parliament Shapes and Sizes (with Raphael Godefroy; *Economic Inquiry,* 2018, 56 (4), 2212-2233)

This paper proposes a model of Parliamentary institutions in which a society makes three decisions behind the veil of ignorance: whether a Parliament should comprise one or two chambers, what the relative bargaining power of each chamber should be if the Parliament is bicameral, and how many legislators should sit in each chamber. We document empirical regularities across countries that are consistent with the predictions of our model.

Learning in a Game of Strategic Experimentation With Three-Armed Exponential Bandits, 2018, in *Frontiers of Dynamic Games,* edited by L.A. Petrosyan, V.V. Mazalov, and N.A. Zenkevich, Birkhäuser

The present article provides some additional results for the two-player game of strategic experimentation with three-armed exponential bandits analyzed in Klein (2013). Players play replica bandits, with one safe arm and two risky arms, which are known to be of opposite types. It is initially unknown, however, which risky arm is good and which is bad. A good risky arm yields lump sums at exponentially distributed times when pulled. A bad risky arm never yields any payoff. In this article, I give a necessary and sufficient condition for the state of the world eventually to be found out with probability 1 in any Markov perfect equilibrium

in which at least one player's value function is continuously differentiable. Furthermore, I provide closed-form expressions for the players' value function in a symmetric Markov perfect equilibrium for low and intermediate stakes.

Will Truth Out?--An Advisor's Quest To Appear Competent (with Tymofiy Mylovanov; *Journal of Mathematical Economics*, 2017, 72, 112-121)

We study a dynamic career-concerns environment with an agent who has incentives to appear competent. It is well known that dynamic career concerns create incentives for an agent to be conservative and to tailor his actions and reports towards a commonly held prior opinion. The existing models, however, have focused on short time horizons. We show that, for long time horizons, there exist countervailing incentives for the agent to report his true opinion and to act in the principal's best interests. In particular, if the agent is sufficiently patient, the time horizon is sufficiently long given the agent's patience, and the quality of the competent expert is high enough given the time horizon and the discount factor, the beneficial long-term incentives overwhelm any harmful myopic ones, and the incentive problem vanishes.

The Importance of Being Honest (*Theoretical Economics,* 2016, 11: 773-811)

This paper analyzes the case of a principal who wants to provide an agent with proper incentives to explore a hypothesis that can be either true or false. The agent can shirk, thus never proving the hypothesis, or he can avail himself of a known technology to produce fake successes. This latter option either makes the provision of incentives for honesty impossible or does not distort its costs at all. In the latter case, the principal will optimally commit to rewarding later successes even though he only cares about the first one. Indeed, after an honest success, the agent is more optimistic about his ability to generate further successes. This, in turn, provides incentives for the agent to be honest before a first success.

Strategic Learning in Teams (*Games and Economic Behavior*, 2013, 82: 636-657)

This paper analyzes a two-player game of strategic experimentation with three-armed exponential bandits in continuous time. Players play bandits of identical types, with one arm that is safe in that it generates a known payoff, whereas the likelihood of the risky arms' yielding a positive payoff is initially unknown. When the types of the two risky arms are perfectly negatively correlated, the efficient policy is an equilibrium if and only if the stakes are high enough. If the negative correlation is imperfect and stakes are high, there exists an equilibrium that leads to efficiency for optimistic enough *prior* beliefs.

Negatively Correlated Bandits (with Sven Rady; *Review of Economic Studies*, 2011, 78(2): 693-732)

We analyze a two-player game of strategic experimentation with two-armed bandits. Either player has to decide in continuous time whether to use a safe arm with a known payoff or a risky arm whose expected payoff per unit of time is initially unknown. This payoff can be high or low, and is negatively correlated across players. We characterize the set of all Markov perfect equilibria in the benchmark case where the risky arms are known to be of opposite type, and construct equilibria in cutoff strategies for arbitrary negative correlation. All

strategies and payoffs are in closed form. In marked contrast to the case where both risky arms are of the same type, there always exists an equilibrium in cutoff strategies, and there always exists an equilibrium exhibiting efficient long-run patterns of learning. These results extend to a three-player game with common knowledge that exactly one risky arm is of the high payoff type.

Do Stronger Patents Lead to Faster Innovation? The Effect of Duplicative Search (with Kaustav Das)

We analyse a model of two firms that are engaged in a patent race. Firms have to choose in continuous time between a traditional and an innovative method of pursuing the decisive breakthrough. They share a common belief about the likelihood of the innovative method being good. The unique Markov perfect equilibrium coincides with the cartel solution if and only if firms are symmetric in their abilities of leveraging a good innovative method or there is no patent protection. Otherwise, equilibrium will entail excessive duplication of efforts in the innovative method, as compared to the cartel benchmark, for any level of patent protection. We show that the expected time to a breakthrough is minimised at an interior level of patent protection, providing a possible explanation for the decrease in R&D productivity sometimes associated with stronger patent protections.

Overcoming Free-Riding in Bandit Games (with Johannes Hörner & Sven Rady)

This paper considers a class of experimentation games with Lévy bandits encompassing those of Bolton and Harris (1999) and Keller, Rady and Cripps (2005). Its main result is that efficient (perfect Bayesian) equilibria exist whenever players' payoffs have a diffusion component. Hence, the trade-offs emphasized in the literature do not rely on the intrinsic nature of bandit models but on the commonly adopted solution concept (MPE). This is not an artifact of continuous time: we prove that such equilibria arise as limits of equilibria in the discrete-time game. Furthermore, it suffices to relax the solution concept to strongly symmetric equilibrium.

Bandits in the Lab (with Johannes Hölzemann)

We conduct an experimental test of the main theoretical predictions of the model of strategic experimentation with exponential bandits by Keller, Rady, Cripps (2005). We find strong evidence for their prediction of free-riding because of strategic concerns. While experimental subjects are not able to update their beliefs precisely, we nonetheless find strong support for the equilibrium prediction of non-cutoff behavior as well.

Strategic Investment and Learning with Private Information (with Peter Wagner)

We study a two-player game of strategic experimentation with private information in which agents choose the timing of risky investments. Agents learn about future returns through privately observed signals, others' investment decisions and from public experimentation outcomes when returns are realized. We characterize symmetric equilibria, and relate the extent of strategic delay of investments in equilibrium to the primitives of the information structure. Agents invest without delay in equilibrium when the most optimistic interim belief exceeds a threshold. Otherwise, delay in investments induces a learning feedback that may

either raise or depress beliefs and investment choices. We show that private information in strategic experimentation can increase ex-ante welfare.

Work in Progress:

- Over-Cautious or Trigger-Happy Advisors—When Best to Stop (with Sidartha Gordon)
- Generally Correlated Bandits (with Sven Rady)
- Learning to Agree (with Lucie Ménager)

Conference Presentations (by myself or a co-author):

2019: Annual Meeting of the Royal Economic Society; Annual Meeting of the Society for the Advancement of Economic Theory in Ischia, Italy

2018: CESifo Area Conference on Applied Microeconomics in Munich; 2018 Conference on Mechanism and Institution Design, Durham University Business School, Durham UK; CIREQ Workshop "The Economics of Strategic Communication and Persuasion : Application to Evidence-Based Public Policy" (Montreal); Workshop on Stopping-Time Problems in Game Theory, Economics and Finance, Stony Brook

2017: 6th Workshop on Stochastic Methods in Game Theory in Erice; Annual Meeting of the Society for the Advancement of Economic Theory in Faro, Portugal; 11th International Conference on Game Theory and Management in St. Petersburg; Bonn Graduate School of Economics Christmas Alumni Meeting

2016: Annual Meeting of the Society for the Advancement of Economic Theory in Rio de Janeiro, Brazil

2015: North American Winter Meeting of the Econometric Society; 19th Annual Conference of the International Society for New Institutional Economics in Cambridge, MA; Annual Meeting of the European Economic Association in Mannheim, Germany; Society for the Advancement of Economic Theory Conference in Cambridge, England; Annual Meeting of the European Association for Research in Industrial Economics in Munich, Germany; Workshop on "Advances in Information Economics and Dynamics," Université Paris II LEMMA; Workshop on Stochastic Games at the National University of Singapore; 1st Workshop on Relational Contracts of the German Science Foundation in Holzhausen, Germany

2014: Canadian Economic Theory Conference; 8th International Conference on Game Theory and Management in St. Petersburg; SING 10 Conference in Krakow; European Summer Meeting of the Econometric Society

2013: North American Summer Meeting of the Econometric Society; Annual Meeting of the Society for Economic Dynamics in Seoul; European Meeting of the Econometric Society; 4th Workshop on Stochastic Methods in Game Theory in Erice; Workshop on "Advances in Experimentation," Université Paris II LEMMA

2012: International Conference on Game Theory at Stony Brook

2011: European Winter Meeting of the Econometric Society; Midwestern Micro-economic Theory Conference; Canadian Economic Theory Conference; North American Summer Meeting of the Econometric Society; International Conference on Game Theory at Stony Brook; Annual Meeting of the Society for Economic Dynamics at Ghent; Society for the Advancement of Economic Theory at Faro

2010: Midwestern Micro-economic Theory Conference at Evanston, IL; International Conference on Game Theory at Stony Brook; World Congress of the Econometric Society in Shanghai; Annual Meeting of the European Economic Association in Glasgow, UK; Workshop on Stochastic Methods in Game Theory in Erice

2009: European Meeting of the Econometric Society; International Conference on Game Theory at Stony Brook; Summer School on "Limited Cognition, Strategic Thinking and Learning in Games" in Bonn; Society for Economic Dynamics; North American Summer Meeting of the Econometric Society; SFB-TR 15 Workshop for Young Researchers at Humboldt University Berlin; SFB-TR 15 Conference in Caputh

2008: European Meeting of the Econometric Society; Annual Meeting of the Society for Economic Dynamics; North American Summer Meeting of the Econometric Society; European Summer Symposium in Economic Theory (Gerzensee); SFB-TR 15 Conference in Gummersbach, Germany; European Doctoral Group in Economics (EDGE) Jamboree in Copenhagen, Denmark

2007: SFB-TR 15 Workshop for Young Researchers in Bonn; SFB-TR 15 Summer School on Contract Theory

Seminar Presentations:

2019: Universität Duisburg-Essen; University of York; University of Warwick

2018: University of Toronto; University of Western Ontario; Séminaire Parisien de Théorie des Jeux; Johannes-Kepler-Universität Linz

2017: Bonn; Concordia University; McGill University; Munich; Seoul National University; Université Laval

2016: Berlin; Guelph; Séminaire Roy Paris; Toulouse; Université Paris-Dauphine

2015: Lund; University of New South Wales; University of Sydney; University of Texas at Austin

2014: GERAD Montréal; INSIDE Luxembourg; Maastricht; Microsoft Research New England; Queen's University; Rochester; Stanford; University of California at Davis; University of Western Ontario

2013: McMaster University; Séminaire Parisien de Théorie des Jeux

2012: Arizona State University; Exeter; Université de Montréal; University of British Columbia in Vancouver; University of Iowa

2011: Bonn

2010: Berlin; École Polytechnique Paris

2009: Pennsylvania State University; Southern Methodist University; Yale University

2008: Århus; Bielefeld; Bonn

Teaching Experience:

Winter terms 2020 and 2019: Introduction to Industrial Organization (2nd-year B.A. class), Economics of Organization (3rd-year B.A. class)

Summer term 2018: Microeconomics workshop (for M.A. students)

Winter term 2018: Microeconomics (PhD class), Economics of Organization (3rd-year B.A. class)

Winter terms 2017, 2016 and 2015: Microeconomics (PhD class), Economics of Organization, Economics of Insurance (both 3rd-year B.A. class)

Winter terms 2014 and 2013: Microeconomics (PhD class), Economics of Organization (3rd-year B.A. class)

Summer semester 2011: Teaching assistant for Advanced Topics in Mechanism Design (doctoral topics course, Prof. Moldovanu)

Summer semester 2009: Teaching assistant for Dynamic Methods in Economics and Finance (doctoral course, Prof. Rady) and Advanced Game Theory (doctoral course, Prof. Dimitrov)

Winter semester 2008/09, summer semester 2009, winter semester 2010-11: Advisor on students' diploma theses

Summer semester 2008: Teaching assistant for student seminar on Corporate Governance (advanced undergraduate course, Prof. Rees)

Winter semester 2007/08: Teaching assistant for Advanced Game Theory (doctoral course, Prof. Rady)

Student Supervision:

PhD: Co-supervisor of **Catherine Gendron-Saulnier** (with Sidartha Gordon and Marc Santugini); title: *Essays in Economics of Information*; graduated from Université de Montréal in 2015, first job with *Analysis Group*.

Co-supervisor of **Samuel Gingras**: Université de Montréal class of 2014

Local advisor to **Dominique Baril-Tremblay**, visiting student in research at Université de Montréal; home institution: Paris School of Economics-Université Paris-1

M.A.: Supervisor of **Mathieu Bruneau:** Thesis at Université de Montréal: *Legal Shifts: The Role of Intellectual Property and Expectations in an Open Innovation Industrial Environment* (2016)

Refereeing Work:

Econometrica; American Economic Review; American Economic Review: Insights; Review of Economic Studies; Journal of Political Economy; Theoretical Economics; Journal of Economic Theory; Games and Economic Behavior; American Economic Journal: Microeconomics; Journal of the European Economic Association; European Economic Review; International Economic Review; Economic Theory; Scandinavian Journal of Economics; International Journal of Industrial Organization; Journal of Law, Economics and Organization; Journal of Economic Behavior & Organization; Journal of Economics and Management Strategy; Journal of Economic Dynamics and Control; Economic Inquiry; Journal of Mathematical Economics; Canadian Journal of Economics; Journal of Economics; Mathematical Social Sciences; B.E. Journal of Theoretical Economics; Operations Research Letters; Dynamic Games and Applications; Economics Bulletin

National Science Foundation (US); Social Sciences and Humanities Research Council of Canada

Conferences Co-Organized:

2nd CIREQ Montreal Economic Theory Conference: Learning in Strategic Settings (November 21--22, 2014, with Ming Li)

1st CIREQ Montreal Economic Theory Conference: Economics of Persuasion and Communication with Applications to Political Economics (October 4—5, 2013, with Ming Li)

Departmental Service:

Co-Organization of weekly Seminar Series in Microeconomic Theory, 2018-2019, 2015-2016 and 2014-2015

Junior Recruiting Committee, 2013-2014

Personal Information:

Citizen of Luxembourg; permanent resident of Canada; fluent in English, French and German