DAVID BENATIA

CONTACT INFORMATION	HEC Montréal 3000, chemin de la Côte-Sainte-Catherine Montréal (Québec) Canada H3T 2A7	Email: david.benatia@hec.ca Phone: (+1) 438-506-6641 Office: 4.156 CSC Languages: English (fluent), French (native)

ACADEMIC POSITION

- o *Tenure-track Assistant Professor in Economics at **HEC Montréal**, (2020-).*
- o *Tenure-track Assistant Professor in Economics at **CREST, ENSAE**, Institut Polytechnique de Paris (2018-2020).*

OTHER AFFILIATIONS

- o *Collaborator at Laboratoire de **Finance des Marchés de l'Énergie**, Paris (2018-).*
- o *Affiliated Researcher at **CREST, ENSAE**, Institut Polytechnique de Paris (2020-).*

PHD

University of Montreal (2012-2018), defended May 2018, summa cum laude (with highest honor), Advisor: Marine Carrasco (University of Montreal, Canada), Co-Advisor: Étienne Billette de Villemeur (Université de Lille 1, France).

OTHER STUDIES

Master 2 in Economics of Environment, Natural Resources, Energy and Agriculture, *Toulouse School of Economics*, Toulouse, France (2011).

M.Sc. in Economics, *Toulouse School of Economics*, Toulouse, France (2010).

B.Sc. in Economics (Honor track), *Toulouse School of Economics*, Toulouse, France (2009).

PUBLICATIONS

- o Benatia D., and S. Gingras, 2023, Reaching New Lows? The Pandemic's Consequences for Electricity Markets. *Energy Journal*.
- o Benatia D., 2022, Ring the Alarm! Electricity Markets, Renewables, and the Pandemic. *Energy Economics.*
- o Benatia D., Godefroy R. and J. Lewis, 2020, Estimates of COVID-19 cases across Canadian provinces, Canadian Public Policy.
- o Benatia D., Debia S. and P.O. Pineau, 2018, Evaluating an Interconnection Project: Do Strategic Interactions Matter? *Energy Journal.*
- o Benatia D., Carrasco M. and J.P. Florens, 2017, Functional Linear Regression with Functional Response. *Journal of Econometrics.*

WORKING PAPERS

- o Benatia D., Chang Y., and D. Firoozi, 2023, Systemic Risk, Large Banks, and Mean-Field Games. *Submitted.*
- o Benatia D. and É. Billette de Villemeur, 2023, Strategic Reneging in Sequential Imperfect Markets. *Submitted.*
- o Bellego C., Benatia D., and L.D Pape, 2023, Dealing with logs and zeros in Regression Models. *Submitted.*
- o Bellego C., Benatia D., and V. Dortet-Bernardet, 2023, The Chained Difference-in-Differences. *Submitted.*
- o Benatia D., Godefroy R. and J. Lewis, 2020. Estimating COVID-19 Prevalence in the United States: A Sample Selection Model Approach. *To be updated.*
- o Benatia D., 2018, Functional Econometrics of Multi-Unit Auctions: An Application to the New York Electricity Market. *To be updated.*
- o Benatia D. and R. Godefroy 2018, Delay in Diagnosis and Probability of Survival: An Estimation Procedure with an Application to Melanoma. *To be updated.*

POLICY REPORTS

- o Bellego C., Benatia D., Kymble C. and V. Dortet-Bernardet, 2020, Évaluation des aides d'État à la R&D et l'innovation. *Rapport Final. Direction Générale des Entreprises, Ministère de l'Économie, des Finances et de la Relance.*
- o Benatia D. and T. Koźluk, 2016, The Determinants of Entry in The Electricity Generation Sector in OECD Countries: A Focus on Renewable Energy. *OECD*

Environment Working Papers, No. 111, OECD Publishing, Paris.

- o Benatia D., Johnstone N. and I. Haščič, 2013, Effectiveness of Policies and Strategies to Increase the Capacity Utilisation of Intermittent Renewable Power Plants. *OECD Environment Working Papers*, No. 57, OECD Publishing.

FELLOWSHIPS AND GRANTS	HEC Montréal Starting Grant (10k$/year, 2020-.)
	Agence National de Recherche (ANR) on Economic Sustainability, Leader of Renewable Investment Work Package, 400k€, 2020-2023 (joint partnership between CREST, X, Université Paris Dauphine, and EDF R&D).
	Collaborator to the Finance for Energy Market (fime-lab.org) research centre, individual funding 4000€/annum.
	Partner of E4C, the EUR project led by IP Paris on Climate Change, funding over 5m€.
	Labex ECODEC Grant, 2019-2021.
	« Génie du mois » FAÉCUM Scholarship, April 2018.
	Excellence Fellowship Bernard Landry, 2016-2017.
	Chair in Energy Sector Management Fellowship, HEC Montréal, 2013-2018.
	Ph.D. Fellowship, CIREQ & Economics Department, University of Montréal, 2012-2017.
	Canadian Energy Economics Association Graduate Travel Scholarship, 2016.
	CIREQ Association Graduate Travel Scholarship, 2016 and 2017.
TEACHING	Time-series econometrics 60837, HEC Montréal, Fall 2022, Winter 2023.
	Environmental economics 40801, HEC Montréal, Fall 2022.
	Microeconomics 10803, HEC Montréal, Fall 2021.
	Environmental economics 30801, HEC Montréal, Winter 2021, Winter 2022.
	Economics of Energy Markets, Master in Economics, ENSAE, Winter 2019, Winter 2020, Winter 2021, Winter 2022
	Topics in Economics (Public Economics), Undergraduate, ENSAE, Fall 2018, Fall 2019.
	Supervisions and evaluations of several Research Master Thesis on a variety of topics: auctions, energy, environment and development; Projects in Applied Statistics; the Student Challenge for Carbon Neutral Cities (E4C); and the Business Data Challenge: building dynamic pricing algorithms using real business data, ENSAE, 2018-2020.
	ECN2910: Environmental Economics, Undergraduate, U. of Montréal, Fall 2014 (Lecturer).
	ECN7065: Theoretical Econometrics, PhD track, U. of Montréal, Winter 2015 (Assistant).
	Economic Instruments of Regulation for Sustainable Development. Sciences Po Paris, Paris School of International Affairs for J.P Barde et N. Johnstone, 2011-2012 (Assistant).
	2nd Year Undergraduate Macroeconomics, TSE for S. Kankanamge, 2010-2011 (Assistant).
PROFESSIONAL EXPERIENCES	External Consultant in the Empirical Policy Analysis Unit (EPU) *at Organisation for Economic Co-operation and Development (OECD)*, Sep 2012-Jan 2014.
	Consultant in the EPU at OECD, Paris (France) Apr 2012-Aug 2012.
	Intern in the EPU at OECD, Paris (France) Sep 2011-Mar 2012, supervised by Nick Johnstone.
CONFERENCES AND SEMINARS	o *Ring the Alarm! Electricity Markets, Renewables and the Pandemic* presented at the FIME seminar (06/2020), FAEE Seminar (04/2021).
	o *Estimating COVID-19 Prevalence in the United States: A Sample Selection Model Approach* presented at École Polytechnique (05/2020).
	o *Strategic Reneging in Sequential Imperfect Markets* presented at UQAM, Montréal (05/17/2019); IAEE International Conference at HEC Montréal, Montréal (05/31/2019). CREST-ENSAE, Paris (06/17/2019); UQAM, Montréal (10/31/2019); HEC Montréal (02/2020).
	o *Functional Econometrics of Multi-Unit Auctions: An Application to the New York Electricity Market* presented at CIREQ Econometrics Conference on Inference in large-dimensional models, Montreal (Poster session, 05/05/2017); 57th Société Canadienne des Sciences Économiques (SCSE) at University of Ottawa, Ottawa (05/10/2017); 13th CIREQ Conference at Concordia University, Montreal (05/12/2017); Montreal

Environment and Resource Economics Workshop, Montreal (11/03/2017); Bank of Canada, Ottawa (01/11/2018); Ryerson University, Toronto (01/15/2018); Sciences Po, Paris (01/22/2018); Universidad Carlos III, Madrid (01/24/2018); University of Bristol, Bristol (01/29/2018); Tilburg University, Tilburg (01/31/2018); CREST-ENSAE, Paris (02/02/2018); HEC Montreal, Montreal (02/06/2018); Polytechnique Montreal, Montreal (03/01/2018); FIME Lab, Paris (07/12/2018); CERNA, Mines ParisTech, Paris (03/20/2019).

OTHERS
- Memberships: Center for Interuniversity Research and Quantitative Economics (CIREQ), Canadian Economic Association (CEA), Société Canadienne de Science Économique (SCSE), American Economic Association (AEA), International Energy Economics Association (IAEE), Alliance Program Initiative on Climate Change (Columbia-X Alliance).
- Co-organizer of the Microeconomics Seminar at CREST (2019-2020).
- Organizer of internal seminars at HEC Montréal (2021-.).
- Referee services: Journal Business Economics and Statistics, International Journal of Industrial Organization, Journal of Financial Econometrics, Energy Journal, Resource and Energy Economics, Journal of Industry Competition and Trade, Energy Economics, Environmental Modeling and Assessment, Metrika.
- Computer skills: MATLAB, Python, R, STATA.

Three essays in econometrics and energy markets.

      The thesis is organized in three chapters and develops methods to analyze strategic behaviors in liberalized electricity markets, notably through the development of econometric methods adapted to functional data. It is articulated around the main research question: *How the market structure and sources of uncertainties affect the behavior of producers in liberalized electricity markets?*

Electricity markets are administered as auctions of divisible goods where participants submit entire supply functions to signal their marginal cost of production. The strategies in those auctions are functions by design, and thus require to be treated as such in the economic and econometric analyses.

(1) Residual demand manipulations and market power in electricity markets

Abstract: In this paper, we study the interactions of residual demand manipulations and supply function strategies in capacity-constrained electricity markets with a pivotal supplier. We focus on market manipulations pertaining to physical withholding of some production capacity subject to fixed price contracts. We characterize the effects of uncertainty on the optimal bidding strategy, and prove that ex-post optimality fails in the presence of a market price cap and a pivotal supplier. We show how residual demand manipulations exacerbate the exercise of market power. Finally, we discuss various extensions and implications, notably with regards to the regulation of intermittent renewable power.

This first chapter develops a theoretical microeconomic model to understand the strategies of market manipulation in electricity markets and their relations to sources of uncertainties. It is found that certain types of contracts, initially used to maintain prices at competitive levels, generate perverse incentives for producers to simulate unexpected outages in order to increase the probability of high prices, and to reduce the uncertainty surrounding wholesale prices.

(2) Functional linear regression with functional response

Abstract: In this paper, we develop new estimation results for functional regressions where both the regressor $Z(t)$ and the response $Y(t)$ are functions of Hilbert spaces, indexed by the time or a spatial location. The model can be thought as a generalization of the multivariate regression where the regression coefficient is now an unknown operator Π. We propose to estimate the operator Π by Tikhonov regularization, which amounts to apply a penalty on the L2 norm of Π. We derive the rate of convergence of the mean-square error, the asymptotic distribution of the estimator, and develop tests on Π. As trajectories are often not fully observed, we consider the scenario where the data become more and more frequent (infill asymptotics). We also address the case where Z is endogenous and instrumental variables are used to estimate Π. An application to the electricity consumption completes the paper.

This second chapter develops a theoretical framework of econometric analysis adapted to functional data. Functional data consist in observations of curves, or functions, and are statistical objects more complex than the usual scalar observations. The developed estimator is extended to the case where predictors are endogenous. The consistency and asymptotic normality are proven analytically. The method is then tested numerically using simulations, and an application is presented to forecasting electricity consumption in Ontario using hourly weather data.

(3) Functional econometrics of multi-unit auctions: an application to the New York electricity market

Abstract: This paper proposes a novel approach to the empirical analysis of multi-unit auctions, to which participants submit supply or demand functions observable by the econometrician. The approach avoids having to model the market mechanism and allows for the evaluation of firm-level market power in a private information setting. This is of practical importance because those auction mechanisms are hard to model, especially in electricity markets. In addition, it is important to allow for private information since firms usually hold financial contracts and do not observe their rivals' bids. The method relies on econometric methods that treat the observed bid functions as function-valued random elements. This is the first paper to propose a functional econometric approach in this context. Notably, I develop a functional instrumental variable linear estimator for that purpose. The method is applied to a model of strategic bidding in multi-unit auctions using data on firm-level bids and marginal costs from the New York day-ahead electricity market for 2013-2015. I estimate firm-level market power and compare actual bidding behavior to profit-maximizing behavior under private information. I find consistent evidence of strategic bidding, suggesting that firms are well aware of their own market power. Therefore, the complex market

environment and limited available information with regards to rival bids do not preclude firms from acting strategically, most likely due to the repeated nature of these auctions.

This final chapter consists in two parts. First, a method is developed to estimate the market power of firms on that type of markets. An empirical analysis of the New York electricity market is then conducted. The model developed in chapter 1 is adapted to a structural econometric model, and the tools from chapter 2 are adapted to study the behavior of firms and their dependence to market fundamentals. The New York market is a canonical example of a market that is relatively difficult to model explicitly, and, where firms cannot observe their rivals' behavior. The proposed method permits to evaluate market power while avoiding this difficulty, but without neglecting the existence of private information. It is found that firms accurately evaluate their ability to affect the market-clearing price distribution, and exert market power accordingly. The uncertainty surrounding this market and the regulatory rules preventing firms to observe their competitors' strategies are not sufficient to prevent strategic behavior.

This thesis delivers an understanding of the issues associated with the exercise of market power in electricity markets. The functional econometric methods permit to shed light on the strategic behavior of producers in markets that are notably difficult to model explicitly. The application of these methods goes beyond energy markets. Finally, the results of this research are of direct empirical significance to the province of Quebec because they focus on two of its principal trade partners in energy goods. This research should hence contribute to guide Quebec trade and energy policies with regards to the north-eastern electricity market.