Mobile phone: 617-412-1095
Email: ristovska@g.harvard.edu

January 20, 2022

Dear Professor Bryan, Professor Jones, and Professor Williams,

It is with great pleasure that I am applying to the Innovation Research Boot Camp held at the National Bureau of Economic Research (NBER) on July 15 - July 21, 2022. As an aspiring health economist and current fifth-year PhD candidate in the Economics Department at Harvard University, I am extremely interested in and excited about attending because my research interest in pharmaceutical innovation is an excellent fit for the topics covered at the boot camp and for the community of researchers in attendance. I would be honored to join other academics interested in similar topics and learn about theory, methods, and topics at the frontier of economics of innovation.

Please find enclosed with this application: (a) this cover letter, (b) a copy of my curriculum vitae, (c) a list of completed PhD courses, and (d) an essay describing my motivation for attending the boot camp, my current research agenda, and future research aspirations.

Additionally, Professor David Cutler, the Otto Eckstein Professor of Applied Economics in the Department of Economics at Harvard University, is submitting a recommendation letter speaking to my interests and background via email to maranjian@nber.org.

Thank you for your consideration, and please do not hesitate to contact me at 617-412-1095 or ristovska@g.harvard.edu should you have any questions or would need further clarification. I look forward to hearing from you.

Sincerely,
LJ Ristovska

LJUBICA (LJ) RISTOVSKA

Littauer Center
1805 Cambridge Street
Cambridge, MA 02138

Email: ristovska@g.harvard.edu
Web: https://scholar.harvard.edu/ristovska
Phone: 617-412-1095

EDUCATION

Ph.D. in Economics, Harvard University, May 2023 (expected)

A.M. in Economics, Harvard University, 2020

B.A. in Computer Science and Economics, Wellesley College, *magna cum laude*, 2013

RESEARCH INTERESTS

Health Economics, Public Economics, Industrial Organization

RESEARCH EXPERIENCE AND OTHER EMPLOYMENT

07/2018 – 09/2018	Graduate Research Assistant for Professor David Cutler, National Bureau of Economic Research
06/2018 – 03/2020	Graduate Research Assistant for Professor Amanda Kowalski, National Bureau of Economic Research
09/2015 – 07/2017	Full-Time Research Assistant for Professor Amanda Kowalski, National Bureau of Economic Research (located at Stanford and Yale)
06/2013 – 09/2015	Analysis Group, Inc., Senior Analyst (promoted from Analyst)
06/2012 – 08/2012	Economic Policy Intern, Center for Economic Analyses (in Skopje, Macedonia)
12/2011 – 12/2012	Research Assistant for Professor Brett Danaher, Wellesley College Economics Department

WORKING PAPERS

Racial Disparities in COVID-19 Cases and Deaths: Theories and Evidence

WORK IN PROGRESS

Regulating Pharmaceuticals with Heterogeneous Populations: Welfare Implications of Pediatric Clinical Trials

Human Capital and Production in Teams: Evidence from Intensive Care Units

Human Capital Spillovers and Health (with Jacob Bor, David Cutler, and Edward Glaeser)

WHITE PAPERS

Regulations and Data Sources on Pediatric Clinical Studies in the United States and European Union. National Bureau of Economic Research and Institute for Fiscal Studies Network on the Value of Medical Research, April 2020.

BOOKS

"Political Consensus for the Economic Future of Republic of Macedonia". Marjan Nikolov, Borce Trenovski, Hristijan Risteski, **Ljubica Ristovska**. Supported by Open Society Institute Think Tank Fund, Budapest. Published in Macedonian, 2013.

PRE-PhD PUBLICATIONS

"Impact of Symptomatic Skeletal Events on Healthcare Resource Utilization and Quality of Life Among Patients with Castration-Resistant Prostate Cancer and Bone Metastases". Rana McKay, Batool Haider, Mei Duh, Adriana Valderrama, Mari Nakabayashi, Matthew Fiorillo, **Ljubica Ristovska**, Lonnie Wen, and Philip Kantoff. *Prostate Cancer and Prostatic Diseases* 20, 276–282 (2017).

"Functional Limitations and Health Care Resource Utilization for Individuals with Cognitive Impairment without Dementia: Findings from a US Population-Based Survey". J. Scott Andrews, Urvi Desai, Noam Y. Kirson, Caroline J. Enloe, **Ljubica Ristovska**, Sarah King, Howard G. Birnbaum, Adam S. Fleisher, Wenyu Ye, Kristin Kahle-Wrobleski. *Alzheimer's and Dementia: Diagnosis, Assessment and Disease Monitoring* 1(10), published online Dec. 2016.

"Assessing the Economic Burden of Alzheimer's Disease Patients First Diagnosed by Specialists". Noam Y. Kirson, Urvi Desai, **Ljubica Ristovska**, Alice Kate G. Cummings, Howard G. Birnbaum, Wenyu Ye, Scott J. Andrews, Daniel Ball, Kristin Kahle-Wrobleski. *BMC Geriatrics* 16(1), 2016.

"Economic Outcomes among Medicare Patients Receiving Bioengineered Cellular Technologies for Treatment of Diabetic Foot Ulcers". J. Bradford Rice, Urvi Desai, **Ljubica Ristovska**, Alice Kate G. Cummings, Howard G. Birnbaum, Michelle Skornicki, David J. Margolis, Nathan B. Parsons. *Journal of Medical Economics* 18(8), 2015.

STATA COMMANDS:

"MTEBINARY: Stata Module to Compute Marginal Treatment Effects (MTE) with a Binary Instrument," with Amanda Kowalski and Yen Tran. First Version: December 2016. Latest Version: July 2018.

"MTEMORE: Stata Module to Compute Marginal Treatment Effects (MTE) with a Binary Instrument," with Amanda Kowalski and Yen Tran. First Version: July 2018.

TEACHING EXPERIENCE

Harvard University, Cambridge MA

Spring 2020	*Using Big Data to Solve Economic and Social Problems*
Spring 2021	Undergraduate Teaching Fellow for Professor Raj Chetty
	Instructor ratings waived university-wide due to COVID-19 in 2020, Instructor Rating: 4.70/5 in 2021
Fall 2019	*Why Is There No Cure for Health Care?*
Fall 2020	Undergraduate Teaching Fellow for Professor David Cutler
	Instructor Rating: 4.56/5 in 2019, 4.80/5 in 2020

Wellesley College, Wellesley MA

Fall, 2012	*Introduction to Microeconomics* Undergraduate Tutor for Professor Andre Switala
Spring, 2012	*Introduction to Probability and Statistics* Undergraduate Teaching Assistant for Professor Brett Danaher
Fall, 2011	*Data Structures (Computer Science)* Undergraduate Teaching Assistant for Professor Brian Tjaden

AWARDS, FELLOWSHIPS, AND GRANTS

2021	Warburg Fund, Harvard University
2021	Certificate for Distinction in Teaching, Derek Bok Center for Teaching and Learning, Harvard University
2020	Lab for Economic Applications and Policy Grant, Harvard University
2020	Remote Research Assistant Funding Grant, Franklin Delano Roosevelt Foundation, Harvard University
2020	Certificate for Distinction in Teaching, Derek Bok Center for Teaching and Learning, Harvard University
2019 – 2020	Value of Medical Research Fellowship, National Bureau of Economic Research and Institute for Fiscal Studies
2019	Certificate for Distinction in Teaching, Derek Bok Center for Teaching and Learning, Harvard University
2019 – 2020	Peggy Howard Fellowship, Wellesley College Economics Department
2019 – 2020	Humane Studies Fellowship, Institute for Humane Studies
2017 – 2018	Peggy Howard Fellowship, Wellesley College Economics Department
2013	Phi Beta Kappa
2013	Sigma Xi
2012 – 2013	Case Fellowship, Wellesley College Economics Department
2012	Audrey Freedman ’51 Endowed Fund for Students in Economics, Wellesley College
2011	Three Generations Prize for Writing in Science (awarded for the paper *Predictions Using Google and Twitter*), Wellesley College Writing Department
2010	Elizabeth Vogel Falk Prize in German, Wellesley College German Department

INVITED PRESENTATIONS

2021	MIT Critical Data: Role of Data in Disaster Preparedness
2020	NBER/IFS Value of Medical Research Conference

SERVICE

2020, 2022	National Collegiate Research Conference Judge
2021 – present	Harvard and MIT Application Assistance and Mentoring Program, mentor

2019 – 2021	Labor Economics and Public Finance Student Workshop at Harvard, organizer
2018 – present	Harvard Graduate Women in Economics, core team member - Annual panel for undergraduates on PhD applications and graduate student life in economics, organizer and panelist - Mentoring program for undergraduate women and underrepresented minorities interested in economics at Harvard, organizer and mentor
2018 – 2020	Harvard Economics Professional Development Team, core team member - Series of seminars on coding for economists in the Harvard Economics Department, organizer and presenter
2018 – present	Harvard Economics Department peer mentor
2018 – 2019	Harvard University Bureau of Study Counsel tutor for: - *Microeconomic Theory I* (Fall 2018), graduate class - *Introduction to Econometrics* (Spring 2019), undergraduate class

PROFESSIONAL ACTIVITIES

Referee: Journal of Urban Economics (x2), Clinical Trials: Journal of the Society for Clinical Trials, PLOS ONE

Membership: American Economic Association (AEA), American Society of Health Economists (ASHEcon), National Tax Association (NTA)

PERSONAL

Citizenship: Macedonian

Languages: Macedonian (native), Bulgarian, Serbian/Croatian/Bosnian/Montenegrin, German

Revised January 2022

List of completed PhD courses

Fall 2017

- Microeconomic Theory (Ed Glaeser, Eric Maskin)
- Macroeconomic Theory (David Laibson, Robert Barro)
- Principles of Econometrics (Gary Chamberlain)

Spring 2018

- Microeconomic Theory (Michael Powell, Jerry Green)
- Macroeconomic Theory (Emmanuel Farhi, Ken Rogoff)
- Econometric Methods (Max Kasy, Elie Tamer)
- Psychology and Economics (Andrei Shleifer, David Laibson)

Fall 2018

- Labor Market Analysis (Larry Katz)
- Research in Health Economics (Joe Newhouse)
- Public Economics and Fiscal Policy (Nathan Hendren)
- Industrial Organization (Ariel Pakes)

Spring 2019

- Public Economics and Fiscal Policy (Stefanie Stantcheva)
- History and Human Capital (Larry Katz, Claudia Goldin)
- Health Economics (David Cutler)

Fall 2019, Spring 2020

- Labor Economics Reading Group
- Labor Economics/Public Graduate Student Workshop

Fall 2020

- Labor Economics/Public Graduate Student Workshop

Spring 2021

- Labor Economics/Public Graduate Student Workshop

Fall 2021

- Labor Economics/Public Graduate Student Workshop
- Public Finance Reading Group

My current research interests address questions on optimal testing and regulation of pharmaceutical drugs in secondary populations and indications. Should secondary approvals be granted earlier and regulated less, i.e., granted with fewer clinical trials? What would be the welfare implications of such policies? How would firm innovation incentives (both for secondary indications/populations and new drugs) be affected under such regulatory changes?

These questions have recently gained traction in the public debate. Just over a month ago, after obtaining approval for use in adults and adolescents, Pfizer's two-dose COVID-19 vaccine failed to provide protection in pediatric patients aged 5-11, thereby failing to obtain FDA approval for this age group.[1] This is not the first high-profile case of differential efficacy and safety of a drug between the pediatric and adult population. For instance, starting in October 2004, the FDA urged drug manufacturers to include "black box" warnings on anti-depressants cautioning use in pediatric patients (children and adolescents) due to increased likelihood of suicidal ideation in these patients.

My current work tackles this case of pediatric approvals. Under the current regulatory framework (Best Pharmaceuticals for Children Act and Pediatric Research Equity Act), every new drug must complete a pediatric assessment to obtain pediatric approval. Using a structural model combined with insurance claims data, I examine the welfare implications of a counterfactual policy that automatically grants pediatric approval upon adult approval regardless of the completion of a pediatric assessment. On one hand, drugs that are ineffective or unsafe in children but effective and safe in adults may obtain approval under this counterfactual policy. Similarly, drugs that are effective and safe in children but unsafe or not effective in adults may not enter the market relative to the status quo policy. Both of these channels, including increased uncertainty over efficacy and safety of drugs that would obtain approval under either the status quo or the counterfactual policy, may lead to welfare losses. On the other hand, automatic pediatric approval once adult approval is granted may lead to welfare gains from cost savings due to reduced number of clinical trials (which tend to be more costly in the pediatric population) and early and expanded market access of patients to new drugs. While this project focuses on pediatric approvals, I examine whether the model and

[1] For more information on the Pfizer COVID-19 vaccine and its efficacy in pediatric patients aged 5-11, please see the following press release.

conclusions can generalize to any secondary populations, secondary indications, and surrogate outcomes.

My future work in this area involves exploring related projects such as using observational data from off-label use in combination with clinical trial data and results to inform where additional clinical evidence is needed for secondary uses and examining welfare implications and changes in innovation incentives when allowing for changes in regulatory policy of secondary uses. Another natural follow-up to these questions involves diving into how physicians internalize information provided by the FDA and how they weigh clinical trial information vs. experience and learning in making prescribing decisions? When physicians treat heterogeneous patients where clinical trials are only conducted for one population, what types of physicians are most likely to correctly infer efficacy and safety for a secondary population and what does that imply for the current regulatory framework and FDA’s role in disseminating drug information?

I am interested in participating in the Innovation Boot Camp because I believe my research ideas and agenda to be an excellent fit for the topics covered in the boot camp and for the community of scholars attending. In particular, I see this as a wonderful opportunity to interact with researchers thinking of similar foundational or regulatory issues but in different fields, as well as graduate students interested in similar topics as potential future coauthors. Relatedly, while I am familiar with the literature at the intersection of health economics and innovation, I hope this boot camp will expose me to similar theoretical and empirical themes and topics across other fields, thereby helping recognize and solidify foundational themes and similarities of approaches across research areas. Lastly, I hope to be inspired to pursue topics in pharmaceutical innovation creatively, borrowing from theory and empirics from other fields beyond health economics.

HARVARD UNIVERSITY
DEPARTMENT OF ECONOMICS

DAVID M. CUTLER
Otto Eckstein Professor of Applied Economics

LITTAUER 226
CAMBRIDGE, MASSACHUSETTS 02138
(617) 496-5216
dcutler@harvard.edu

January 18, 2022

To Whom It May Concern:

I am writing in recommendation of Ljubica "LJ" Ristovska for the Innovation Research Boot Camp. I recommend LJ extremely highly.

LJ is an unusual student. She grew up Macedonia, came to the US for college, and has worked and studied in the States successfully since. Because of this background, LJ is a bit more 'worldly' than most economics PhD students.

LJ is interested in how to regulate access to new therapies for population groups in which drugs have not been tested. The classic situation here is whether approval of a drug in adults should extend to children. Bridging the gap between adult and pediatric approval is very difficult. On the one hand, not all medications that work in adults work in children – antidepressants and COVID vaccines are two examples. On the other hand, conducting clinical trials in children is costly and time consuming. Thus, it may not be optimal to wait on pediatric trials before making a decision on pediatric approval.

LJ is interested in several aspects of this question. One central issue is to determine empirically the rule that physicians use in extrapolating adult trials to children in the absence of pediatric trials. Do physicians work by weight, age, organ system, or some other rule of thumb? Second, LJ wishes to know how physicians update their decisions when pediatric clinical trials are released. One would hope for a major updating of use when new information comes out, but a good deal of health economics research on adult medicine has not found rapid adjustment to information. Third, LJ wants to use these findings to consider alternative public policies. Should pediatric clinical trials be mandated up front? Are there certain therapies for which extrapolation from adults works well and others where it works poorly? What guidelines should be put on pediatric use of medications before there are pediatric clinical trials?

All told, this is a very ambitious project. LJ is diving into the heart of a major economic and public policy issue, and her results could have wide-ranging impacts. LJ has some results and is currently refining them. I am eager to see put them all together.

LJ has other work ongoing that is similarly interesting. She is working on how nursing home staffing affects clinical outcomes, how COVID affected mortality in different urban environments, and why the gap in health between better educated and less educated areas has increased over time. None of these involve innovation policy as much as the pediatric trials project does, but I raise them to highlight that LJ could be a very strong student on the market and a key contributor to health economics going forward.

Personally, LJ is a pleasure to interact with. She is bright, considerate, widely read, and able to consider multiple points of view. She is also a good speaker. Thus, I believe she would be an asset to other students in the program.

For all of these reasons, I give LJ my highest recommendation for the Innovation Research Boot Camp. Please contact me if you would like additional information.

Sincerely,



David M. Cutler