Jean-Felix Brouillette

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Stanford University
579 Jane Stanford Way
Stanford, CA, 94305

January 20, 2022

Dear Committee Members,

I was thrilled when Professors Charles I. Jones and Peter J. Klenow, my doctoral co-advisors, suggested I apply to the NBER's inaugural Innovation Research Boot Camp (IRBC). I am currently a 4th year doctoral candidate in economics at Stanford University, with strong research interests in economic growth and the economics of innovation.

I am extremely interested in participating to the IRBC, which will be an unprecedented and unique opportunity to engage with a brilliant community of researchers.

For your consideration, I have included a curriculum vitae, a list of all doctoral courses I have completed and an essay describing my current and future research as well as my motivation for attending the IRBC. In addition, Professor Charles I. Jones will provide you with a recommendation letter.

Sincerely,

Jean-Felix Brouillette

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Education

2024	**Ph.D. in economics**, Stanford University Advisors: Peter J. Klenow and Charles I. Jones
2018	**M.Sc. in economics**, HEC Montréal
2016	**B.B.A. in economics**, HEC Montréal

Positions

2019–present	**Research assistant**, Stanford University
2017–2018	**Research assistant**, Northwestern University
2010–2013	**Sprint canoeing athlete**, Canoe Kayak Canada

Fellowships and honors

2020	**Young Scholar**, Lindau Nobel Laureate Meetings
2018	**Graduate fellowship**, Stanford University
2018–2022	**Doctoral fellowship**, SSHRC and FRQSC
2016–2018	**Master's scholarship**, SSHRC and FRQSC
2012–2013	**National sprint canoeing champion (U20)**, Canoe Kayak Canada

Work in Progress

1. "Race and Economic Well-Being in the United States." With Charles I. Jones and Peter J. Klenow. NBER Working Paper 29539, December 2021.
2. "Women Inventors and Economic Growth."

Professional Activities

Referee for: *Econometrica*

List of completed doctoral courses:

1. Microeconomics I (ECON 202), with Professor Ilya Segal at Stanford University.
2. Microeconomics II (ECON 203), with Professor Paul Milgrom at Stanford University.
3. Microeconomics III (ECON 204), with Professors Fuhito Kojima and Matthew Jackson at Stanford University.
4. Macroeconomics I (ECON 210), with Professors Monika Piazzesi and Martin Schneider at Stanford University.
5. Macroeconomics II (ECON 211), with Professors Monika Piazzesi and Pete Klenow at Stanford University.
6. Macroeconomics III (ECON 212), with Professors Adrien Auclert and Patrick Kehoe at Stanford University.
7. Intermediate Econometrics I (ECON 270), with Professor Joseph Romano at Stanford University.
8. Intermediate Econometrics II (ECON 271), with Professor Guido Imbens at Stanford University.
9. Intermediate Econometrics III (ECON 272), with Professors Liran Einav, Luigi Bocola, Luigi Pistaferri and Thomas MaCurdy at Stanford University.
10. Advanced Macroeconomics I (ECON 233) with Professors Chad Jones and Pete Klenow at Stanford University.
11. Advanced Macroeconomics II (ECON 234), with Professors Adrien Auclert, Robert Hall and Sebastian Di Tella at Stanford University.
12. Financial Economics II (ECON 237), with Professors Christopher Tonetti and Martin Schneider at Stanford University.
13. International Finance and Exchange Rates I (ECON 268), with Professor Luigi Bocola at Stanford University.
14. International Finance and Exchange Rates II (ECON 269), with Professor Patrick Kehoe at Stanford University.
15. Industrial Organization I (ECON 257), with Professors Jose Ignacio Cuesta, Liran Einav and Paulo Somaini at Stanford University.
16. Industrial Organization II (ECON 258), with Professors Ali Yurukoglu and Matthew Gentzkow at Stanford University.
17. Labor Economics III (ECON 248), with Professor Isaac Sorkin at Stanford University.
18. U.S. Economic History (ECON 226), with Professors Daniel Fetter and Gavin Wright at Stanford University.

NBER Innovation Research Boot Camp Essay

Jean-Felix Brouillette

January 20, 2022

Economic growth is the product of a handful of people discovering infinitely usable ideas that raise everyone's living standards. With this crucial role, the hope is that our brightest and most creative minds engage in the process of innovation. But is that really the case? In 1976, 3% of inventors in the U.S. were women, and by 2020, that fraction had only moved up to 13% (Toole, Saksena, Degrazia, Black, Lissoni, Miguelez and Tarasconi, 2020). With no gender differences in innate inventive talent, that underrepresentation of women would reveal that the U.S. is missing out on some of its most talented inventors. This raises two questions: (1) What are the barriers faced by those "lost" Jennifer Doudnas? and (2) How costly is the resulting (mis)allocation of inventive talent for U.S. aggregate productivity and welfare?

In an ongoing research project, I intend to provide answers to these two questions through the lens of a general equilibrium model of endogenous growth and occupation choice. In the model developed in this project, individuals must choose whether to pursue a career in innovation considering their talent, but four forces can distort women's decisions: (1) they might be denied due compensation for their inventions because of discrimination in the labor market, (2) they might experience adverse learning environments during the development of skills required in inventive careers, (3) work interruptions due to childcare and housework may disrupt the accumulation or maintenance of human capital on-the-job (Kim and Moser, 2021), or (4) girls might simply not receive the same exposure to inventive opportunities during childhood as boys (Bell, Chetty, Jaravel, Petkova and Van Reenen, 2018). Distinguishing those distortions is critical from a policy standpoint, as interventions might differ in their cost and feasibility. But this is also why it is just as important to be able to quantify the potential economy-wide gains from improving the allocation of inventive talent (Hsieh, Hurst, Jones and Klenow, 2019).

With the crucial but natural assumption that women and men draw from the same *innate* talent distribution, it must be that gender differences in the *quantity* and *quality* of inventions stem from distortions. Through the prism of my model, each distortion has different implications for these two moments, both in the cross-section and over

the life cycle. The data on those moments comes from PatentsView, which contains information on all patents granted by the U.S. Patent & Trademark Office (USPTO) since 1976. In particular, PatentsView uses a series of disambiguation algorithms to uniquely identify inventors over time and determine their gender from their name.

A second research project I intend to pursue in the near future is to study the interaction between creative destruction and frictional labor markets. In the canonical models of growth through creative destruction, labor markets are assumed to be frictionless, that is, when an entrant replaces an incumbent firm, the displaced workers are instantly and costlessly re-allocated to other jobs. However, there is now a large and growing body of evidence that job displacements come with substantial present value earnings losses, which is at odds with the stylized treatment of labor markets in models of endogenous growth. In particular, recent work by Burdett, Carrillo-Tudela and Coles (2020) and Jarosch (2021) show that the degradation of human capital during unemployment is an important mechanism behind the large and persistent costs of job loss.

A question that emerges from these observations is how much lower is the social return to innovation when entering firms don't internalize what their innovation decisions imply for displaced workers? In particular, the resulting creative destruction might (1) raise unemployment (Aghion and Howitt, 1994) and (2) contribute to human capital degradation. If those externalities are quantitatively large enough (as suggested in the job displacement literature), we ought to revise our views on the optimal size of R&D subsidies. To illustrate this, consider the case of Netflix and Blockbuster. How much should the innovation efforts of Netflix be subsidized knowing that, when it replaces Blockbuster, the latter's employees will spend a nontrivial amount of time in unemployment during which their skills and abilities might be depleted?

I intend to answer this research question through the lens of a model of endogenous growth through creative destruction with a frictional labor market. In particular, the model should be carefully calibrated to replicate salient features of (1) the U.S. economy and most importantly, (2) the costs associated with job displacement as estimated in the corresponding literature.

References

Aghion, Philippe and Peter Howitt, "Growth and Unemployment," *The Review of Economic Studies*, 07 1994, *61* (3), 477–494.

Bell, Alex, Raj Chetty, Xavier Jaravel, Neviana Petkova, and John Van Reenen, "Who Becomes an Inventor in America? The Importance of Exposure to Innovation," *The Quarterly Journal of Economics*, 11 2018, *134* (2), 647–713.

Burdett, Kenneth, Carlos Carrillo-Tudela, and Melvyn Coles, "The Cost of Job Loss," *The Review of Economic Studies*, 04 2020, *87* (4), 1757–1798.

Hsieh, Chang-Tai, Erik Hurst, Charles I. Jones, and Peter J. Klenow, "The Allocation of Talent and U.S. Economic Growth," *Econometrica*, 2019, *87* (5), 1439–1474.

Jarosch, Gregor, "Searching for Job Security and the Consequences of Job Loss," Working Paper 28481, National Bureau of Economic Research February 2021.

Kim, Scott Daewon and Petra Moser, "Women in Science. Lessons from the Baby Boom," Working Paper 29436, National Bureau of Economic Research October 2021.

Toole, Andrew A., Michelle J. Saksena, Charles A. W. Degrazia, Katherine P. Black, Francesco Lissoni, Ernest Miguelez, and Gianluca Tarasconi, "Progress and Potential: 2020 update on U.S. women inventor-patentees," Working Paper 2020.

STANFORD

GRADUATE
SCHOOL OF BUSINESS

January 13, 2022

Recommendation for Jean-Felix Brouillette to NBER Innovation Bootcamp

Dear Kevin, Ben and Heidi,

I am writing to strongly recommend **Jean-Felix Brouillette** for the 2022 NBER Innovation Bootcamp. Jean-Felix is a Ph.D. student in the Department of Economics at Stanford University. I met him when he took the Ph.D. class on economic growth that I co-teach with Pete Klenow 2.5 years ago and have been working closely with him ever since, both on a joint research project and as an adviser of his dissertation research. The bottom line of my letter is simple: Jean-Felix is one of the star Ph.D. students at Stanford and would be an excellent addition to the NBER Innovation Bootcamp. I give him my highest recommendation.

Jean-Felix's dissertation is focused on **the effects of race and gender discrimination on economic growth**. He has two very important projects underway on this topic. His sole-authored future job market paper is explicitly about gender and innovation, while his other paper is joint with me and Peter Klenow. I'll summarize both below.

Jean-Felix's main paper is tentatively titled "**Women Inventors and Economic Growth**." The paper studies the misallocation of talent in research and its effects on economic growth. At a casual level, the project can be thought of as "Where are all the female Einsteins?" Given that the innate distribution of talent for men and women in science, medicine, economics, and other innovative fields is naturally thought of as identical, one would expect women to be equally represented in innovation, patenting, and Nobel Prizes in an undistorted economy. Instead, women are sharply underrepresented. This misallocation of talent means that we are all missing out from many brilliant innovations and technological improvements that would make the world a better place: we are not just missing Einsteins, but we are missing the improvements to global living standards that would come from their innovations. Jean-Felix seeks to estimate how large the economic losses are from this misallocation of talent.

Interestingly, there are significant signs of improvement in the past half century. For example, women have gone from representing about 2% of all patent filings in 1975 to more than 10% in recent years. First, notice that these numbers strongly

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suggest that an enormous misallocation of talent remains and that there are important opportunities for economic growth associated with improving the allocation of talent. At the same time, the numbers also suggest that there has been an improvement over time. Jean-Felix quantifies both of these forces and finds that they are large. For example, improving the allocation of talent could easily raise U.S. growth rates by 0.3 percentage points in coming decades. I think very highly of this paper and discussed it in my new essay for the *Annual Review of Economics*.

The joint paper with me and Pete is "**Race and Economic Well-Being in the United States**." In this paper, we construct a measure of consumption-equivalent welfare for Black and White Americans from 1940 to 2018. Our statistic incorporates life expectancy, consumption, leisure, and inequality in consumption and leisure. According to our estimates, the welfare of Black Americans started at only 47% of that for White Americans in 1984 and rose to 69% by 2018. The remaining gap in welfare is large, suggesting there is still a substantial misallocation of talent due to discrimination. But at the same time, there has been significant progress. This progress occurred because of increases in relative life expectancy and consumption of Black Americans relative to White Americans, with both forces playing roughly equal roles.

I would also like to emphasize Jean-Felix's high level of motivation and commitment to his research. Jean-Felix is extremely talented and well-trained and I think he would be a fantastic participant in the NBER Innovation Bootcamp. Pete very much feels the same way and echoes this recommendation.

Please let me know if I can be of further assistance.

Sincerely,



Charles I. Jones
STANCO 25 Professor of Economics