January 20, 2022

NBER Innovation Research Boot Camp 2022
Application Committee

Dear Professor Bryan, Professor Jones, Professor Williams,

I am writing to apply for the NBER Innovation Research Boot Camp 2022 that was recently announced. I am currently a second year PhD student at Stanford University , having previously completed my MSc in Economics at University College London. My research interests are in the fields of macroeconomics and labour, with a focus on misallocation and labour. As such, I am very interested in participating in the NBER Innovation Research Boot Camp this summer, where I hope to develop valuable insights to support my research in these topics.

My research interests are directly relevant to innovation and sub-fields that will be discussed at the bootcamp, and I believe I would be well-placed to participate. I'm interested both in how structural change and government policies can have implications (both intended and unintended) for the incentives to innovate, and in how innovation can have wider effects on the economy that policy must respond to. My current research focuses on the impact of non-compete agreements on labor markets and innovation, particulalry on how they affect the incentives of incumbent firms to innovate and adopt new technology, and the constraints they place on the entry of new firms. I also a number of ideas surrounding the interaction and impact of innovation policy with other policy decisions, particularly trade, immigration, and competition policy.

In addition to these ideas, I would bring an international perspective to the Boot Camp, particularly knowledge of European data and innovation policies. Moreover, working at a central bank has also given me insight into the policy-making process and the concerns of policy makers that are central when thinking about existing innovation policy, and potential constraints on optimal policy. This is particularly relevant to my research interest in global spillovers from innovation, where the interests of a national policy maker may well not align with those of a global social planner.

I believe I would find the Innovation Research Boot Camp very valuable - as a researcher still very early in my career, I would deeply appreciate the opportunity to discuss my ideas with others in the field, both for exposure to different perspectives and techniques, particularly given the expertise of the instructors, and in the hopes of finding future collaborators or shared interests.

Please find enclosed my curriculum vitae, list of current and completed PhD courses, and two page essay. My full contact information is above, and the information of my recommendation letter writer are below. I would be happy to supply any additional materials or information as required. Thank you very much for your consideration.

Sincerely,

Emma Rockall

Contact Information:

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Recommendation Letter Writer:

Professor Pete Klenow,
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Emma Rockall

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Education

2020– **Stanford University: PhD in Economics**

2018-19 **Warwick Business School: Certificate Central Banking & Financial Regulation**

2016–17 **University College London: MSc Economics**

2017 Distinction in MSc Economics

Distinction in dissertation: 'Did the Introduction of the National Minimum Wage Improve the Health of Low-Paid Workers?'

2013–16 **Wadham College, University of Oxford: BA (Hons) Philosophy, Politics and Economics**

Funding and awards

2016–17 Bank of England Postgraduate Sponsorship Scheme (fees and stipend for MSc Economics)

2014, 2015 Undergraduate scholarship, Wadham College (renewed 2015)

Employment and relevant experience

2017–20 **Economist, Monetary Analysis, Bank of England**

2018–20 Member of Household team in the Structural Economics Division, conducting medium- and long-term research on the role of households within the economy and operation of monetary policy.

- Authored multiple internal papers on effect of credit availability, balance sheet positions and uncertainty on consumption, and on pass-through of Bank Rate to retail interest rates.
- Organised an internal conference of external academics on the role of heterogeneity in the transmission mechanism.
- Supported the production of the Bank's quarterly forecasts by examining the importance of precautionary saving historically in the UK.
- Developed framework for the response of consumption to COVID-19, which I presented to the Monetary Policy Committee and was the basis of the 2020Q2 consumption forecast.

2017–18 Member of Monetary Transmission Mechanism team in the Monetary Assessment and Strategy Division, monitoring and assessing interest rate and inflation expectations.

- Contributed to paper by chief economist Andy Haldane on importance of central bank communication and transparency using microdata from survey of household expectations to show the impact of knowledge about central banks on inflation expectations.

2015–16 **Summer Intern, Monetary Analysis, Bank of England**

2016 Eight-week project on how to best utilise high frequency indicators to assess the immediate economic impact of the 2016 European Union referendum and inform monetary policy response.

- Produced a review of all high-frequency indicators available and a literature review of existing internal and external research using novel indicators and 'big data'.
- Built nowcasting and near-term forecasting models for car registrations, retail sales, house prices and unemployment using Google Trends data and compared their performance to a variety of baseline models.

2015 Eight-week internship in Structural Economics and Analysis Division, conducting a comparative analysis of UK source of income data.

- Worked on a project examining structural changes in job to job flows, extending the Labour Force Survey data on file back to 1979 and cleaning it to produce descriptive analysis.

2014 **Summer Intern, Wealth Management Division (Sydney), UBS**

- Conducted market research project on Australian aged care provision industry, performing data analytics on existing care providers, demographic trends and areas of growth.
- Assessed the potential impact of new legislation and lower interest rates on the industry.

2014–15 **Academic and Careers Officer, Wadham College Student Union, University of Oxford**

- Worked with senior tutor and college staff to review and amend academic monitoring procedures and suspension policy.
- Established a graduate study advisors scheme.

Teaching experience

2018–20 Taught maths to high-performing students at a local secondary school as part of the Bank of England's community outreach programme.

Relevant skills and courses

Skills Proficient in: Stata, R, Eviews, MATLAB, Dynare and Julia

Courses **Tools for macroeconomists: the essentials (LSE, 2019)**
Five-day course taught by Wouter den Haan and Petr Sedlacek on the key techniques to analyse and estimate macroeconomic models, including numerical analysis, projection and perturbation methods. Practical exercises in MATLAB and Dynare.

Heterogeneity, monetary policy and the business cycle (Bank of England, 2019)
Three-day course taught by Vincent Sterk on solving and estimating HANK models and how they compare to standard representative agent models. Practical exercises in MATLAB and Dynare.

Publications and working papers

Bunn, Phil, Jagjit Chadha, Thomas Lazarowicz, Steven Millard and Emma Rockall. *Household Debt and Labour Supply.* Bank of England Staff Working Paper No. 941, September 2021.

Panigrahi, Lisa, Harry Rigg and Emma Rockall. *The Financial Position of British Households: Evidence from the 2018 NMG Consulting Survey.* Bank of England Quarterly Bulletin, December 2018.

Rockall, Emma. *Could knowledge about Central banks impact households' expectations?.* Bank Underground (blog), 22 October 2018. https://bankunderground.co.uk/2018/10/22/could-knowledge-about-central-banks-impact-households-expectations/.

Bracke, Philippe, Emma Rockall, Hasdeep Sethi and Catherine Shaw. *The Financial Position of British Households: Evidence from the 2017 NMG Consulting Survey.* Bank of England Quarterly Bulletin, December 2017.

List of PhD Courses

MSc Level Courses (UCL)

- Research Methods (ECONG100)
- Microeconomics (ECONG021)
- Macroeconomics (ECONG022)
- Econometrics (ECONG020)
- Advanced Microeconometrics (ECONG009)
- Time Series Econometrics (ECONG004)
- Behavioural Economics (ECONG050)
- Health Economics (ECONG041)

PhD Level Courses (Stanford)

- Microeconomics I (ECON202)
- Microeconomics II (ECON203)
- Microeconomics III (ECON204)
- Macroeconomics I (ECON210)
- Macroeconomics II (ECON211)
- Macroeconomics III (ECON212)
- Econometric Methods I (ECON270)
- Econometric Methods II (ECON271)
- Labor Economics I (ECON246)
- Labor Economics II (ECON247)
- Advanced Macroeconomics I: Growth and Misallocation (ECON233)
- Heterogeneity in Macroeconomics (ECON237)
- Macroeconomics and Financial Markets (ECON236)
- Development Economics II (ECON215)

NBER Innovation Research Boot Camp 2022: Research Statement

Emma Rockall

I have long been interested in the forces driving growth and structural change in economies, whether through revolutionizing technologies, institutional change or shifts in the balance of global power and trade. I believe understanding innovation and its interaction with policy is central to being able to understand questions. In particular, I'm interested both in how structural change and government policies can have implications (both intended and unintended) for the incentives to innovate, and in how innovation can have wider effects on the economy that policy must respond to. On the first of these themes, one of my current research projects is focused on the impact of non-compete agreements (NCAs) on labor markets and innovation. NCAs are a 'restrictive covenant' used widely in employment contracts in the US, which prevent the employee in question from competing with their employer by joining a rival firm or starting a new firm within the industry for the duration of the clause (typically up to two years). A large proportion of the US workforce is covered by an NCA – a 2017 survey of firms (Colvin and Shierholz, 2019) suggest somewhere between 30-45% of the US private sector workforce are subject to an NCA. Moreover, the use and enforcement of NCAs has been growing, with a 95% increase between 2000-2012 in the number of cases of an employee being sued by their former employer over a breach of an NCA. More recently, however, some states have begun to restrict their use and enforceability, and the Biden administration is currently considering restricting their use at a federal level.

Non-compete agreements (and restrictions on their use) are likely to have far-reaching consequences on both labor markets and innovation. Although innovation incentives are the reason most touted for the need for NCAs, the full effect of NCAs on innovation are likely to be nuanced, with the net effect theoretically ambiguous. While it is the case that incumbents may have more incentive to innovate if NCAs can allow them to better protect their trade secrets, and thus appropriate the returns to that innovation, they can also have a chilling effect on innovation through limiting entry and creative destruction (by preventing former employees from starting rival firms and restricting the ability of entrants to attract workers). They might also affect endogenous innovation decisions by reducing 'external diffusion' – the ability of other firms to adopt new technologies produced by leaders. This is because many technologies diffuse through economies by the movement of staff between firms. But on the flipside, the presence of NCAs may encourage 'internal diffusion' – the exchange of ideas internally within firms, if firms are less likely to silo employees internally due to trade secret concerns, which may increase new innovation by incumbents.

The net effect of NCAs on innovation is thus potentially large, but ambiguous. Although they have been an area of legal focus for a while, the economic literature around them is relatively small, and even fewer papers consider the impact of non-compete agreements on innovation. Conti (2014) shows that over 1990-2000, firms in states where NCAs are enforceable pursue 'riskier' RD paths, although by relying on existing state level differences they are not able to identify any causal effect of NCAs. Carlino (2021) and Starr, Balasubramanian and Sakarkibara (2017) both consider the entry dimension, looking at state level start-up activity and within-industry spinouts,respectively. But there has been no work looking at the impact of NCAs on the diffusion of technologies, and very little work on how they impact firm's endogenous innova-

tion decisions, much less an attempt to bring all these channels together. My aim is therefore to attempt to formalise these competing channels in a model and use the recent state level changes in the enforceability of NCAs to estimate and quantify them, making use of firm-level micro data, household survey data and patent data. My hope is that through doing so, my work could identify the net effect of NCAs on innovation, the trade-off with labour market outcomes, and the extent to which their optimal use may vary by sector (and thus the extent to which it may be optimal to restrict their use for certain sectors or groups of workers).

On the second theme, I am also concerned more broadly with the interaction and impact of innovation policy with other policy decisions, particularly trade, immigration, and competition policy. Much of the innovation and endogenous growth literature considers innovation in the context of a large closed-economy model, where domestic firms and entrants choose their innovation and entry decisions in essentially a closed system. There have been interesting exceptions to this – for example, Perla, Tonetti and Waugh (2021) consider the impact of trade and globalization on technology diffusion and growth, with the gains from trade operating through encouraging technology adoption. And Prato (2021) looks at how the migration of inventors affects innovation and knowledge diffusion. But there remain many important unanswered questions around the adoption of technology across borders, the impact of globalization and trade on incentives to innovate, and the size and presence of global spill-overs from innovation.

For example, although a number of papers have found a large social return to innovation, suggesting governments should optimally fund more RD (e.g. Bloom, Schankerman and Van Reenen (2013), Akcigit, Hanley and Serrano-Varlarde (2021)), they ignore that in the presence of global spill-overs to innovation, governments may instead have the incentive to 'free-ride'. At the very least, it may seem that they may do better to subsidise technology adoption and 'catch-up' rather than new innovation or basic research. In this case, a 'national social planner' may optimally choose lower RD investment than a 'global social planner', due to the international positive externalities from research and innovation. This would have interesting implications for the extent to which research and funding programmes should be globalised. For instance, the creation of the EU led to much of the research funding across the bloc being centralised through the European Research Council (and the Horizon 2020 framework more generally). To the extent that such programmes internalise some of the global positive externalities between countries in the bloc, they should choose to fund RD to a greater extent than the countries individually would want to. To consider the benefits of these policies, we require a greater understanding of the impact of trade and globalisation on firms' own innovation decisions, and on the spill-overs of these decisions to firms internationally.

I would like to attend the NBER Innovation Research Boot Camp, as I believe it will give me a strong foundation to pursue these topics, benefiting from the expertise of leaders in the field, as well as exposure to related ideas that hopefully will spark further questions for me to engage in. I would particularly value the insight of the instructors of the boot camp, and the other participants, on datasets related to innovation, particularly novel ones, given the data challenges many of these questions face. Moreover, I would deeply appreciate the opportunity to discuss ideas and possible collaborations with others in the field, both fellow current and recent graduate students, and professors from other universities. This Innovation Research Boot Camp presents a unique opportunity to be able to do, and I would love to participate.

References

[1] U. Akcigit, D. Hanley, and N. Serrano-Velarde, *Back to basics: Basic research spillovers, innovation policy, and growth*, Strategic Management Journal, 88 (2020), pp. 1–43.

[2] N. Bloom, M. Schankerman, and J. Van Reenen, *Identifying technology spillovers and product market rivalry*, Econometrica, 81 (2013), pp. 1347–93.

[3] G. A. Carlino, *Do non-compete covenants influence state startup activity? evidence from the michigan experiment*, Working Paper, (2021).

[4] A. Colvin and H. Shierholz, *Noncompete agreements: Ubiquitous, harmful to wages and to competition, and part of a growing trend of employers requiring workers to sign away their rights*, 12 2019.

[5] R. Conti, *Do non-competition agreements lead firms to pursue risky rd projects?*, Strategic Management Journal, 35 (2014), pp. 1230–1248.

[6] J. Perla, C. Tonetti, and M. Waugh, *Equilibrium technology diffusion, trade, and growth*, American Economic Review, 111 (2021), pp. 73–128.

[7] M. Prato, *The global race for talent: Brain drain, knowledge transfer and growth*, Job Market Paper, (2021).

[8] E. Starr, N. Balasubramanian, and M. Sakakibara, *Screening spinouts? how non-compete enforceability affects the creation, growth, and survival of new firms*, Management Science, 64 (2018), pp. 552–572.

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January 19, 2022

Dear NBER Innovation Boot Camp Selection Committee,

I am writing to enthusiastically recommend **Emma Rockall** for a spot in the 2022 NBER Innovation Boot Camp.

Emma is a 2nd year PhD student in the Stanford Economics Department. She took my first-year PhD course on Economic Growth, as well as my second-year PhD course on Economic Growth that I co-teach with Chad Jones. I have been her advisor since June of last year.

Emma would be a great fit for the program. Innovation, growth, and firm dynamics is her primary area of interest. As I describe below, she has a promising research idea about the impact of noncompete agreements on innovation and has shown considerable talent so far in her her RA work for me.

Taking part in the Innovation Boot Camp would be particularly valuable for Emma because it would superbly complement the growth modeling perspective she gets at Stanford from Chad Jones, Chris Tonetti, and myself. The Boot Camp would expose her to a wider array of models, questions, and datasets with a much more applied micro orientation. Of course Heidi Williams and Nick Bloom are here, but the Boot Camp would provide an intensive and formal way to soak up and learn from a broad range of talented and active scholars that will help her when she returns to Stanford.

Emma would be a wonderful asset to have in the Boot Camp. She is creative and talented in terms of both empirical and modeling skills. She is highly personable and interactive. In fact, she and Mohamad Adhami (whom I am also recommending for a spot) have organized social activities for our 1st year PhD students and student morale has soared as a result.

Emma is a research assistant on a project I have with Chang-Tai Hsieh on "Misallocation versus Inequality in India." We are making the simple point that reducing misallocation in India might entail lower tax rates for formal firms (relative to those facing informal firms), and such firms are owned by and employ higher educated individuals. We can see from the Indian National Sample Survey (NSS) that large firms pay dramatically higher wages than informal

firms and employ more educated workers. This is true in all sectors: manufacturing, retail, services, and more. And we can see from the Indian Annual Survey of Industries (the ASI, for manufacturing) and big firms in Prowess (all private industry) that larger firms appear to have much higher average products of capital and labor (the latter even adjusting for worker skill). Thus reducing misallocation in India is likely to substantially raise the demand for skilled labor relative to unskilled labor and drive up the already high skill premium. This would worsen consumption inequality, which we can also see from modules of the NSS. On the upside reducing misallocation might incentivize more human capital accumulation and more innovation by firms. A key question, however, is how much higher consumption inequality undermines the gains from reducing misallocation. It could even affect political support for policies reducing misallocation and raising efficiency. Emma has done fantastic data work on this project blending the Survey of Unorganized Manufacturing (yet another module of the NSS) with the ASI. We already plan to give her co-authorship on the paper.

For her own research, Emma has alit upon an exciting topic of analyzing the effects of noncompete agreements (NCA′s) on innovation. This is a fascinating and rich topic. NCA′s restrict the ability of employees to work in the same occupation for another firm or a new firm they create. NCA′s are allowed and enforced to varying degrees in various states and industries, and in ways that differ over time. Thus she can study their effects using a panel of industry-state-years. A key motivation for NCA′s is to allow firms to reap a higher share of the returns from their innovation, rather than let their employees capture these benefits. Yet California famously restricts them in all industries, and some have speculated that this is one reason for Silicon Valley (noting the large number of spinouts from Fairchild Semiconductor). So do NCA′s encourage or discourage innovation on net? By looking at patents Emma wants to understand whether they boost innovation by incumbent firms but inhibit innovation by new firms. With patent data she can even trace innovation to inventors moving among firms, and see whether this occurs more in state-industry-years without NCA′s. There are many other angles to NCA′s, of course, like worker mobility, bargaining power, wages, and human capital accumulation. So this is rich and well-motivated topic with promise to shed light on a key policy affecting innovation.

To recap, I enthusiastically and highly recommend Emma Rockall for a spot in the inaugural NBER Innovation Boot Camp based on her research potential, research interest, and interactive nature.

Yours Sincerely,

