To boot camp application review committee, January 16, 2022

I am writing to express my interest in the National Bureau of Economic Research's (NBER) innovation boot camp. I am a third-year economics PhD student at NYU Stern School of Business. My research interests are development, innovation, and economic history. My advisor, Petra Moser (pm119@stern.nyu.edu), agreed to write a recommendation letter for me to apply for this program.

In my second year of doctoral studies, I first learned about economics research on innovation and entrepreneurship in my second year of PhD. While I enjoy reading innovation papers, I am still having trouble identifying research frontiers or gaps in the current literature. Furthermore, I am not aware of many peers in my department that are interested in contributing to the economics of innovation. I believe getting to know other PhD students or early career researchers will be a vaulable experience.

Thank you for reading my application.

Sincerely,

Youn Baek

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Youn Baek

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EDUCATION

NYU Stern School of Business *2019 - Present*
Ph.D. in Economics

Korea University *2018*
M.A. in Economics

Korea University *2016*
B.B.A. in Business Administration

Arizona State University *2016*
Exchange Student

INTERESTS

development, innovation, economic history

RESEARCH

Works in progress

Beet sugar: an exploration of agglomeration spillovers

Labor scarcity and land reform in South Korea

FELLOWSHIPS AND AWARDS

2019-2023	Doctoral Fellowship, Ilju Academic Foundation
2019	Doctoral Fellowship, Kwanjeong Educational Foundation (declined)
2019-2024	Doctoral Fellowship, NYU Stern
2017	Honors Scholarship, Korea University Graduate School
2016	Undergraduate Thesis Grant, Korea University
2015-2016	Undergraduate Fellowship, Korea Foundation for Advanced Studies

PRESENTATIONS

2019: NEKST conference **2018**: Asian and Australasian Society of Labour Economics, Korean Association of Public Finance Fall Conference, International Conference of the Association of the Korean Economic Studies, Korean Association for Applied Economics PhD session, Korean Association of Public Finance Spring Conference, Korea University-Pusan National University BK21 PhD Conference.

Last updated: January 16, 2022

Research summary

Youn Baek *

January 16, 2022

My research interests are economic development, innovation, and economic history. In my current project, I am looking into agglomeration economies and knowledge spillover by investigating the effect of establishing beet sugar factories on agricultural and manufacturing productivity increases in the United States between 1900 and 1940.

This project was motivated by historical accounts that showed the benefits to establishing sugar beet industry. There were a number of reasons to anticipate positive effects. The sugar beet cultivation required heavy plowing and fertilized the fields, increasing the yields of other crops. Furthermore, the sugar beet businesses recruited agriculturalists to advise farmers on how to raise high quality sugar beet, as well as other crops. Roy Blakey, an economics professor at Cornell, wrote in his 1913 Journal of Political Economy article that every sugar beet factory is a kind of "agricultural college" as it spreads enlightenment and increases agricultural productivity in virtually every place it enters[1].

Sugar beet is a bulky crop with a limited range of geographical suitability. They were frequently built in rural locations even when population density is insufficient to support construction. The sugar beet factories boosted demand for intermediate inputs for manufacturing goods and more scientific workforce. Bags for containing the sugar, thread for sewing the bags, chemicals and filter aids, valves, pipes and fittings, copper and brass tubing, boiler tubes, refractories, lime rock, new construction and machinery equipment were all needed by the beeg sugar factories, which employed chemists, engineers, machinists, founders, carpenters, blacksmiths, coppersmiths, wheelwrights, plumbers, woolen and linen manufacturers. I found multiple descriptive evidence at the town or city level indicating the sugar beet business increased railroad revenue and population.

I use runner-up locations as a counterfactual group for sugar beet factory counties to find the causal effect of sugar beet factories. I found the suggested locations for beet sugar factories in a monthly commercial journal on sugar beet industry. I contrasted counties that were supposed to have sugar beet factories versus counties that were supposed to have

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[1]Blakey, R.G., 1913. Beet sugar and the tariff. *Journal of Political Economy*, 21(6), pp.540-554.

factories but didn't wind up having any. The site of the sugar beet facility was determined by a number of factors that were not always easily observable. However, the list of potential locations was generated by people who had a stake in the outcome, so it's reasonable to think that the runners-up will be able to assist us in observing counterfactual outcomes. In my preliminary analysis, I find that those treatment and control groups are balanced, and the differences-in-difference estimates show that the construction of sugar beet factories led to agricultural and manufacturing productivity growth.

Another intriguing aspect of my research setting is the experiment conducted by the United States Department of Agriculture. The sugar beet business began in Europe, and various attempts were made by American entrepreneurs to embrace this new technology from Europe, some of whom were abolitionists who wished to provide an alternative for cane sugar produced on slave plantations. However, the sugar beet business in the United States has struggled for decades, due to a lack of understanding about where to grow sugar beets. The sugar beet industry in the United States did not take off until USDA chemists disseminated sugar beet samples to potential locations in the US and evaluated the sugar content of the sample at the end of the year between 1890 and 1900. In addition to studying agglomeration economies, I intend to quantify the effect of federal RD on new technology uptake. I digitized the records from the experiments that showed the quality of beet sugar in various regions. According to historical records, the government experiment reduced investment uncertainty, putting this industry on its feet.

This study project made me realize how critical it is to have a scientific workforce that have the potential for positive externality. There may be a scarcity of engineers and scientists in the economy if people chose their occupations to maximize their utility and do not consider the external effects of occupations on the economy. With this idea in mind, I'm evaluating the impact of an engineering education program in one of my early stage studies. I'm not going to say what this setting is because there's still a lot of work to be done on this project.

I planned to specialize in development economics and political economy when I started my PhD program. I just learned about innovation and science economics after taking in a second-year course. The articles in the syllabus sparked my curiosity, and I began to think about issues around innovation. Having the opportunity to attend the NBER's innovation boot camp will help me better understand the literature and the important research questions that should be explored.

Taking classes from prominent researchers would be fantastic, but meeting other PhD candidates working on similar topics could have a longer-term impact on my research career. In my graduate program, I am surrounded by inspiring colleagues, but few of them work on innovation or entrepreneurship. Interacting with people that have similar interests

to me will undoubtedly increase my research productivity.

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January 14, 2022

Dear Kevin, Heidi, and Ben,

It is a pleasure to recommend **Youn Baek** for the NBER's inaugural Summer Bootcamp on Innovation. Youn is extremely smart, hard-working, and energetic. He'd be a great addition to the bootcamp and would benefit greatly from interacting with other innovation faculty and students. In fact, I would be surprised if he had not started another project by the end of the bootcamp, hopefully his job market project.

I have interacted regularly with Youn since Fall 2020. We first met on NYU's visit day for admitted student. In Fall 2020, he took my PhD course in Applied Microeconomics. This last fall he was the teaching fellow for my MBA class "Economics of Creativity and Innovation." In the current semester he is working as my research assistant this term on a project about shell shock, and how exposure to trauma affected the productivity of scientists after World War II. He has also become my advisee and we are talking regularly about his research on the persistent effects of war time mobilization in Korea, on the productivity effects of sugar beet factories, and on the long run productivity effects of engineering training.

In my PhD class, Youn stood out because he is exceptionally thorough. For an assignment, I ask my students to discuss one or two of the papers on the syllabus. Youn shocked me (and his classmates) by replicating the entire paper and catching errors in the estimation.

Youn is extremely productive. At the end of our PhD course, he had completed a substantial draft of an original analysis of the long-run effects of war-time mobilization in Korea. Through his research of archival documents and digitized war records, Youn shows that war-time mobilization, which weakened the power of Korea's exploitative rural elite, helped pave the way for redistributive policies that resulted in higher levels of education and economic growth. With a bit of help on the writing, the paper has a good shot at a top field journal like the *Journal of Economic History* or *Explorations in Economic History.*

In spring 2020, when he took a class on economic development, Youn started another promising project, on the localized productivity effects sugar beets. In this project he examines the effects of the establishment of a sugar beet factory on productivity growth in agriculture and manufacturing. To identify the causal effects of establishing factory on productivity, Youn compares changes in productivity growth in counties that get a factor with runner up locations.

The sugar beet project exemplifies Youn's resourcefulness and drive. As you can imagine, identifying locations that almost got a sugar beet factory is not straightforward. Youn, however, was able to extract this information from a monthly trade journal for the beet sugar industry. After testing that the pre-construction characteristics of winners and losers are comparable, Youn estimates difference-in-differences regressions comparing changes in productivity after the construction of a sugar beet plant . His preliminary analyses indicate that the establishment of a sugar beet factory increased agricultural and productivity growth.

An extension of this project examines the productivity effects of government-funded R&D. Beets are a small share of sugar production in the United States, while they are much more prominent in Europe. Abolitionists had favored sugar beet as an alternative to cane sugar, which relied heavily on enslaved workers. Yet, the sugar beet making did not take off until the

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1980s, when chemists of the US Department of Agriculture (USDA) conducted thorough analysis of the sugar content of beets chemists disseminated sugar beet samples to farmers in the United States. Youn proposed project (which I think has potential to turn into a job market paper) investigates the effects of this information campaign on the adoption of sugar beets. To pursue this project, he has already digitized records of experimental data on the quality of beet sugar across US locations and he is getting ready to perform empirical analyses this spring.

For spring 2022, Youn asked whether he could work as my research assistant, and we started a new project on "shell shock." Our project investigates how exposure to war-time trauma affects productivity. Data for our analyses include detailed biographies, including information on university education, employment histories, and military service, for 90,000 American scientists in 1956. I have matched these scientists with their patent records, to measure changes in productivity. Our joint project uses this information to examine how exposure to combat trauma affected the productivity of US scientists after WWII.

Preliminary analyses reveal a large and persistent decline in inventive output for scientists who were exposed to combat, while placebo estimates for scientists with non-combat assignments show no change in productivity. These comparisons suggests that the drop in productivity cannot be explained by work disruptions, and instead appears to have been the result of trauma. To extend this work, we are currently matching scientists with records of hospital admissions. Once complete, these data will allow us to control for the severity of shell shock.

This fall, Youn served as a teaching fellow for three separate classes. I did not know this when he asked whether he could teach for my MBA class "Economics of Creativity and Innovation." Had I known what he planned, I certainly wouldn't have hired him or allowed it (which is probably why I wasn't told). Unincumbered by my advice, Youn managed to fulfil all of NYU's teaching requirement in one term. Despite the heavy teaching load, Youn did an outstanding job. He helped me with grade weekly 300-word reflections and two group presentations for ten MBA students. All students submitted their evaluations and gave a score of 5 out of 5. Several students commented on Youn's thorough comments on their reflections and group projects.

To sum up, Youn is an impressive student who would be an asset to the bootcamp and who'd also benefit immensely. He is smart, hard-working, and resourceful. Only in his third year, he already has an impressive pipeline of four papers. I'm absolutely thrilled that he wants to study innovation and I think that the bootcamp would be extremely valuable for his research. Please do not hesitate to contact me with further questions (pm119@nyu.edu).

Best regards,

