

Dear Norm –

I am not a recipient of your e-newsletter, but your comment on my paper was forwarded to me. I respond to your criticisms below. You are welcome to forward this to your email newsletter or keep it just between us, but I ask that you do send this note in its entirety and uncut if you do forward it on.

This morning I further received an updated note which includes direct correspondence between us. I unfortunately won't be able to properly review this until later. This note is only in reference to your original newsletter, which is copied at the very end.

I use the pronoun "I" below exclusively. For many aspects related to the paper itself, this would better be termed "we" to include my coauthor. My coauthor has provided several comments incorporated below. But, the original email exchange was just between us, and so it seems easiest to keep a single pronoun throughout.

The General Tone of the Debate

Before jumping into the points raised regarding the H-1B paper itself, I do want to apologize for offense that you took with my lack of reply. I have not ignored or trivialized your comments in the least. I have thankfully collected comments from many people now, either through email distributions or comments at seminars, and I am considering all of them closely.

Your comments have been among the most thoughtful on the paper. I was certain you would dislike the paper when I sent it to you. Your negative reply within five minutes of my hitting send, based upon reading an abstract that by custom is limited to 100 words, confirmed that. But still, even if your opinion is set on the issue, I can learn a lot from your perspectives and concerns.

As an aside, you suggest that the paper will be cited by many industry lobbyists. I have certainly heard positive reactions from some readers on the industry side, but others have also been upset that I did not find a strong crowding-in effect for natives. They argue that the study under-represents beneficial effects for American workers, for example in terms of job creation in other occupations like support staff.

I recognize that I will not sway the most ardent in either direction, and I personally do not have a prior opinion on what the results "should be". I can promise that finding stronger effects for inventors with English names – in either direction! – would have been a bigger career boost in academic circles. But, this a scientific matter, and I will report as accurately as possible what the data say.

You seemed especially upset about the fact that your comments are not reflected in any revision of the paper. Simply put, the working paper is still the same that I sent to you. The refereeing process in economics takes literally years and the published version will look different on many dimensions. I remain very convinced of the central message of the working paper, otherwise I would pull it. But given the sensitive nature of the topic at hand, I will not partially revise the working paper here and there. This can be unfair to those reading the work and commenting on it.

So, in the end, I again sincerely apologize for the offense that you took. I believe the whole H-1B debate, as well as the larger questions of immigration to the US, could be more productive if the discourse was less antagonistic. I hope I did not spoil future exchanges between us.

Specific Comments on the Paper

Much of what I am hoping to do in this email is to be clear about what the paper says and does not say. My condition for talking with anyone writing a story about this paper is that they present the findings in their true, scientific form. They may then draw their own conclusions, suggest strengths and liabilities of the work, and so on. But the paper is to be viewed as scientific paper, not a policy document. Clarifying some of the issues you raised may help to that end.

- To your first paragraph, the study was not just released. It was released last December when I sent the working paper to you and about 50 other scholars and industry observers. I apologize if this was not clear in my original email. It is a working paper for submission to an academic journal and to solicit feedback. The study certainly received more attention over the last few weeks, but it has been available for a couple of months.
- To your first paragraph, I regret using the term “shocking”. This a term common in the theoretical economics literature to indicate isolating the treatment effects from changing one and only one external factor. I used the term while discussing the economic theory models in which the paper’s empirical analysis is embedded.

In writing this paper, I needed to balance two groups of readers. This paper is ultimately for publication in an academic economics journal, and thus the exposition speaks to this audience primarily. The potential broader readership of the paper, however, led me in several cases to look for substitute phrases. I should have found a better term in this context.

- To your second paragraph, I do not make any empirical statements about one ethnicity being more inventive than another. The entire analysis is about trying to understand how the composition of US invention was influenced by the H-1B program.

The results find that Indian and Chinese invention rose as a share of US patenting with higher H-1B populations. Given that the first-order effect on the program is for letting more of these immigrants into the US for work, we should expect to see relatively higher responses from inventors with these ethnic names. And that is what the paper finds.

One can further wonder whether inventors become more or less productive depending upon the characteristics of other inventors surrounding them. However, it is very hard to disentangle this productivity factor from population sizes. The patent data do not contain unique inventor ids, just inventor names. So, I can’t say whether more inventors with the “Gupta” surname represents higher productivity of existing inventors with that surname or a greater number of distinct inventors.

Finally, and most importantly, I could never say with this data whether someone is more or less innovative. Even if I correctly linked unique inventors, I have no data about the inputs and efforts they make into patenting activities. The best inventor may only have one patent if he or she is working on other fronts simultaneously. A lower productivity inventor may have more patents if that is all he or she does.

A recent paper by Hunt and Gauthier-Loiselle provides the best evidence on this question of which I am aware. They report that immigrants patent more primarily due to being more

involved in science and engineering, versus an inherent difference in productivity. While you might like this finding, you won't be too happy with their strong crowding-in effects however.

Bottom line, my empirical analyses do not say anything about how innovative different inventors are based upon their ethnicity. I can only measure how the composition of patenting adjusted. That effect will be a net effect that includes both changes in the number of inventors of different ethnicities and changes in patenting rates by individuals. This paper should be solely viewed in terms of the net composition effect.

- No comments on paragraphs 3 and 4 except as noted above.
- To your fifth through eighth paragraphs, I discuss in the paper how the H-1B allocation is an outcome of a national political economy process. I also describe our concern for isolating the effects of the H-1B program from other contemporaneous trends like booms and busts. I firmly believe the paper is a solid scientific treatment of the link between H-1B policies and US invention, which should be welcome for discussing a sensitive topic that has relied too much on case studies and anecdotal evidence.

In terms of controlling for omitted factors – like the differential effects of boom-bust cycles – I include measures of expected patenting by city-ethnicity in the estimations. In terms of the political economy forces, I examine effects in places that have little or no influence on the program. I run a counterfactual experiment for Canada and drop the patenting of firms that do lots of lobbying on H-1B issues.

I won't repeat all of those arguments here, but I do feel your representation in the newsletter is unmerited. The first-order effects that you mention are directly discussed in the paper. If readers believe that the controls and techniques are insufficient, then I hope they suggest to us the deeper factors that are leaking through into the estimates.

As to your statistical note regarding multicollinearity, I believe the estimates are again sound. I have tested many variants of the model, and the results show no evidence of exhibiting the large sensitivity to the model's specification that is symptomatic of problems with multicollinearity. For the most part, the paper's techniques are standard in the labor economics literature. I also specifically chose our technique to have the highest transparency.

- To your comment "the authors' analysis boils down to showing that more patents are produced during booms", I must strongly disagree. First, I would point to the very tight specifications and comparisons being made, as discussed above.

Second, the paper measures effects relative to existing inventor group sizes across ethnicities. Technically, this is where the logs and panel effects come in. If the results were merely "more patents", the effects would be the same for each ethnicity. 10% more patents would result in 10% more Indian invention, 10% more English invention, and so on. The ethnic composition of invention would be unchanged.

Instead, there is an ethnicity-specific component to the patent growth. Even if we change the argument to "more high-tech patents", the relative sizes of the inventor groups still preclude such a simple story. At the end of the sample period, Indian and Chinese inventors account for

~13% of measured activity. The concentrated treatment effects among a group that accounts for ~13% of patents cannot be reconciled in a simple “more patents” story.

- In your ninth paragraph, you argue “What they don't mention, though, is that the confidence intervals they have for those regression coefficients suggest almost as strongly that the coefficients are negative”.

I believe the paper is very clear, and perhaps even conservative, with respect to how it represents the results. First, the paper reports all standard errors, which are conservatively estimated through cross-sectional clustering. Second, our discussion directly comments on when results are not statistically different from zero. I do discuss the point estimates in the paper. They are the best estimate the data can support and deserve discussion.

Most importantly, however, is the bottom-line conclusion I draw from the work. I summarize that the weight of the evidence is that there is no crowding-in effect nor crowding-out effect in the short run. In other words, I conservatively went in your direction in the conclusion. I expected resistance to come more from the groups that want a stronger interpretation of the findings.

- In paragraphs ten through twelve, you express concern with how I present George Borjas’ work and technique. I have loads of respect for Borjas and have learned a lot from his work. For the purposes of this dialogue, I again hope that the paper speaks for itself. I am very up-front that this is a short-run analysis of changes in the H-1B program. I speak at several points about how long-run effects can be different due to the issues you highlight. I cite the existing work on these long-run effects with equal weight, and I hope that readers draw their own conclusions.
- In the eleventh paragraph, I want to be very clear about the funding for this project. The funding came almost exclusively from my employer, HBS. Bill Lincoln is not affiliated with Harvard University, but is instead at the University of Michigan.

I also received assistance from the Innovation Policy and the Economy group at the National Bureau of Economic Research for general research purposes over the period studied. I thank them for this support, as I do in all my innovation-related papers during this period. The IPE group at the NBER in turn received funding from the Kauffman Foundation, which has never been involved in this work except through this indirect channel.

The support by the National Science Foundation and the MIT George Schultz Fund are more dated. These two groups helped fund my graduate studies at MIT, which ended in 2005. While at MIT, I began the ethnic-name matching work with patents. I continue to cite these two groups in any study that involves my ethnic-name data as thanks for their initial support. Neither institution has been involved in H-1B specific research.

To be very clear, I have never received industry support for this work, from either side. Even if offered such support, I would turn it down. I do not want my scientific work spoiled by perceived biases due to funding sources with specific interests in what the results “should be”. Funding for this effort came exclusively from general research budgets. The views in the paper are mine and my coauthor’s only.

- In paragraph thirteen, you ask about the counterfactual of giving H-1Bs to native workers. I appreciate the motivation behind this question, but I believe it is the wrong question. In this context, the US government does not direct people to work in one capacity or another. The policy lever is the H-1B worker admissions. Empirical researchers must then look for techniques to discern the impact of the program compared to the counterfactual of no program or reduced admissions. This is what our paper does through comparisons across cities, comparisons to Canada, and so on.

Your counterfactual would be something more like increased support for US citizens to obtain science and engineering educations, or similar policy initiatives. It is well beyond the scope of this study to comment on such alternative initiatives, and I hope that your call there is taken up in future work.

- In paragraph fourteen, you point to an insensitivity with using the terms Indian, Chinese, English, and so on. I have received two other complaints about this (out of many comments over the years). In several years of working on this topic, I unfortunately have not been able to devise a better naming convention that portrays the study in an intuitive way. I hope that readers understand the naming conventions in the context of the paper; any offense is regretted.

A second factor mentioned is that clearly some inventors with Chinese or Indian surnames would be second or later generation immigrants, here on other visas, or similar. I certainly agree that this is true, and I wish the data could further allow for disaggregated effects. Addressing these complications is a central rationale for my choice of estimation procedure – for example, looking at growth rates in invention versus population levels – that better isolates new immigration to the US. I again believe the paper is upfront on this point.

I hope this short note helps clarify the paper and its positioning. I have listened to your comments and will continue to do so (especially if you place me on the e-letter distribution list). Your work points to displacements and/or abuses of the H-1B program, which certainly exist in some contexts. Others point to beneficial effects, which certainly exist in some contexts. My paper is quantifying the aggregate effects of these policies on invention patterns. I will continue to look at this important issue in future work and solicit your inputs along the way.

Thanks
Bill Kerr

To: H-1B/L-1/offshoring e-newsletter

Profs. Wm. Kerr and Wm. Lincoln of the Harvard Business School just released a study in which they claim that Chinese and Indian H-1Bs, especially the Chinese, are highly innovative, and that "shocking" (their term) our economy with a large inflow of H-1B would be greatly beneficial. The paper is already making the rounds--Kerr will speak at the Center for Immigration Studies on Feb. 13, and Vivek Wadhwa lauds it in his BusinessWeek column--and is sure to be highly cited by the industry lobbyists. [1]

The authors' finding that the Chinese are the most innovative might strike some readers as odd? Aren't East Asians known for lack of innovation? Actually, the governments of China, Japan, South Korea and Taiwan themselves believe this, and have publicly wondered how to reverse it. Nobel physicist C.N. Yang has said, "...[those] trained in the Orient tend to be too [intellectually] timid...This attitude prevents them from jumping over hurdles to make important contributions...This too timid attitude is a handicap later in life when they want to be more creative or more imaginative." I must assure you that there are indeed many East Asians that are fantastic innovators (Yang himself of course being a prime example)--but at the same time, I share the views of the abovementioned governments and Dr. Yang. [2]

As I will explain, the study is indeed fundamentally flawed. It is impressive looking, 50 pages in length, extensive data analysis, lots of references, and math that goes beyond the capabilities of people on the Hill (i.e. logarithms). But, sadly, it makes a number of major errors. [3]

Prof. Kerr kindly e-mailed me a draft of the study, asking for comments, and I responded with a detailed list of suggestions. Some of them involved important aspects of H-1B that he seemed to be unaware of, while others were methodological. (I am a former statistics professor, and continue to do research and consulting in the field.) But as far as I can tell, he did not heed any of my comments in the final version of his paper, though of course he does cite my work, primarily "On the Need for Reform of the H-1B Nonimmigrant Work Visa in Computer-Related Occupations," N.S. Matloff, University of Michigan Journal of Law Reform, Fall 2003, Vol. 36, Issue 4, pages 815-914. [4]

Where, then, did the authors of this study go wrong? The most glaring error is their failure to properly account for the relation of H-1B hiring to the boom/bust nature of the tech field. They do note that boom/bust nature, but don't understand the implications. [5]

Clearly, there is more patenting during boom times and less during busts. During booms, there are more jobs, in particular more R&D jobs, since R&D is a luxury for almost all firms, and thus more patents. Moreover, there is much more venture capital available during booms, and since startup firms tend to be more innovative, this makes the boom/bust variable even more important. [6]

This ties directly to the number of H-1Bs. Congress has been willing to expand the H-1B program during times of boom in the tech sector, and has declined to expand it during times of bust. Thus the authors' analysis boils down to showing that more patents are produced during booms, rather than showing a direct H-1B effect on patenting. [7]

This is of course already a central problem in the study's analysis. But in addition, I pointed out to Prof. Kerr that this in turn exacerbates a methodological problem called multicollinearity, in which the variables are so intercorrelated that it can change regression coefficients from positive to negative and vice versa. No need to go into the details here (the Wikipedia entry is actually a pretty good exposition

of the issue if you want a basic summary), but the point is that since the author's entire analysis rests on the signs of these coefficients--positive meaning that H-1Bs have a positive effect on U.S. innovation--the authors have real statistical problems in addition to the "common related variable" flaw due to the boom/bust pattern discussed above. [8]

One aspect the authors were especially interested in was whether Americans were "crowded out" of the field--i.e. displaced--or "crowded in," meaning that the presence of the H-1Bs actually enhanced the innovation efforts of the Americans. They find that there appears to be a crowding-in effect, though they mention that it is not statistically significant, i.e. their sample size is not large enough to be very sure. What they don't mention, though, is that the confidence intervals they have for those regression coefficients suggest almost as strongly that the coefficients are negative. [9]

Also on the crowding-in/out issue, the authors cite the work of fellow Harvard professor George Borjas that "natives are crowded-out from graduate school enrollments by foreign students, especially in the most elite institutions, and suffer lower wages after graduation due to the increased labor supply." The authors say that Borjas' findings don't jibe with other work on this topic, but in fact the papers they cite don't address the Borjas issue at all, a serious, disturbing logical error. [10]

Moreover, the National Science Foundation (one of the funders of the Kerr/Lincoln study) itself stated at the time Congress was considering instituting the H-1B program that the program would indeed crowd OUT the Americans. In the paper I've quoted often here, the NSF said that "A growing influx of foreign PhDs into U.S. labor markets will hold down the level of PhD salaries...[If] doctoral studies are failing to appeal to a large (or growing) percentage of the best citizen baccalaureates, then a key issue is pay...A number of [the Americans] will select alternative career paths." That of course is exactly what happened in the subsequent years; enrollment by Americans in tech grad programs has gone way down, and tech PhD salaries have not kept pace with those of comparable professions, exactly as Borjas found. [11]

So the crowding-out is quite clear and, as mentioned, actually forecast by the NSF. That invalidates Kerr's and Lincoln's regression analyses right at the outset, because they are based on data that doesn't account for the crowding-out at the graduate school level, which the authors agree is the source of most of the later patent activity. [12]

Another key issue is that the authors do not address the counterfactual. What if natives were to hold the positions taken by H-1Bs? Would the number of patent applications filed be the same as, greater than or less than the number we now see? Again, failure to address those questions renders the authors' findings invalid. [13]

Aside from all these problems with the study, it showed an insensitivity that I tried (unsuccessfully) to warn Prof. Kerr about. It counted everyone with a Chinese or Indian surname as foreign-born, and by implication, a current or former H-1B. This ignores the huge numbers of Chinese- and Indo-Americans who were born here or immigrated as minors with their families. On the other hand, anyone with a British surname is counted as a U.S. native, and the authors repeatedly describe U.S. natives in this manner, using terms such as "English inventors," "English patenting," "English ethnicity," and so on. While I can understand why the authors might find it convenient to use such proxies, I pointed out that it might be offensive to some (especially given the "English" surnames of the two authors). But the authors made no change. [14]

You can download the paper at <http://www.H-1Bs.edu/research/pdf/09-005.pdf>

Norm