November 8, 2015

Recruitment Committee:

I am **enthusiastically** writing to recommend Sara Moreira for a position within your school. Sara is working at the intersection of macroeconomics, IO, firm dynamics, and entrepreneurship (in the John Haltiwanger and Chad Syverson mold). She is one of the top students coming out of the Chicago Economics Department this year. I recommend her for <u>all</u> departments, business schools and policy schools.

I have known Sara for three years ever since she took my 2nd year Ph.D. course "Micro Data for Macro Models" that I co-teach with the Steve Davis in the economics department. In that class, we start students down the path of doing research in applied macroeconomic topics (broadly defined). We make students write papers as part of the class as well as having them pitch ideas about future project. Sara was in the top one or two students of her cohort when she took the class. Since that time, both me and Steve have been advising her as she has developed her various research projects. Sara has a top notch job market paper that has a real shot at a top journal. She also has four other papers at various stages of development. She is immensely hard working, understands both empirical work and theory, and has a knack for tackling very interesting questions. As you go through my letter, you can see why I am quite enthusiastic about Sara's career path.

Her job market paper is after an interesting topic. There is a literature showing that individuals who enter the labor force during a recession underperform over their early lifecycle relative to like individuals who enter the labor force during booming times. Sara shows a similar effect for firms. Firms who start during a recession remain persistently smaller (in terms of total employment) relative to otherwise similar firms that start during booms. These firms remain smaller over the first 10-15 years of their life never converging in their lifecycle profile relative to counterparts who start in a boom. As you see from her early figures in the paper, it is like the lifecycle profile of log employment for firms who start in a recession is a level shift down compared to the lifecycle profile of log employment for firms who start in a boom.

To be clear, documenting the above fact took a tremendous amount of work. Sara has become a master at using the confidential data from the U.S. Census's Longitudinal Business Database (LBD). The LBD contains a panel of the universe of establishments and firms in the U.S. non-farm private sector with at least one employee. This is a massive data set. Within the dataset, Sara can measure true births and deaths of establishments. This allows her to see establishments born in recessions vs. establishments born in boom times. The goal of the data part of her paper is to estimate a regression of log employment on a vector of year dummies, a vector of "age" dummies, and a control for business cycle conditions at the establishment's birth. The age dummies represent the firm lifecycle. This specification also controls for

fixed effects for the establishments industry, location, legal-status, and whether it is part of a multi-unit firm. In her main specifications, she allows the "age" dummies to interact with her business cycle conditions at the establishment's birth. She uses many metrics for business cycle conditions at the establishment's birth including variables like de-trended real GDP in the year of inception. So, formally, Sara is able to estimate the lifecycle profile of log employment (conditional on industry, location, etc.) for firms that are born when de-trended real GDP is low at inception compared to when de-trended real GDP is high at inception.

One natural concern with a naïve approach to estimating causal effects of business cycles on the lifecycle of firm employment is that different firms may start in recessions relative to booms. Sara takes this concern very seriously. A large portion of her empirical work is actually documenting that higher quality firms are more likely to start in recessions. If anything, this causes her estimated gap in firm size for firms born in recessions to be a lower bound on the true gap. The reason is that higher quality firms are more likely to grow faster. I do not want to understate this part of her paper. In order to measure quality correctly, Sara merged in (and processed) data from the Census Business Register Report (BR) which records administrative data from business tax returns that tracks establishment sales revenue. With this data, Sara can make firm productivity measures (revenues per worker). As far as I know, only Haltiwanger et al (2015) ("High Growth Young Firms") have used the sales revenue data for the universe of firms. So, in summary, Sara convincingly documents that (1) firms start smaller in recessions, (2) firms that start small in recessions stay small throughout their lifecycle relative to firms that do not start in recessions, and (3) firm quality as measured by revenue per worker is countercyclical. That is, better firms start in a recession. Despite being better, these firms stay small. Again, all of this is conditional on narrow industry controls – so, all the effect is being driving by within industry variation.

The next part of the Sara's paper is to explore potential mechanisms. She shows convincing evidence that the results are likely not driven by liquidity constraints or access to credit. She does this by looking at variation across narrow industries. She finds that there are no differential business cycle effects between either (1) capital intensive industries or (2) industries that require large amounts of starting capital and industries that have lower capital intensity or require less starting capital. If changing access to credit was important in explaining her results, one would expect her to find different patterns within capital intensive and non-capital intensive industries. Sara does find, however, different patterns for industries that engage in more advertising spending. This would be consistent with a story where new firms are trying to acquire "brand capital" (my words, not hers). If new firms have to work hard to build a customer base, starting a firm in a recession – when demand is low – may slow down the accumulation of brand capital. This slowdown may persist for as long as customer base is continuing to grow within the firm. Sara argues that industries that spend more on advertising may rely more on brand capital (or customer capital, as she refers to it) than industries that rely less on advertising. The effect of being more in a recession has much larger persistent effects in industries where advertising is more important.

This latter finding motivates Sara's modeling choice. The goal of her model is to (1) formalize the importance of selection in establishment entry and exit decisions of the lifecycle and (2) perform counterfactuals about how the firm size distribution would have evolved over the business cycle if the customer capital concerns were shut down. A key component of her calibration strategy is to use micro estimates of the importance of customer capital (from the IO literature) to discipline her model

parameters. A calibrated version of her model with the micro estimates matches the lifecycle of employment for firms born in recessions relative to firms born in booms nearly exactly. (As an aside, I go back and forth between using "firm" and "establishment" in my letter – Sara is much more precise in her paper). She finds that this customer capital acts a force that generates a higher persistence for aggregate shocks. A shock that causes demand to be temporarily low will have effects on total employment in the economy in future periods because new firms (that usually grow fast) will grow slower because consumer capital will be lower than it would have been otherwise.

As a whole, this is a very nice paper. The data work alone would warrant publication in a top journal. This paper, however, is also reflective of Sara's interests more broadly. She is very interested in both firm dynamics at business cycle and longer run frequencies. She has many other papers in this vein. For example, Sara has another paper entitled "Self-Employment and Business Cycles". In this paper, she is trying to understand dynamics in aggregate employment (hours) by distinguishing among wage workers and the self-employed. She shows that employment (hours) is much more volatile at business cycle frequencies for the self-employed relative to wage and salary workers. She is also developing a search theoretic framework of occupational choice where jobs can exist within an existing firm (wage workers) or exist in self-employment. This paper is evolving and was put on the back burner when she was working on her job market paper. You can see in this paper Sara's agenda of thinking about firm dynamics at business cycle frequencies.

Sara also has three other papers. I will let Steve Davis expand on their joint work. However, let me comment further on her joint work with Brent Neiman and Loukas Karabarbounis. Brent and Loukas sought out Sara as a coauthor given her skill set. She is a master at working with micro data and has a strong understanding of firm dynamics. Brent and Loukas want to create a measure of trends in the labor share within each U.S. state/industry. Loukas and Brent have already made measures for the U.S. as a whole. Given Sara's expertise with using both firm data (her job market paper) and household data (her work on self employment over the business cycle), Loukas and Brent asked Sara to join their project. Using a variety of micro data sources, the three of them are making measures of the labor share at the state-industry level. Once they have those measures, they can use the state-industry panel of labor shares to test out potential theories as to why the aggregate labor share fell within the U.S. (such as the decline in unionization or competition from foreign trade). I think this will be a very nice paper when they finish. What you should take away from this most is that Loukas and Brent sought out Sara to work on this paper with them. I imagine that if you hire Sara, many of your existing faculty will want to collaborate with her.

I want to end my letter by stressing that Sara will also be a very good teacher. She has done teaching both in the Economics Department and at the Harris School (Chicago's policy school). I have no reservations about her ability to teach in any setting. My sense is that you will conclude this as well from her interview and seminar. A question may exist as to what she will teach. She is really at the border of macro and IO. I will let Chad and Ali (who are also writing letters for Sara) speak to her fit in IO groups. However, I have no qualms recommending her to anyone looking for someone in macro/productivity/entrepreneurship.

Lastly, in terms of comparisons, I view Sara in the mold of Steve Davis, John Haltiwanger, and Chad Syverson. She is interested in firm dynamics and she combines strong data skills (and interests in getting her hands dirty with raw micro data) with strong theory skills. A few years ago, Ben Pugsley (now at the New York Fed) was one of my students. I was very bullish on Ben when he was on the market. Sara is like Ben is many ways – they share similar interests, both have a desire and skills to work with large micro data sets like the LBD, and both have strong theory skills. However, at this stage, I think Sara is stronger than Ben. I think Sara dominates in two dimensions. First, I think Sara's job market paper is stronger. As is, I think the paper has a shot at being published in a top journal. Second, Sara has a larger footprint without having coauthored papers with her advisor. Ben had some impactful papers that were joint with me. Even though Ben was an equal participant on those papers, it complicated the signal extraction while on the job market. So, I would rank Sara as being stronger than Ben at a similar stage.

In summary, I enthusiastically recommend Sara Moreira to all departments, business schools and policy schools. As students go, Sara has no downside and lots of upside. What you would get is an extremely hard working scholar, who has an established research program, who will be a good teacher and a great colleague. She is also working in an area (the use of micro firm level data) where there is growing amount of activity. Sara already has access to the data and knows how to work with it. I can imagine that there will be a large amount of gains from trade with other faculty if you were to hire her.

If I can be of any other assistance, please reach out to me directly.

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