Application for NBER Productivity, Innovation and Entrepreneurship Program Post-Doctoral Fellowships in Innovation and Entrepreneurship

Research Proposal

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I want to understand what determines aggregate productivity and growth. In the vanilla creative destruction theory of growth, growth rate is determined by the step-size of innovation and the entry rate of new firms. My current approach involves studying various factors affecting firm entry, production and innovation decisions at the micro level for a large number of firms and then drawing aggregate implications using macroeconomic models. This proposal lays out two of my work-in-progress.

1. Growth without entry?

The U.S. shows long term decline in startup rate and this has raised concerns about stagnation of the U.S. economy. As shown in Figure 1, Japan has half the startup rate of the U.S. and Japan indeed has stagnated for more than two decades. Then, does the decline in entry rate in the U.S. mean U.S. will stagnate like Japan? Conversely, does Japan's entry rate need to increase in order for growth to happen?[1]. This project tries to understand whether high entry rate is needed for growth by investigating the gap between Japan and U.S. entry and exit rate and how that relates to long run growth.

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[1] An explicit target of Japan's new growth strategy (the so-called Abenomics) is "Ensure that business startup rate exceeds business closure rate, and raise current 5% business startup and closure rate to 10% range on par with the US and UK" (Japan Revitalization Strategy p13).

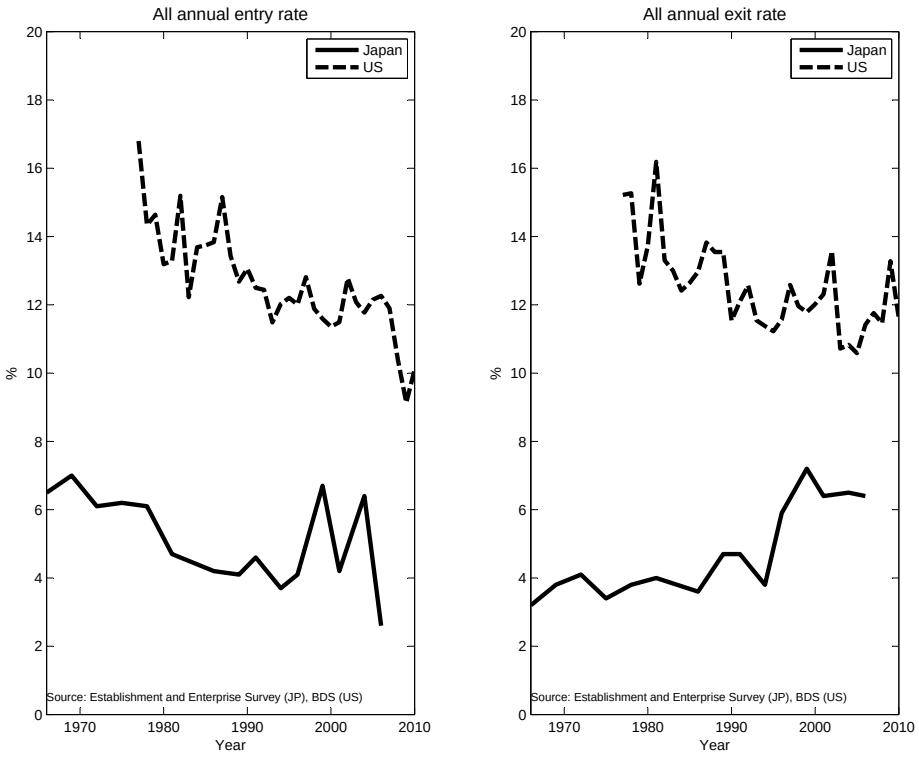


Figure 1: Comparison of U.S. and Japan's long run establishment entry and exit rate, aggregate

Empirically, Japan's low entry and exit rate does not correlate with lower productivity growth. As Figure 1 shows, the US-Japan turnover rate gap is a persistent phenomenon that existed even in the 1970's when Japan enjoyed higher productivity growth rate than the U.S. Furthermore, the US-Japan turnover rate gap exists uniformly across all detailed sectors while the US-Japan relative productivity growth and level differ considerably across sectors[2]. Japan's manufacturing sector, for example, exhibits comparable productivity growth relative to the U.S. despite also having a persistently low turnover rate.

Theoretically, low gross entry and exit rate can be consistent with high productivity growth rate. For example, in the textbook endogenous growth model where all growth

[2]My calculations from publicised U.S. and Japanese Census data.

come from entrants improving on incumbents, productivity growth rate is equal to net entry rate times the step size of entrants improvement over incumbents. There, low turnover rate in itself is not detrimental to growth; it is a combination of low turnover rate and low quality improvement by entrants that lead to lower growth rate. Hence, knowing the relative quality of innovation by entrants versus incumbents is also important for understand whether low entry rate lead to low growth rate.

For this project, I have linked over 3 million Japanese patents with over 0.8 million Japanese firms. I will use this data to document how firm age and other characteristics correlate with patent quality over time. I will construct an endogenous growth model that is consistent with these facts and use the model to quantify how much of Japan's stagnation is due to low entry rate versus low innovation quality.

2. Selection into entrepreneurship and legal capital requirements

The aforementioned matched patent and firm data covers the years during which the Japanese government tried various policies to stimulate entry rate. My second project uses this data to study whether those policies were effective in raising entry rate and encourage higher quality innovation. In 2003 and 2006, Japan relaxed and then abolished its minimum shihonkin (or legal capital) requirement for the incorporation of limited liability firms and for paying dividends. The goal of the reduction was to increase the number of innovative startups and stimulate economic growth.

Figure 2 display the *shihonkin* distribution for new limited liability firms in Japan by Census years. The top three panels are for years before the reform. It shows that tight bunching at the pre-reform requirements indicating that the requirements were enforced and they were binding for many firms. The last two panels in Figure 2 are after the reform. It shows a drastic smoothing of the distribution. This is consistent with the fact that registering positive amounts of *shihonkin* is costly.

My preliminary finding shows support for the policy leading to a reduction in the shihonkin entrants incorporate with and an increase in the share of limited liability entrants. I also find that the policy change did not affect the quality of entrants, as measured by employment, patenting propensity and founder characteristics.

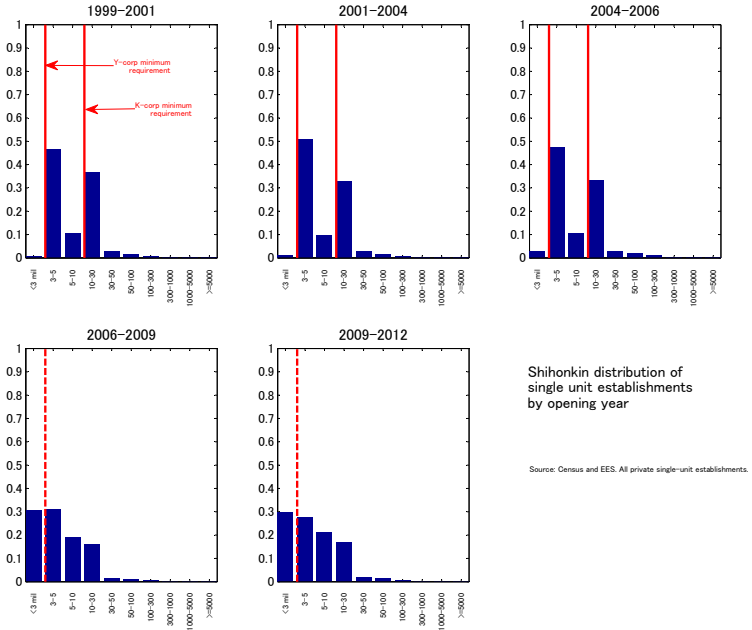
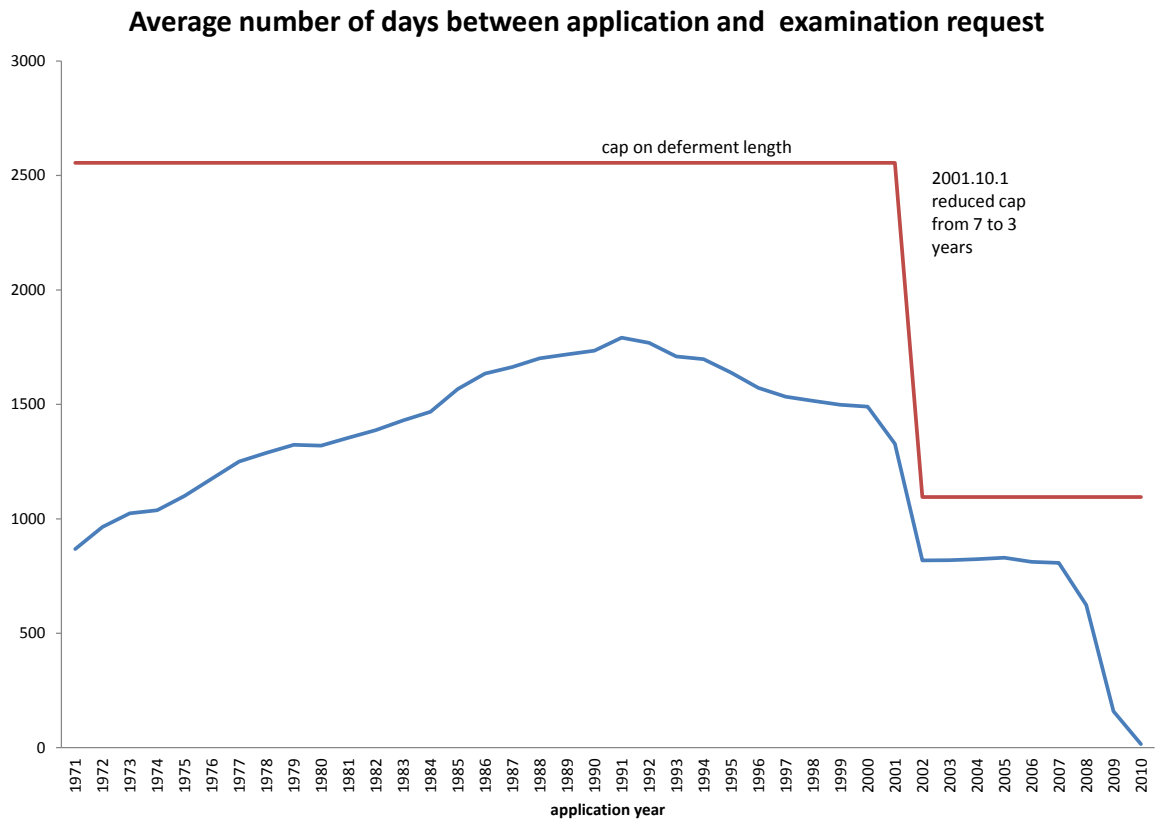


Figure 2: *shihonkin* distribution for new single-unit establishments. Source: Japan Census

3. Patent Protection Length and Firm Innovation

In 2001, the Japan Patent Office shortened the length of patent examination deferment from 7 to 3 years. Consequently, the average number of days between application and examination request declined from 4 years before the reform to 2.5 years after the reform (see Figure 3). As Japan patent law follows the first-to-file principle, this reform arguably shortened the effective patent protection length by 4 years. My third project investigates the impact of the reform on firm innovation. In particular, I plan to study whether innovation with longer lag between creation and commercialization and innovation with more uncertain profitability were disproportionally reduced.


Average number of days between application and examination request
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