Research Statement
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My research focuses on understanding firm size distribution, firm growth dynamics, and corporate strategies in the context of domestic and international economies. In addition, I study innovative technologies such as blockchain and text analysis applications for firms and public institutions. My research involves empirical work using micro-level data as well as theoretical work to understand the economic mechanisms behind empirical facts. Furthermore, I work closely with industries and conduct interviews and surveys to understand economic forces and managerial actions.

Motivational background: In many countries, markets consist of a few large firms and many small firms. The same is true in Japan, where small and medium enterprises (SMEs) account for 98.5% of the total number of firms, with the remaining 1.5% consisting of large firms commanding over half of the market share. What is the economic mechanism that generates this enormous firm size heterogeneity? Why is SME growth stagnant? Is there any role for policies to promote SMEs' growth? To answer these questions, my research has focused on the following five research topics: (1) the mechanism of firm size heterogeneity, (2) the relationship between loan contracts and SMEs’ risk-taking behavior, (3) the relationship between loan contracts and SMEs’ business successions, (4) supply chain finance as a tool to resolve financial friction for SMEs, and (5) how supply chain linkages affect firm growth dynamics. In what follows, I describe each topic in detail.

First, in my job market paper, “Firm Size and Complementarity between Geography and Products,” I combine empirical facts from Japanese scanner data, a survey of corporate executives, and theoretical framework to show that two extensive margins amplify firms’ productivity differences and generate firm size heterogeneity: product scope (i.e., the number of products firms sell) and geographic scope (i.e., the number of locations where firms sell their products to consumers). Higher productivity firms not only sell more per product per location, they also sell more products in more locations. I develop a structural model of firms with a choice of product and geographic scope and then structurally estimate the model, which successfully fits the empirical patterns of product and geographic scope as well as matches the observed firm size distribution in the data. In addition, I find that product and geographic scope complement each other and jointly amplify firm size heterogeneity. Due to the large complementarity between them, omitting either of the margins reduces firm size heterogeneity in the model by more than 85%. Lastly, I quantify the welfare implications of an actual SME subsidy in Japan as an example.

Second, I study how financial contracts affect SMEs’ risk-taking behaviors and growth dynamics. Japanese SMEs are known for avoiding risks although risk-taking promotes firm growth. One of the primary reasons for the lack of risk-taking is the personal guarantee loan arrangement. With a personal guarantee loan, the business owner has a personal obligation to pay back the loan if the firm cannot repay the lender, and so SMEs tend to avoid risky business investments. To deal with the issue, the Japanese government formulated “Guidelines for Personal Guarantee Provided by Business Owners” in 2014, aimed at reducing reliance on personal guarantees by publicly owned banks. In “Personal Guarantees and Firms’ Risk-Taking Behavior,” a paper I wrote with Takeo Hoshi, we analyze the welfare implication of this policy reform. Whether imposing personal guarantees is efficient depends on whether the risk-taking opportunities are socially optimal; when risk-taking opportunities yield net positive social returns, removing personal guarantees encourages welfare-improving, risk-taking behaviors of firms and vice versa. Using Japanese loan-level data from a publicly-owned financing corporation we find that removing personal guarantees induces firms with low credit ratings to engage in socially sub-optimal risk-taking behaviors, suggesting an undesirable consequence of the policy reform.

Third, another potential reason for the stagnant growth of Japanese SMEs is aging business owners: the median age of Japanese SME owners is over 65 years old. Why are new generations failing to succeed in SMEs? My currently ongoing research, “Personal Guarantees and SMEs’ Business Successions,” also written with Takeo Hoshi, examines whether the personal guarantee loan arrangement affects firms’
business succession strategies; when loans require personal guarantees, the business successor risks banks seizing their personal assets, which discourages business succession. Using loan- and firm-level data in Japan, we show that removing personal guarantees from loans encourages business succession in SMEs by approximately 3%.

Fourth, in the context of supply chains, trade finance plays an important role in SMEs’ growth; more than 80% of SMEs rely on trade finance when involved in international trade. In “Multi-tier Supply Chain Financing with Blockchain,” which I co-authored with Volodymyr Babich, we study new trade finance technology enabled by blockchain. Recent developments in blockchain-enabled financing technology allow deeper-tier firms in the supply chain to extend financing to upstream suppliers. But does deep-tier financing with blockchain always generate higher supply chain values? We build a three-tier supply chain model to compare supply chain values with blockchain-based deep-tier financing to traditional supply chain financing. Interestingly, a blockchain-based system does not emerge as the dominant financing choice. We identify two causes of this surprising result: risk spillover from the higher-tier to the immediate-tier buyer and the accumulation of more noise in the collateral asset when using the higher-tier buyer’s collateral asset for financing. In the recent working paper, “Capacity Commitment and Deep-tier Supply Chain Finance,” which I also wrote with Volodymyr Babich, we further extend the analysis to understand the advantage of deep-tier financing when combined with capacity commitment inside supply chains.

Finally, I study how firm linkages affect firm growth dynamics. The Chinese growth miracle after 2010 has been recognized as a negative shock to firms in other countries due to harsher competition with goods imported from China. In “International Influences on Japanese Supply Chains,” which I co-authored with Michal Fabinger and Mina Taniguchi, we show that the Chinese growth miracle can have positive effects in Japanese manufacturing industries. We empirically analyze the transmission mechanism of Chinese productivity shock in the Japanese manufacturing industry using firm-to-firm linkage data. In contrast to the general belief, we find that increased Chinese productivity in a particular industry not only negatively affects Japanese suppliers of Japanese firms in that industry (i.e., upstream propagation) but also positively affect their Japanese corporate customers (i.e., downstream propagation). The corporate customers benefit because the harsher competition with Chinese firms upstream lowers the customers’ input prices.

Since “Multi-tier Supply Chain Financing with Blockchain,” I have been exploring innovative technologies, such as blockchain and machine learning, and their applications to the real world. In “Selfish Mining Attacks Exacerbated by Elastic Hash Supply,” I collaborate with industry researchers and computer science faculty at NTT Research Inc. (Go Yamamoto, Fuhito Kojima, Elaine Shi, Shin’ichiro Matsuo, and Aron Laszka) to analyze the security of cryptocurrency systems against so-called Selfish Mining Attacks. In the paper, I apply the free-entry condition to cryptocurrency markets and show that the general equilibrium effect of the free-entry condition, which has not been accounted for by typical cryptography models, exacerbates the effect of these attacks.

During my internship at the International Monetary Fund (IMF), I worked on a project that applied machine learning tools for business evaluation. In “How Do Member Countries Receive IMF Policy Advice: Results from a State-of-the-art Sentiment Index,” written with Ghada Fayad, Chengyu Huang, and Peng Zhao, we develop a text analysis model to evaluate the quality of the IMF’s policy advice to its member countries. The model evaluates sentiments in large-scale documents that contain member countries’ responses to the IMF’s policy advice by providing cross-country and time-varying measures of countries’ reception of IMF policy advice. Our analysis has been well-received by IMF executives and comprises the main part of “2021 IMF Comprehensive Surveillance Review—Background Paper in Traction.” The tool is customized for the IMF’s use; however, similar tools can be developed for any institution and used to evaluate their businesses.
Publications


FAYAD, G., C. HUANG, Y. SHIBUYA, P. ZHAO [2020], “How Do Member Countries Receive IMF Policy Advice: Results From a State-of-the-art Sentiment Index”, IMF working paper, No. 20/7.


Working Papers

Firm Size and Complementarity between Geography and Products (Job Market Paper)

Multi-tier Supply Chain Financing with Blockchain with Volodymyr Babich, Under Review at Management Science

Personal Guarantees and Firms’ Risk-Taking Behavior with Takeo Hoshi

Work in progress

Capacity Commitment and Deep-tier Supply chain Finance with Volodymyr Babich

Personal Guarantees and SMEs’ Business Successions with Takeo Hoshi