Summary Report: Network of Firms and the Aggregate Economy: Evidence from Costa Rica

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General Motivation of the Project

There has been a recent effort in better understanding the role of firm linkages in production and aggregate stability. This comes to challenge the original idea of Lucas (1977), who argued that small shocks to particular firms would not matter in the aggregate because the Law of Large Numbers would average out those shocks. On the opposite side, the more recent view presents the idea that a shock to a single firm (or sector) could have a larger impact if it also affects other firms connected to this firm through a network of input-output linkages.

These new ideas have immediate applications in studying aggregate fluctuations, systemic risk and contagion, international trade shocks, industrial organization, economic geography, among others. In general, it is widely applicable in all areas of Economics dealing with production supply-chain. However, most of the advances in the area have been theoretical and the testable implications of the models have been mainly explored only at the sector level due to data unavailability. So far, almost all papers have focused on input-output matrices to create networks between sectors in the economy. The frequency and depth of these data are also limited. For example, for the US there is yearly information for only 15 industries or decennial for 389 industries.

Research Idea

The particular idea that I want to study for is the potential productivity increase of Costa Rican firms when they are part of the supply-chain of a multinational firm or a firm involving Foreign Direct Investment (FDI). It is ofter argued that FDI can encourage valuable productivity spillovers to domestic firms in developing countries. The superior technology of these foreign firms could lead to new technology adoption in the host country or could increase domestic productivity through knowledge flows. This arguments are the base of the policy making of several development countries which not only have reduced barriers to FDI

and foreign firms' entry but have also offered special incentives (like tax holidays) to attract them.

Costa Rican policy makers are not the exception in this trend and have put in place an aggressive strategy to attract foreign firms to the country. However, empirical evidence thus far is still open to criticism. Data unavailability or the lack of a credible research design are frequent concerns. I want overcome these difficulties using administrative records of transactions among all Costa Rican firms. With this data I will be able to construct and understand the complete network of production of the Costa Rican economy and in particular, the supply-chain connecting domestic and multi-national firms. To study the causal effect on domestic firms we make use of a Matching Program used by the Ministry of Commerce to establish contacts between foreign firms and domestic suppliers. This program creates short-lists of potential supplier candidates for each major multi-national entrant. We plan to use "losers" from the short-list as a control group for those firms which ultimately established business relations with the entrant foreign firms. Next steps involve the study of mechanisms through which spillovers occurred.

A New Dataset: Data From Costa Rican Tax Records

As noted above, further progress on this area of research is limited by data availability. However, the way Costa Rican corporate taxes are collected brings a new design that to push the frontier on these topics.

For the purpose of this research I am planning to use a novel firm-level dataset coming from confidential administrative records of the entire universe of Costa Rican firms. The *Ministerio de Hacienda* (the Costa Rican Ministry of Finance) collects yearly information of all transactions that have a value larger or equal than 2.5 million colones (approximately $\$5,000$ USD) between firms. Providing this information is an enforceable mandatory request to all existing formal firms. The purpose of this request is related to corporate taxes. Costa Rican firms pay different tax rates depending on the reported benefits (for further details on the Costa Rican tax structure see Bachas and Soto (2016)). In order to try to prevent firms from inflating their costs or deflating their revenue, the Ministerio de Hacienda obliges any firm to report the exact amount of the transactions and the information (tax identifier) of the seller/buyer. With this information in hand, the Ministerio de Hacienda double checks the veracity of the reports. For example, if Firm A reports selling (buying) $\$X$ to Firm B, then the Ministerio de Hacienda checks if Firm B reports buying (selling) $\$X$ to Firm A.

Accomplished Objectives of the Exploratory Trip

The nature of the dataset is highly confidential and the usage is very restrictive even within the Ministerio de Hacienda and the Costa Rican Central Bank. The purpose of the trip was to negotiate access to the data with the authorities of the Central Bank. For this it was of major importance to explain the benefits that this project could potentially provide to the policy making of the institution and to propose a protocol to allow me to conduct the research using these data while protecting the confidentiality of the firms involved.

The negotiation process took several steps from which I got very general lessons that will enormously benefit my career in the future. The first step was the initial approaching with the institution at the end of 2015. I explicitly decided to discuss first with the research department of the Costa Rican Central Bank because they understand very well the importance and challenges to be faced when conducting academic research. It was also important to convince them that the topic of research was not only of interests in academic circles but also very relevant for the Central Bank and the Costa Rican Government in general.

A second step was to ask the director of the research department to consult about a potential collaboration with the highest hierarchy of the Bank. For this I had to write a formal petition with a research proposal in Spanish (available upon request). Being clear and repetitive in stressing that the confidentiality of the data was of major relevance was one of the most important components of the formal petition. It was very helpful as well to suggest the possibility of working in-situ and to offer a co-authorship to the research department. This allowed me to have access to the data from their secured computer inside their main building in San Jose, Costa Rica and to interact with researchers and directors of the Bank, which I found as a mutually enriching experience.

The third step was to present my progress to the authorities of the Central Bank towards the end of my stay. This allowed me to show them my very preliminary data work, to discuss my conceptual progress in defining the research idea and to inform them about the next challenges of the project. Only then, I felt confident enough to ask for the formalization of the collaboration starting this summer and until we complete the project. The usual length of these projects from the start to the moment of publication could take several years. For this reason is important that all the parts involved can commit to it.

The fourth and final step was to discuss a protocol in which the collaboration could take place remotely from now onwards. My teaching responsibilities during the academic year substantially restrict my geographic mobility. For this reason, it was important for me to establish a communication channel through which I could make constant progress in the data work without being in person in the Central Bank. The confidential nature of the data precluded me from taking even a sample of it. Given these circumstances I would produce codes and programs in different statistical/econometric software that I would write from

Berkeley and my institutional coauthor (Alonso Alfaro) will take them from there and adapt them to be compiled in the secured computer. Fortunately, the Central Bank agreed on share all aggregated results with me as long as they do not compromise the identity of any of the individual tax payers.

Next Steps

The most important next step is to "clean" the dataset and to merge different sources in order to create a final dataset on which the main analysis will be conducted. The data contains approximately 30 thousand Costa Rican firms recording almost 4 million transactions. The dimensionality of the data could be one of its main strength but at the same time imposes a huge burden on the initial construction of the ready-to-use data. This is work in progress and could take several months.

The second step would be to actually analyze the data. This will be the most exciting part but at the same time the most challenging one. I am excited to get to that point and hopefully have results that can inform the policy making in Costa Rica.

References

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