

論文の内容の要旨

An analysis of impediments to trade between local rice markets in the Philippines
(フィリピンにおける国内各地方コメ市場間交易の障壁要因に関する分析)

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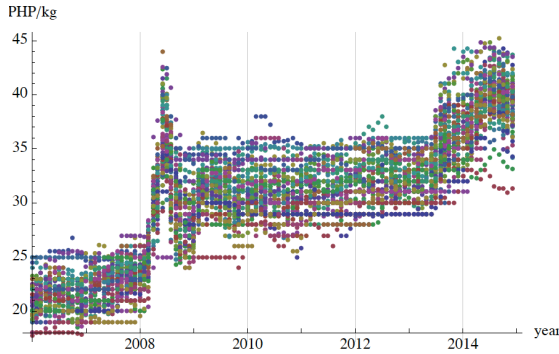
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In most developing nations such as the Philippines, there is a large degree of heterogeneity in each geographic market's ability to produce food staples. Also, a lack of rice for consumption has often been at the root cause of political instability. The sharp contrast in the supply of rice available for consumption across geographic markets within the nation speaks of the importance in ensuring that rice is redistributed efficiently from regions where it is produced in surplus, to regions where it is in deficit. This dissertation aims to answer two questions, which have a tremendous bearing on food security. First, are rice markets in the Philippines well arbitrated across space, *ceteris paribus* (that is, given the existing state of transportation and logistics facilities)? Second, what factors prevent rice from being traded between surplus regions and deficit regions?

The existing literature is unable to provide a conclusive answer to both questions. For example, while findings have been made, which suggest that Philippine rice markets are well arbitrated across space, Figure a1 below indicates significant price gaps across provinces which do not get arbitrated away across time. In the figure, each line plots the evolution of the wholesale price of regular milled rice across time in each of the different provinces in the

Philippines. Compared to the observable shipping cost of less than 1 peso / kilogram, there seem to be opportunities for traders to make profits via arbitrage.

Figure a1. Evolution of rice prices over time



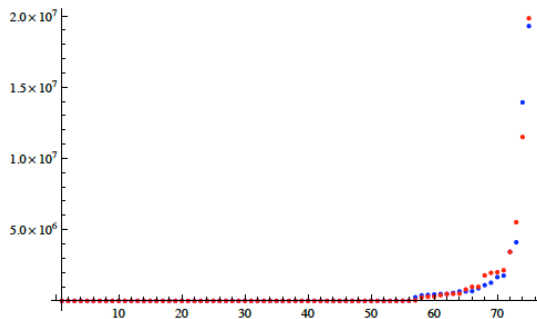
On the other hand, in an influential and highly cited paper, [Allen, T. (2014). Information frictions in trade. *Econometrica*, 82(6), 2041-2083.] argues that Philippine rice markets are not well arbitrated across space and large information frictions are responsible for preventing trade from taking place between surplus and deficit markets. As evidence to support his claim that information frictions are tremendous in the Philippines, Allen (2014) points to the fact that about 50% of importing provinces export rice to destinations from which they import (that is, they engage in “two-way trade”). According to Allen (2014), if we assume that prices in each province are fairly stable across the months of a year, the fact that provinces both import to and export from the same trading partners within a year must be indicative of the fact that traders are not well-informed about the prices of rice in other geographical locations. In this dissertation, we scrutinize the author’s claims and make findings that differ. In particular, we find empirical evidence to show that (1) within time periods shorter than a year, trade between most pairs of provinces is almost unilateral as opposed to bilateral; and that (2) differences in seasonality, coupled with the need for consumers to smooth out their consumption of rice across the months of a year, are largely responsible for causing province pairs to engage in “two-way trade” – that is, to both import to and export from the same trading partners within a year. In other words, we find that Allen (2014) may very possibly have over-estimated the importance of information frictions in preventing trade from taking place between pairs of provinces in the Philippines.

In order to answer our research questions, we build an original model to predict the amount of trade that would take place between every pair of provinces within a given period of time, such as a quarter of a year. The model assumes perfectly competitive markets and perfect information across space. We solve the model using linear programming and concepts from transportation theory and compare the model’s solutions with actual trade flow data. Due to its

assumptions on perfect competition, the model’s solution is a Pareto optimal set of trade flows between every pair of provinces in the Philippines, where the exporting province has a surplus and the importing province a deficit of rice. The solution serves as a Pareto optimal benchmark, against which we can compare actual trade flow data, to evaluate how far away from Pareto optimality Philippine rice markets are. The solution, or predicted trade flows, of our model captures the features of observed trade flows very well even though the model assumes perfect information.

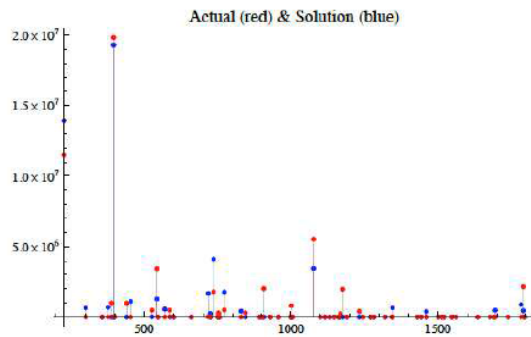
In Figure a2, the horizontal axis represents pairs of provinces, which have been ordered in ascending order according to the magnitude of trade flows which took place between them. Each dot represents a pair of provinces, and the vertical axis captures the trade flows (in kgs) between each pair. Red dots represent actual trade flows and blue dots represent the trade flows predicted by our model. Figure a2 shows that the solution of our model assumes a distribution that is very similar to the distribution of actual trade flows.

Figure a2. Distribution of trade flows, 2009



In Figure a3, each dot represents a pair of provinces, the horizontal axis captures the actual shipping distance between pairs of provinces and the vertical axis captures the trade flows (in kgs) between them. Red dots represent actual trade flows and blue dots represent the trade flows predicted by our model. This figure shows that our model is able to predict the identities of each province’s trading partner, as well as the magnitude of trade flows between pairs of provinces, very well.

Figure a3. Shipping distances against trade flows, 2009



Finally, when we regressed the model's predicted trade flows against actual trade flows we obtained regression coefficients very close to 1 and adjusted R-squared values between 0.6 and 0.93. The results are significant at the 99% confidence level, and they suggest a very good fit between the model's Pareto optimal solution and the actual trade flows. The findings of this research suggest that previous work may have over-estimated the significance of information asymmetries in preventing arbitrage from taking place between rice markets in the Philippines. Our results also indicate that non-observable trade costs, including packaging, storage and logistics costs, play a large role in obstructing the trade of rice between surplus and deficit markets. The policy recommendations are clear-cut. Better transportation, packaging, storage, and logistics facilities, which would help to reduce trade costs, are of tremendous importance in ensuring that rice markets are better integrated across space. In other words, we would expect price differentials between regions to converge closer to the observed trade costs, as the above-mentioned services improve.