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Firm Closures, a Global Phillips Curve, and More: A Recap of the Fall Research Workshop

By John Mullin

How do firms decide how to locate their stores? Do payday loan regulations help or harm consumer welfare? How many firms go out of business due to financial market inefficiencies? These were among the questions addressed by researchers during a recent research workshop.

Economists from the Federal Reserve Bank of Richmond, the University of Virginia and Duke University met in Richmond for a research workshop in November. This *Economic Brief* summarizes the research presented during the workshop.

Plants in Space

A fundamental part of a firm's decision-making process is to determine the number, size and location of its plants. (For firms such as Starbucks and Walgreens, plants take the form of retail stores.) When firms add locations, they increase their proximity to consumers. But adding new locations comes at a cost, namely increased management costs and loss of business from existing locations through cannibalization.

Nicholas Trachter of the Richmond Fed discussed how firms locate plants. The paper he presented, "[Plants in Space](#)," was co-authored with Ezra Oberfield and Esteban Rossi-Hansberg of Princeton University and Pierre-Daniel Sarte of the Richmond Fed.¹ The paper advances a model with heterogeneous firms, each of which produces a unique variety of products at various locations with differing levels of productivity and proximity to customers.

Modeling firms in an economy with a vast number of widely distinct locations is complex because it involves a massive number of possible outcomes. In mathematical terms, this translates into a large "combinatorial" problem. Using insights from discrete geometry, the

researchers studied a tractable case of the problem. Their analysis delivers clear predictions on sorting across space.

Firms with higher productivity place more plants in densely populated areas with high rents than firms with lower productivity. Conversely, higher productivity firms place fewer plants in markets with lower population density and low rents. Controlling for the number of plants, higher productivity firms have larger plants than less productive firms in locations where both are present.

High-Cost Consumer Credit

Societies have a long history of instituting restrictions on high-cost credit. Yet, various economic analyses have concluded that restrictions on high-cost consumer loans can reduce consumer welfare, despite the good intentions of policymakers. Joaquin Saldain of the University of Virginia presented his paper "[A Quantitative Model of High-Cost Consumer Credit \(PDF\)](#)," which attempts to contribute to the understanding of this conundrum.

He presented data on U.S. households' use of "payday loans," which are generally unsecured by collateral. In 2012, the median loan size was \$350 and carried an extremely high annualized interest rate of 322 percent. Although the maturity of the median loan was 14 days, Saldain noted that this number is somewhat misleading because 80 percent of loans were renewed upon maturity.

He then outlined U.S. payday lending regulations. More than 20 percent of U.S. states have instituted outright bans on payday loans, and an additional 40 percent have set borrowing caps of \$500 per loan.

Saldain's paper studies the welfare consequences of these regulations. In his model, borrowers may be willing to borrow at high interest rates during bad times (following health shocks, for example), but they may also be tempted to consume more now than is desirable in the long run, and thus overborrow. The pricing of credit by lenders can either exacerbate overborrowing or limit it, which affects the efficacy and optimality of regulations.

Using estimates based on his model, Saldain finds that one-third of high-cost borrowers suffer from the temptation to overborrow, but that regulatory borrowing limits and interest-rate caps tend to reduce the welfare of these households. This result holds because, even in the absence of regulation, private borrowers in his model impose loan terms that effectively limit the borrowing of temptation-prone households.

Firm Exit and Financial Friction

Firm exit — or when firms shut their doors for good — is an important contributor to macroeconomic dynamics. In the U.S., for example, roughly 10 percent of firms go out of business each year, accounting for about 20 percent of all job losses. According to survey

results, 29 percent of U.S. firms that went out of business cited "low cash flow" as the main reason for their exit, and another 13 percent cited a "lack of credit." These observations pose interesting questions for policymakers, including:

- How many firms are forced to exit due to frictions caused by financial market inefficiencies?
- How much do such exits cost the economy?

Laura Castillo-Martinez of Duke University presented research from her forthcoming working paper "Financial Frictions and Firm Exit: Theory and Facts," which she is co-authoring with Gideon Bornstein of the University of Pennsylvania. The paper builds a two-period model of debt and potential default. In the case of default, a firm's debt holders take possession of the firm, which has been pledged as collateral. Under new ownership, the firm's profitability declines. The decline in profitability upon default — which can be interpreted as an inefficiency — creates a positive relationship between the firm's initial debt level and its probability of exit.

Castillo-Martinez presented empirical results based on data from Italy, Portugal and the U.K. for the period 2002-2016. She and her co-author found that the probability of a firm's exit was positively correlated with various indicators of financial health, including the firm's debt-to-asset and liquidity ratios. Moreover, they found that the relationship between indicators of financial health and exit becomes stronger during economic recessions. They conclude that the economy-wide losses from inefficient exit are potentially sizeable.

Consumption Segregation

Increasing inequality and segregation are pressing socioeconomic issues. Geographic segregation exists across several dimensions, including race, income and education. Such segregation can amplify inequality and have important implications for welfare, equality of opportunity and overall economic activity. Yet, little is known about consumption segregation — the geographical separation of people with relatively high levels of consumption from those with relatively low levels of consumption.

Elisa Giannone of Pennsylvania State University and the Richmond Fed presented "[Consumption Segregation \(PDF\)](#)," a forthcoming paper she is co-authoring with Corina Boar of New York University. The researchers point to several reasons consumption segregation is important. For example, it can have long-lasting implications because durable consumption goods can be passed across generations. Moreover, consumption segregation is arguably more directly related than income segregation to welfare segregation. Consumption segregation can also have important implications for the design of place-based policies to reduce inequality.

The working paper describes patterns of consumption segregation based on a data set drawn from several sources:

- Infutor, a new source with detailed geographical information about the ownership of durable consumption goods such as cars and properties
- Nielsen Homescan, which the researchers used to measure the segregation of nondurable consumption
- The American Community Survey, which they used to measure segregation by income and race

The researchers measured segregation with an entropy index in the case of categorical variables (such as race and consumption categories) and a rank-order index for continuous variables (such as consumption expenditure and income).

They found that durable goods consumption in the U.S. is much more segregated than nondurable goods consumption. In addition, while the segregation of total consumption (that is, durables plus nondurables) has been relatively stable over the past 15 years, there has been a modest decline in the segregation of nondurable consumption. They found that income segregation is the main driver of consumption segregation.

A Theory of Simplicity in Games

Economists use game theory to study the outcomes produced by the interacting choices of economic agents. In the case of some simple games, the optimal strategies of participants can be identified with relative ease. However, for more complicated games, it is often difficult to identify a single optimal strategy.

A large literature has been devoted to characterizing and finding the "solutions" to complicated games. Peter Troyan of the University of Virginia presented his recent contribution to this literature, "[A Theory of Simplicity in Games and Mechanism Design](#)," which he co-authored with Marek Pycia of the University of Zurich.

In this paper, agents playing in what are known as "extensive-form games" don't forecast all the way to final outcomes. Instead, they plan only for simple paths based on their current perspectives. Then, they update their so-called "strategic plan" as the game progresses. Also, players' moves are considered "simply dominant" only if they lead to unambiguously better outcomes, no matter what occurs over non-simple histories.

The researchers acknowledge that the relatively demanding "simplicity standards" proposed in their paper may reduce the flexibility of game designers in some cases. However, they also note that this is not always true, and many well-known game mechanisms are simple:

- Ascending auctions
- Posted prices
- Serial dictatorship-style mechanisms

In particular, the researchers explain the widespread popularity of the well-known random priority mechanism by characterizing it as the unique mechanism that is efficient, fair and simple to play.

Education, Marriage and Child Development

What determines sorting patterns in what economists refer to as the "marriage market"? What is the role of complementarities in household production? How do marriage and child-rearing affect the formation of economic inequality and its transmission across generations? These are just some of the questions that motivated the research of Pengpeng Xiao of Duke University and the Institute for Fiscal Studies, who presented "Education, Marriage and Child Development," a forthcoming paper co-authored with Pierre-André Chiappori of Columbia University, Monica Costa Dias of the Institute for Fiscal Studies and Costas Meghir of Yale University.

The researchers' goal is to understand how tax and welfare policies interact with education choices, marriage, divorce and investments in children. To that end, they develop a unified framework in which these various elements can be studied and quantified. Their framework is a life-cycle model with three stages:

1. Educational choices are influenced by the prospective returns they can yield in both the marriage and labor markets. More schooling yields higher income streams and increases the probability of marrying a highly educated spouse, which, in turn, increases the surplus obtained in marriage.
2. Marriage provides benefits of risk sharing and gains from complementarity in household production.
3. Life-cycle choices (including investment in children, labor supply, consumption and divorce) are influenced by tax and welfare policies.

The researchers plan to estimate the life-cycle model using data from the Panel Study of Income Dynamics (PSID). The PSID data includes a sample of over 18,000 individuals living in 5,000 families in the U.S. from 1968 to 2015 with information on education, employment, wages, marriage and children.

The Global Phillips Curve

GDP growth and inflation tend to co-move across countries. For example, when the rates of GDP growth and inflation declined in the U.S. during the 2007-2009 recession, they also declined in Europe, Canada, Japan and China. When the rates reversed course during the subsequent U.S. recovery, they also reversed course abroad. These co-movements indicate spillover effects transmitted through global asset and goods markets.

Exploring such global economic linkages, Felipe Schwartzman of the Richmond Fed presented research that will appear in the forthcoming paper, "The Global Phillips Curve," which he is writing jointly with Paul Ho and Pierre-Daniel Sarte, both also of the Richmond

Fed. The researchers aim to estimate a model that can explain the co-movements of inflation, GDP growth and interest rates across multiple global markets.

The economics literature exploring cross-market linkages typically takes one of two approaches:

- The first approach is to build a two-country model.
- The second approach is to build a model of a small open economy, one affected by movements in foreign asset and goods prices but too small to influence those prices.

In contrast, the researchers are developing a multi-country model, where multiple foreign countries are not simply combined into a "rest of the world" aggregate.

The researchers are taking a structural approach that includes multilateral trade linkages. In their model, the co-movements of prices and output are induced by global factors, common policies and the international transmission of foreign shocks. The model seeks to incorporate the intuitive idea that multilateral trade connects countries through a network in which the impact of trade shocks is transmitted through knock-on effects that effectively echo across the globe. In their model, multilateral trade and sticky prices give rise to a global Phillips curve that helps to explain cross-country co-movements in GDP growth and inflation.

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¹ *Trachter also summarized this research in his October 2021 article "[How Do Firms Choose Where to Place Establishments?](#)"*

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