

# Understanding Exports from the Plant Up\*

BY GEORGE ALESSANDRIA AND HORAG CHOI

**S**ome companies export their products abroad, while others choose to sell only in their home market. Similarly, over time, some nonexporters become exporters and some exporters stop exporting. The decision to export is a big, important decision for an organization, one that takes time and resources but one that can lead to an expansion of sales and profits. Policymakers recognize that although exporting isn't easy, it can boost sales and create jobs when successful. To help in this process, many states devote substantial resources to encouraging exports, including loans, trade missions, and trade fairs. Even the federal government has policies that encourage exporting, providing special tax treatment of profits on export sales and low-interest loans. In this article, George Alessandria and Horag Choi discuss some key factors that affect companies' decisions to export by describing some salient characteristics of establishments that export and then building a simple model of the decision to export that captures these features.

different models of this car in Europe for almost 10 years. Indeed, the U.S. market was the 37<sup>th</sup> export market for the car, even though the U.S. market is the largest car market in the world.<sup>1</sup> With high gas prices and a well-known parent company, the launch of this new product in the U.S. created a lot of buzz and sales: about 11,400 cars in six months.<sup>2</sup>

Like Mercedes with the smart car, some companies export their products abroad, while others choose to sell only in their home market. Similarly, over time, some nonexporters become exporters and some exporters stop exporting. The decision to export is a big, important decision for an organization, one that takes time and resources but can lead to an expansion of sales and profits.

Policymakers recognize that exporting isn't easy but can boost sales and create jobs when successful. To help in this process, many states devote

<sup>1</sup> According to Global Insight.com, in 2007 the top three national car markets in terms of units sold were the U.S. (16 million), China (8 million), and Japan (5.3 million).

<sup>2</sup> Based on data from motorintelligence.com.



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charge at [www.philadelphiafed.org/research-and-data/publications/](http://www.philadelphiafed.org/research-and-data/publications/).

In January 2008, Mercedes officially began selling the Smart Four-Two car in the U.S. market. The arrival of this little fuel-efficient car was a long time coming, since Mercedes had been producing and selling

\*The views expressed here are those of the authors and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

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substantial resources to encouraging exports, including loans, trade missions, and trade fairs.<sup>3</sup> Even the federal government has policies that encourage exporting, providing special tax treatment of profits on export sales and low-interest loans. These policies are often justified by pointing to the desirable characteristics of exporters: Exporters tend to have more workers and are more productive than nonexporters.<sup>4</sup> The hope is that if exporting is encouraged, some firms will hire more workers and become more productive. But it could be the case that successful firms export rather than the case that exporting leads to success. If so, the policy implications are quite different.

In this article, we discuss some key factors that affect companies' decisions to export by describing some salient characteristics of establishments that export and then building a simple model of the decision to export that captures these features. Our analysis has four key benefits. First, our model of exporting allows us to think about whether establishments become bigger and more productive when exporting or whether bigger and more productive establishments become exporters. Second, it provides a framework for categorizing and interpreting the barriers to trade.

Knowing what the barriers to trade are can help policymakers to design policies to lessen the impact of these barriers. Third, it also helps to explain the pattern of trade, since the number of establishments exporting is an important determinant of trade flows between countries. Finally, we

vehicles and subcompacts, since these products tend to be produced in different establishments. Thus, focusing on establishments provides the cleanest look into the relationship between products produced and traded.

The data we study are based on economic surveys of manufacturers

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explain how the decision to export may be important for the response of trade to changes in the costs of trade over time.

### SOME KEY CHARACTERISTICS OF EXPORTERS

We start our analysis of exporters and nonexporters by focusing on their characteristics at a moment in time in a few countries. To be consistent with the theory we develop later, which studies the decision to sell a single product overseas, we use the establishment, rather than the firm, as our basic unit of analysis. An establishment is a physical location, or plant, where economic activity takes place, while a firm is a collection of establishments with the same owner. For instance, the Ford Motor Company owns a manufacturing assembly plant in Louisville, Kentucky, where about 4,000 workers assemble trucks.<sup>5</sup> This assembly plant is an establishment. Ford also owns many plants in other parts of the U.S. and throughout the world, each representing an establishment. To take the Ford example one step further, by looking at establishments, we can separately consider exports of large sport utility

undertaken by statistical agencies in each country. We focus on manufacturers because they produce the goods that are most easily traded across countries. For the U.S. our analysis is based on data from the Census of Manufactures, a survey of the economic activity of the universe of U.S. manufacturing establishments that is taken every five years.

Three key characteristics of establishments and trade emerge from the data. First, not all establishments export. In the U.S., out of 31,133 active manufacturing establishments in 2002 with 100 or more employees, only 46 percent exported anything. The percentage of exporters would be even smaller if we included establishments with fewer than 100 employees in our analysis. Second, exporters tend to be bigger than nonexporters, with nearly 50 percent more workers (an average of 388 workers for exporters and 257 for nonexporters) and twice as many annual sales (an average of \$133 million vs. \$67 million per year). Again, these gaps are even bigger if we include plants with fewer than 100 employees. Third, exporters are more productive as measured by labor productivity (the amount of output produced per worker). For instance, in our sample, exporters generate nearly 31 percent more sales per worker than nonexporters.

<sup>3</sup> An example of a state-level program to help companies export is the Pennsylvania Market Access Grant (MAG). The MAG provides small and medium-size companies with financial assistance and support for entering foreign markets. Specifically, the MAG program provides up to \$5,000 in matching funds to both offset a portion of the qualifying expenses associated with new international initiatives and provide international business support (<http://www.newpa.com/download.aspx?id=1114>).

<sup>4</sup> Starting in 1971, the U.S. tax statutes allowed companies to create a separate sales organization for exports that exempted their export revenue from corporate taxes. Such tax breaks have been at the center of trade disputes between the European Union and the U.S. over the years and were eliminated only in 2006.

<sup>5</sup> This plant assembles the F-250-F550, Super Duty, Lincoln Navigator, and Ford Expedition. It is one of 81 manufacturing locations (<http://media.ford.com/plants.cfm>).

While the data show that exporters are bigger in terms of workers and sales than nonexporters, this ordering is not absolute. There are some small establishments that export, and some big establishments that sell only in the U.S., so that size is a useful, but imprecise predictor of exporting. Figure 1 shows how the fraction of establishments exporting varies with establishment size. For instance, in 2002 among U.S. manufacturing establishments with 100 to 249 employees, about 42 percent exported, while among establishments with over 2,500 employees, about 80 percent exported.

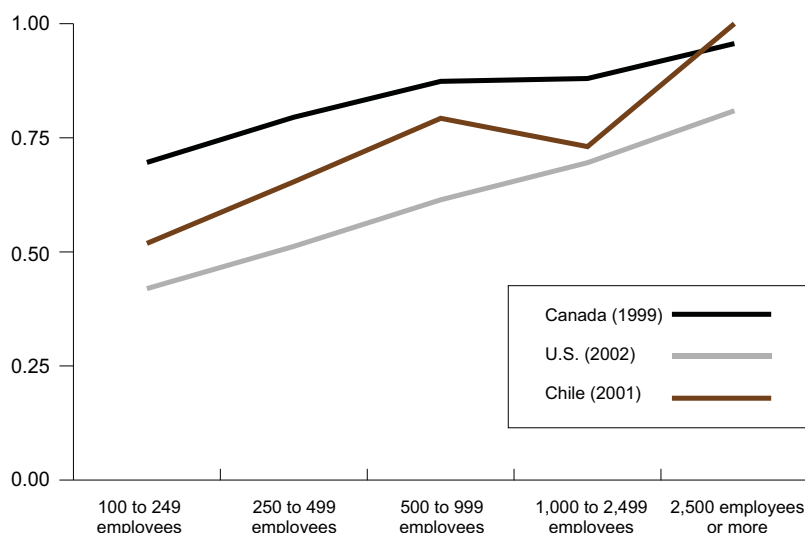
Across countries, we find similar features of manufacturing establishments. For instance, based on manufacturing data<sup>6</sup> on establishments in Canada (in 1999) and Chile (in 2001), Figure 1 shows that, as in the U.S., not all plants export but the fraction of establishments exporting increases with size. From Table 1, we also see that exporters are also relatively larger and more productive in these countries too. For instance, in Canada exporters have 50 percent more workers, 119 percent more sales, and 45 percent more sales per worker. Similar premiums are evident for Chilean exporters.

These characteristics of establishments are also robust across industries. For instance, using similar data for the U.S., Andrew Bernard and Bradford Jensen show that these exporter premiums are not just due to differences in industry composition or the amount of capital, such as machines, software, or infrastructure, that each worker has to work with. That is, within narrowly defined industries, we find similar differences between exporters and nonexporters.

<sup>6</sup> Statistics for Chile are based on a sample of 794 plants with 100+ employees and, for Canada, on a sample of 4,258 plants with 100+ employees.

**FIGURE 1**

### Fraction of Establishments Exporting by Size



**TABLE 1**

### Exporter Premiums in U.S., Canada, and Chile\*

	U.S. (2002)	Canada (1999)	Chile (2001)
Employment	51%	50%	46%
Sales	97%	119%	102%
Sales per worker (labor productivity)	31%	46%	39%

\* Based on plants with 100+ employees in the year of the survey. Premiums are calculated as  $\text{premium} = X_{\text{exporters}} / X_{\text{nonexporters}} - 1$ , where X is the variable in question.

#### DYNAMIC CHARACTERISTICS OF EXPORTERS AND NONEXPORTERS

As in the case of the factory producing the Smart Four-Two in Hambach, France, for the U.S. market, not all establishments are born exporters but rather come to this decision over time. Thus, the key attributes of exporters and nonexporters we've just

described reflect both current and past choices made by establishments. We now describe how the ins and outs of exporting are related to the life cycle of establishments.

While exporting is not a once-and-for-all decision, it is fairly persistent. For instance, using a sample of U.S. manufacturing establishments contained in the Longitudinal

Research Database (LRD), an annual survey similar to the Census of Manufactures but geared toward large establishments, Bernard and Jensen (1999) find that from 1984 to 1992, among U.S. exporters there was, on average, only a 14 percent probability that an exporter in one year stopped exporting in the next year (Table 2). Similarly, nonexporters are likely to continue not exporting from one year to the next. For instance, in the U.S. from 1984 to 1992, the typical nonexporter in the LRD had only about a 12 percent chance of becoming an exporter in the next year. The churning in exporting suggests that the typical exporter expects to spend about seven years exporting when it enters the export market. Similarly, medium-size nonexporting manufacturers expect to start exporting in eight and a half years.<sup>7</sup>

These movements in and out of exporting are also observed in other countries. In Chile, there are slightly fewer movements in and out of exporting, since only 11.5 percent of exporters stop exporting in the following year, while only 3.5 percent of nonexporters start exporting in the following year (Table 2).

These movements in and out of exporting are also not random. Indeed, prior to exporting, future exporters are already relatively big and growing fast. For instance, studying a panel of plants that are in continuous operation, Bernard and Jensen find that four years prior to starting to export, these future exporters already sell 27 percent more and have 20 percent more employees than firms that do not export at all over the same period. Not only are future exporters bigger than

current nonexporters, but they also tend to grow relatively quickly prior to exporting. For instance, in the run-up to exporting, these future exporters tend to grow 1.4 to 2.4 percent faster in both sales and employment, respectively. These superior characteristics of future exporters in size and growth are even larger for future exporters among Chilean establishments (Table 3).<sup>8</sup>

### A SIMPLE MODEL OF THE DECISION TO EXPORT

We now describe a simple theory that captures the key cross-sectional and dynamic features of plants involved in international trade. A key idea of this theory is that big plants have more to gain by exporting than small plants. Additionally, big plants are big because they tend to be good at what they do and so people want more of their products. Taken together, these two ideas suggest that big plants are both more likely to export and

<sup>8</sup>These calculations are based on plants that are continuously producing and do not take into account how the likelihood of survival differs by plant size or export participation. When examining the relationship between exporting and exiting, or going out of business, Bernard and Jensen find that plants that export are less likely to exit, controlling for other characteristics of plants.

more likely to be productive. Thus, the desirable characteristics of exporters arise because producers with desirable characteristics have chosen to export.

This theory is based on the work of Mark Roberts and James Tybout (1997) and contains four distinct elements.

**Producer Heterogeneity in Ability.** The first element of the theory is that producers fundamentally differ in their ability and hence can be said to be heterogeneous. Some establishments produce products of higher quality, so that people are willing to pay more for them; other plants are more productive, so that they can produce the same products but more efficiently and hence more cheaply. Fundamentally, both these sources of heterogeneity imply that producers differ in how efficiently they can convert inputs, such as workers, raw materials, and machines, into revenue and ultimately profits.

To make this idea concrete, consider the market for MP3 players. Apple iPods tend to have higher prices than other brands with similar memory, yet Apple sells many iPods (over 200 million, and counting, since launch). Similarly, an establishment may come up with a great way of producing a good inexpensively and then

**TABLE 2**

### Probability an Establishment Starts or Stops Exporting

	U.S. (1984 to 1992)	Chile (1990 to 2001)
Probability of starting to export in $t+1$	12%	3.4%
Probability of stopping export in $t+1$	14%	11.5%

U.S. statistics are based on calculations from Bernard and Jensen (1999), which are based on data from the U.S. Longitudinal Research Database. Chile statistics are based on the industrial census.

<sup>7</sup> The duration of exporting and nonexporting is calculated as the inverse of the probability of changing status (for an exporter  $7.6 \text{ years} = 1/[1-0.86]$ ).

**TABLE 3****Exporter Premiums of Future Exporters**

	U.S. (1984 to 1988)	Chile (1997 to 2001)
Levels (4 years prior to exporting)		
Sales	27%	85%
Employment	21%	51%
Growth rate (4 years leading to exporting)		
Sales	2.4%	3.6%
Employment	1.4%	3.0%

The top panel (levels) shows that plants that start exporting (in 1988 in U.S. and in 2001 in Chile) already have a size advantage, either in sales or employment, four years prior to starting to export (1984 in U.S. and 1997 in Chile). The second panel shows that these new exporters grow faster than plants that did not export at all in the entire period. U.S. statistics are from Bernard and Jensen, Tables 2 and 3. Chile statistics are based on our own calculations.

be able to undercut its competitors on price to attract more customers. In the iPod example, this can be thought of as the original innovation making it easy for people to carry an entire collection of music without pulling a trailer of CDs.

For simplicity, think of this heterogeneity as being summarized by an establishment's ability to convert work effort into a product consumers are willing to buy. Let's also suppose that an establishment that is better at converting its workers' efforts into revenue also sells more goods and earns a bigger profit. The two lines in Figure 2, Panel A show how an establishment's innate ability translates into its de-

mand for workers and profits. A plant with a higher ability will have larger sales, which requires it to hire more workers and yields more profits.

**Changes in Ability Over Time.**

The second element of the theory is that a plant's ability changes over time. This may arise from luck<sup>9</sup> or the uncertain returns from investing in product or process innovation. Take Apple again. Over 30 years it has had some real big hits, such as the Apple II, Mac, iPod, and iPhone, and some other products that didn't sell so well, such as the Apple III or Lisa. With its successes and failures Apple has expanded and contracted over time, adding and subtracting workers as profits rose and fell.

The specific points in Panel A of Figure 2 capture one possible path of a plant's ability over time in our simplified framework. In period 1, a plant starts out with low ability. In period 2, it becomes better and has high ability. In period 3, its ability slips back to medium. Notice that as a plant gets better

and worse at producing, it adds and subtracts workers (from low workers to high workers to medium workers) and its profits fluctuate as well (from low profits to high profits to medium profits).

**Costs of Exporting.** The third element of the theory is that there are costs to exporting. To make things simple, we consider two types of costs: fixed costs, which don't depend on the amount being sold in the market; and variable costs, which depend on the amount sold in the foreign market.

The fixed costs can also be split into upfront costs and continuation costs. Upfront costs reflect the investments that a plant must make prior to exporting its product. Some examples of these costs are the market research about the export market, investments to tailor its product to a specific market, and the creation of marketing and distribution networks. Many of these costs are specific to the product being exported and are said to be sunk costs, since they have no residual value to any other establishment. These investments are made upfront and do not really depend on how many units are subsequently sold. Continuation costs are costs incurred each period to continue selling in the market, and again, these do not depend on the amount to be sold in the current period. In the case of the Smart Four-Two, the product needed to be modified to U.S. safety and emission standards, a dealer network needed to be established with salesmen and mechanics, plus parts needed to be stocked for repairs. The costs of maintaining these dealer and repair networks must be incurred each period to keep selling in the U.S. and are typically lower than the costs of entering the export market. (See *Estimates of the Costs of Trade*.)

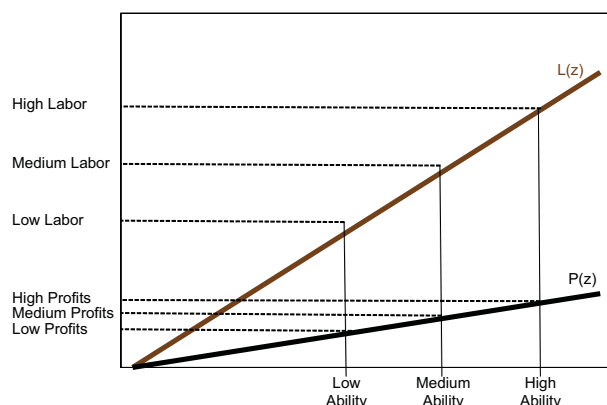
The variable costs to trade essentially are those costs that increase the cost to consumers in the destination

<sup>9</sup> By luck we mean that a producer's sales might be affected by something outside its control such as the weather or the decisions of other producers. For instance, a farmer may face a drought, a competitor may succeed in developing a product that makes another product obsolete, or alternatively, a customer may find a new use for an existing product, making it more valuable.

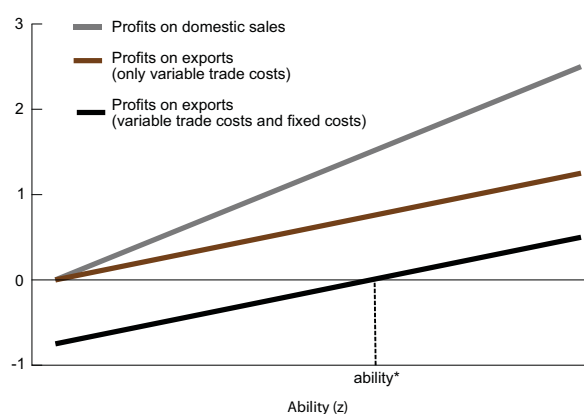


# FIGURE 2

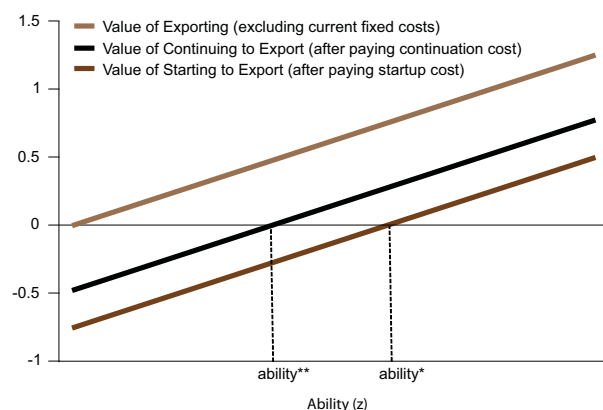
## A. Labor Demand and Profits as a Function of Ability



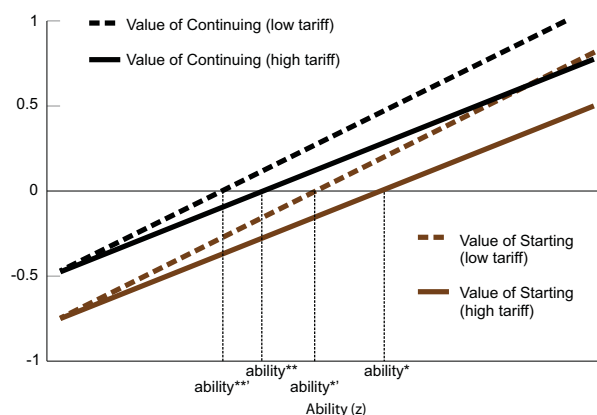
## B. Profits as a Function of Ability and Trade Costs



## C. Value of Exporting with Upfront and Continuation Costs



## D. Value of Exporting and Tariffs



market of each unit shipped. Some examples of these costs are packaging, shipping (air, ocean, rail/truck), insurance, and tariffs.

### How Ability and Export Costs Affect Sales at Home and Abroad.

The fourth element of the model is explaining how a firm's ability in one market translates into its ability/profits in a second market, given the costs of trade. For now let's suppose that consumers like goods equally in both markets, so that if an establishment charges the same price overseas as

it does at home, it will sell the same amount overseas as it does at home.

To start, suppose there are only variable trade costs; that is, fixed costs are equal to zero, so that it is more costly for a firm to sell more of its products in foreign markets. In this case, the firm would not want to charge the same price on exports, since these exports cost more to deliver to consumers in the export market and this will lower profits. For instance, suppose there is a 5 percent tariff, so that a product that sells in the U.S. for

\$100 will now sell overseas for \$105.

This higher price will tend to lower both the amount sold and hence profits on sales in the destination market. In Panel B of Figure 2 this is depicted by the brown line, which shows that for the same ability the plant will make lower profits on its exports than on its domestic sales.

Now, suppose that in addition to variable costs there are also fixed costs to exporting. Moreover, assume that the costs of starting to export are the same as the costs of continuing to

## Estimates of the Costs of Trade

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dentifying and measuring the barriers to international trade are important because it allows policy-

makers to prioritize reform. For instance, we can ask whether we should cut tariffs, improve infrastructure at ports and customs, alter product standards, provide exporters with financing, or alter the tax code.

In general, the barriers to trade are quite large. One way of measuring them is to ask: How much would these barriers have to add to the price of a good shipped internationally to explain the amount of trade we actually see in the data? This methodology assumes that trade makes imported goods relatively more expensive, lowering demand. In a recent *Business Review* article, Edith Ostapik and Kei-Mu Yi take this approach and find that barriers to international trade

add about 74 percent to the price of foreign-produced goods.

Traditionally, these model-based measures of trade barriers ignore the salient characteristics of exporters we have summarized. However, a similar exercise can be undertaken using the model we have sketched out. In one of our studies (2007), we estimate the fixed costs (both upfront sunk costs and those to continue in the market) separately from the per unit cost of exports for U.S. exporters. We find that the cost of starting to export is nearly four times larger than the cost of continuing to export. Including these fixed costs, we now find that the per unit cost of trade adds about 45 percent to the price of imported goods, or about 75 percent of what one would find ignoring exporter characteristics (in which case the cost is closer to 66 percent). This suggests that the costs involved in entering and staying in export markets account for about one-quarter of the barriers to international trade.

when the upfront costs of starting to export are larger than the costs of continuing to export. With this cost structure of exporting, a plant that pays the costs of starting to export today will have the option to continue exporting in future periods by paying the lower continuation costs. Because this investment in exporting lowers the plant's future costs of exporting, making it cheaper to continue exporting in the future, the plant must consider how both its current and future profits are affected by entering the exporting market. Thus, a plant will export when the total additional profits earned over time from exporting exceed the additional costs of exporting.

To make the dynamic aspects of the export decision clear, let's think about a plant that is considering exporting its product for two periods: today and tomorrow. Suppose it considers only two periods because its competitor is developing a superior product that is going to make its product obsolete. By exporting, it will earn profits of \$100 today and \$100 tomorrow. Suppose further that starting to export costs \$125, while the cost of staying in the export market is only \$25. If the plant exports today and tomorrow, it will lose \$25 today and make profits of \$75 tomorrow. Now, if the plant values future profits in the same way as current losses, it will start exporting because the total profits of \$50 over the lifetime of the investment exceed the costs.

Consider now how the decision to export is different in the second period than in the first. Having arrived in the second period, the plant will continue to export as long as the profits from doing so exceed the costs, which are lower, only \$25. So the plant will need a much smaller scale of operation to continue to export than it needed to start. Of course, the plant will take into account the likelihood of these

export. There is now a simple tradeoff between current profits and the cost of selling overseas. Essentially, the profits of exporting are lowered by the cost of exporting so that export profits are lower at every ability level (denoted by the black line in Panel B of Figure 2).

To make things concrete, suppose a plant is considering exporting today and that exporting will cost \$100 regardless of how much the plant sells overseas. For it to be worthwhile to export, the plant must earn enough extra profits in the foreign market to cover the \$100 cost of entering the market. Consequently, excluding the \$100 upfront cost, a plant that gains \$125

in profit from exporting will enter the export market, since it will make a net profit of \$25, while a plant that gains only \$75 will not export, since it would end up losing \$25 by exporting.

More generally, because producers don't like to lose money, they will export only when profits net of these export costs are greater than zero. Since profits increase with ability, this means that there is some minimum ability level, call it ability\*, so that only establishments with ability equal to or above ability\* will export.

**Putting It All Together.** The final piece of the model is to understand how the decision to export changes

profits in the second period when deciding to start exporting in the first period.

Panel C plots the net gain in profits to a plant from exporting. Because this is based on a plant's current and future ability, just like current profits, this also increases with a plant's current ability. A plant that is not exporting but would like to export must pay a high cost to start exporting, so this will shift down the value of exporting by the entry cost and there will be a cutoff,  $ability^*$ , so that only plants with ability greater than or equal to  $ability^*$  find that the benefits of exporting exceed the costs. For a plant that is already exporting, the cost of continuing in the export market is smaller and so there is a different threshold,  $ability^{**}$ , such that all producers with ability above  $ability^{**}$  find it worthwhile to export. Given that the costs of starting to export are greater than the costs of continuing to export, the threshold to start exporting is higher than the threshold to continue exporting ( $ability^* > ability^{**}$ ).

Finally, we consider how the gains to exporting affect the thresholds to export. Specifically, if the variable trade cost to a destination is lower (say, because tariffs are low or it is in close proximity, leading to lower shipping costs), a producer will sell more for the same ability. In panel D, this means that the value of exporting to this destination will be higher for a given ability. (In practice, this shows up as an upward rotation of the value of starting [brown dashed line] and the value of continuing exporting [black dashed line]). This makes that market more attractive. Because the export market is more attractive, some lower ability nonexporters will find it profitable to start exporting, leading to a lower threshold  $ability^*$ . Similarly, some low ability exporters will now find it worthwhile to continue

exporting, so the threshold to continue exporting,  $ability^{**}$ , will also be lower. With lower cutoffs, there will be more exporters and each exporter will sell more.

Having described our model, we can now study how changes in a plant's ability — recall that this is either productivity or quality — over time affect sales, employment, and the decision to export. Table 4 considers a particular sequence of abilities over a 10-year period for a single plant. We also include the labor that the plant hires each period to satisfy demand for its product at home and abroad (if it exports).

The plant originally starts small, selling just at home. Over time, as its ability improves, it adds workers. In year three, once it has become sufficiently productive, it starts exporting and needs to hire additional workers to produce goods for the foreign market. The plant's ability improves until year 6 and then starts to decline. In year 10, the plant's ability has fallen so far that it is no longer worthwhile to export

and so it sells just at home. Notice that the plant continued to export even after its ability had slipped below the level when it started exporting. This is because the cost of staying in the market is lower than the cost of starting to export, and so the ability threshold to exit is lower than the ability threshold to start exporting.

## SUCCEEDING TO EXPORT? OR EXPORTING TO SUCCEED?

With this simple model in place, we return to a key question about exporting: Does success beget exporting, or does exporting lead to success? We can use our model to see which of these views has more support. If success begets exporting, our model, which is based on this idea, should be able to explain the key facts we've described. If exporting really does lead to success, our simple model will not be able to capture these same facts.

First, consider how our model can capture the size advantages of exporters and the persistence of their export

**TABLE 4**

### An Example of a Plant's Dynamics

Year	Ability	Workers for Domestic	Workers for Exports	Total Workers
1	1	5	0	5
2	1.8	9	0	9
3	2	10	2	12
4	2.2	11	2.2	13.2
5	2.4	12	2.4	14.4
6	2.8	14	2.8	16.8
7	2.2	11	2.2	13.2
8	2	10	2	12
9	1.8	9	1.8	10.8
10	1.5	7.5	0	7.5

Workers for exports are the additional workers hired to produce products for export.



participation. In our model, because of the fixed costs, not all establishments export. Exporting is worthwhile only when plants have high ability. Consequently, the model explains why exporters tend to be bigger and have more ability than nonexporters. Additionally, if the costs of continuing to export are low relative to the costs to start, once a plant starts exporting, it will continue exporting for a long time, as in the data. So the decision to export will be quite persistent, as in the data.

Next, consider how our model can also capture the level and growth advantages of future exporters described in Table 3.

With regard to the size advantages of future exporters, recall, for instance, that in the U.S., plants that will export in the future have about 27 percent more employees than those plants that will not export in the future. To understand how the model generates the size differences of future exporters, consider two plants with different abilities: one plant with ability 1 and the other with ability 1.5. Suppose that both plants' ability improves by 10 percent and that it takes an ability of 1.6 to start exporting. Now the higher ability plant, whose ability has improved to 1.65, will export, and the low ability plant, whose ability has improved to 1.1, will not export, generating a size premium of future exporters. As long as future ability depends positively on current ability, in the future, high ability plants will be more likely to export than low ability plants and there will be a size premium of future exporters.

Next, consider the growth advantages of future exporters. Recall that in the U.S., plants that export in the future grow 1.4 percent faster per year than plants that do not export in the future. Take two plants with the same ability today, normalized to 1. Suppose that, to export, a plant needs an ability

of 1.5. If tomorrow we observe that one plant is exporting and the other is not exporting, it must be the case that the exporter's ability improved by more than that of the plant that did not export. This may explain why plants that eventually export experience more growth than those that don't.

Our simple model of exporting captures the key characteristics of exporters and nonexporters at a moment in time and over time. This is consistent with the idea that successful plants become exporters.

### MACROECONOMIC CONSEQUENCES OF MICRO HETEROGENEITY

The basic model developed here captures the salient features of manufacturers that export. It also provides some insights into the determinants of aggregate trade flows across destinations and over time. We now show how the model of entry and exit from exporting can matter for aggregate

trade flows by first looking at how the characteristics of U.S. exporters differ by destination. We then consider how changes in the characteristics of U.S. exporters are related to changes in the volume of U.S. exports to the rest of the world.

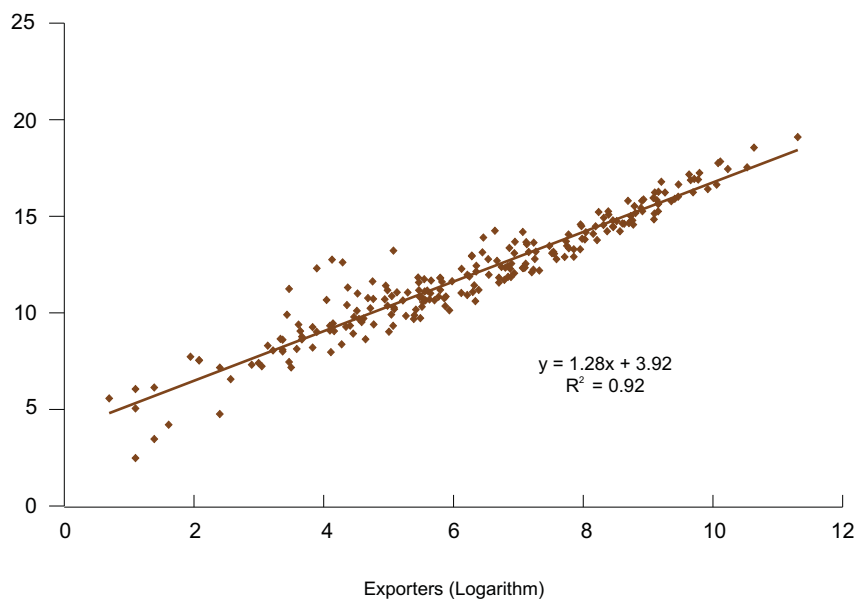
Looking at the volume of U.S. exports by destination<sup>10</sup> in 2006, we see from Figure 3 that the value of exports (measured in U.S. dollars) increases with the number of exporters. Indeed, the value of exports rises faster than the number of exporters, so that a destination with 10 percent more exporters tends to receive 12.8 percent more U.S. exports. This suggests that desti-

<sup>10</sup> The data for the destination-specific analysis described in this paragraph and in Figures 3, 4, and 5 come from the U.S. Exporter Database, available from the U.S. Department of Commerce's International Trade Administration division. Unlike the case with our plant-level data, the unit of analysis here is the firm. These data are available at <http://ita.doc.gov/td/industry/otea/edb/index.html>.

**FIGURE 3**

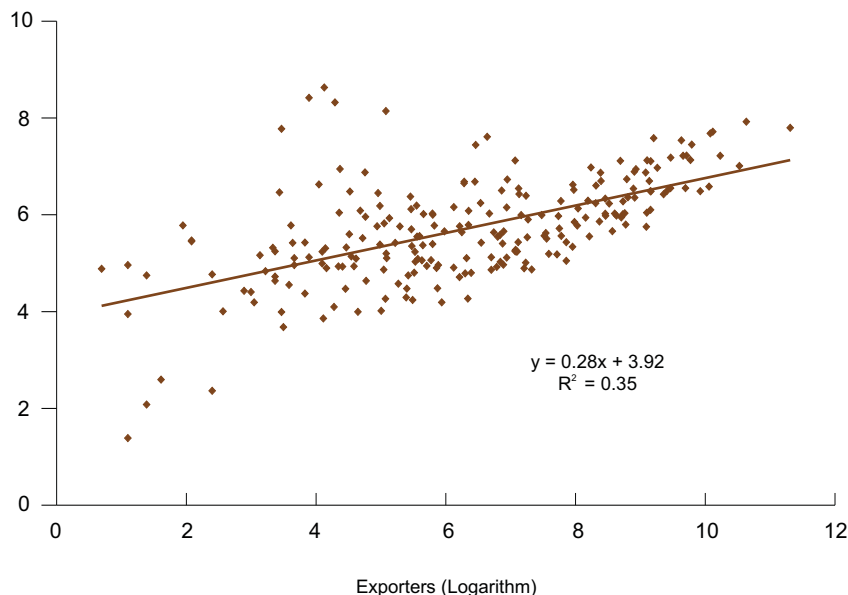
### Value of Exports Rises Faster than Number of Exporters

Value of exports (\$- Logarithm)



**FIGURE 4****Exports Per Firm Are Rising With Number of Exporters**

Shipments per firm (\$ - Logarithm)



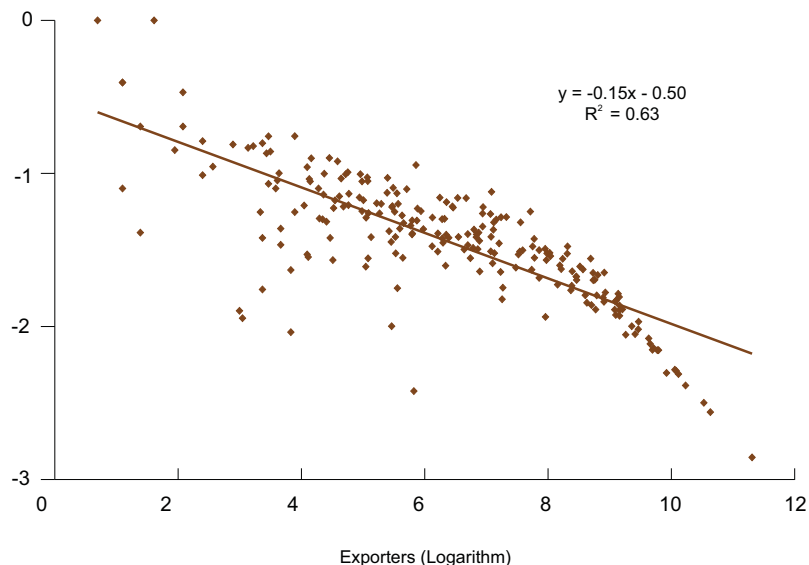
nations with a high volume of exports tend to have exporters that are selling a lot on average. One way of seeing this is to plot the average exports per firm against the number of exporters in each destination market (Figure 4). Recall from our theory that firms sell more overseas if the variable costs are lower. So Figure 4 suggests that the costs of shipping to these destinations are lower, which increases demand for exports and sales per exporter. Additionally, because these variable costs are lower and firms can sell more in these markets, these markets also attract more exporters. Indeed, our theory says that these more attractive markets should attract more low ability firms. Figure 5, which plots the number of exporters against the share of big exporters (those with more than 500 employees) in 2006, shows this is the case. Destinations with more U.S. exporters also tend to attract a smaller share of large exporters.

Looking across destination markets provides some insight into how exports may expand through time. Another, perhaps more direct, approach is to directly examine how exports and the characteristics of exporters have changed over time.

In a recent paper (Alessandria and Choi, 2010), we study how the U.S. has increased its trade with the rest of the world. Specifically, we examine the change in the share of U.S. manufacturing output that was exported from 1987 to 2002. Again, focusing on those establishments with 100 or more employees, we find that the share of manufacturing output exported rose from 6.1 percent to 9.7 percent. We then show that this nearly 46.4 percent change in the share of output being exported<sup>11</sup> can be broken down

**FIGURE 5****Markets with More Exporters Attract Smaller Exporters**

Fraction of Exporters with 500+ employees



<sup>11</sup> Changes in this section are calculated using the log of a variable so that the change in trade of 46.4 percent equals  $\ln(9.7/6.1)$ .

into three distinct margins measuring the change in: 1) exporter intensity, 2) exporter premium, and 3) exporter participation.

The first margin, exporter intensity, measures the share of exporters' output that is exported. This term rose 42.3 percent, from 10.0 percent to 15.2 percent, as each exporter exported more of its output. In our theory, the amount that an exporter sells overseas is directly tied to the variable cost of exports, so that an increase in this margin is evidence of a fall in the variable costs of trade.

The second margin, the exporter premium, measures the size of exporters relative to all establishments in the economy, in terms of average sales. This term captures the idea that if exporters are big, then all else equal, this will raise the share of output being exported. Over time, the exporter premium fell from exporters being 64.5 percent larger than the average establishment to only 35.4 percent larger.

Finally, the third margin, exporter participation, measures the share of manufacturing plants that are also exporters. This rose from 37 to 46.9 percent. Taken together, the change in these last two margins tell us that the size gap between exporters and all plants is falling because more small plants are exporting.

The change in trade over time in the U.S. is consistent with what we see in the cross-section of destinations. Trade growth is a result of more sales per exporter and more plants exporting, although these additional exporters tend to be smaller than the plants exporting originally.

Our breakdown of trade growth sheds some light on why trade and exporting have grown. In particular, exporters will sell more abroad when the variable costs of selling are lower and this attracts more exporters. Given the rising share of exporters' output that is being exported, our research finds that the main source of growth in trade has thus been a fall in the variable costs of exporting, rather than a drop in the fixed costs of trade.


## SUMMARY

The decision to export is an important decision for most establishments. Here we describe some of the key features of establishments that sell their products overseas. These exporters are superstars. They are bigger and both more productive and more profitable than nonexporters and remain so for a long time.

Some point to the success of these exporters and call for policies to encourage exporting with the hope that the process of exporting will transform

less productive producers into superstars. But correlation is not causation. Our simple model shows that causation may run from superstar to exporting. Indeed, future exporters tend to be more productive and to grow faster even before they enter export markets.

Studying the export decision also provides some guidance about the structure of barriers to international trade and their magnitude. The relative size of exporters and the persistence of export participation suggest that the upfront costs to exporting may indeed be sizable. To the extent that these costs are man-made, policies that lower these barriers will encourage more exporters and more exports. Finally, studying the export decision sheds light on the determinants of the pattern of trade between countries. A key source of differences in exports by destination market is in the number of establishments that sell their products in a destination.

The cross-sectional dynamics of exporting suggest that the decision to export is important for the expansion of trade. Much export growth occurs when the value of selling in foreign markets rises enough so that some nonexporters start exporting and some current exporters earn enough to delay exiting and export for a longer time. 

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# What Have We Learned About Mortgage Default?\*

BY RONEL ELUL

**B**y the end of 2009, one out of every 11 mortgages was seriously delinquent or in foreclosure. Economists have devoted considerable energy over the past several years to understanding the underlying causes of this increase in defaults. One goal is to provide a guide to dealing with the existing problems. In addition, a better understanding may help avoid future problems. In this article, Ronel Elul reviews recent research that has shed light on two areas: the extent to which securitization is responsible for the increase in default rates; and the relative contributions of negative equity, compared with “liquidity shocks,” in explaining mortgage default.

The current crisis has seen an increase in mortgage default rates unprecedented since the Great Depression. By the end of 2009, one out of 11 mortgages was seriously delinquent or in foreclosure.<sup>1</sup> In states that have been

<sup>1</sup>“Seriously delinquent” mortgages are defined, in this case, as those mortgages that are 90 or more days delinquent, that is, that have missed three or more payments, without actually being in foreclosure. Many of these mortgages later end up in foreclosure.



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hit hard by the collapse in housing, the figure is even higher: for example, one out of five in Nevada. Concerns about the effect of losses caused by mortgage defaults also led to the collapse of several large financial institutions.

Economists have devoted considerable energy over the past several years to understanding the underlying causes of this increase in default. One goal is to provide a guide to dealing with the existing problems. For example, should troubled mortgages be modified and, if so, how? In addition, a better understanding may help avoid future problems. Recent research has shed light on two areas: the extent

\*The views expressed here are those of the author and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

to which securitization is responsible for the increase in default rates; and the relative contributions of negative equity (that is, having a mortgage balance greater than the value of one’s house), compared with liquidity shocks (for example, job loss or expenses due to unforeseen illness) in explaining mortgage default.

## MORTGAGE SECURITIZATION

Many of the mortgages issued during the boom were securitized. When mortgages are securitized, they are sold by the issuer to a trust (known as a special purpose vehicle, or SPV). The SPV issues securities that are backed by these mortgages, known as mortgage-backed securities (MBS). Mortgage securitization first began in 1970, in part to ease financing constraints that arose when the baby boom generation reached adulthood and began to purchase houses en masse.<sup>2</sup> By 2006, nearly two-thirds of all mortgages originated were securitized.<sup>3</sup>

Traditionally, mortgages were securitized by the three government-sponsored enterprises (GSEs): Fannie Mae, Freddie Mac, and Ginnie Mae.<sup>4</sup> In exchange for a fee, they guaranteed the mortgages in the pool against default. (This guarantee was explic-

<sup>2</sup> See the book by Michael Fishman and Leon Kendall.

<sup>3</sup> Source: Inside Mortgage Finance.

<sup>4</sup> Ginnie Mae is part of the Department of Housing and Urban Development, while Fannie Mae and Freddie Mac are private corporations (although, since September 2008, they have been under the conservatorship of the Federal Housing Finance Agency).

itly backed by the U.S. government for mortgages securitized by Ginnie Mae, and it was widely believed by the market that mortgages securitized by Fannie Mae and Freddie Mac were also implicitly government-backed.)

However, beginning in the early 2000s, the *private securitization* market began to expand. These loans were securitized without government backing (either explicit or implicit). The MBS were issued by large financial institutions such as Lehman Brothers and Countrywide, although in many cases the loans themselves may have been originated by smaller nonbank mortgage lenders. Private securitization can be attractive to issuers for several reasons. First, GSEs were prohibited from guaranteeing mortgages with large balances (known as jumbo mortgages); this was particularly important in markets with high house prices, such as California. Also, the GSEs typically focused on safer loans, known as *prime* loans. By contrast, they were more reluctant to finance *subprime* mortgages made to riskier borrowers.<sup>5</sup> The private securitization market grew rapidly, making up over half of all securitization by 2005 (Figure 1).

When the mortgage market collapsed in mid-2007, these private securitized loans began defaulting at particularly high rates (Figure 2). The popular press laid blame on securitization for encouraging risky lending practices, and the financial reform bill passed in July 2010 requires securitizers

to retain 5 percent of the assets they securitize. The underlying view of this reform is that underwriting practices would improve if the seller had more “skin in the game.”

But how does securitization affect default rates? One possibility is that lenders securitized riskier loans and, in particular, that they took advantage of the fact that investors could not fully distinguish the loans’ risk. The other possibility is that securitized loans defaulted at higher rates because servicers<sup>6</sup> were less likely to work with borrowers who got in trouble after the loans were originated — either

<sup>6</sup> A servicer is an entity responsible for the day-to-day management of the mortgage loan, collecting payments, and transferring them to the lender or the investors in the security. Most important, they are also the ones who work out the details of modifications with borrowers. In some cases, the servicer actually owns the loans it is servicing, whereas, in other cases, the servicing is outsourced; this is the case for securitized loans, in particular.

because there was less incentive for them to do so, or because the structure of the securitization made it more difficult to do so.

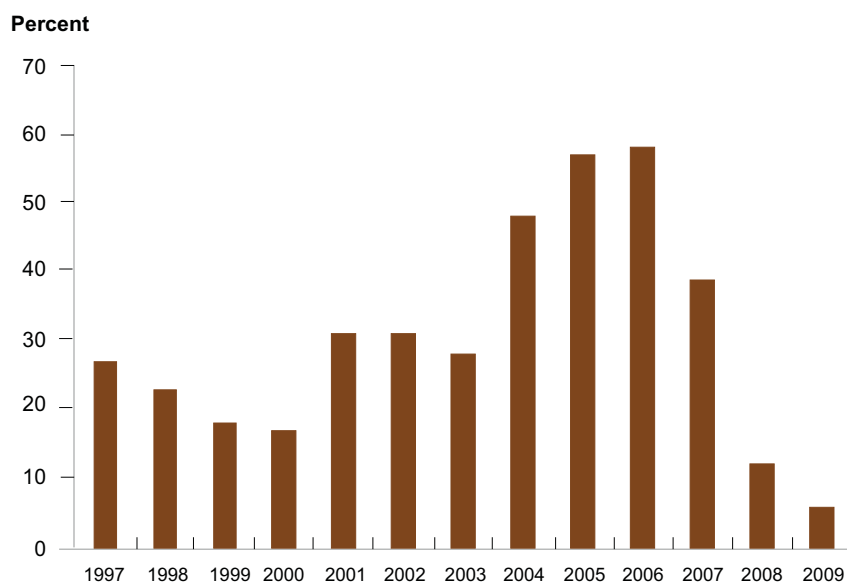
**Private Securitized Loans Are Riskier.** To see why securitized loans might be riskier when originated, it is useful to understand why banks securitize loans.<sup>7</sup> One reason is regulatory arbitrage; that is, by securitizing loans, banks do not need to hold capital against them (which would be costly). Another reason is to obtain funding through bankruptcy-remote vehicles. That is, securitized loans are isolated from the broader risk of the issuer and would thus be unaffected should it default; this allows the bank to fund these investments more cheaply. One thing to note is that under both of these motivations, lenders would want

<sup>7</sup> These and other motivations for securitization are discussed in my 2006 *Business Review* article.

<sup>5</sup> There is no single definition of a subprime loan, but typically these were mortgages made to borrowers with low credit scores, for example, a FICO score below 660. In addition, a related category of loans, known as Alt-A, includes loans made to borrowers with good credit histories, but who are unable or unwilling to provide full documentation of their income or assets. See the article by Christopher Mayer, Karen Pence, and Shane Sherlund for further discussion.

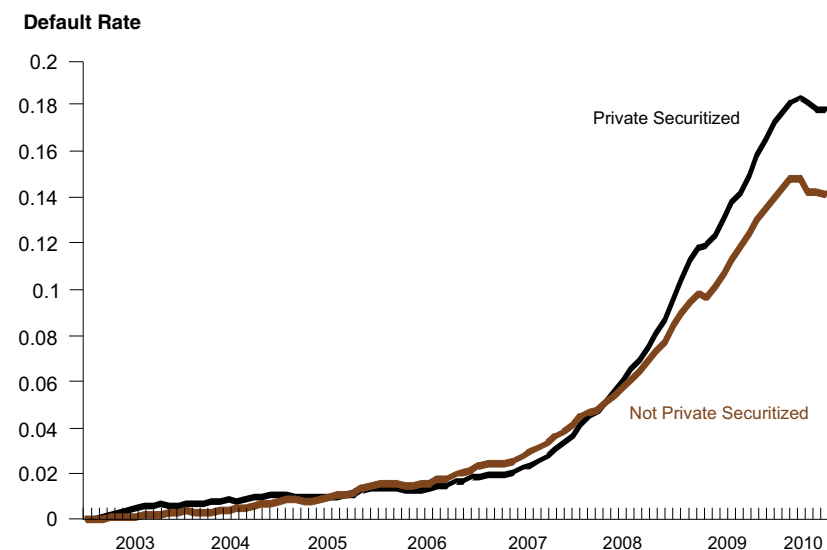
**FIGURE 1**

## Private Securitization Share



Source: Inside Mortgage Finance



**FIGURE 2****Mortgage Default Rates:  
Private Securitized Loans**

Source: LPS Analytics

to securitize relatively *safer* loans, and therefore, this would not explain the higher default risk of securitized loans.<sup>8</sup>

Two other reasons have been suggested for securitization, which are, in fact, consistent with the higher risk observed. The first is risk-sharing, or diversification. By selling loans through securitized pools, banks are able to diversify their balance sheets. This is especially important for banks that lend primarily in a single region, since it facilitates geographic diversification. Note that according to this explanation, the risk of the loan would be priced appropriately; there is no

presumption that the seller is taking advantage of the buyer.

A final reason that has been suggested is *adverse selection*, or *cream-skimming*. In this case, securitization would allow banks to lower their lending standards and make *riskier* loans — ones that they would have been less willing to make on these terms if they actually had to bear the full risk of the loan by holding it in portfolio. Moreover, given two loans that appear similar to investors, but which the bank could distinguish on the basis of its *private* information about the borrower, the bank would choose to securitize the one that is actually riskier. Private information that might be available to the lender, but not the investor, could include the existence of second liens that are not reported on the application (so-called silent seconds), or information about the borrower's actual income in the case of no-documentation loans.

Atif Mian and Amir Sufi confirm that riskier loans were, in fact, securitized by using ZIP-code level data on subprime originations, defaults, and securitization rates. They show that those ZIP codes in which securitization was most prevalent were ones in which subprime lending rose the most and default rates subsequently increased most dramatically. One limitation of their work is that they use aggregate data, and so it is difficult to be sure of securitization's actual contribution.

In particular, without detailed information on individual loans, it is not possible to determine whether investors could tell that these loans were riskier and so allow us to distinguish risk-sharing from adverse selection. That is, market participants on all sides may have been aware that these loans were risky, and securitization simply facilitated sharing the risk of the loans. This is an important distinction, because if investors could not distinguish the true risk of the loans, it is possible that a *market failure* occurred, in that the amount of risky lending that took place was greater than was economically efficient.<sup>9</sup>

**There Is Evidence of Adverse Selection.** Benjamin Keys, Tanmoy Mukherjee, Amit Seru, and Vikrant Vig wrote an influential study that uses loan-level data<sup>10</sup> and concludes that adverse selection did indeed occur in the securitized loan market. They show, in particular, that those subprime loans with low or no documen-

<sup>8</sup> In the case of regulatory arbitrage, bank lenders would seek to economize on capital by retaining the riskiest loans and selling safer ones (which require the same amount of capital as riskier loans, but for which they can obtain the highest price on the market). Similarly, segregating assets from the risk of the overall firm makes sense when these assets are less risky than the average.

<sup>9</sup> A classic discussion of the market failure induced by adverse selection can be found in Nobel Laureate George Akerlof's model of the "market for lemons."

<sup>10</sup> Their loan-level data set includes the status of each loan (current, 30 days delinquent, 60 days delinquent, etc.) as well as loan characteristics (interest rate, loan amount, etc.). By contrast, the aggregate data set used by Mian and Sufi contains only the average default rate and characteristics for loans in a particular ZIP code.

tation of income that were more likely to be securitized were also more likely to default. Keys and co-authors argue that low-documentation loans have more “soft” information that is not easily observable by investors and therefore provide more scope for cream-skimming. On the other hand, they do not find evidence for cream-skimming for either prime mortgage loans (even with low documentation) or for those with full income documentation.

One difficulty with their analysis is that while their database contains loan-level data, all of the loans in the data set are securitized. This creates a problem. If all the loans in the data set are securitized, how can they even ask the question: Are securitized loans more likely to default than unsecuritized loans? Also, what does it mean for a loan to be “more likely to be securitized”?

Keys and co-authors come up with a clever approach. They argue that even in a sample of securitized loans, some of the loans were initially originated expressly with the end of securitization in mind, and others only more incidentally ended up as part of a package of securitized loans. They pose the question: Which loans (at origination) did the lender expect would be more likely to end up being securitized? They use the fact that private securitizations often required additional screening by the lender for loans to borrowers with FICO scores below 620, and so such loans are more “difficult” to securitize. Thus, lenders expect that there is a chance they may end up holding them. Now, all things being equal, the creditworthiness of a borrower with a score just above 620 (say, 621) should be essentially the same as one with a score just below (say, 619), and, if anything, those with scores of 621 should be slightly less likely to default.<sup>11</sup> However, Keys and co-authors show that, in their data

set, the subprime loans with scores just above 620 are actually *more likely* to default than ones with scores just below 620. How can this be explained? They suggest that lenders anticipated that loans with scores below 620 would be more difficult to securitize and thus took more care in underwriting them (using information beyond that contained in the credit score). This, they argue, provides support for the negative effect of securitization on underwriting standards.

Ryan Bubb and Alex Kaufman argue, however, that this “620 cutoff” applied in all markets, both securitized and unsecuritized, and thus cannot be used to draw any conclusions about the role of securitization. In particular, they develop a model that shows that *all* lenders would use such a cutoff rule when it is costly to distinguish between safe and risky borrowers, regardless of whether the loan is expected to be securitized.<sup>12</sup> To support this conclusion, they then show that portfolio loans exhibit a similar jump in default rates when comparing loans with scores just below 620 to those with scores just above. This suggests that while lenders may indeed use a 620 cutoff rule, they do so for both securitized and unsecuritized loans. So, they argue, such a rule cannot be used to identify those loans that are more difficult to securitize.<sup>13</sup>

In my working paper, I address some of the difficulties in previous work. My paper uses loan-level data on both securitized and unsecuritized loans that cover two-thirds of the mortgage market during the period

2004-2006.<sup>14</sup> I show that private securitized loans are indeed more likely to default than loans that are not securitized, and this is true for both low- and full-doc loans (although the effect is modestly stronger for low-documentation loans). Moreover, I find that this effect is actually strongest in prime markets, unlike Keys and his co-authors, who, by construction, are restricted to examining only subprime loans with credit scores around 620. This may be because only in prime markets did lenders really have a choice of whether or not to securitize a loan, whereas nearly all subprime loans were securitized. In addition, investors in subprime securities may have been more attuned to the potential risks of such loans. To summarize, after examining a broader segment of the market than does the previous work, I find robust evidence that links securitization and mortgage default.

### **Does Securitization Affect What Servicers Do to Avoid Foreclosure?**

In addition to a possible effect on lending standards, whether a loan is securitized may also affect the likelihood that a lender or servicer modifies a troubled loan or otherwise engages in activities that reduce the likelihood of

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<sup>11</sup> Since the relationship between credit scores and default risk is essentially continuous.

<sup>12</sup> That is, lenders will find that the benefits of investigating a borrower outweigh the costs only for those with low credit scores, since they are the likeliest to subsequently default.

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<sup>13</sup> Recently Keys and co-authors have circulated a paper that seeks to refute some of Bubb and Kaufman's criticisms. In particular, they argue that Bubb and Kaufman's results stem from their pooling of a wide variety of loans. Keys and co-authors provide two findings that support their original paper. The first is that if one uses Bubb and Kaufman's data, but focuses solely on low-documentation subprime mortgages that were not insured by the GSEs, the securitization rate drops for borrowers with FICO scores below 620. Also, the default rate for non-GSE-securitized loans goes up as one moves from FICO scores just below 620 to scores just above. However, given the evidence in my study that securitized loans were riskier even in prime markets, this focus on loans with scores around 620 seems too narrow.

<sup>14</sup> Bubb and Kaufman use the same data set as I do in my working paper.

foreclosure. There are several possible reasons why this might be the case. First, modifications and forbearance are costly for the servicer, since they take considerable time and expertise to successfully complete, and a servicer who does not own the loan will not accrue the full benefit from a successful outcome, since it receives only a small percentage of the monthly payments. Also, securitization agreements may place limits on the number or types of loan modifications. Finally, changing these agreements typically requires the unanimous agreement of the investors, which is difficult, since the ownership base is usually very dispersed for these securitizations.<sup>15</sup>

Tomasz Piskorski, Amit Seru, and Vikrant Vig find that, after becoming seriously delinquent, loans held by banks (as opposed to those in securitized pools) are less likely to be foreclosed and more likely to resume making payments. This suggests that securitized loans are less likely to be renegotiated. However, one difficulty with Piskorski and co-authors' analysis is that they cannot identify actual renegotiations and instead focus on whether the loans enter into foreclosure. This may be misleading; for example, some researchers have suggested another possible explanation for these findings: that banks may be delaying foreclosure on the loans they own simply in order to avoid writing down the loan, but they do not actually take any actions to effect a long-term cure.

Two studies by Manuel Adelino, Kristopher Gerardi, and Paul Willen dispute the findings of Piskorski and his co-authors, although they use the same database. Rather than focusing

on outcomes, as do Piskorski and his co-authors, Adelino, Gerardi, and Willen try to infer whether a loan was modified by finding those mortgages for which terms were changed. Significantly, they show that such modifications are very infrequent, occurring less than 3 percent of the time. Moreover, they show no significant difference in modification rates between loans held in portfolio and those in securitized pools. They argue that this is because such modifications are generally not profitable for lenders, whether or not the loans are securitized. The reason is that lenders take into account two costs to modifying a loan. The first is that modification may, in fact, not be necessary, in that the borrower would have continued paying the unmodified loan, with higher cash flow to the lender (Adelino and co-authors term this self-cure risk). The other is that modification might not help, in that the borrower is in such distress that he defaults regardless of the modification, and thus, it is not worth expending resources to renegotiate (redefault risk).<sup>16</sup>

One limitation of their work, however, is that they are generally not able to verify that the loans were actually modified.<sup>17</sup> Also, there may be other types of renegotiations that do not actually change loan terms and so would not be picked up by Adelino and his co-authors' method for identifying renegotiated loans. One example would be forbearance and repayment plans, in which borrowers postpone payments for a number of periods and then make

up the arrears. Finally, they are also not able to observe all of the factors that might explain when modifications succeed, such as a borrower's income or the existence of other liens.

Summing up, to properly evaluate the effect of securitization on foreclosure-mitigation efforts, it would be desirable to have explicit data on loan modifications and other renegotiations, as well as other pertinent information (in particular, information about lenders' policies and more details on the borrower, such as income).

## CONTRIBUTIONS OF ILLIQUIDITY AND NEGATIVE EQUITY TO EXPLAINING MORTGAGE DEFAULT

One striking feature of the current crisis is, of course, the sharp nationwide drop in house prices. Another unusual aspect is that defaults on mortgages rose more rapidly than those on other forms of consumer credit, such as credit cards, whereas in previous recessions quite the opposite was the case (Figure 3). The crisis has thus led to heightened interest in a better understanding of the determinants of homeowners' decision to default on their mortgages. In particular, are defaults driven by falling house prices or by "liquidity shocks" such as job losses? Or perhaps both are important.

In addition to the value of improving our theoretical understanding of mortgage default, there is also an immediate policy motivation. One important part of the government's efforts to reduce foreclosures has been mortgage modifications that change loan terms. But should mortgage modifications focus more on increasing equity to give homeowners more of a stake or on reducing monthly payments to make them more affordable? Existing government programs now seem to reflect both possibilities.

For example, when the Trea-

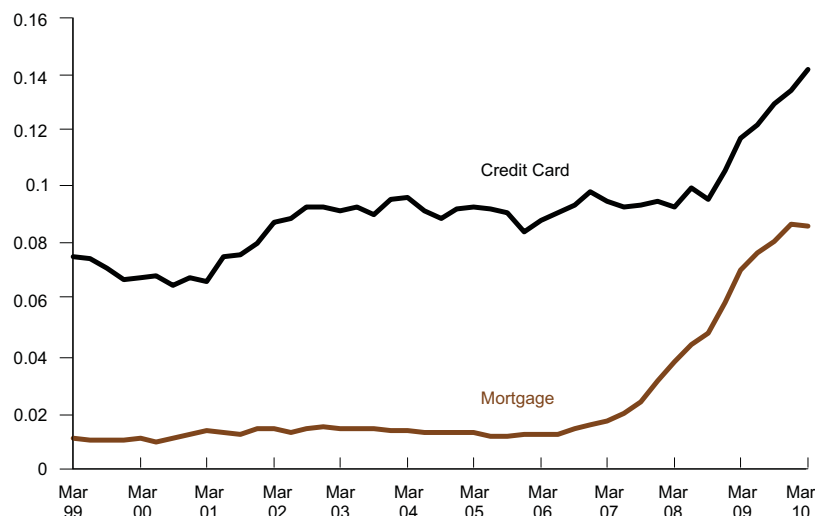
<sup>15</sup> See the article by Piskorski, Seru, and Vig and also the studies by Adelino, Gerardi, and Willen for further discussion of the impediments to renegotiating mortgage contracts.

<sup>16</sup> Note that Adelino and co-authors argue that lenders do not find it *privately* profitable to renegotiate most loans. This isn't inconsistent with the possibility that loan modifications could be *socially* beneficial.

<sup>17</sup> But they do test their algorithm on a database of loans that explicitly identifies modifications and find that it performs reasonably well in identifying actual modifications.

# FIGURE 3

## Credit Card and Mortgage Delinquency Rates\*



\* Fraction of loans that are 60+ days delinquent.  
Source: Credit bureau data

sury's Home Affordable Modification Program (HAMP) was introduced in March 2009, it focused on adjusting monthly payments so that they do not exceed 31 percent of a borrower's pretax monthly income (by lowering interest rates or by extending the maturity). But recently the HAMP program was also expanded to encourage servicers to instead consider reducing the outstanding principal so that the loan-to-value ratio does not exceed 115 percent.

The traditional "option-theoretic" view of mortgage default provides a way to understand the effect of house prices on the mortgage default decision. According to this model, when homeowners make the monthly payments on their mortgage, they get two things. First, they get the benefit of continuing to live in the house for the current month.<sup>18</sup> In addition, they have an "option" on any future appreciation in the value of the house. That is, they

will profit if their house increases in value. According to this model, the key driver of default will be *negative equity*. That is, if the house is worth less than the mortgage, then, in the extreme case, the homeowner would be better off not paying the mortgage, giving up the house, and buying (or renting) a similar house for less. In a previous *Business Review* article, I provide further details on the option-theoretic model of mortgage default and survey the earlier empirical work in this area.

However, as I discuss, studies have also found that many households with negative equity do not immediately default. Furthermore, default is often associated with indicators of shocks such as high unemployment rates. According to the pure option-theoretic model, these should play no role; only a homeowner's equity position should affect his default decision.

One way of reconciling the theory

and the data is to first observe that default is costly,<sup>19</sup> and so homeowners may prefer to wait before defaulting, to see if house prices recover. However, for someone who is very illiquid (that is, has little cash to spare for the mortgage payment and is unable to borrow), the cost of waiting for prices to recover may be very high, and he or she is likely to default on his or her mortgage sooner rather than later. Thus, a homeowner's liquidity position has a role in the default decision as well.<sup>20</sup>

**The Relative Roles of Negative Equity and Illiquidity.** The empirical question remains: How important are negative equity and illiquidity in the default decision? Because of data limitations, previous research had to use very indirect ways to identify which borrowers had suffered a liquidity shock or were otherwise cash-constrained. For example, earlier studies used local unemployment rates to measure the likelihood that a borrower might have suffered an unemployment shock (see the study by Chester Foster and Robert Van Order). Or they identified characteristics of the mortgage at origination (for example, a low down payment) as evidence that the borrower was already liquidity-constrained when taking out the mortgage (see the study by Patrick Bajari, Sean Chu, and

<sup>18</sup> This model is clearly idealized. For example, even if a homeowner does not pay his mortgage, he will not necessarily be forced to leave his home immediately, since the foreclosure process can take a long time, depending on the state in which the house is located (for example, over a year in New York).

<sup>19</sup> These costs can include limited access to future credit, moving costs, and even the psychological trauma of being thrown out of one's home.

<sup>20</sup> While the popular press often terms equity-driven defaults "strategic" and contrasts them with "involuntary" defaults driven by factors such as job loss, my article suggests that such a sharp distinction is unwarranted.

Minjung Park). These studies typically find weak evidence for the role of liquidity. But it may be that imperfect measures of illiquidity used in previous research led to weak results. A further difficulty is that many of these liquidity measures are taken at the state or county level. Since house prices are also typically measured at the state or MSA level, previous research found it difficult to empirically disentangle the effects of house prices and liquidity.

In a 2010 study, my co-authors and I more directly assess the relative importance of these two factors for mortgage default. We combine loan-level data on mortgage performance with information on credit card utilization rates from credit bureau files to obtain a sample of first mortgages originated in 2005 and 2006. The card utilization rate provides a direct way to measure a borrower's liquidity position. All things being equal, a consumer who is using a larger fraction of his credit line is expected to be less liquid and hence more likely to default on his mortgage. Another way to understand why a high utilization rate is associated with increased default risk is that it may reflect shocks that the consumer has experienced in the past (for example, someone who has lost his job is likely to run up a large balance on his credit card).

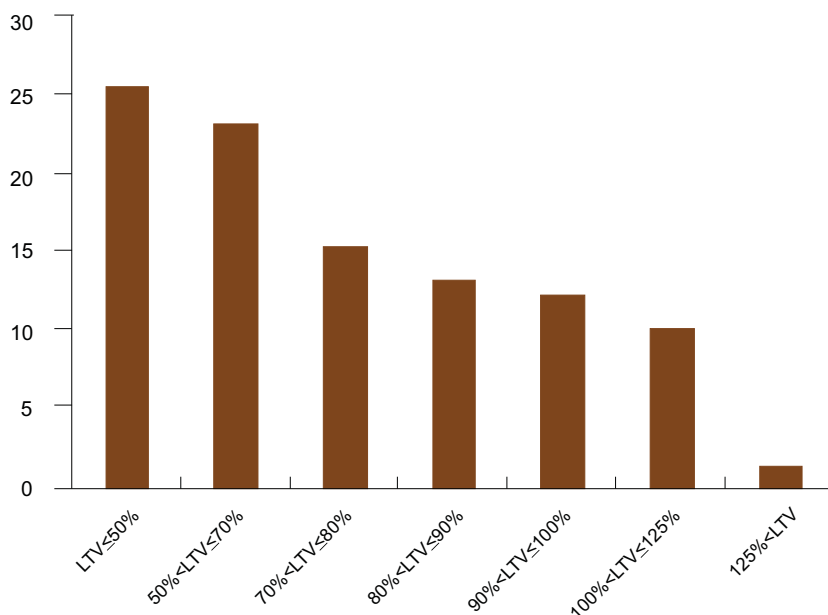
We find that both low levels of home equity (that is, a high loan-to-value ratio, or LTV) and high card utilization rates are associated with increased default risk and have roughly similar magnitudes. Going from a loan-to-value ratio of below 50 percent to one just above 100 percent (that is, to negative equity) more than doubles the average default rate, from below 1 percent to 2 percent. Similarly, going from a credit card utilization rate of below 50 percent to one above 80 percent has approximately the same effect on default.

**FIGURE 4**

## Distribution of LTV and Utilization Rates\*

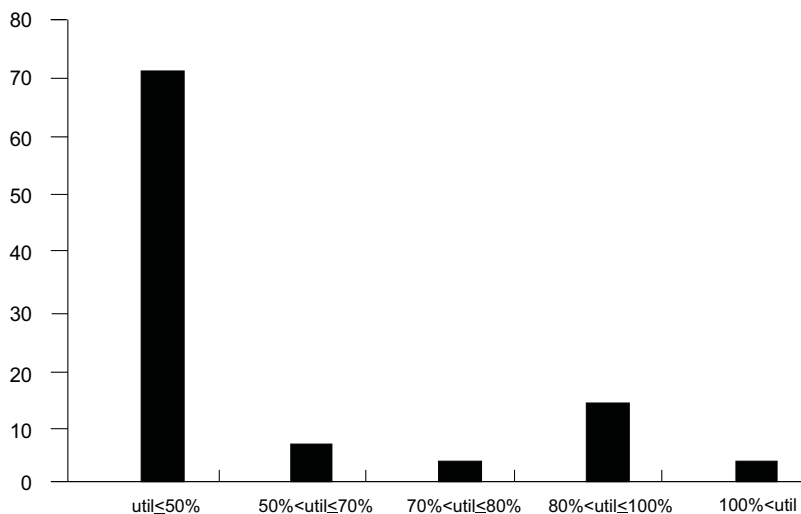
### 1<sup>st</sup> Mortgage LTV Distribution

Fraction of Mortgages



### Credit Card Utilization Rate

Fraction of Consumers



\* As of March 2010.

Sources: LPS Analytics and credit bureau data




To help assess the economic significance of these results, Figure 4 shows the distribution of LTV and credit card utilization rates across the population; from these it is apparent that the fraction of the population with either high LTV or high utilization exceeds 10 percent. We also find evidence of an *interaction* between the two effects: The impact of high utilization is more pronounced when the loan-to-value ratio is also high. This makes sense, since when the loan-to-value is low, the homeowner would lose a lot of equity in the event of default. Such a homeowner will make every attempt to avoid default, even when cash on hand is very low.<sup>21</sup>

## CONCLUSION

Economists have learned about the impact of securitization on mortgage default. There is robust evidence that securitized loans were riskier, and this may have contributed to a general decline in lending standards, which led to the spike in default rates. My co-authors and I have also shown that negative equity and liquidity shocks are of comparable importance in explaining mortgage default. Moreover, it is also

<sup>21</sup> We also find that the effect of utilization is less significant when the LTV is very high (above 120 percent); this may reflect the fact that when equity is very negative, the borrower will not find it worthwhile to keep his home even if he has ample liquidity.

now clear that one should not view each of these in isolation and that the sharp distinction between “strategic” and “involuntary” defaults often found in the popular press is misleading.

However, to date, the literature is inconclusive about the effects of securitization on loan restructurings to cure default and, more generally, on which types of loan modifications are successful. There is also still more to learn about the extent to which investors understood the risks in securitized loans and on how consumers manage different types of credit. 

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# Economic Effects of the Unemployment Insurance Benefit\*

BY SHIGERU FUJITA

**T**he U.S. labor market has remained weak in recent years, even though the overall economy itself has started to grow again after the deep recession. In response to the weak labor market conditions, the U.S. government has greatly expanded the entitlement period of unemployment insurance (UI) benefits. In this article, Shigeru Fujita reviews some of the academic literature on the economic effects of UI benefits. On the one hand, UI can improve people's well-being because it helps them avoid a large drop in consumption in the face of job losses when job losers do not have enough savings. On the other hand, there is a concern that it might produce an adverse effect on the incentive to look for a job. The author covers leading theoretical as well as empirical studies, which are useful in evaluating the recent expansion of unemployment insurance benefits.

The U.S. labor market has remained weak in recent years, even though the overall economy itself has started to grow again after the



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deep recession. For example, in the fourth quarter of 2009, the average unemployment rate was at a double-digit level, a level we have not seen since the early 1980s, even though real GDP grew by more than 5 percent. One of the main policy reactions to painful developments in the labor market has been the expansion of unemployment insurance.

\*The views expressed here are those of the author and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

The unemployment insurance (UI) system constitutes one of the major components of the social security programs in the U.S.<sup>1</sup> It provides income (and thus consumption) protection for those who have lost their jobs involuntarily. During “normal” times, unemployment insurance benefits are provided through the regular unemployment compensation (UC) program, which is funded and administered at the state level. Regular benefits, which are paid weekly, replace 50 to 80 percent of pre-unemployment earnings and last 26 weeks in the majority of states.<sup>2</sup> During economic downturns, however, the federal government often provides additional support by extending UI benefits. Especially in the last few years, the U.S. government has greatly extended the duration of benefits as a means to combat the surmounting joblessness. As of the summer of 2010, unemployed workers who reside in states with a relatively high unemployment rate are entitled to receive UI benefits up to 99 weeks (26 weeks of regular benefits and 73 weeks of extended benefits).

Given the painful nature of job losses, the merits of UI benefits are often taken for granted in public policy discussions. In this article, I will review some of the academic literature on the

<sup>1</sup>The original framework of the unemployment compensation system is contained in the Social Security Act, which was signed into law by President Franklin Roosevelt in 1935.

<sup>2</sup>The benefit level is also subject to a cap. The weekly maximum ranges from \$200 to \$600 across states. Because of the cap, the average replacement ratio is roughly 50 percent.

economic effects of UI benefits. This is useful for evaluating the expansions of the UI system in recent years.

First, UI can improve people's well-being because it helps them avoid large drops in consumption in the face of job losses: The government provides an insurance against job loss. There is, however, a concern that it might produce an adverse effect on the incentive to look for a job. That is, UI benefits could cause job seekers to put less effort into searching for a job, consequently raising the unemployment rate. Some researchers have argued that this incentive effect is large, given the observation that the rate of exit from unemployment at the time of expiration of UI benefits increases noticeably. An important issue here is that the increase in the exit rate from unemployment can be driven by the fact that the worker is simply dropping out of the labor force, thereby losing eligibility for UI benefits. This phenomenon can complicate the interpretation of the incentive effect. Other researchers also point out the possibility that UI benefits enhance a firm's incentive to create more jobs. Below, I will lay out these arguments in detail.

Before getting into the detailed discussion, let's first briefly review recent developments regarding UI benefits and the U.S. labor market.

## UNEMPLOYMENT INSURANCE DURING THE GREAT RECESSION

As mentioned above, regular unemployment insurance benefits typically last 26 weeks. However, the federal government often enacts extensions of UI benefits during economic downturns. There are two types of federal emergency programs. The first is called the extended benefit (EB) program, which is permanently authorized, meaning that the

extension is triggered automatically whenever the state unemployment rate reaches a certain level. It provides additional weeks of unemployment benefits up to a maximum of either 13 weeks or 20 weeks, depending on the state.

The second type is a federal program that Congress enacts temporarily during downturns. The latest program of this type, the Emergency Unemployment Compensation program (EUC08),

**Historically speaking, the scale of the extensions during the current downturn is very large compared with the extensions enacted in the past.**

represents the eighth time Congress has created such a program.<sup>3</sup> EUC08 was signed into law in June 2008. Initially, the maximum entitlement period under this program was 13 weeks, but it has been extended several times since then. As of July 2010, EUC08 provides extended benefits for up to 53 weeks. This means that, combining the regular benefit and the two emergency programs, an unemployed worker is entitled to UI benefits for up to 99 weeks. (See *The Chronology of the Emergency Unemployment Compensation Program (EUC08)* for details.).

Historically speaking, the scale of the extensions during the current downturn is very large compared

<sup>3</sup> Congress created federal programs in 1958, 1961, 1971, 1974, 1982, 1991, 2002, and 2008. See the article by Julie Whittaker for details of these programs.

with the extensions enacted in the past. During most of the post-WWII recessions, Congress has implemented federal emergency programs, but these programs typically provided benefits for a total of around 60 weeks.<sup>4</sup> Given past experience, the duration of UI eligibility in the most recent downturn (that is, a total of 99 weeks) is quite generous.

Figure 1 plots the number of UI recipients since December 2007, the start of the Great Recession. This includes those who are covered under the regular state programs as well as those covered by the federal extension programs. As can be seen from the figure, the number of claimants has increased steadily since the start of the recession. One noticeable trend is the increase in the number of those covered under the emergency programs — it has more than doubled since the beginning of 2009. Because workers can be covered by the emergency programs only after state UI benefits are exhausted, the increase in the number of federal UI recipients implies that long-term unemployment is increasing.

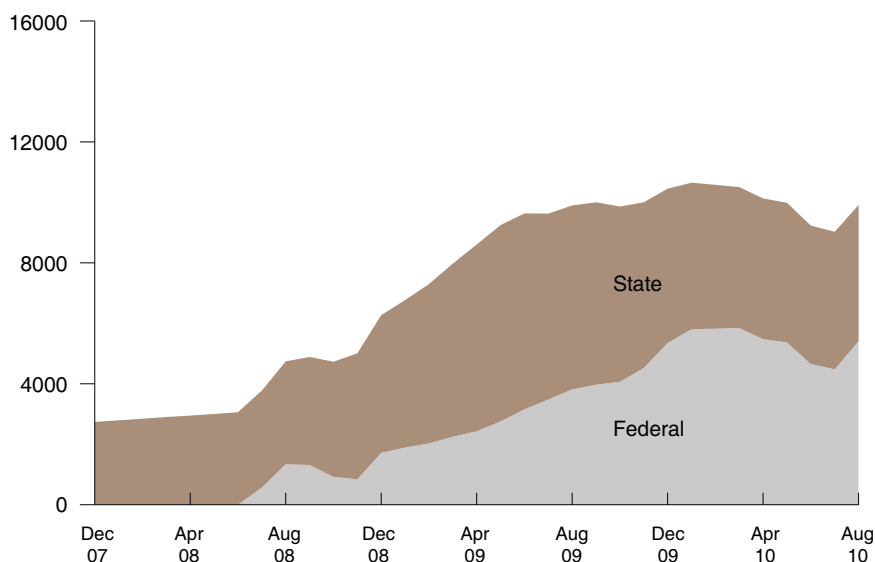
Figure 2 confirms this trend from a separate data series based on the Current Population Survey. The figure presents the total number of unemployed and those who are unemployed for 27 weeks or longer. From this figure, we can see that the proportion of long-term unemployment is rising rapidly.<sup>5</sup>

<sup>4</sup> Again, see the article by Julie Whittaker for details of the previous programs.

<sup>5</sup> Comparing the total number of benefit recipients and unemployment allows us to see that a substantial number of unemployed workers do not receive UI benefits. The main reason is that some workers are not qualified to receive them: To be eligible, workers must have at least 20 weeks of full-time insured employment or the equivalent amount of work at insured wages during the previous 12-month period.

**FIGURE 1****Unemployment Insurance Claimants**

Claimants (Thousands)



Source: Department of Labor

These empirical observations underscore the importance of reconsidering the effects of UI benefits on current labor market conditions. Now let's move on to the economics of UI benefits.

**A SIMPLE SEARCH MODEL**

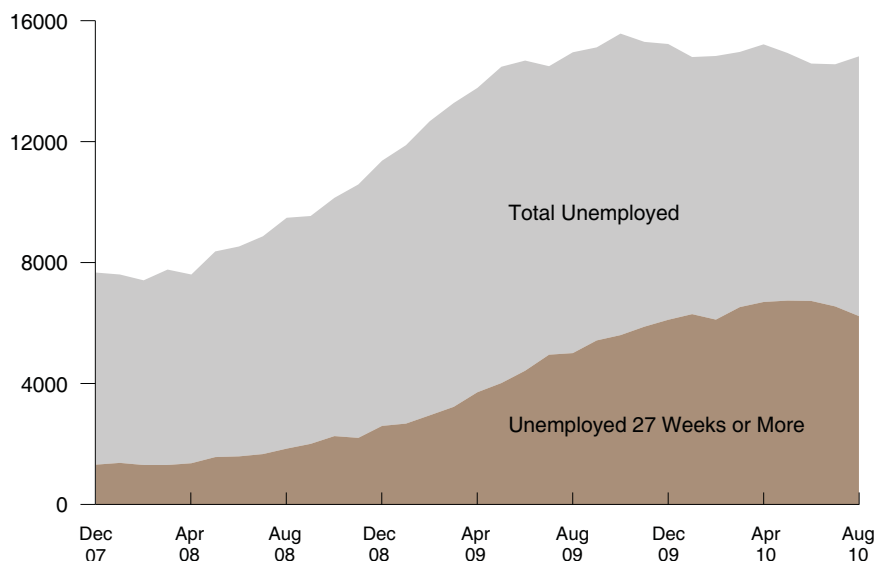
An economic model called a “search model,” pioneered by John McCall and others, is often used to analyze the decisions facing a job seeker. In this model, the worker receives occasional random job offers. How often the worker receives an offer depends on how hard he looks for a job. Once the offer has arrived, the worker decides whether to accept or reject it.

One of the key implications of this model is that higher UI benefits lead to a longer duration of job search. The reason is that the worker puts less effort into searching for a job because higher benefits mean that he has less to lose from being unemployed. Furthermore, he may hold out for a higher-wage job before accepting an offer, since higher benefits lower the cost of being out of work. This means that the arrival of an acceptable offer becomes less likely (that is, the chance that the worker rejects the job offer is higher), and thus, the waiting time in the unemployment pool is longer. In this simple model, the reduction of the search effort caused by the increased benefit level is often called the moral hazard effect.<sup>6</sup>

An important thing to remember here is that this simple model is designed to focus on the incentives to search for a job, omitting from consideration many issues that are relevant in reality. In particular, workers who have no savings at the time of job loss may

**FIGURE 2****Long-Term Unemployment**

Persons (Thousands)



Source: Bureau of Labor Statistics, Current Population Survey

<sup>6</sup> In more elaborate models, it can be misleading to label the decline in the effort level as moral hazard. I will discuss those cases below.

## The Chronology of the Emergency Unemployment Compensation Program (EUC08)

A

s mentioned in the main text, the EUC08 was originally signed into law in June 2008 but has been expanded several times since then. Below is the chronology of EUC08.

**June 30, 2008.** The EUC08 program was introduced. The maximum duration of the extended benefit under this program was 13 weeks. It was set to expire on March 28, 2009. The expiration date is when the program stops accepting new claimants. The existing claimants can continue receiving benefits until the entitlement period is over.

**November 21, 2008.** The maximum entitlement period was extended from 13 weeks to 20 weeks. Tier II of benefits was introduced, providing up to an additional 13 weeks of benefits for those who worked in states with a total unemployment rate of at least 6 percent. It was set to expire on March 28, 2009. After this date, the program would no longer accept new claimants and existing claimants in Tier I cannot move to Tier II.

**February 17, 2009.** As part of the American Economic Recovery and Reinvestment Act, the expiration date of EUC08 was extended to December 26, 2009. It also included a provision to pay an additional \$25 weekly

benefit for those receiving benefits under the EUC08.

**November 6, 2009.** The duration of the EUC08 program was substantially expanded. Tier III and Tier IV were introduced. The Tier I benefit continues to be up to 20 weeks. The Tier II benefit was expanded to 14 weeks from 13 weeks and no longer depended on a state's unemployment rate. The new Tier III benefit provided up to 13 weeks to those workers in states with an average unemployment rate of 6 percent or higher. The new Tier IV benefit may be provided up to an additional six weeks if the state unemployment rate is at least 8.5 percent. The expiration date stayed the same as before (December 26, 2009). Again, after this date, the program would no longer accept new claimants, and existing claimants in the lower tier cannot move to the next tier.

**December 19, 2009.** The expiration date was extended to February 28, 2010.

**March 2, 2010.** The expiration date was extended to April 5, 2010.

**April 15, 2010.** The expiration date was extended to June 2, 2010.

**July 22, 2010.** The expiration date was extended to November 30, 2010.

experience a large drop in consumption. Moreover, if the economy is not producing many jobs, it will be difficult to exit unemployment by becoming employed rather than dropping out of the labor force. In these cases, UI benefits can improve the economy's welfare, offsetting the negative incentive effect. I will come back to these issues later. But for now, let's take this simple model as a useful benchmark.

### EMPIRICAL STUDIES FOR TESTING THE MORAL HAZARD EFFECT

Is there empirical evidence that moral hazard is a serious problem of UI benefits? A seminal study by Robert

Moffitt tests the implication of the search model. He looks at how the unemployment exit rate (the rate at which a worker exits from the unemployment pool) changes right before UI benefits are exhausted, exploiting variations of maximum entitlement periods across states and across individuals within states. For example, imagine that two workers who reside in two different states have the same characteristics such as gender and education but have different unemployment exit rates. We can associate the difference in the exit rates with the differences in the generosity of UI benefits.<sup>7</sup> Moffitt uses a high-quality data set collected by state UI offices, which covers the

period between 1978 through the first quarter of 1983. Note that this is another period in which federally funded extended benefits were available. More specifically, Congress enacted the Federal Supplementary Compensation (FSC) program in the fall of 1982, which, combined with the regular benefit and the benefit under the EB program, provided UI benefits for more than 60 weeks.<sup>8</sup>

<sup>7</sup> Similarly, there can be differences in the generosity of the benefits even across workers within the same state.

<sup>8</sup> Since the FSC was enacted late in Moffitt's data set, his analysis focuses on the workers who were receiving the benefits for at most 39 weeks.



The key finding is that there is a large spike in the exit rate from unemployment at the time UI benefits expire. Using a statistical technique called a regression analysis, Moffitt translates this large spike as indicating that, on average, a one-week extension of benefits leads to an increase in the duration of unemployment of 0.15 week. Using the same administrative data set, a study by Lawrence Katz and Bruce Meyer and one by Meyer extend Moffitt's work and find a similar spike in the exit rate at the time benefits are exhausted.

Figure 3 presents the median duration of unemployment in recent years. It increased dramatically from the pre-recession level of around eight weeks to around 20 weeks at the end of 2009. This has occurred in tandem with the increases in the number of benefit claimants (see Figure 1). There is no doubt that the recession was the cause of the longer duration of unemployment. However, the literature suggests that at least part of the increase in the duration was actually *caused by* the extensions of UI benefits. Estimating “how much” is beyond the scope of this article, but *The Effect of the Extension of UI Benefits on the Unemployment Rate: An Illustrative Example* presents an example in which I calculate the effect of doubling the maximum benefit on the observed unemployment rate using Moffitt's result. The exact magnitude of the effect aside, it seems plausible to say that the extensions played at least *some* part in raising the duration of unemployment and thus the unemployment rate.

While this calculation as an accounting exercise is useful for inferring the effect of the extended benefits on the unemployment rate, there is good reason to be somewhat careful about its interpretation. In particular, should it really be

interpreted as moral hazard? In other words, the presence of a spike in the exit rate is consistent with the moral hazard story, but there may be other stories consistent with the empirical observation. One alternative story is based on the so-called “reporting effect” of UI.

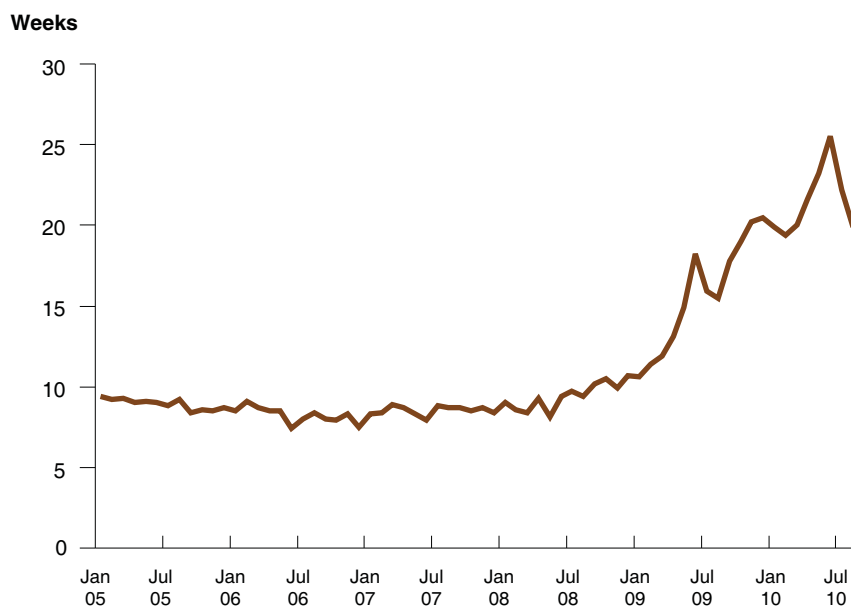
### REPORTING EFFECT OF UI

To understand the reporting effect, note first that the earlier literature looks at the effects of UI on the “exit rate.” However, “exiting from unemployment” does not necessarily mean finding a job. In other words, it is possible that workers are simply dropping out of the labor force when their benefits expire. Because the data set used in the aforementioned studies is based on UI records, it does not tell the labor market status of workers, that is, whether the worker found a job or simply dropped out of the labor force after exiting from the UI system.

Is it realistic to think that workers are actually dropping out of the labor force once their benefits are exhausted? To appreciate this possibility, consider the following example: A worker initially tried very hard to find a job, but after a series of unsuccessful job searches, he became very discouraged. However, to be qualified for UI benefits, he is required to be “unemployed.” This means that he needs to fill out claim forms periodically and may even need to report to the local UI claims office to show that he is “actively looking for a job.” Once the benefit is exhausted, these requirements cease to exist, and consequently, he officially exits from the unemployment pool. This appears to be a plausible possibility. Note that the reporting effect story involves little change in a worker's decision around the expiration date, yet it induces a large change in the unemployment exit rate. In this sense, it is misleading to infer the extent of

**FIGURE 3**

### Median Duration of Unemployment



Source: Bureau of Labor Statistics, Current Population Survey

## The Effect of the Extension of UI Benefits on the Unemployment Rate: An Illustrative Example

I

n his study, Robert Moffitt estimates the effect of the extension of UI benefits on the duration of unemployment. He estimates that a one-week extension of benefits results in an increase in the duration of unemployment of 0.15 week, on average. Here, I take this estimate as given and calculate the effect on the unemployment rate when the benefit entitlement period is doubled from 26 weeks to 52 weeks. As mentioned in the main text and in the *Chronology of the Emergency Unemployment Compensation Program (EUC08)* on page 23, the maximum entitlement period in the current downturn is 99 weeks. However, a worker may not have known at the time he lost his job that the entitlement period was 99 weeks because the extension announcement may have come after the initial job loss. Furthermore, as explained in *EUC08*, after the expiration date, workers can continue to be covered under the UI program only up to the entitlement period of that tier. Given these considerations, I only look at a simple case of doubling the entitlement period.

First, assume that the rate at which the average

worker finds a job (that is, the job-finding rate) is 30 percent per month, which implies that the duration of unemployment of the average worker is 3.3 months (approximately 13 weeks). These numbers are roughly consistent with empirical observations. Also assume that employed workers are flowing into the unemployment pool at a rate of 2 percent per month. In the “steady state,” where flows into and out of unemployment are equal to each other, the job-finding rate of 30 percent per month and the job-loss rate of 2 percent imply an unemployment rate of 6.25 percent.

Now assume that the maximum entitlement period is increased from 26 weeks to 52 weeks. Moffitt’s estimate implies that the duration of unemployment goes up by 3.9 weeks. This translates into a decline in the job-finding rate from 30 percent per month to approximately 24 percent. I further assume that the job-loss rate is unaffected by the extension. The steady-state unemployment rate with the extended benefit entitlement period then becomes 7.7 percent.

moral hazard based on the size of the spike in the exit rate.<sup>9</sup> One simple way to empirically distinguish them is to examine whether the spike in the unemployment exit rate is associated with re-employment or dropping out of the labor force. This is exactly what a recent paper by David Card, Raj

<sup>9</sup> Theoretically distinguishing the two stories requires extending the simple search model discussed above along several dimensions. For example, the simple search model does not incorporate the feature that workers’ skills can deteriorate while they are unemployed. In the model with such an extended feature, workers would reduce their search effort over time as the value of work relative to being unemployed declines as their skills deteriorate. In such a model, the increase in the re-employment rate right before the expiration date can be much smaller than that implied in the simpler search model.

Chetty, and Andrea Weber did.

These authors analyzed this issue using a rich data set from Austria. According to the authors, the UI system in Austria is similar to the one in the U.S., although there are some institutional differences. The data set is rich enough so that they can examine the effect of UI benefits on job finding (not just exit from unemployment). When they focus on the unemployment exit rate, they find a very large spike at the time of benefit exhaustion. In their sample, the jump in the exit rate amounts to 200 percent and is of similar magnitude to the one reported by Moffitt. However, when they consider only those who are re-employed, the spike almost disappears. In other words, there is little evidence that

people exit benefits by finding a new job. More specifically, Card and co-authors find a modest increase, roughly 20 percent, in the re-employment rate. They further point out that this modest increase in the re-employment rate implies that less than 1 percent of unemployment spells have an end date that is manipulated to coincide with the expiration of UI benefits.

Several papers look at the effects on re-employment rates using U.S. data. A paper by Bruce Fallick, using data from the Displaced Worker Survey (DWS), finds that there is no significant difference in the job-finding rate after benefits have been exhausted. On the contrary, Katz and Meyer argue that there is a significant spike in the re-employment rate associated

with the exhaustion of benefits, supporting the moral hazard story.<sup>10</sup>

While these data sets derived from surveys include information on workers' labor market status (employed, unemployed, and out of the labor force), thus allowing the researchers to distinguish between the re-employment rate and the exit rate, the information in these surveys is necessarily less accurate, compared with the data that come from UI offices. For example, the worker-level information regarding his or her maximum entitlement period and the actual benefit-collection period can be subject to serious measurement errors.<sup>11</sup>

Given the limitations of these survey data sets (DWS and PSID), we can only agree with Card, Chetty, and Weber that "the size of the spike in re-employment rates at exhaustion in the current U.S. labor market remains an open question." This is unfortunate, but the argument made by Card, Chetty, and Weber at least gives us a reason to keep the reporting effect in mind when thinking about the positive relationship between unemployment duration and UI benefits in recent years.

## LIQUIDITY EFFECT OF UI BENEFITS

A study by Jonathan Gruber and one by Raj Chetty provide another possible reason (other than the moral hazard story) for the positive relation-

ship between higher UI benefits and the duration of unemployment. That is, UI benefits work as a mechanism to relax the liquidity constraint of unemployed workers. To understand the idea, note first that in the simple search model, the wealth level of the worker has no implications for his or her search behavior. More to the point, it does not suppose a situation in which an unemployed worker accepts a low-paying job simply because he needs to put food on the table. Is the underlying assumption of the standard search model realistic? Probably not. Actually, there is ample empirical evidence that many unemployed individuals do not have enough savings, and thus, their consumption is quite sensitive to cash on hand (see, for example, the study by Gruber). When workers are subject to the liquidity constraint, the wealth level does have an effect on search behavior. In particular, UI benefits increase cash on hand held by unemployed workers to support their consumption. Higher benefits then reduce the pressure to take a low-paying job, leading to the longer duration of unemployment. At least for these workers, UI benefits work literally as insurance against job loss.

Note that, as opposed to the moral hazard effect, the liquidity effect highlights the aspect of UI policy beneficial to the overall economy. The liquidity constraint limits the worker's ability to take an "optimal" action, such as declining what may be a poor job match, an action he might have taken if he had enough savings. Relaxing the liquidity constraint through UI is then desirable from a policy perspective.

Chetty empirically shows that the liquidity effect is sizable. Using U.S. labor market data from the Survey of Income and Program Participation (SIPP), he finds that higher UI benefits are associated with much lower job-

finding rates for workers with little wealth, while they have no noticeable impact on job-finding rates for workers with greater wealth. He then estimates that 60 percent of the increase in the duration of unemployment from higher UI benefits can be attributed to the liquidity effect. He further develops a simple method of calculating the economy's welfare gains from UI. Using this method, he concludes that a UI system in which benefits replace 50 percent of pre-unemployment earnings for six months is optimal. Note that this "optimal" system is close to the current U.S. system during normal times. Presumably, a more generous benefit structure is desirable during economic downturns,<sup>12</sup> although answering the question of how much more generous the benefits should be during recessions requires further research.

## JOB-CREATION EFFECT

The discussion so far has focused on workers' job-search behavior. Daron Acemoglu and Robert Shimer point out another welfare-improving effect of UI, one that works through the feedback effect on job creation. The authors develop a model in which there are two types of jobs: high-productivity and low-productivity jobs. The high-productivity jobs are harder to find, but they pay a higher wage. Similarly, low-productivity jobs are easier to find, but they pay a lower wage.

To understand how Acemoglu and Shimer's model works, think of a job acceptance decision of a worker who has been offered a low-productivity job. Note that the trade-off is whether to accept this low-paying offer or to bet on getting an offer of a high-productivity job in the future. The latter choice involves giving up the income from

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<sup>10</sup> The study by Katz and Meyer (as mentioned in the previous section) mainly focuses on unemployment exit rates, but they supplement their analyses by attempting to distinguish between re-employment and exit. They use the Panel Study of Income Dynamics (PSID) for this purpose.

<sup>11</sup> Another issue is that these survey data contain relatively few observations. For example, in the Katz and Meyer study, which finds a sharp spike in re-employment, there are only 26 observations at the spike.

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<sup>12</sup> For example, more workers may be liquidity constrained during economic downturns.

the low-productivity job. Furthermore, if the worker rejects the offer, he also faces the risk of not getting an offer at all in the near future. This acceptance decision is based on balancing between the two competing effects. In this situation, the higher benefit level shifts the balance toward looking for a high-productivity job, turning down offers of low-productivity jobs.

When the benefit level is raised, firms have a higher incentive to create high-productivity jobs, knowing that workers are more likely to turn down low-paying job offers (the job-creation effect). Through numerical exercises using this model, Acemoglu and Shimer show that higher UI benefits raise the unemployment rate mainly through the moral hazard effect, but aggregate output and welfare increase as a result of the positive feedback between workers' willingness to look for high-productivity jobs and the creation of high-productivity jobs.<sup>13</sup>

They do not assess the empirical significance of this job-creation effect. We thus do not know how significant the job-creation effect is in reality.


However, it is possible to associate the model's implications with a real-world situation in which more generous UI benefits give workers some time to look for a high-paying job, which in turn has some impact on firms' decisions to create such jobs.

## SUMMARY AND MISSING PIECE

In this article, I have reviewed some of the key findings on the economic effects of UI benefits. It has sometimes been argued that extending UI benefits causes adverse incentives for searching for a job. However, reporting effects complicate the interpretation that moral hazard effects predominantly account for the spike in the exit rate from unemployment. Furthermore, the arguments based on the liquidity and job-creation effects justify the positive relationship between the level of UI benefits and the duration of unemployment as socially desirable.

The expansions of UI benefits during the most recent recession may be supported by the latter argument at least *qualitatively*. Unfortunately,

the economics profession has not accumulated enough research that tells us how large the extensions should be during economic downturns.

Also, one important issue that has not been studied very much in the literature on UI is the interaction between the benefit level and human capital or skill depreciation. There is a long-standing empirical literature on earnings losses; those who are out of work for a long time tend to lose human capital and thus earn much less than they did pre-unemployment, even if one is lucky enough to find a job. Longer eligibility of UI may exacerbate this effect. The academic research examining this interaction would also be valuable for policymakers and economists. 

<sup>13</sup>Acemoglu and Shimer's model does not feature the liquidity effect, and thus the higher benefit causes workers to devote less effort to job search, raising the unemployment rate. However, its negative effect on output and welfare is more than offset by the positive job-creation effect.

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## DEVELOPING A LARGE DATABASE TO AID FINANCIAL REGULATION

This paper sets forth a discussion framework for the information requirements of systemic financial regulation. It specifically proposes a large macro-micro database for the U.S. based on an extended version of the Flow of Funds. The author argues that such a database would have been of material value to U.S. regulators in ameliorating the recent financial crisis and will be of aid in understanding the potential vulnerabilities of an innovative financial system in the future. The author also argues that the data should — under strict confidentiality conditions — be made available to academic researchers investigating the detection and measurement of systemic risk.

*Working Paper 10-22, "Durable Financial Regulation: Monitoring Financial Instruments as a Counterpart to Regulating Financial Institutions," Leonard I. Nakamura, Federal Reserve Bank of Philadelphia*

## A NEW LOOK AT THE COST OF STARTING A CREDIT RELATIONSHIP

The author studies the terms of credit in a competitive market in which sellers are willing to repeatedly finance the purchases of buyers by extending direct credit. Lenders (sellers) can commit to deliver any

long-term credit contract that does not result in a payoff that is lower than that associated with autarky, while borrowers (buyers) cannot commit to any contract. A borrower's ability to repay a loan is privately observable. As a result, the terms of credit within an enduring relationship change over time, according to the history of trades. Two borrowers are treated differently by the lenders with whom they are paired because they have had distinct repayment histories. Although there is free entry of lenders in the credit market, each lender has to pay a cost to contact a borrower. A lower cost makes each borrower better off from the perspective of the contracting date, results in less variability in a borrower's expected discounted utility, and makes each lender uniformly worse off *ex post*. As this cost becomes small, borrowers get nearly the same terms of credit within their credit relationships with lenders, regardless of individual repayment histories.

*Working Paper 10-23, "Pairwise Credit and the Initial Cost of Lending," Daniel R. Sanches, Federal Reserve Bank of Philadelphia*

## EXPLORING THE CYCLICAL PROPERTIES OF A SEARCH AND MATCHING MODEL

The author introduces risk-averse preferences, labor-leisure choice, capital, individual productivity shocks, and



market incompleteness to the standard Mortensen-Pissarides model of search and matching and explores the model's cyclical properties. There are four main findings. First and foremost, the baseline model can generate the observed large volatility of unemployment and vacancies with a realistic replacement ratio of the unemployment insurance benefits of 64 percent. Second, labor-leisure choice plays a crucial role in generating the large volatilities; additional utility from leisure when unemployed makes the value of unemployment close to the value of employment, which is crucial in generating a strong amplification, even with the moderate replacement ratio. Besides, it contributes to the amplification through an adjustment in the intensive margin of labor supply. Third, the borrowing constraint or uninsured individual productivity shocks do not significantly affect the cyclical properties of unemployment and vacancies: Most workers are well insured only with self-insurance. Fourth, the model better replicates the business cycle properties of the U.S. economy, thanks to the co-existence of adjustments in the intensive and extensive margins of labor supply and the stronger amplification.

*Working Paper 10-24, "Business Cycles in the Equilibrium Model of Labor Market Search and Self-Insurance," Makoto Nakajima, Federal Reserve Bank of Philadelphia*

### **PRECOMMITTED LINES OF CREDIT, DISTRESSED BANKS, AND THE SUBPRIME CRISIS**

Using the subprime mortgage crisis as a shock, this paper shows that commercial borrowers served by more distressed banks (as measured by recent bank stock returns or the nonperforming loan ratio) took down fewer funds from precommitted, formal lines of credit. The credit constraints affected mainly smaller, riskier (by internal loan ratings), and shorter-relationship borrowers, and depended also on the lenders' size, liquidity condition, capitalization position, and core deposit funding. The evidence suggests that credit lines provided only contingent and partial insurance during the crisis, since bank conditions appeared to influence credit line utilization in the short term. It provides a new explanation as to why credit lines are not perfect substitutes for cash holdings for some (e.g.,

small) firms. Finally, loan level analyses show that more distressed banks charged higher credit spreads on newly negotiated loans but not on funds disbursed from precommitted, formal credit lines. The author's analyses are based on commercial loan flow data from the confidential Survey of Terms of Business Lending.

*Working Paper 10-25, "How Committed Are Bank Lines of Credit? Experiences in the Subprime Mortgage Crisis," Rocco Huang, Michigan State University, formerly Federal Reserve Bank of Philadelphia*

### **INVESTIGATING THE IMPACT OF GOVERNANCE AND CONTROL MECHANISMS ON PURCHASE PREMIUMS IN BANK M&As**

Few transactions have the potential to generate revelations about the market value of corporate assets and liabilities as mergers and acquisitions (M&As). Corporate governance and control mechanisms such as independent directors, independent blockholders, and managerial share ownership are usually important predictors of the size and distribution of the incremental wealth generated by M&A transactions.

The authors add to this literature by investigating these relationships using a sample of banking organization M&A transactions over the period 1990-2004. Unlike research on nonfinancial firms, the impact of independent directors, share ownership of the top five managers, and independent blockholders on bank merger purchase premiums in this environment is likely to be measured more consistently because of industry operating standards and regulations. It is also the case that research on banks in this area has not received adequate attention. The authors model controls for risk characteristics of the target banks, the deal characteristics, and the economic environment.

Their results are robust. They support the hypothesis that independent directors may provide an important internal governance mechanism for protecting shareholders' interests, especially in large-scale transactions such as mergers and takeovers. The authors also find the results to be consistent with the hypothesis that independent blockholders play an important role in the market for corporate control as does managerial share ownership. But these effects dampen the impact of independent directors on target

shareholders' merger prices. Their overall findings would support policies that promote independent outside directors on the board of banking firms in order to provide protection for shareholders and investors at large.

*Working Paper 10-26, "Corporate Governance Structure and Mergers," Elijah Brewer III, DePaul University and Federal Reserve Bank of Chicago; William E. Jackson III, University of Alabama; and Julapa Jagtiani, Federal Reserve Bank of Philadelphia*

### EXPLORING THE CONTINUING IMPORTANCE OF PORTAGE SITES

The authors examine portage sites in the U.S. South, Mid-Atlantic, and Midwest, including those on the fall line, a geomorphologic feature in the southeastern U.S. marking the final rapids on rivers before the ocean. Historically, waterborne transport of goods required portage around the falls at these points, while some falls provided water power during early industrialization. These factors attracted commerce and manufacturing. Although these original advantages have long since been made obsolete, the authors document the continuing and even increasing importance of these portage sites over time. They interpret this finding in a model with path dependence arising from local increasing returns to scale.

*Working Paper 10-27, "Portage: Path Dependence and Increasing Returns in U.S. History," Hoyt Bleakley, University of Chicago, and Jeffrey Lin, Federal Reserve Bank of Philadelphia*

### CONSTRUCTING AN OPTIMAL MECHANISM FOR REVEALING TRADES

When contracts are unobserved, agents may have the incentive to promise the same asset to multiple counterparties and subsequently default. The author constructs an optimal mechanism that induces agents to reveal all their trades voluntarily. The mechanism allows agents to report every contract they enter, and it makes public the names of agents who have reached some prespecified position limit. In some cases, an agent's position limit must be higher than the number of contracts he enters in equilibrium. The mechanism has some features of a clearinghouse.

*Working Paper 10-28, "Inducing Agents to Report*

*Hidden Trades: A Theory of an Intermediary," Yaron Leitner, Federal Reserve Bank of Philadelphia*

### ANOTHER LOOK AT THE FRIEDMAN RULE IN VARIOUS ENVIRONMENTS

In this comment, the author extends Cavalcanti and Nosal's (2010) framework to include the case of perfectly divisible money and unrestricted money holdings. He shows that when trade takes place in Walrasian markets, counterfeits circulate and the Friedman rule is still optimal.

*Working Paper 10-29, "Comment on Cavalcanti and Nosal's 'Counterfeiting as Private Money in Mechanism Design'," Cyril Monnet, Federal Reserve Bank of Philadelphia*

### WHY CENTRAL COUNTERPARTIES EMERGED

The authors explain why central counterparties (CCPs) emerged historically. With standardized contracts, it is optimal to insure counterparty risk by clearing those contracts through a CCP that uses novation and mutualization. Since netting is not essential for these services, it does not explain why CCPs exist. In over-the-counter markets, as contracts are customized and not fungible, a CCP cannot fully guarantee contract performance. Still, a CCP can help: As bargaining leads to an inefficient allocation of default risk relative to the gains from customization, a transfer scheme is needed. A CCP can implement it by offering partial insurance for customized contracts.

*Working Paper 10-30, "The Emergence and Future of Central Counterparties," Thorsten V. Koeppl, Queen's University, and Cyril Monnet, Federal Reserve Bank of Philadelphia*

### OFFERING INSURANCE AGAINST COLLEGE-FAILURE RISK

Participants in student loan programs must repay loans in full regardless of whether they complete college. But many students who take out a loan do not earn a degree (the dropout rate among college students is between 33 to 50 percent). The authors examine whether insurance against college-failure risk can be offered, taking into account moral hazard and adverse selection. To do so, they develop a model

that accounts for college enrollment, dropout, and completion rates among new high school graduates in the US and use that model to study the feasibility and optimality of offering insurance against college failure risk. The authors find that optimal insurance raises the enrollment rate by 3.5 percent, the fraction acquiring a degree by 3.8 percent and welfare by 2.7 percent. These effects are more pronounced for students with low scholastic ability (the ones with high failure probability).

*Working Paper 10-31, "Insuring Student Loans Against the Risk of College Failure," Satyajit Chatterjee, Federal Reserve Bank of Philadelphia, and Felicia Ionescu, Colgate University*

### **PAYDAY LENDERS: EXACERBATION OR RELIEF OF CUSTOMERS' FINANCIAL DIFFICULTIES?**

Payday lending is controversial. In the states that allow it, payday lenders make cash loans that are typically for \$500 or less that the borrower must repay or renew on his or her next payday. The finance charge for the loan is usually 15 to 20 percent of the amount advanced, so for a typical two-week loan the annual percentage interest rate is about 400 percent. In this article, the author briefly describes the payday lending business and explains why it presents challenging public policy issues. The heart of this article, however, surveys recent research that attempts to answer what the author calls the "big question," one that is fundamental to the public policy dispute: Do payday lenders, on net, exacerbate or relieve customers' financial difficulties?

*Working Paper 10-32, "Payday Lending: New Research and the Big Question," John P. Caskey, Swarthmore College, and Visiting Scholar, Federal Reserve Bank of Philadelphia*

### **EXAMINING THE SPATIAL CONCENTRATION OF R&D LABS**

The authors document the spatial concentration of more than 1,000 research and development (R&D) labs located in the Northeast corridor of the U.S. using point pattern methods. These methods allow systematic examination of clustering at different spatial scales. In particular, Monte Carlo tests based on Ripley's (1976) K-functions are used to identify clusters of labs — at

varying spatial scales — that represent statistically significant departures from random locations reflecting the underlying distribution of economic activity (employment). Using global K-functions, they first identify significant clustering of R&D labs at two different spatial scales. This clustering is by far most significant at very small spatial scales (a quarter of a mile), with significance attenuating rapidly during the first half mile. The authors also observe statistically significant clustering at distances of about 40 miles. This corresponds roughly to the size of the four major R&D clusters identified in the second stage of their analysis — one each in Boston, New York-Northern New Jersey, Philadelphia-Wilmington, and Virginia (including the District of Columbia). In this second stage of the analysis, explicit clusters are identified by a new procedure based on local K-functions, which they designate as the multiscale core-cluster approach. This new approach yields a natural nesting of clusters at different scales. The authors' global finding of clustering at two spatial scales suggests the possibility of two distinct forms of spillovers. First, the rapid attenuation of significant clustering at small spatial scales is consistent with the view that knowledge spillovers are highly localized. Second, the scale at which larger clusters are found is roughly comparable to that of local labor markets, suggesting that such markets may be the source of additional spillovers (e.g., input sharing or labor market matching externalities).

*Working Paper 10-33, "The Agglomeration of R&D Labs," Gerald A. Carlino, Federal Reserve Bank of Philadelphia; Jake Carr, Federal Reserve Bank of Philadelphia; Robert M. Hunt, Federal Reserve Bank of Philadelphia; and Tony E. Smith, University of Pennsylvania*

### **WHY DO WORKERS ENGAGE IN ON-THE-JOB SEARCH?**

This paper provides a set of simple, yet overlooked, facts regarding on-the-job search and job-to-job transitions using the UK Labour Force Survey (LFS). The LFS is unique in that it asks employed workers whether they search on the job and, if so, why. The author finds that workers search on the job for very different reasons, which lead to different outcomes in both mobility and wage growth. A nontrivial fraction

of workers engage in on-the-job search due to a fear of losing their job. This group mimics many known features of unemployed workers, such as wage losses upon finding a job. Workers also search on the job because they are unsatisfied. This group is roughly equally split into those who are unsatisfied with pay and those who are unsatisfied with other aspects of their job. Distinguishing these two groups allows the author to highlight the importance of the nonpecuniary value of a job. He further shows that the evidence that firms

make a counteroffer in response to a worker's outside offer is scarce and that wage outcomes at the time of job-to-job transitions are closely linked to the worker's outside option. The evidence in this paper contributes not only to deepening our understanding of labor reallocation, but it also suggests the fruitful directions of future research in the labor search literature.

*Working Paper 10-34, "Reality of On-the-Job Search,"*  
Shigeru Fujita, Federal Reserve Bank of Philadelphia