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# Economic Insights

Taxing the 1 Percent

The Value of Loyal Customers

Regional Spotlight

Research Update

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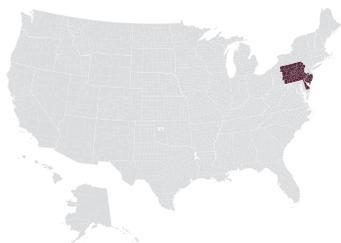
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## Economic Insights

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On the first attempt to ring it in 1753, the bell that the British colony of Pennsylvania had ordered from a **London foundry** cracked. Recast by Philadelphia metalsmiths John Pass and John Stow, it pealed from atop the Provincial Assembly (later the Pennsylvania State House, now Independence Hall) to mark such occasions as King George III's ascension to the throne in 1761, the Battles of Lexington and Concord in 1775, the ratification of the Constitution in 1787, and the deaths of Benjamin Franklin in 1790 and George Washington in 1799. By 1839, antislavery publications had coined the name Liberty Bell, inspired by its inscription from Leviticus 25:10. Likely in the 1840s it acquired the iconic crack that has left it mostly mute yet fully resonant as a worldwide symbol of freedom. The **Independence Hall Association** offers an account of the Liberty Bell's history.

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# Taxing the 1 Percent

Raising taxes on top earners is often seen as a straightforward way to stem inequality. The trick is preserving efficient revenue generation and work incentives for the economy's most productive contributors.

BY MAKOTO NAKAJIMA

Income inequality has been widening in the United States since the 1970s and is now greater than in any other industrialized country. While U.S. median household income has barely grown over the past four decades, the income of the top-earning households has almost doubled. In other words, the U.S. economy's overall growth has disproportionately accrued to the very rich. This phenomenon has garnered popular attention—witness, for example, the Occupy Wall Street movement of several years ago and the worldwide popularity of economist Thomas Piketty's book *Capital in the Twenty-First Century*. Besides the social concerns that income inequality raises, it also has tax implications. And considering how much their share of total income has been rising over the past 40 years, how those with the highest incomes should be taxed is becoming an increasingly important question, especially when the governments of the U.S. and most other developed countries have been accumulating debt. One answer that is often proposed is to significantly raise taxes on those in the top 1 percent of the income distribution. Even a small change in the tax rates applied to the top 1 percent could raise tax revenue significantly, as the top 1 percent contribute disproportionately to total U.S. output and total tax revenue. Would high taxes on the economy's most productive members discourage their efforts that contribute to economic growth? As with most economic policies, when we think about how to tax the

1 percent, we need to consider the complex trade-off between equity and efficiency.

## Inequality's Rise

The median U.S. income has grown at a significantly slower pace than the income of the top 1 percent (Figure 1). The median increased from \$48,066 in 1976 to \$56,516 in 2015, adjusted for inflation, an 18 per-

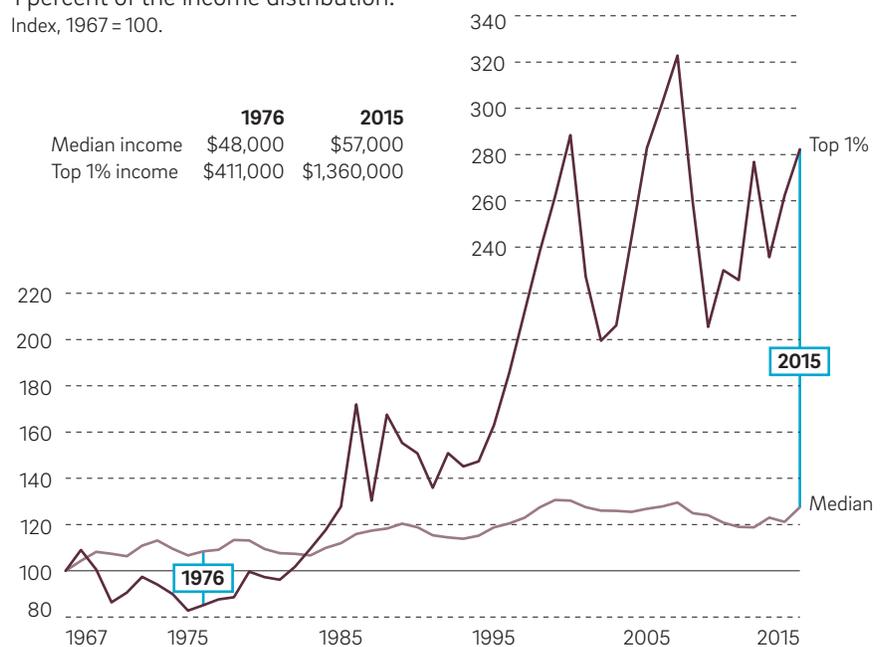
**Makoto Nakajima** is a senior economist at the Federal Reserve Bank of Philadelphia. The views expressed in this article are not necessarily those of the Federal Reserve.

cent increase over 40 years, or an annual average growth rate of just 0.4 percent. By contrast, the income of the top 1 percent of households increased from \$411,236 to \$1.36 million over the same four decades. Their income more than doubled—a growth rate of 132 percent—or an average annual rate of 3.0 percent. Put differently, in 1976 the income of the top 1 percent was about 8.6 times the median household

FIGURE 1

## Income Has Risen Much Faster at the Top

Median inflation-adjusted U.S. household income vs. household income of the top 1 percent of the income distribution. Index, 1967 = 100.



**Sources:** Household median income is from the U.S. Census Bureau's Current Population Survey, Annual Social and Economic Supplements. The top 1 percent income is from Emmanuel Saez's website, which updates the numbers initially used in his 2003 paper with Thomas Piketty.

income but had grown to 24.1 times the median in 2015. Moreover, top incomes rose even faster if you look at the top 0.1 percent of households, whose income increased 460 percent during the same period, to \$6.7 million in 2015.

Because of the different growth rates of the median and top household incomes, the degree of income inequality has increased significantly over the past 40 years. One way to measure the change in income inequality is to look at how the proportion of income earned by the richest households has changed over time (Figure 2). Before the Great Depression, the top 1 percent earned close to 20 percent of total income. But between the end of the Second World War and the late 1970s, their proportion gradually declined to 10 percent. Since then, though, their proportion has rebounded, having reached 23.5 percent in 2007 before stabilizing at around 20 percent today, comparable to their share in the early 20th century. In other words, although the U.S. economy advanced in terms of equality of income across households during the first half of

the last century, that gain has been wiped out since the 1970s.

For the top 10 percent of households, the trend is similar. They earned about 45 percent of total income in the early 20th century, but their proportion declined to about 35 percent after the Second World War before starting to rise over about the past 40 years. In recent years, the top 10 percent of households have earned more than 50 percent of total income.

### What's Behind Rising Income Inequality?

Understanding what is behind the rise in income inequality can help us think about the best way to tax the top 1 percent. First, it is helpful to look at which component of income contributed to the rising income inequality seen in Figure 1. That's because income is more than one's paycheck. Households may earn not only wage income but also entrepreneurial income from ownership in a business or financial income from returns on investments such as stocks, bonds, and real estate.

Financial income includes dividends, rents, and interest. Moreover, when values of financial assets change, households' income is affected by capital gains, which I will discuss separately.

First of all, it is easy to see from Figure 3 that the importance of financial income, excluding capital gains, has been declining since the early 20th century. Financial income made up about 50 percent of the income of the top 1 percent of households at the beginning of the 20th century, but in recent years the proportion has been only about 10 percent. Some of the decline reflects a shifting of income from financial income to capital gains, for tax purposes. The share of capital gains increased from less than 10 percent in the first half of the 20th century to 15 percent on average since 2000. One can also see that capital gains are quite volatile, having increased significantly during the dot-com boom of the late 1990s and early 2000s and during the boom leading up to the Great Recession. Even if financial income and capital gains are combined, their share has declined from above 50 percent of total income to about 25 percent in recent years. There is other evidence that financial income's contribution to rising income inequality has been small. As Roc Armenter showed in his 2015 *Business Review* article, until 2001, financial income had remained stable at around 38 percent of total income, yet income inequality continued to increase significantly.

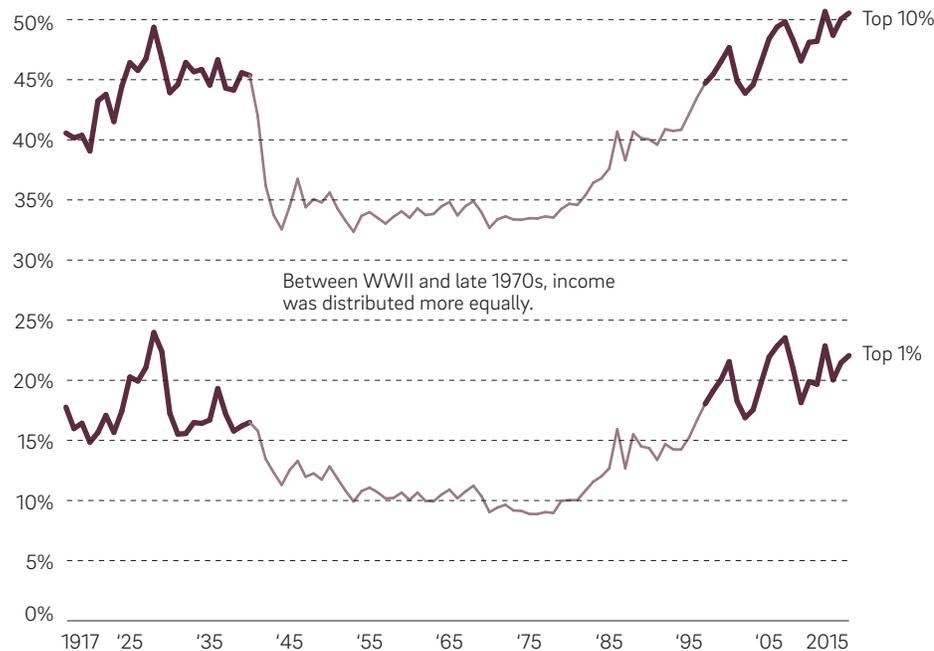
Entrepreneurial income has made up about 30 percent of the income of the top 1 percent, except around the Second World War and in the mid-1980s. The share of entrepreneurial income shrank in the 1970s and 1980s but since then has been rising. Therefore, entrepreneurial income might have become important for the income growth of the 1 percent since the 1990s, but it was not important in the 1970s and 1980s, when income inequality had already started widening.

Now compare the trends in financial and entrepreneurial income with wage income. The 1 percent's proportion of wage income increased from around 30 percent in the 1940s to 40 percent in the 1960s, and then accelerated to about 60 percent in the 1980s before plateauing. Wages are now by far the largest source of income for top-earning households in the U.S.

FIGURE 2

### Recent Years Resemble Early 20th Century

Proportion of total income earned by highest-earning 1 percent and 10 percent of U.S. households, 1917–2015.

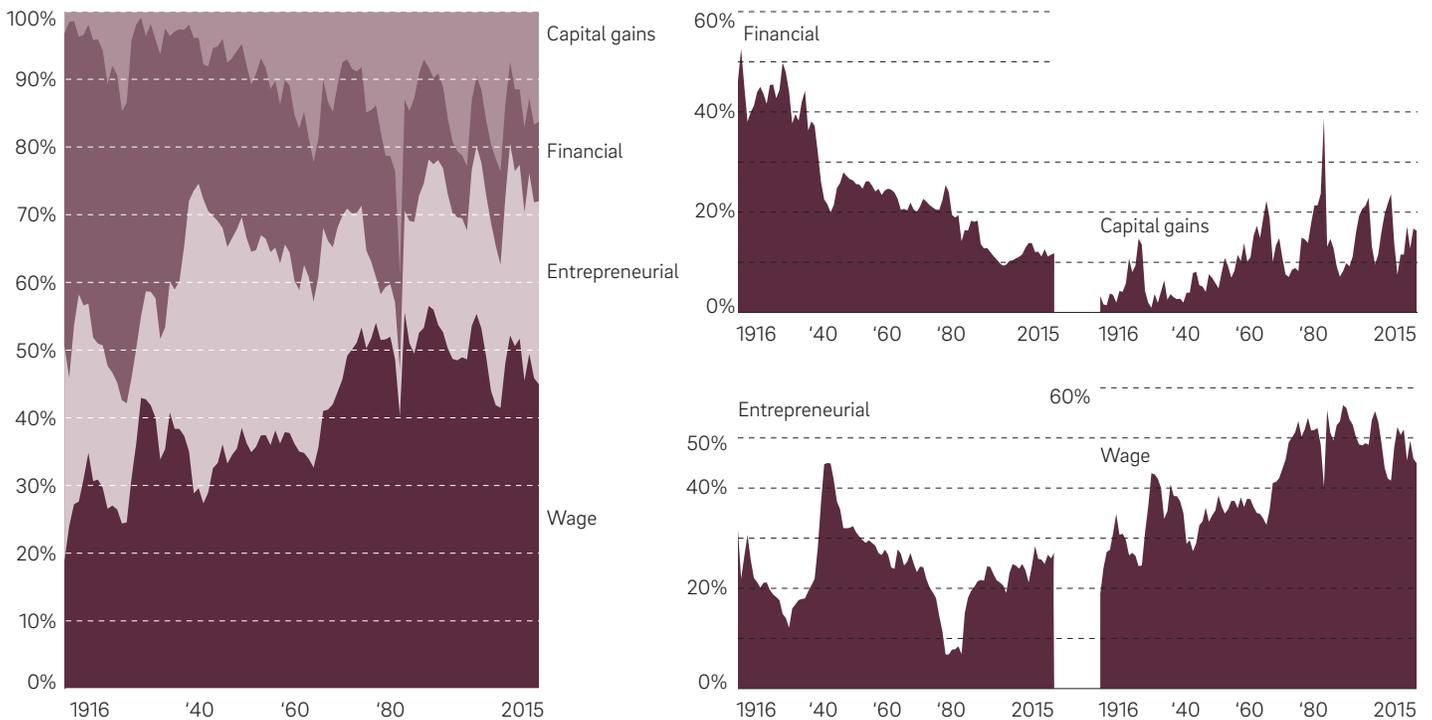


Source: Piketty and Saez (2003) and updates since.

FIGURE 3

### Financial or Entrepreneurial Income Not the Key Factors

Composition of total income of households in top 1 percent of U.S. income distribution, 1916–2015.



Source: Author’s calculation based on Piketty and Saez (2003) and updates since.

Moreover, the timing of this acceleration in the wage share coincides with the timing of the increase in their share of total income, suggesting that wage income played an important part in the rise of income inequality. Figure 4 confirms this intuition: Its U shape is similar to the U shape in Figure 2.

Clearly, the most important part of the top-earning households’ income has been wage income, especially before the 1990s. And their share of total wage income has increased significantly over about the past 40 years. For these households, entrepreneurial and financial income are nonnegligible parts of their overall income, but those shares are smaller than for wage income, and the importance of financial income for these households has been on a declining trend. Based on the fact that inequality in wage income has played an important role in rising income inequality, I will present a simple theory of taxation of the 1 percent that focuses on taxing the wage income of the 1 percent.

### Composition of Occupations and Rise of the Finance Industry

How about sectors and occupations? Which types of workers in what fields tend to be found in the top 1 percent of earners? How have occupations at the top of the income heap changed since income inequality started rising in the 1970s? Answers to these questions could help us understand the driving force behind the rising income inequality since the 1970s.

Between 1979 and 2005, income growth among financial professionals made up a disproportionate part of the overall rise in income inequality, although this trend might have slowed

FIGURE 4

### Rise in Wage Share Coincides with Rise in Income Share of 1%

Proportion of wage income earned by top 1 percent and 0.1 percent of households out of total U.S. wage income, 1927–2011.



Source: Piketty and Saez (2003) and updates since.

after the Great Recession.<sup>1</sup> Executives and managers at nonfinancial firms make up the largest group among the top 1 percent of income earners, but their proportion declined slightly, from 35.3 percent in 1979 to 30.0 percent in 2005.<sup>2</sup> Similarly, when the top 1 percent's share of total income rose from 9.7 percent in 1979 to 21.0 percent in 2005, the share of income earned by nonfinancial executives and managers among the top 1 percent remained the largest among different occupation groups, though their share dipped slightly, from 39.5 percent to 37.4 percent. Meanwhile, over that same quarter-century, financial professionals became much more numerous among the 1 percent, rising from 7.7 percent in 1979 to 13.2 percent in 2005. During this same period, their income share rose from 9.4 percent to 16.4 percent.

Although attention is often paid to the income of CEOs and financial professionals, it is also important to point out that the top earners are not only executives, managers, and financial professionals. Medical professionals made up 15.9 percent of the top 1 percent in 1979 and 14.2 percent in 2005. The proportion of lawyers grew from 6.7 percent in 1979 to 7.7 percent in 2005. Other professions represented in the 1 percent include engineers, real estate professionals, professors and scientists, and those in the arts, media, and sports. In other words, the 1 percent is a diverse group.

## Taxation and Income Inequality

Among the many possible reasons behind rising income inequality in the U.S., pieces of evidence suggest that tax policy might

See **Marginal and Average Tax Rates and Progressivity.**

be at least one of the reasons.

During the first half of the 20th century,<sup>3</sup> the top income tax rate was raised on net and remained high until the 1960s, when the top rate began to be gradually lowered to the current 39.6 percent (Figure 5). Notice that this is not the rate that the top 1 percent pay on all their taxable income. That would be their average income tax rate. Rather, 39.6 percent is the highest marginal income tax

rate, which is applied only to the amount of one's income that exceeds the highest income bracket in the tax code.

Now compare the shape of Figure 5 with Figure 2 (reproduced beneath Figure 5). Observe that the share of total income earned by the highest-income households declined whenever the top income tax rate was raised and rose when the top income tax rate was lowered. In other words, if you were to flip Figure 2 upside-down, you would obtain the approximate shape of Figure 5.<sup>4</sup> Bear in mind that income in Figure 2 is shown before taxes are taken out. If we look at the correlation between lower top tax rates and after-tax income, inequality widens further whenever the top earners can keep a larger fraction of their income.

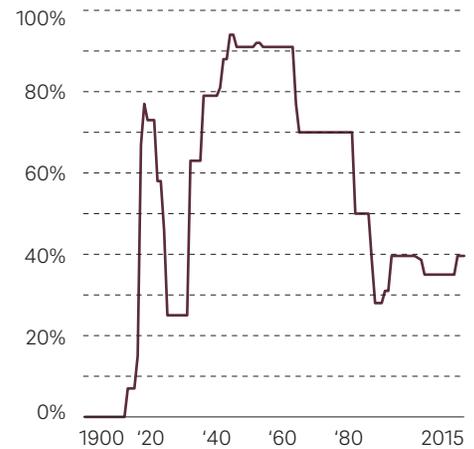
This suggestive evidence for the role of tax rates in the rise of inequality appears to extend beyond the United States. For example, in Britain, the top marginal income tax rate declined nearly 50 percentage points from the early 1960s to the late 2000s, while the income share for the top 1 percent increased 6 percentage points. For the U.S., the top marginal income tax rate declined from 85 percent in the 1960s to 35 percent in the 2000s (a 50 percentage point decline), while the top 1 percent income share increased from 8.2 percent to 17.6 percent (a 9.4 percentage point increase). The negative relationship between the change in top marginal income tax rates and the change in income shares for the top 1 percent can be seen in Figure 6, with the diagonal line showing the average relationship. It is easy to see that countries that experienced larger declines in their top marginal income tax rates from the 1960s to the 2000s saw larger increases in the share of income earned by the top 1 percent during those same periods. This correlation is by no means definite causal evidence, but it does suggest that changes in the top marginal tax rate might contribute to the degree of concentration of income among the highest-income households.

Why might that be? Alvaredo, Atkinson, Piketty, and Saez offer two interpretations of this negative relationship. The first is tax avoidance. When the top marginal tax rates decline, as they have since the 1960s, households with high incomes might have less reason to employ tax avoidance

FIGURE 5

## Lower Taxes Coincide with Higher Share of Income

Top marginal U.S. income tax rates.



Source: Tax Foundation.

Proportion of total income earned by highest-earning 1 percent and 10 percent of U.S. households, 1917–2015.



Source: Piketty and Saez (2003) and updates since.

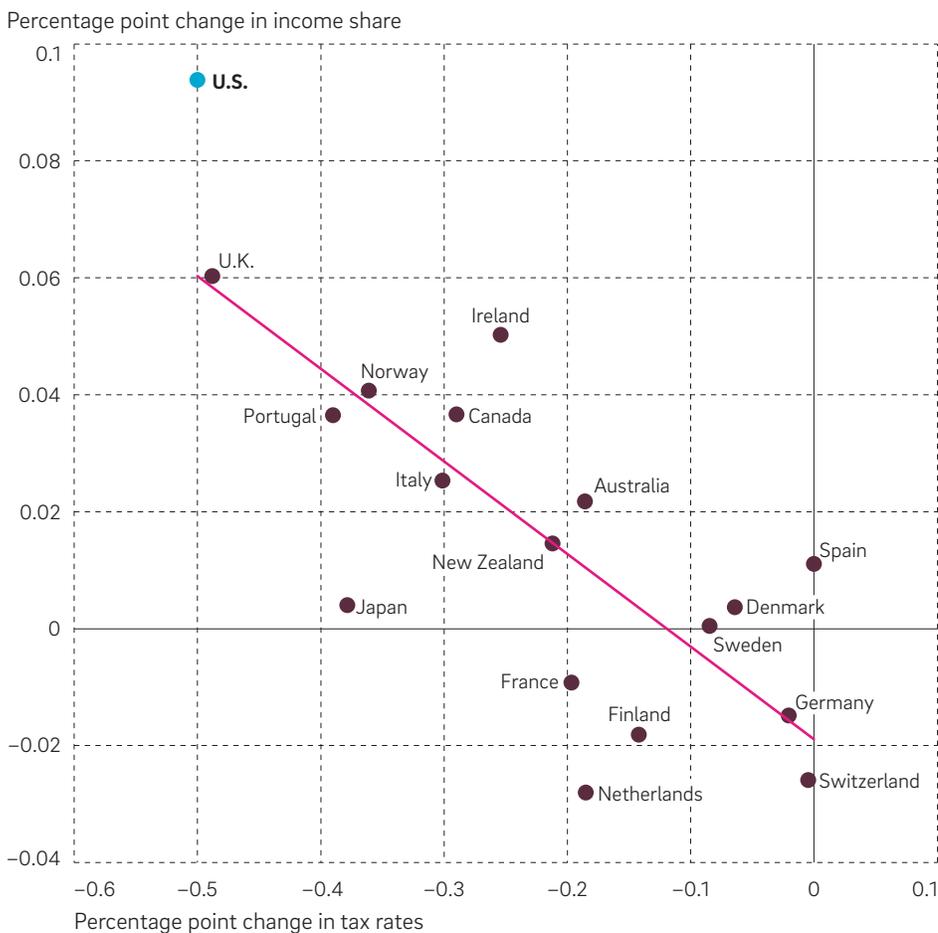
strategies, so they tend to report their incomes without trying hard to make them look smaller. These researchers argue that this hypothesis certainly can explain some of the negative relationship but is hardly the only story. A related possibility, which I will discuss later, is that the rich could move out of the country if the income tax rate applied to them is high.

The alternative interpretation is based on economic incentives. When the top tax rates are lower, it stimulates economic activity among top earners. They might increase their effort or work longer hours to increase their income because they can

FIGURE 6

### Similar Inverse Relationships Globally

Change in top marginal income tax rate and income share for households in top 1 percent of income distribution in 18 industrialized countries, 1960–1964 average to 2005–2009 average.



**Source:** Replicated from cross-country evidence by Alvaredo, Atkinson, Piketty, and Saez, <https://www.aeaweb.org/articles?id=10.1257/jep.27.3.3>.

**Note:** For countries where data are not available for the same five-year ranges, data for the closest five years are used. For example, for Portugal, the top income tax rate and top 1 percent’s income share are available only for 1976–2005. Therefore, the averages of 1976–1980 and 2001–2005 are substituted.

keep more after-tax income resulting from those additional hours or efforts. This second interpretation is the foundation of the simple standard theory of how to tax the top 1 percent of households that I will explain next.

### A Simple Theory of How to Tax the 1 Percent

The top 1 percent made 23.5 percent of total income in 2007, but because of the progressivity of the federal income tax code, they paid an even higher 40.4 percent of total federal individual income

taxes collected. Since the 1 percent pay a disproportionately large fraction of total income taxes, any change in income tax rates applied to them could have significant consequences for the total amount of tax revenue that the federal government can generate. Because the most highly paid households are taxed at a higher rate, a progressive income tax structure helps narrow the gap in after-tax income between higher earners and lower earners. In other words, progressive taxation promotes equality among individuals in terms of their after-tax income. One can argue that this effect is beneficial in

promoting a harmonious society. Moreover, we saw that the income earned by the top 1 percent of households has been on the rise over roughly the past 40 years. This makes how to tax them an even more important issue, from the standpoint of government tax revenue and equality. By raising the top income tax rates applied to these households, the government can raise even more tax revenue, and we could improve equality in terms of after-tax income even more.

But is there a catch? As I discussed, a higher marginal tax rate may discourage individuals from working longer or harder in general. Conversely, if people can earn more after-tax income by working longer hours or putting more effort into their work, they will naturally be inclined to do so. This efficiency loss effect needs to be taken into account when the tax rate is determined. This efficiency loss effect could be significant if the top 1 percent work fewer hours or less hard, since they are generally the ones whose skills are highly valuable (and thus highly valued) in the economy or who run the most financially successful businesses. So, the optimal tax rate is the marginal rate that strikes the desired balance between the loss in efficiency and the gain in equality and additional tax revenue resulting from higher taxes on top earners.

So how can we arrive at the “optimal” tax rate? If the government can receive a significant amount of tax revenue from the richest 1 percent, it does not need to tax the rest of the population too much. In this sense, the more tax revenue collected from the 1 percent, the happier the 99 percent will be. Of course, members of the 1 percent are less happy if their tax burden is higher. But since they are a small fraction of the population and vastly richer than the rest of the population anyway, it is arguably worth calculating how to maximize tax revenue from the 1 percent without significantly curbing their productivity.

A study that defined the optimal rate as that which maximizes the tax revenue from the 1 percent, by Peter Diamond and Emmanuel Saez, focuses on two numbers that they say characterize this optimal rate:

The first number is labor supply elasticity, which represents how strongly

workers respond to tax hikes or cuts. Let me give a simple example to illustrate what it is. Imagine a worker works 160 hours per month at \$25 per hour. The monthly income of this worker is \$4,000, or \$48,000 per year. Suppose this worker's hourly wage goes up by \$5 per

hour, to \$30. This is a 20 percent hourly increase. Using the commonly estimated value of U.S. labor supply elasticity of 0.25, a 20 percent increase in wages induces a 5 percent increase ( $= 20 \times 0.25$ ) in hours worked.

Taking into account the wage increase

and the induced increase in hours worked, the worker now works 168 hours ( $= 160 \times (1 + 0.05)$ ) at \$30 per hour, and earns \$5,040 per month, or \$60,480 a year. If only the person's wage is raised, his or her annual earnings would be \$57,600 (20 percent higher than the initial \$48,000), but the additional increase of \$2,880 happens because the worker decides to work longer to take advantage of the higher wage per hour. Notice that this channel works in the opposite direction as well. If the income tax rate is raised, the wage per hour after paying income taxes is lowered, and the worker works fewer hours and earns even less after-tax income.

From this example, it is easy to see that, if labor supply elasticity is high, workers work significantly less or put in significantly less effort when the tax rate is raised. This means that a tax hike might not generate more tax revenue after all. If labor supply elasticity is low, workers are not too discouraged by a higher tax rate, and the government can easily collect more revenue by raising taxes. Since in Diamond and Saez's study the goal of the government is to receive as much tax revenue as possible from the 1 percent, higher labor supply elasticity implies that the optimal revenue-maximizing tax rate is lower.

The second number is the income concentration measure, which is the ratio of the average income of all households in the top 1 percent group to the lowest income in the top 1 percent group. The larger this ratio, the greater the dispersion of income among the top 1 percent. That is, the higher the ratio, the more that the top incomes of the 1 percent exceed the average income among the 1 percent. According to Diamond and Saez's simple model, a higher income concentration measure in the top 1 percent implies a higher optimal tax rate applied to them. If the income distribution is more concentrated among the highest earners, raising their taxes will still generate the desired revenue, even if the tax hike leads them to work less or expend less effort because of the labor supply elasticity channel. The average income among the

See *Income Concentration and the Pareto Distribution*. [→](#)

## Marginal and Average Income Tax Rates and Progressivity

When discussing how to tax the 1 percent, it is important to be aware of the difference between average and marginal tax rates.

The average rate is the amount of taxes paid divided by pretax income. For simplicity, let's forget about tax deductions, exemptions, credits, and other details of the tax code. Consider an individual whose pretax income is \$50,000 and who pays \$6,000 in income taxes. This person's average tax rate is 12 percent (\$6,000 divided by \$50,000).

The marginal tax rate is applied to the next \$1 that the person earns. In 2015, the marginal tax rate for someone filing as single and making \$50,000 was 25 percent. This means that if this person makes one more dollar, 25 cents is taxed away, so the person keeps 75 cents out of that one additional dollar earned.

A taxpayer's marginal rate is higher than his or her average rate because the U.S. tax code is structured in such a way that the marginal rate increases as the taxpayer's income increases. This is called the *progressivity* of the federal income tax system.

As Figure 7 shows, in 2016 the marginal tax rate started at 10 percent and topped out at 39.6 percent for annual taxable income above \$415,050.

In addition, individuals have to pay so-called payroll taxes to fund Medicare and Social Security, and pay state income taxes and sales taxes, together adding about 7.0 percent.<sup>5</sup> In total, the highest marginal rate was 46.6 percent (39.6 percent plus 7.0 percent) in 2016.

The average rate was lower than that, because the top rate is applied only to income above the highest threshold, but the marginal rate is what matters to someone deciding whether to work slightly more or less. This is why the simple theory I discuss is about the marginal tax rate applied to the top 1 percent of earners.

FIGURE 7

### Marginal Federal Income Tax Rates

By single filer brackets, 2016.

Single filer	Rate
\$0–\$9,275	10%
\$9,276–\$37,650	15%
\$37,651–\$91,150	25%
\$91,151–\$190,150	28%
\$190,151–\$413,350	33%
\$413,351–\$415,050	35%
\$415,051+	39.6%

Source: Internal Revenue Service, <https://www.irs.com/articles/2016-federal-tax-rates-personal-exemptions-and-standard-deductions>.

Note: The standard deduction for single filers in 2016 was \$6,300, and the personal exemption was \$4,050.

top 1 percent of U.S. earners is \$1.2 million, while the lowest income among the top 1 percent group is \$400,000, which results in an income concentration measure of 3 (\$1.2 million / \$400,000).

Using the standard value of 0.25 for U.S. labor supply elasticity and the value of 3 for the U.S. income concentration among the 1 percent—both of which are consistent with U.S. data—Diamond and Saez arrive at an optimal tax rate of 73 percent, which is significantly higher than the current 46.6 percent (the sum of the top federal income tax rate of 39.6 percent and various other taxes that amount to 7 percent).<sup>6</sup>

How does their optimal tax rate change if we change those two numbers? For example, if the labor supply elasticity is assumed to be 0.5, which is on the high end of available estimates, the optimal tax rate becomes 57 percent, which is much lower than 73 percent but still 10 percentage points higher than the current rate. When the labor supply elasticity is higher, we need to worry more about efficiency loss, but the optimal tax rate is still higher than the current rate of 46.6 percent. If the income concentration measure is 2.5, which is at the low end of estimates, the optimal tax rate is still a very high 71 percent, according to Diamond and Saez. If income across the economy is less concentrated at the top, there are fewer extremely rich households, and thus a higher tax rate lowers the total amount of tax revenue collected from rich households more. Therefore, the optimal top tax rate must be lower. However, again, the optimal top tax rate is not too much lower compared with the baseline rate of 73 percent. In the end, the message from their analysis is that the 1 percent should be more heavily taxed than they currently are. Taxing the highest earners at a higher marginal rate has also been supported by the work of the late British inequality scholar Anthony B. Atkinson, who recommended a 65 percent top marginal tax rate as one of 15 proposals he prescribed to remedy inequality.<sup>7</sup>

## Not So Simple? Factoring in Saving

The simple formula of how to tax the 1 percent that Diamond and Saez propose

relies on various assumptions that differ from features of the real world that might be important. First of all, they assume that workers decide how much to work once and for all. In reality, over the course of their working lives, workers may choose to work part time, stay home with their

families, work overtime, and so on, based on their personal needs and preferences. Ignoring the dynamic aspect of choice also means that the need for savings is ignored. Workers save for retirement as well as for a rainy day. Savings are not small potatoes, as financial income and

## Income Concentration and the Pareto Distribution

The simple theory of optimal taxation that Diamond and Saez provide relies on the assumption that income among the top 1 percent is distributed according to the Pareto distribution. Named after economist Vilfredo Pareto (1848–1923), it is a distribution that is known to have a thick (sometimes called a “fat”) tail. That is, it has a high probability of containing very high values.

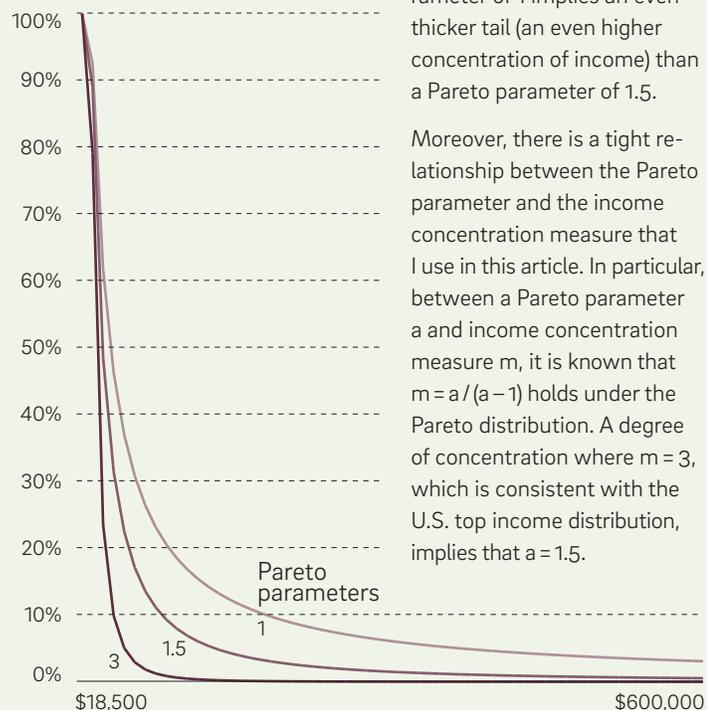
For example, the Pareto distribution is known to exhibit the “80–20 rule”—20 percent own 80 percent of the total. Therefore, the Pareto distribution can capture the U.S. income distribution, which exhibits a high concentration among the top earners.

The shape of the distribution is controlled by what is called the Pareto parameter. When the Pareto parameter is lower, the distribution has a thicker tail. In other words, when applied to the distribution of income, a lower Pareto parameter means there are more households with very high incomes. Figure 8 shows Pareto distributions for three different values of the Pareto parameter. The lines plotted show the percentage of households whose incomes are higher than the values given on the horizontal axis. One can see that a Pareto parameter of 3 implies a thinner

tail compared with a Pareto parameter of 1.5. A Pareto parameter of 1 implies an even thicker tail (an even higher concentration of income) than a Pareto parameter of 1.5.

Moreover, there is a tight relationship between the Pareto parameter and the income concentration measure that I use in this article. In particular, between a Pareto parameter  $a$  and income concentration measure  $m$ , it is known that  $m = a / (a - 1)$  holds under the Pareto distribution. A degree of concentration where  $m = 3$ , which is consistent with the U.S. top income distribution, implies that  $a = 1.5$ .

**FIGURE 8**  
**Pareto Distributions**



capital gains, which make up a sizable portion of the income of rich households, are generated by savings. How much would the optimal top income tax rate change if the calculations were not as simplified as in Diamond and Saez's model and included the role of savings?

In a model constructed by Fabian Kindermann and Dirk Krueger, individuals work while young and then retire. They decide not only how many hours to work or how much effort to put in, but also how much money to save. Individuals can use their savings as a rainy day fund, to support consumption expenditures should their incomes fall, or to support themselves in retirement. If an individual is lucky, he or she might earn a very high wage and become part of the 1 percent.

What happens in this setup if the top tax rate is raised? And what is the optimal rate when the need to save is taken into consideration? Interestingly, the optimal rate in this study was close to 90 percent, which is even higher than the 73 percent that Diamond and Saez obtained by ignoring savings.

Why? The key is that working individuals are trying to save for both retirement and for difficult times. Individuals want to be able to supplement any pension income with savings. They also want to be prepared in case of a future pay cut or job loss. Given the need to save, someone who happens to be extremely highly paid will want to work as much as possible, or put in as much effort as possible, even if the tax rate is very high. When their pay is very high, it is a great time to work hard and save for a rainy day. In other words, the labor supply elasticity is effectively lower if savings motives are taken into account. As I discussed earlier, lower labor supply elasticity implies that the government can tax the 1 percent at a higher rate without discouraging the work effort of those highest-income workers too much.

Nevertheless, a study similar to Kindermann and Krueger's in which individuals save for both retirement and for a rainy day provides a cautionary tale. Authors Nezhil Guner, Martin Lopez-Daneri, and Gustavo Ventura argue that even though the optimal top tax rate is higher than the current rate, the amount of additional revenue raised by increasing the top rate would not be very large. According to their benchmark simulation, total tax revenue from high earners increases 6.8 percent (about \$135 billion in 2015) when the income tax schedule is tilted more toward high earners, but total tax revenue from all sources goes up only 0.6 percent (about \$12 billion in 2015), partly because the higher tax rates discourage saving. In other words, the benefits of enacting the "optimal" tax rate might be limited revenue-wise, although raising the top tax rate would still reduce inequality in after-tax income.

## Effect on Aspiration?

Another missing element is the possible effect on skill acquisition and productivity. To make it to the top, individuals typically need to go to school, study hard, and learn on the job. If the

reward for such preparation is curbed by higher top tax rates, entrepreneurship might be discouraged, the productivity of the workforce might be diminished, and the economy might suffer as a result. The effort needed to reach the 1 percent is hard to measure, but one measurable aspect is how individuals accumulate skills.

Today's top earners tend to have acquired skills when they were young. For instance, today's members of the Forbes 400, who are the top 0.0001 percent of earners, did not grow up with as many advantages as in the past. Members in the 2000s were less likely to have inherited their wealth or to have grown up wealthy compared with their counterparts in the 1980s.<sup>8</sup> Rather, they grew up in what one might call the upper-middle class and

were able to get good educations and apply their skills in finance, technology, or mass retail. But if their income tax rate is raised too much, it could discourage such people not only from working hard today but also from investing time and money in education or training. Diamond and

Saez's simple theory captures the effect of tax rates on work effort after one becomes a top-earner but not the effect on skill acquisition. In this way, a much higher tax rate for top earners might have a much larger negative effect on the productivity of top earners in the long run. This effect might be strong enough to justify a lower optimal income tax rate than what Diamond and Saez found.

So, what might the optimal top income tax rate be when skill acquisition is taken into account? According to one model, the optimal tax rate is 66 percent if there is no need to acquire skills to join the 1 percent.<sup>9</sup> This number is not far removed from Diamond and Saez's optimal rate of 73 percent, the difference owing to various differences in their models. But the optimal tax rate goes down to 52 percent if we take incentives for skill acquisition into account. The skill acquisition channel does not negate Diamond and Saez's main message that the top 1 percent should be taxed at a higher rate than the 46.6 percent they now pay, but their result does imply that it might not be desirable for society to raise the current top income tax rate too high.

## Taxing Top CEOs?

Another consideration missing from Diamond and Saez's calculation is the role of very highly paid executives. Laurence Ales and Christopher Sleet argue that talented CEOs help firms grow larger and thus create positive spillover benefits for society. Therefore, taxing them too much creates potentially significant costs for society. The researchers argue that the optimal tax rate applied to CEOs is lower if these spillovers are taken into consideration. However, as I discussed, although CEOs and other highly paid executives are among the highest earners within the top 1 percent, they are only a part of a diverse group of top earners. Therefore, this argument is probably applicable only to a subset of the top 1 percent.

**If higher top tax rates curb the reward for study and hard work, entrepreneurship and economic productivity and growth might be diminished.**

## The Elusive 1 Percent

As I mentioned earlier, one potential way for the top earners to avoid paying high taxes when the top income tax rate is raised is to move to a different country or to move their income or income sources to a different country. As it gets easier to communicate, travel, and move assets across countries, this channel might become more and more relevant.

Let me discuss what happened in France as a cautionary tale. In 2013, France introduced a 75 percent “super tax” on those whose income exceeded 1 million euros (\$1.4 million). However, after 2014, the super tax was allowed to expire, partly because it did not generate as much additional revenue as expected. The government had forecast that the super tax—along with higher value-added and corporate tax rates—would increase tax revenue by 30 billion euros in 2013. But revenue actually increased by less than half that. Why didn’t the French government collect as much in taxes as it had forecast? One channel is that the super rich can simply renounce their citizenship and move to a country with lower tax rates. For example, Bernard Arnault threatened to obtain Belgian citizenship and leave France, and Gerald Depardieu moved to Russia.

In addition to these anecdotes, there is academic research on the international mobility of top earners. When superstar inventors in the top 1 percent decide where to live, their choice has been found to be significantly affected by taxes.<sup>10</sup> If the average major industrialized country were to lower its top tax rate by 10 percentage points, it would be able to retain 1 percent more domestic superstar inventors and attract 38 percent more foreign superstar inventors. The response of inventors who were not in the top 1 percent was found to be weaker, confirming that the superstar inventors are more mobile internationally.

The Danish preferential foreigner tax law of 1991 revealed much the same effect. It allowed new immigrants with high earnings to be taxed at a preferential flat rate of about 30 percent for up to three years. The special tax rate doubled the number of highly paid foreigners who were able to benefit from the tax benefits relative to slightly lower-paid foreigners who were not able to benefit from it.<sup>11</sup> The result implies that high earners are very responsive to tax changes. Likewise, top income tax rates significantly influence where star European football (soccer) players choose to live.<sup>12</sup> Although it might be unlikely that a lot

of high-income individuals left France right away to avoid the super tax, these studies indicate that it could have significantly hurt French fiscal revenue in the long run. Thus, we should be cautious given the possibility of such an effect.

Technological progress and globalization have made it easier to move money across borders, too. Offshore personal wealth has been growing fast recently, and the bulk of it seems to have been moved for the purpose of avoiding taxes.<sup>13</sup> Of course, emigrating or moving money around would not work if all countries were to impose high income tax rates on the rich at the same time, which Piketty proposes. But it might be too optimistic to think that such a coordinated global effort, which has never happened, will suddenly materialize in the near future. Other reasons have been suggested for why the super tax was scrapped: Firms may have held off raising compensation for top earners in anticipation of the super tax expiring, and the tax generated bad publicity for France. In any case, the French experience suggests the practical obstacles of implementing high taxes for top earners. Of course, it might be easier for top earners to move across borders in Continental Europe compared with the U.S., but this episode still serves as a cautionary tale that other potentially important elements are missing from the simple theory that I present in this article.

## Concluding Remarks

We need to be aware of the potential cost of raising taxes on top earners, as higher taxes could dampen the incentive of the most productive individuals in the economy to work. But such negative efficiency effects might not be large enough to negate the conclusion that tax revenue could be increased by raising the top tax rates. We also need to be aware of the possibility that high earners or their income could leave the country, but it is not easy to say how strong this effect would be.

A higher income tax for the top 1 percent of households might lessen income inequality, both directly—as the after-tax income of the 1 percent shrinks—and indirectly—through a negative incentive effect. The simple theory I presented in this article suggests that the optimal—in the revenue-maximizing sense—top income tax rate is higher than the current rate. 

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## Notes

**1** Financial professionals include executives and managers in the finance industry.

**2** See the work by Jon Bakija, Adam Cole, and Bradley Heim.

**3** After the Supreme Court declared income taxes unconstitutional in 1895, there was no federal income tax until 1913.

**4** As pointed out by Facundo Alvaredo, Anthony Atkinson, Thomas Piketty, and Emmanuel Saez.

**5** I follow the imputation by Peter Diamond and Emmanuel Saez.

**6** Using these standard values, this tax rate can easily be calculated as  $(m - 1)/(m - 1 + me)$ , where  $m$  is the income concentration measure and  $e$  is the labor supply elasticity.

**7** Atkinson’s proposal No. 8 in his 2015 book states, “We should return to a more progressive rate structure for the personal income tax, with marginal rates of tax increasing by ranges of taxable income, up to a top rate of 65 per cent, accompanied by a broadening of the tax base.” See <http://www.tony-atkinson.com/the-15-proposals-from-tony-atkinsons-inequality-what-can-be-done/>.

**8** See Steven Kaplan and Joshua Rauh’s article.

**9** Alejandro Badel and Mark Huggett’s model incorporates skill acquisition decisions.

**10** See the study by Ufuk Akcigit, Salome Baslandze, and Stefanie Stantcheva.

**11** See the research by Henrik Jacobsen Kleven, Camille Landais, Emmanuel Saez, and Esben Schultz.

**12** See the findings by Kleven, Landais, and Saez.

**13** See the research by Gabriel Zucman.

# The Value of Loyal Customers

Is there a rational reason that stock prices in some industries greatly exceed book values? The answer may lie in the idea that customers are capital.

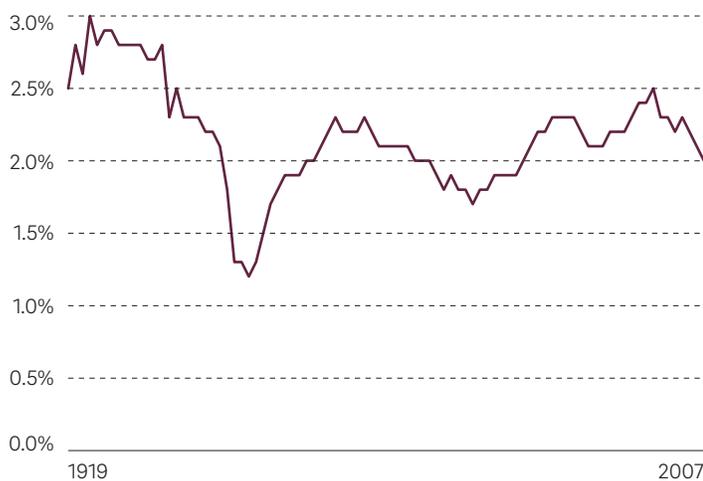
**Leena Rudanko** is an economic advisor and economist at the Federal Reserve Bank of Philadelphia. The views expressed in this article are not necessarily those of the Federal Reserve.

BY LEENA RUDANKO

No business can survive, let alone profit, without customers. For most businesses, it takes money and creative effort to attract and retain customers. Businesses therefore have clear incentives to spend resources on these activities. Reflecting how important it is to secure a steady stream of customers, a recent study finds that U.S. businesses spend as much as 8 percent of their revenue on marketing the value of their products, services, or brand for the purpose of generating sales.<sup>1</sup> Total U.S. marketing spending has been estimated to amount to 8 percent of the gross domestic product—a substantial share of the nation's output—while advertising, which makes up a big part of marketing, amounts to 2 to 3 percent of GDP just on its own (Figure 1).<sup>2</sup>

Customers are obviously essential for businesses as a source of current revenue, but is there more to it than that? Once

**FIGURE 1**  
**Businesses Spend Big to Entice Customers**  
Annual U.S. advertising spending as a share of GDP, 1919–2007.



Source: Douglas Galbi, "U.S. Annual Advertising Spending Since 1919," <http://galbithink.org/ad-spending.htm>.

customer loyalty comes into the picture, customers become particularly valuable to those businesses that need to spend resources to attract them. A company's base of existing and repeat customers becomes an asset for the firm, while the money it spends on marketing and selling activities aimed at attracting additional customers becomes a form of investment in the customer base of the firm—its "customer capital."

The notion that loyal customers are capital for firms has intrigued economists in part because it may explain why young firms grow so slowly. The gradual pace at which new businesses accumulate customers has been shown to be a key factor limiting firm growth.<sup>3</sup> New businesses start out small relative to existing ones, and this gap closes only slowly over time. The slow growth does not appear to be due to lower productivity or higher prices at new businesses, however. If anything, new businesses appear to be more productive and set lower prices, suggesting their growth is constrained by insufficient demand amid the gradual growth of their customer base.

As further evidence that the gradual accumulation of customers limits firm growth, it has also been shown that businesses that begin during economic downturns start out smaller—and remain smaller throughout their existence—than those beginning during expansions, despite being more productive.<sup>4</sup> Similar patterns characterize export growth in new markets: Sales start out small and grow only slowly as the exporting firm accumulates customers in the new market.<sup>5</sup>

Based on these observations, macroeconomists have found that the notion of customer capital can explain such varied phenomena as how the long-run decline in the cost of advertising may have led to greater industry concentration over time due to heightened competition among businesses,<sup>6</sup> how the costly and time-consuming process of gaining market penetration can explain patterns in volume and pricing in international trade,<sup>7</sup> and why output prices might not respond fully to changes in costs in general.<sup>8</sup>

There is yet another pricing puzzle that the concept of customer capital helps us understand and that I will focus on in this article: stock market prices.

## Customer Capital and the Stock Market

The stock of many U.S. firms increasingly trades well above the value of the net assets reported on their books, with the total financial value of the firms listed on the stock market clearly exceeding the corresponding value of the hard assets—plants, equipment, inventory—of these firms.<sup>9</sup> This disparity between the share price and the book value per share is sometimes cited as evidence that the stock market is overvalued.

Shareholders, of course, have an interest in knowing whether they are paying too much. And to the extent that the overall economy is vulnerable to severe market corrections, economists and policy-makers are also interested in determining whether investors are accurately pricing firms' prospects or are instead driving the market to unsustainable heights—in other words, creating a bubble.

But what if market prices are actually not out of line with firms' fundamental value? What if high price-to-book ratios reflect "hidden" assets? In today's consumer- and information-oriented economy, it is generally acknowledged that the value of a business may lie less in the physical assets tallied on its books such as buildings and equipment and more in intangibles such as patents and trademarks.<sup>10</sup> Yet, confirming whether investors are indeed pricing in intangible worth is problematic, since, by their nature, intangibles resist precise measurement.<sup>11</sup> As this article will show, progress in solving the valuation puzzle may lie in exploring one type of intangible—firms' customer base.

## Are Investors Pricing in Customer Capital?

From an accounting perspective, spending on marketing and selling is counted on the expense side of a firm's balance sheet, not as investment in a durable asset owned by the firm. But to the extent that it inspires brand loyalty, the resulting customer affinity takes on the quality of productive capital capable of driving future profits, just as investment in more efficient equipment would. And expensing this investment today even when it is made in anticipation of profits accruing

later, leads to the present discounted value of those future profits raising the market value of the firm above the value of the assets that are on its books.<sup>12</sup> Therefore, because it is costly to attract new customers, investors recognize a loyal customer base as an asset and factor its value into the price they are willing to pay for equity in the firm.

Industries also vary significantly in how much firms spend on marketing and selling activities—what we would think of as investment in customer capital.<sup>13</sup> While firms do not always report their spending on these activities, one possible way to quantify these differences is to use a variable in their accounting statements called selling, general and administrative (SG&A) expenses. SG&A is not a perfect measure, because it includes various overhead expenses that are not directly related to promoting sales. But the category is clearly positively correlated with a firm's advertising spending, so there is nevertheless reason

to view SG&A as a plausible measure of investment in customer capital.<sup>14</sup>

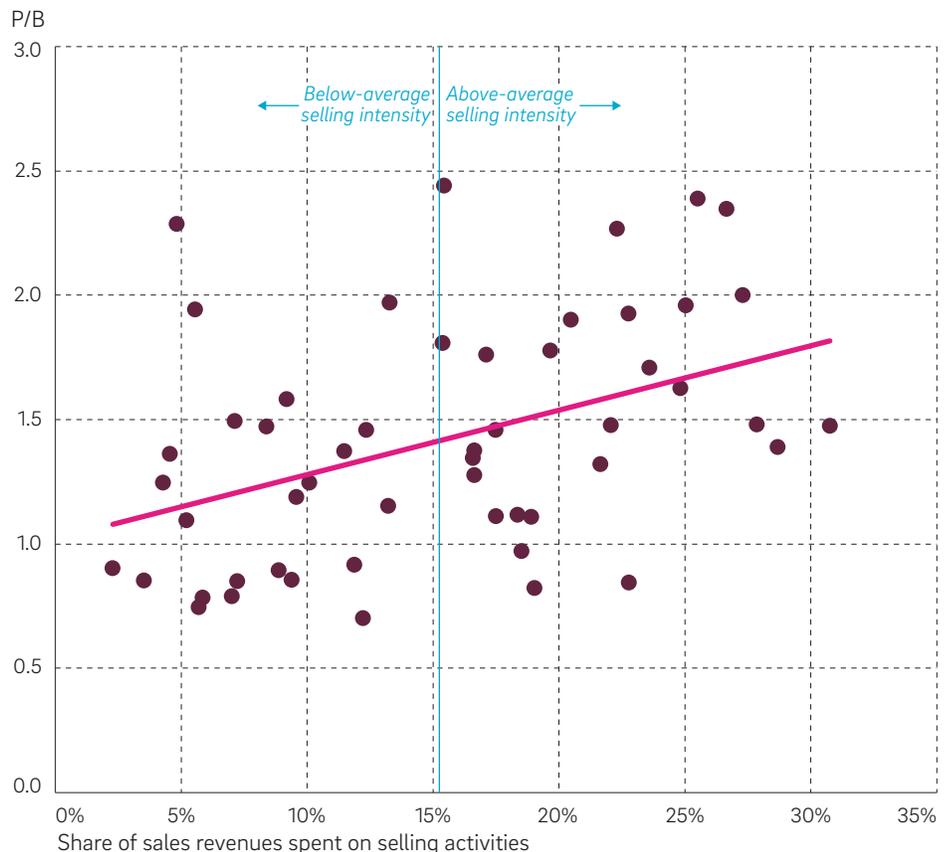
This variation across industries in SG&A reflects how much more important customer capital is to certain types of businesses than to others, as the value of existing customers is critically linked to how costly it is for firms to attract new customers.<sup>15</sup>

For example, some businesses sell very specialized goods or services, which means that it likely takes more effort on the part of salespeople to persuade a customer to make a purchase. Consider apparel retailing. This sector includes many competitors offering different styles and levels of quality, and as a consumer you likely have some preferences that influence where you purchase your clothing. The marketers and salespeople of these retailers work hard to help you in these decisions, and once you have found a store or brand you like, you may stick with them for some time to avoid having to shop around for alternatives. By

FIGURE 2

### Positive Correlation Is Clear

52 U.S. industries by price-to-book ratio and selling, general & administrative spending.



Sources: Compustat and author's calculations.

contrast, in deciding where to buy gas for your car, the choice is much simpler, as there is much less variation in the product across sellers. For these types of businesses, whose products cannot be easily differentiated, marketing efforts are less likely to significantly boost sales.

As there is significant variation across industries in how much firms' market values exceed their book values, we would like to know whether these measures of customer capital can help rationalize these differences. To test the hypothesis that customer capital contributes to the high market values of firms, we compare an industry's overall intensity of selling-related activities—SG&A spending relative to sales revenue—with the difference between the market and book values of firms in that industry. Do more selling-intensive industries have larger differences?

To answer this question, we start by comparing industries with above-average selling intensity against those with below-average selling intensity. The first group includes, for example, apparel retailers and business services, whereas the second group sells commodities such as petroleum products and primary metals. How do the two groups compare in terms of their average price-to-book ratios (sometimes called P/B or market-to-book ratios)? Do share prices in selling-intensive industries exceed book values by a greater margin? Yes, substantially. The more selling-intensive industries have an average P/B ratio of 2.0, meaning that their market value is twice their book value, whereas the less selling-intensive industries have an average P/B ratio of only 1.3. The difference between the two groups is large as well as statistically significant.

Looking at the evidence on a more detailed, industry-by-industry level reveals significant variation across industries in both variables and a clearly positive correlation between the two (Figure 2). Firms in more selling-intensive industries tend to have higher P/B ratios. This evidence shows that customer capital does help explain the stock market valuation of firms.

### **Are Other Factors Driving Prices?**

The evidence so far supports the idea that customer capital helps explain the market values of firms. But of course you might be concerned that our empirical measure of customer capital is perhaps correlated with some other explanation that might be driving the differences in firm values, rather than the one we have in mind here. What else might allow some industries to have higher stock prices? Can we rule out that some other factor is driving market values above book values? One such factor is market power.

By market power we have in mind a situation in which one firm—or a few firms—dominate a market and are consequently able to raise their prices above

competitive levels. The extreme example is a monopoly, in which a single firm serves the whole market and is able to immediately and costlessly profit from the absence of competition by naming its price. Limited competition generally leads firms to produce too little and charge too much in their effort to profit from the position—not beneficial from a social welfare point of view.

By contrast, the story of customer capital boosting stock prices hinges on a firm investing in customer capital through its marketing spending and profiting only later as those customers continue to purchase its products. This also looks as if the firm is making profits above what should be possible in a competitive market. But if high valuations reflect profits accruing from its prior spending to accumulate customer capital, that is simply a matter of earning a return on its investment and need not imply market inefficiencies.

Evidence suggests that differences in our measure of customer capital across industries are not directly related to differences in market power across industries. Comparing an industry's selling intensity with the degree to which it is dominated by a few firms, as measured by the Herfindahl index, does not indicate a systematic relationship between the two measures across industries, suggesting that the story of customer capital is distinct from the story of market power (Figure 3).

Another possibility is that firms' P/B ratios are elevated because they face financing constraints that prevent them from acquiring as much productive capital as they could profit from, raising their potential value to investors relative to the book value of their current capital. An industry's average firm size and dividend payout can both be viewed as proxies for whether its firms face financing constraints. It turns out, however, that there is no clear relationship between an industry's selling intensity and either dividend payouts or firm size. This finding illustrates that the customer capital story appears separate from financing issues as well.

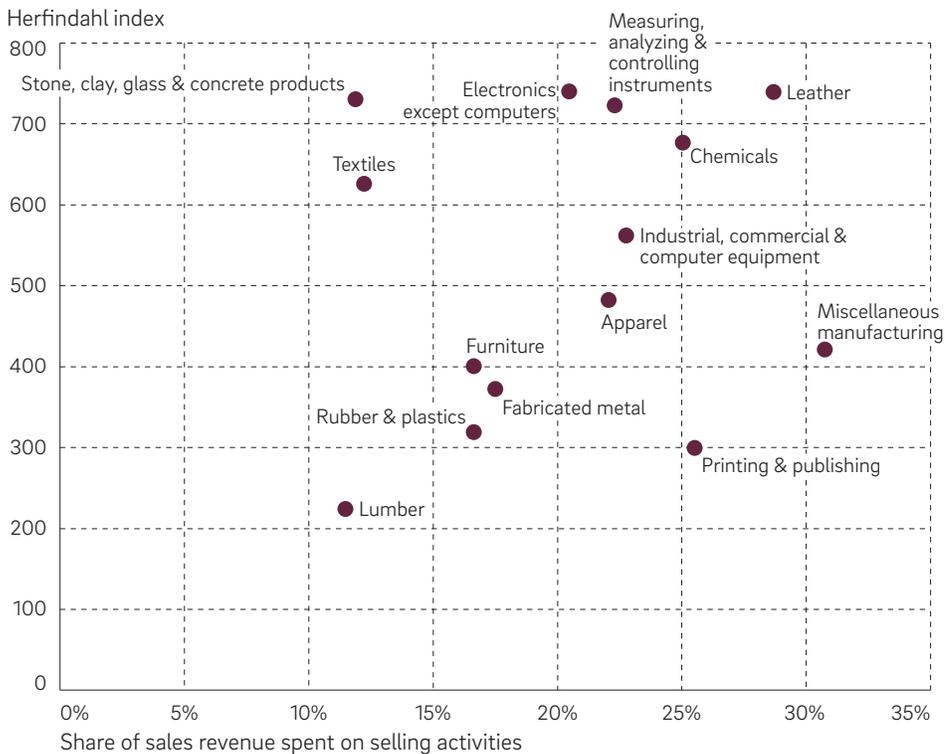
### **A Long-Standing Puzzle**

The evidence we have seen suggests customer capital plays a potentially important role in explaining the market values of firms and calls for developing a theory to rationalize these observations. With such a theory, economists can use our measure of customer capital to test additional implications against the data—including a perplexing issue regarding firms' investing behavior.

A theory that François Gourio and I have proposed posits that consumers search for sellers whose products they like, and once they find one, continue to purchase from that seller for some time, to avoid the costs of searching for a new one. Put another

FIGURE 3

## Market Power and Selling Intensity Not Correlated



Sources: Compustat and author's calculations.

### The Herfindahl Index

The Herfindahl Index, as the Herfindahl-Hirschman Index is more commonly known, measures concentration. In this article, I use it to look at market concentration—that is, the number of companies dominating their respective industries.

You can calculate the index by squaring the market shares of the companies in the market and then summing the squares. Depending on whether you use fractions or percentages, the index can range from either 0–1.0 or 0–10,000. The closer to 1.0 or 10,000, the more concentrated the market.

For a fuller explanation of the index, see a technical note from the Federal Reserve Bank of St. Louis at [https://fraser.stlouisfed.org/files/docs/publications/FRB/pages/1990-1994/33101\\_1990-1994.pdf](https://fraser.stlouisfed.org/files/docs/publications/FRB/pages/1990-1994/33101_1990-1994.pdf).

way, all else equal, consumers would rather keep buying what has worked out well for them in the past, making them more brand-loyal than brand-fickle. For their part, firms undertake costly marketing and selling activities to inform these searching consumers of their products with the goal of ultimately turning them into new customers. Some of those consumers then become part of the firm's loyal customer base, contributing to its revenues for a period of time.

The model provides a simple framework for explaining how customer capital raises the firm's market value above its book value. In the theory, in markets where the costs of acquiring new customers are greater, firms spend more on marketing and selling and have greater price-to-book ratios, as their existing customer base is more valuable. In markets whose products can be differentiated by style or quality, firms must spend more on marketing and selling and they also have higher price-to-book ratios, as their customer base is more valuable to them than existing customers are to firms whose products are harder to distinguish from those of their competitors.

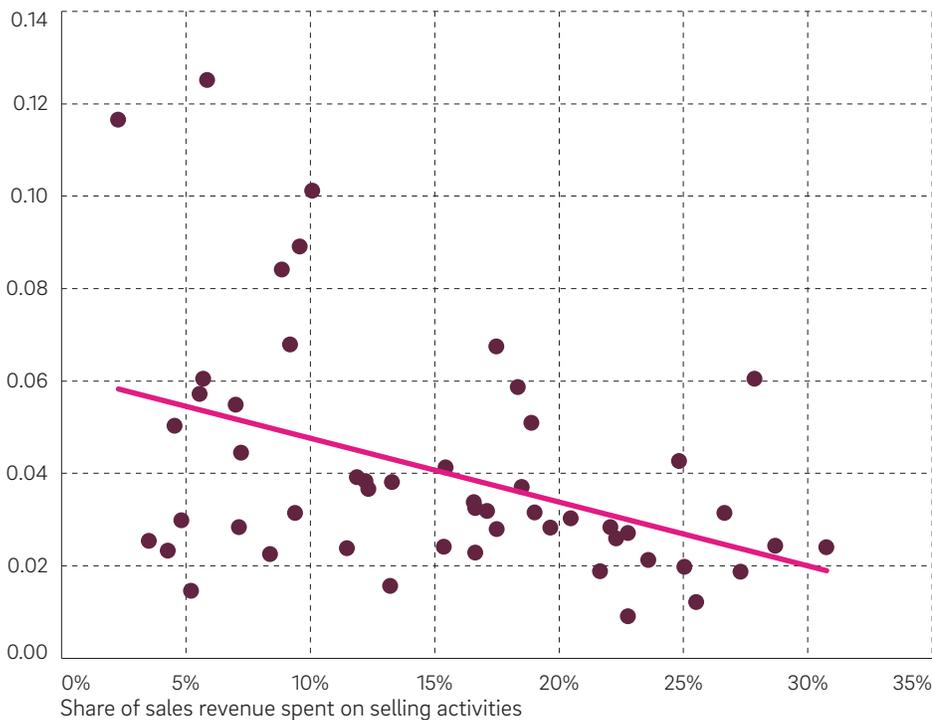
The theory has other predictions that allow us to better understand a long-standing puzzle regarding firm investment behavior. Standard business theory holds that a firm's decision to invest should generally depend on how much value it can derive from the additional capital. A high P/B ratio would indicate its assets are generating profits beyond the value of those assets, which would justify investing in more assets. In reality, though, businesses do not appear to systematically invest according to this seemingly simple logic.

Incorporating customer capital into the theory offers a new rationalization for firms' behavior. Again we group industries according to their selling intensity. Now we can observe how investment responds to higher price-to-book ratios depending on whether they are in industries with greater than average versus less than average selling activity. Our theory would predict that, in the presence of customer capital, the investment response to changes in P/B becomes weaker. And that is what the evidence indicates (Figure 4). In the theory, investment responds

FIGURE 4

## Investment Less Responsive to P/B in Selling-Heavy Industries

Unit increase in firm investment rate to unit increase in firm P/B



**Note:** Responsiveness is measured by the covariance of a firm's investment rate with its price-to-book ratio relative to the overall variance of the price-to-book ratio. The measure is also equivalent to the regression coefficient in a linear regression of the investment rate on the price-to-book ratio.

Sources: Compustat and author's calculations.

with a delay because an expanding firm must also accumulate additional customers, and that takes time. The theory thus helps explain why the basic prediction about business investment that researchers have tried to test has not held up.

Applying this idea to recent macroeconomic events, economists wish to better understand why business investment has remained low following the Great Recession. If customer capital explains the gap between stock prices and book values, then P/B ratios might not reflect the true return on firms' assets. It could be that firms are already investing in their operations in a way that reflects the value they can expect to gain from expanding. And today's low interest rate environment would imply a higher present value of customer capital, perhaps helping explain the higher market valuations of firms.

### Intangible Capital Matters

Our work supports the idea that intangible capital—and not simply bubbles driven by changing

sentiment—plays a role in explaining the high market values of firms.<sup>16</sup> But of course intangible capital is a broader concept than just customer capital, including things like organizational capital and research and development capital as well.<sup>17</sup> With this broader interpretation of intangibles in mind, economists have argued that intangible capital can explain, for example, the fact that the U.S. economy was booming during the 1990s, while a standard macroeconomic model would predict a recession!<sup>18</sup> The key to the explanation lies in the observation that during that period, the economy was intensively accumulating intangibles that largely got expensed away in accounting instead of being treated as investment. Clearly, neglecting intangibles can give a very incorrect impression of how the economy is doing and of what policies are warranted. The challenge lies in finding ways to quantify these intangibles—a key motivation for the measures of customer capital proposed here, as well as a call for new work to deepen our understanding of intangible capital in general. ■

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## Notes

- 1** See the CMO Survey.
- 2** Costas Arkolakis' article includes a measure of marketing as a share of GDP.
- 3** See the two articles by Lucia Foster, John Haltiwanger, and Chad Syverson.
- 4** See Sara Moreira's work.
- 5** See Doireann Fitzgerald, Stephanie Haller, Yaniv Yedid-Levi's work.
- 6** See Emin Dinlersoz and Mehmet Yorukoglu's article.
- 7** See the articles by Costas Arkolakis and by Lukasz Drozd and Jaromir Nosal.
- 8** See the article by Isaac Kleshchelski and Nicholas Vincent and the unpublished work of Luigi Paciello, Andrea Pozzi, and Nicholas Trachter. Taking the pricing implications a step further, a forthcoming article by Simon Gilchrist, Raphael Schoenle, Jae Sim, and Egon Zakrajzek explains why inflation did not fall more during the Great Recession by arguing that while firms in general had cut their prices to maintain their customer base, financially constrained firms were forced to raise their prices instead. Gilchrist and his coauthors also argue in an unpublished paper that related ideas may help explain the financial tensions created when the member countries of a monetary union differ in their fiscal soundness, as in the European Union, leading the weaker countries to run persistent trade deficits.
- 9** Robert Hall documented this discrepancy in his 2001 articles.
- 10** Hall attributed the difference in valuations to the value of intangible assets not being captured among the hard assets in the firms' accounts. He also showed that there is considerable variation in these differences across industries.
- 11** See Leonard Nakamura's work on intangibles and measurement.
- 12** In fact, in the face of large marketing expenses, the company Groupon has adopted the nonstandard accounting practice of treating marketing expenses as investment, amortizing the expenses over time rather than expensing them as the spending occurs. See the *Wall Street Journal* blog.
- 13** Hall's work forms the basis of this observation.
- 14** Ad spending for industries with above-average selling intensity averages 1.8 percent of sales versus 1.3 percent for those with below-average selling intensity. Data are from Compustat.
- 15** The loyalty of existing customers matters also and is likely to vary across industries, but we will abstract from that in what follows.
- 16** See also the work of Frederico Belo, Xiaoji Lin, and Maria Vitorino on differences across firms in asset returns.
- 17** See Leonard Nakamura's work on intangibles in Philadelphia Fed *Business Review* articles and working papers.
- 18** See Ellen McGrattan and Edward Prescott's research.

# Regional Spotlight: Surveying the South Jersey Economy

After 25 years and two recessions, how well has our South Jersey Business Survey tracked the local economy?

**Michael Trebing** is a senior economic analyst at the Federal Reserve Bank of Philadelphia. The views expressed in this article are not necessarily those of the Federal Reserve.

BY MICHAEL TREBING

The South Jersey Business Survey has been asking firms the same questions every quarter without interruption for 25 years, providing a consistent basis for observing ups and downs in the area’s economy. The Philadelphia Fed has conducted this survey in cooperation with the Chamber of Commerce Southern New Jersey, whose members make up the survey’s respondents. After a quarter-century, we have enough results in hand to look at how useful the survey’s indexes have been as economic indicators. The Philadelphia Fed, of course, is not the only party with an interest in knowing how meaningful the survey’s results are for gauging current and future business conditions in South Jersey. Firms, community groups, state and local policymakers, and others increasingly rely on survey-based measures to round out their views of the economy and to help inform their decisions. Although qualitative, survey data can still provide valuable information that is timelier than or unavailable from other sources.

So, how can we test whether the survey’s structure and methodology remain valid? How do survey-based measures enhance our understanding of economic fluctuations? Does the South Jersey survey do a reliable job of picking up on economic conditions later reflected in the official hard data on employment and other vital measures? Are improvements to the survey warranted? We look first to the structure of the survey’s indexes and then explore how its results correlate with nonsurvey indicators and such phenomena as local economic shocks and recessions.

## The Membership List: Pros and Cons

Each quarter, we send a short survey, comprising 12 questions, to the members of the Chamber of Commerce Southern New Jersey. The questionnaire asks for basic information about changes in business conditions for the current quarter and a few questions about firms’ expectations for the next six months. Begun in the second quarter of 1991, the survey asks participants to check boxes indicating whether overall business activity in the region over the past quarter increased, decreased, or stayed the same,

and likewise for four indicators of conditions at their firm—sales, prices paid, prices received, and employment (Figure 1). It also asks for their expectations for some of the same indicators over the next six months. No quantitative information such as actual dollar amounts or volumes is requested, although participants can voluntarily comment about economic conditions or special factors relevant to their business.

Using a sample from an organization such as the Chamber of Commerce raises concerns regarding incentives for participating that create the potential for statistical bias. When a sample is not representative of the population intended to be measured,

**FIGURE 1**  
The Value of 25 Years of Data  
South Jersey Business Survey questionnaire.

Federal Reserve Bank of Philadelphia		
South Jersey Business Survey (Fourth Quarter 2016)		
Current		
Please describe current activity for the Fourth Quarter 2016 compa		
	Lower	Same
<b>Region</b>		
General business activity for the region	<input type="radio"/>	<input type="radio"/>
<b>Company</b>		
General business activity for your company	<input type="radio"/>	<input type="radio"/>
<b>Company Measures</b>		
Total sales	<input type="radio"/>	<input type="radio"/>
Number of employees	<input type="radio"/>	<input type="radio"/>
Prices received for your own products	<input type="radio"/>	<input type="radio"/>
Prices paid for raw materials (not labor or	<input type="radio"/>	<input type="radio"/>

statisticians worry about selection bias. Essentially, chamber members are self-selected, inasmuch as they join the organization for some purpose such as to network, gain visibility or legitimacy in the community, or as a part of a community relations strategy, which in the case of banks could be a way to fulfill their legal requirement to serve the needs of their communities under the Community Reinvestment Act.<sup>1</sup> Statisticians and analysts who have studied the motivations and behavior of individuals responding to business surveys have identified both intrinsic and extrinsic motivational factors that might contribute to a statistically biased sample or impinge on the consistency of reporting over time.<sup>2</sup>

So, the question arises: Why use a list of firms from a business networking organization and not a probability sample? Ideally, one would collect a random sample of all businesses in the region of interest. That is, the firms being surveyed should reflect the industrial makeup, size, and location of the region under study. Unfortunately, a probability sample is difficult to construct and maintain for a regional survey, as it requires identifying a wide base of appropriate firms and getting them to consistently volunteer to respond to the questions. Therefore, we rely on the chamber of commerce list for

a ready source of information on a region of southern New Jersey that matches its membership. Chambers of commerce typically attract a meaningful slice of a community's or a region's employers by providing membership benefits including networking, timely information, and business advocacy. Unlike many local chambers that represent a single township or borough, the Chamber of Commerce Southern New Jersey's membership is spread across a large region, primarily encompassing southern New Jersey, Greater Philadelphia, and northern Delaware.<sup>3</sup> This wide net mitigates potential bias, as the pool of respondents should be a reasonable representation of the region. If you have a representative mix of respondents, reporting bias becomes less of an issue.

### How Representative Is the Sample?

Given its less than ideal method of sampling, can the South Jersey Business Survey still yield useful information? First we need to know how well the list represents the firms in the region and how we might evaluate it against a statistically relevant standard.

The geographic coverage of the sample is concentrated in southern New Jersey

(Figure 2). Over the past year, nearly 80 percent of the responding firms have come from four counties: Camden (32 percent), Burlington (29 percent), Atlantic (9 percent), and Gloucester (8 percent). Smaller percentages are located in New Jersey counties to the north and south of those four, and 8 percent are in Pennsylvania.

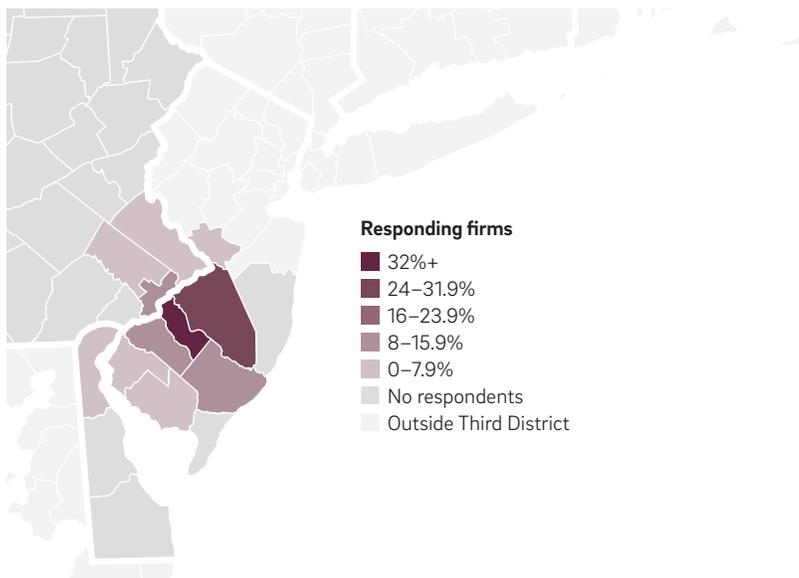
Conveniently for comparison purposes, nearly 70 percent of our responding firms are located within the Camden metropolitan division, which consists of Burlington, Camden, and Gloucester counties and which represents nearly 45 percent of employment for the territory we describe as South Jersey—those New Jersey counties that lie within the Third Federal Reserve District: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, and Salem (Figure 3).

Because the Bureau of Labor Statistics releases monthly employment data for the Camden division, we have a way of testing whether our survey's indicators line up over time with changes in economic conditions as measured by the official regional employment count. Firms on the overall South Jersey chamber membership list employed about 360,000 workers in 2016, and for the firms that responded, their collective number of employees ranged from 90,000 to 110,000. The survey

FIGURE 2

### Chamber Membership Largely Overlaps Survey Focus

Percentage of South Jersey Business Survey respondents by county.

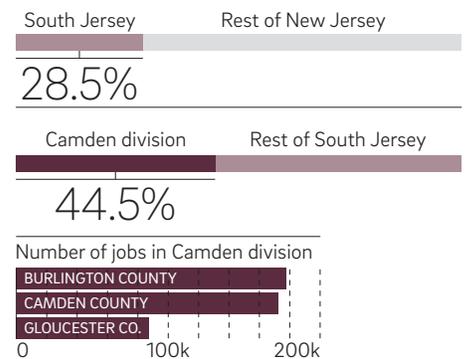


Source: Federal Reserve Bank of Philadelphia Research Department.

FIGURE 3

### Official Data on Jobs Allow for a Meaningful Test

Camden division private employment relative to South Jersey & the whole state.



Source: Bureau of Labor Statistics.

Note: Employment figures are for private jobs in all industries from the third quarter 2016 Quarterly Census of Employment and Wages.

captures information from both large and small organizations. The median size respondent has about 36 employees. Given that the division is home to about 438,000 jobs, the coverage is substantial enough to provide a meaningful test.

Another way to assess the suitability of our sample is to compare the industry breakdown of the responding firms with how employment is distributed among industries in the region and state (Figure 4). The survey covers most subsectors, including government. Nonprofit organizations are also subsumed in some of the subsectors such as arts and entertainment and education and health. Comparing the industry distribution of our sample against industry employment shares for the state and the Camden division, the two most prominent industries in the survey are professional and business services (38 percent) and financial services (19 percent). These two categories are overrepresented compared with their prevalence in the Camden division, though they are closer to the state's industry distribution. At the opposite extreme, government and transportation, utilities, and trade are underrepresented in the 2016 survey samples compared with the Camden division and state.

Regardless, a reasonably representative mix of questionnaire recipients is valuable only to the extent that enough of them respond. The chamber's membership list contains contacts for about 1,000 firms that are tagged by location, industry, and workforce size. From this list, we have averaged over 250 responses for each quarterly survey over the past year. More than 44 percent of the firms invited to participate have responded at least once, and 22 percent have responded more than once. In our experience conducting the Manufacturing Business Outlook Survey and, anecdotally, in the experience of other Federal Reserve Banks that conduct business surveys, this is a very good response rate. The Philadelphia Fed's pledge of confidentiality to participants and the fact that the survey is intended to benefit public knowledge may help to explain its high rates of participation and repeat responders.

## Why Conduct a Qualitative Survey?

The value of the survey's data stems from scarcity of two kinds. First, its information on employment is timelier than hard employment data from other sources. Even quantitative employment data that are especially rich in detail are available only with a lag of several months. Qualitative data from surveys may fill gaps until these data are available. For example, quarterly employment data for the Camden metro division are available with a lag of two months, compared with the qualitative survey data, which are released four to six weeks earlier. Additionally, information on production, sales, or any useful measure of economic change is not available until years later. For example, manufacturing value-added data based on the Census Bureau's census of manufactures (every five years) or annual survey of manufactures are not available until two years later, and the data are collected on an annual basis from relatively small samples.

For quantitative data on services other than employment, the problem is more a lack of information than a lag, even at the national level. Considering the paucity of regional data, particularly on the service

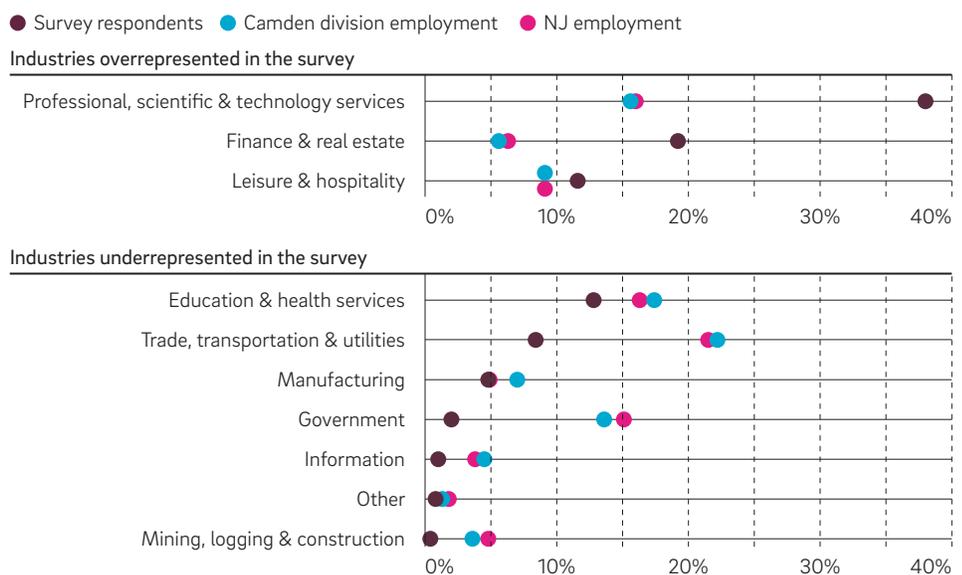
sector, the South Jersey survey helps fill a void when it comes to understanding local economic conditions. Timely data on services are increasingly valuable because, over the past 50 years, the share of U.S. output attributable to goods-producing industries has fallen from 47 percent to 26 percent, while service-providing industries now account for about 63 percent of private sector U.S. GDP and 77 percent of private sector regional output. Additionally, the service sector has been responsible for essentially all of the net job gains over the past 20 years, both nationally and regionally.

Moreover, the survey collects more detail on sales, prices, and expectations, which enhances its usefulness. The relatively cyclical nature of some service sectors also increases the survey's value as a business barometer. The service industries that are most represented in the survey are also the most sensitive to the business cycle. During recessions, construction and manufacturing output typically decline more severely than services. However, the most sensitive service industries have been professional business services; trade, transportation and utilities; finance and real estate; and leisure and hospitality—the same industries

FIGURE 4

### Survey Captures All Industries

Industry breakdown of firms responding to South Jersey Business Survey versus industry employment for region and state.



Source: Bureau of Labor Statistics via Haver Analytics.

most represented in the survey, making up 77 percent of responding firms. The industries least sensitive to the business cycle have been government, education, and medical services, and they represent less than 15 percent of the respondents. For forecasting turning points in the business cycle, or even accelerations or decelerations in growth, it may be advantageous to have cyclically sensitive firms in the sample in order to pick up these changes in an overall index, even though the result may be a less representative sample.

### Survey Design Considerations

The South Jersey survey is structured so as to elicit the direction of change; respondents are asked to indicate an increase, decrease, or no change in various business conditions. Conducting this type of survey has several advantages compared with collecting hard economic statistics. Because they do not require specific numbers, qualitative questionnaires are easier to answer and less intrusive into a firm's affairs. Surveys of this kind take about two minutes to complete, helping ensure a high response rate. There is some reason to believe that respondents

may view sharing information about their business conditions as a duty. Although the body of research on business survey participants is relatively small, it seems reasonable to suppose that some respondents may also be motivated by self-interest. For instance, firms may see such a survey as an opportunity to have their voices heard on business problems or trends that they believe are being neglected or are poorly understood by policymakers.

From the collection perspective, a qualitative survey can be conducted inexpensively, tabulated quickly, and reported promptly. In the case of the successful Philadelphia Fed Manufacturing Business Outlook Survey, a large percentage of responses come from chief executives, financial officers, or other individuals in a position to know the details of the questions being posed. The accuracy of individual responses is periodically verified through telephone conversations with respondents, and focus groups with respondents have suggested a high degree of accuracy.

Another advantage of a qualitative survey is that the core questionnaire can be supplemented with special questions on topics of interest to the Philadelphia

Fed's understanding of regional economic conditions. Examples have included evaluating the impact of strictly regional events such as Hurricane Sandy and the local employment effects of the Affordable Care Act. Often the questions are coordinated with other Federal Reserve Banks, providing broader coverage geographically and across industries. The consistency of the questionnaire also adds considerable value to the South Jersey survey. The questions have changed very little over time and are posed according to a set quarterly timetable.

Both of these features create considerable value for measurement, and diffusion index summaries provide a way of drawing comparisons over time and across regions, bringing us to our central question: How do the survey indexes compare with official employment statistics and other measures of regional economic performance?

### The Survey's Track Record

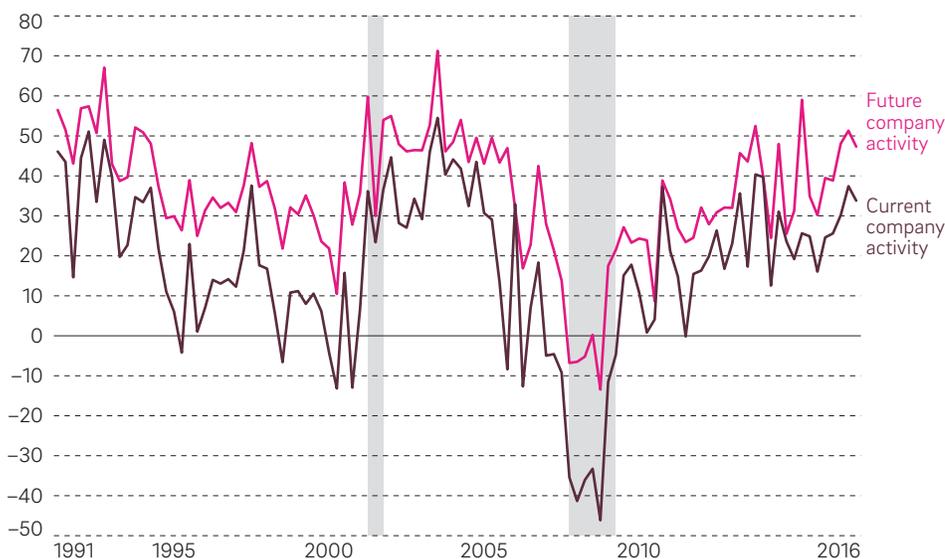
The survey's longevity allows us to observe how it has behaved over its 25-year history, encompassing two complete business cycles, including the Great Recession. The survey's current company index, which we consider its headline statistic because it provides the most comprehensive information on overall conditions, has coincided closely with official U.S. recession dates. It moved into negative territory in the second quarter of 2001 and the first quarter of 2008 (Figure 5). The current conditions index's movement in tandem with the official recession dates, which are determined many months later, is a valuable characteristic, inasmuch as a negative reading, by definition, indicates that more firms report declines than those that report increases.

For the two recessions, the average reading of the current index was -20.9, compared with an average reading of 17.1 during nonrecession periods (Figure 6). During the Great Recession, which was far more severe, the current conditions index averaged -24.8 and reached a series low of -40.5 in the fourth quarter of 2008 (Figure 5). The greatest difference has been in the current diffusion index for regional

FIGURE 5

### Current Index Has So Far Moved in Sync with Recessions

South Jersey Business Survey current and future general activity indexes, Q2 1991–Q4 2016.



Source: Federal Reserve Bank of Philadelphia Research Department.

FIGURE 6

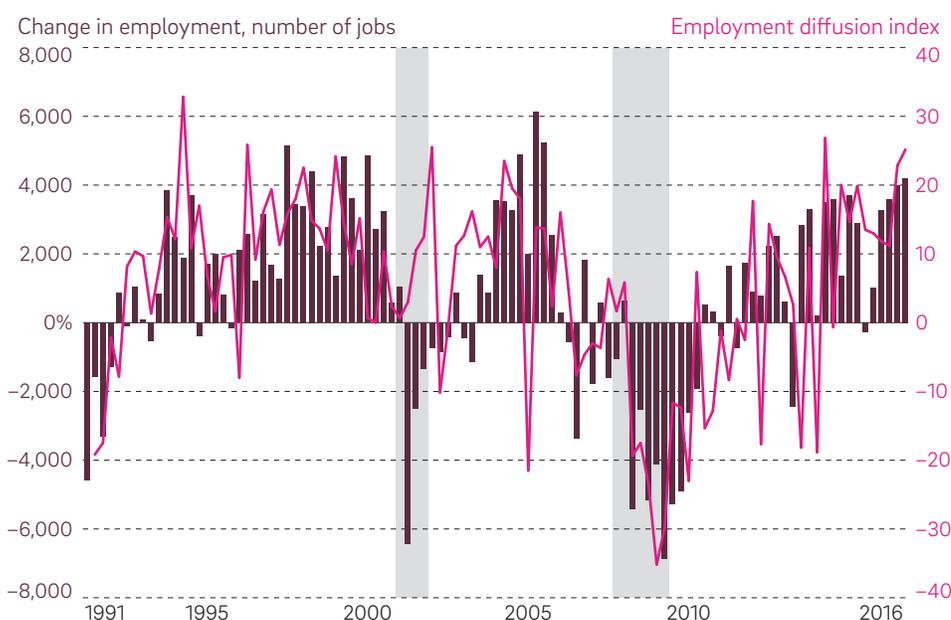
### Reliable Indicators of Current and Future Conditions

Average difference between recession and nonrecession index averages, Q2 1991–Q4 2016. (Nonrecession average minus recession average.)

	CURRENT INDEXES FOR			FUTURE INDEXES FOR		
	Nonrecession	Recession	Difference	Nonrecession	Recession	Difference
Regional activity	1.1	-57.9	<b>59.0</b>	17.6	-8.5	<b>26.1</b>
Company activity	17.1	-20.9	<b>38.0</b>	35.4	17.6	<b>17.8</b>
Total sales	15.1	-18.9	<b>34.0</b>	33.8	14.5	<b>19.3</b>
Total employees	6.4	-18.7	<b>25.1</b>	17.6	2.6	<b>15.0</b>
Prices paid	24.3	22.4	<b>1.9</b>	25.9	20.4	<b>5.5</b>
Prices received	1.5	-8.9	<b>10.4</b>	11.5	2.1	<b>9.4</b>

FIGURE 7

### 25 Years of Remarkable Similarity to Hard Data on Jobs



Sources: Bureau of Labor Statistics via Haver Analytics; Federal Reserve Bank of Philadelphia Research Department.

FIGURE 8

### Higher Correlation with State vs. Camden Division Employment

Correlation of South Jersey survey indexes with percent change in employment in different regions.

Employment	Employment index	Activity index	Regional activity index
Camden division employment	0.56	0.51	0.53
New Jersey employment	0.63	0.55	0.58
Philadelphia metro employment	0.63	0.51	0.52

Sources: Bureau of Labor Statistics via Haver Analytics; Federal Reserve Bank of Philadelphia Research Department.

Note: Employment change is calculated as the change in nonfarm employment from the last month of the previous quarter to the last month of the current quarter.

activity, which averaged 59 points lower during recessions than during nonrecession quarters. Although the survey’s price indexes have also been lower during recessions, the differences were much smaller: 1.9 points lower for current prices paid and 10.4 points lower for prices received. Firms’ outlook as measured by forward-looking indexes, moderated during recessions, decreasing an average of 26 points for the survey’s future regional index and decreasing 15 points for the future employment index. In addition, the current company index has led the past two recessions. The sign and magnitude of the index, therefore, have been reliable indicators of current conditions, suggesting that the survey has a use in assessing current conditions ahead of the release of the hard data.

The statistics that make up the diffusion indexes provide a more detailed story of business cycle patterns. Knowing the share and type of firms reporting the increases and decreases tells us a great deal about the breadth and composition of economic change across the region. For example, employment, which is a lagged indicator, can be evaluated by reviewing what types of firms cut their payrolls and by how much over time. During the seven quarters that the Great Recession lasted, for example, an average of nearly 30 percent of the firms reported cutting employment. Similarly, price changes are influenced by business downturns. During those same seven quarters, an average of 25 percent of firms reported cutting their prices.

### How Well Correlated with Employment Data?

The current employment diffusion index summarizes the responses to the survey’s question about employment changes from the previous quarter. A positive index reading should correlate with growth in employment at chamber members’ firms. That is, when the reading is positive, more firms have indicated they are adding workers than have indicated they are subtracting workers.

So, what relationship do we see between the employment diffusion index and two statistical measures: nonfarm employment in the Camden division and

in New Jersey as a whole?<sup>4</sup> The index behaves remarkably similarly to official Bureau of Labor Statistics changes in employment, especially when viewed over the full 25 years (Figure 7). During the Great Recession, Camden division employment declined at the same time as the current employment index. Even after the recession, employment did not increase for several years. The current index signaled employment growth slightly earlier than did the hard data. This behavior is consistent with the fact that employment is a lagged indicator of the health of the overall economy. In subsequent quarters, the acceleration in employment gains has also been evident in the higher readings of the current employment index.

How well does the survey's employment index correlate with actual employment across different geographies? Statistically, the survey index has a higher correlation with overall New Jersey employment data than with Camden division employment data (Figure 8).

The index's correlation with employment data for the state was on par with the coefficient for the Camden division alone. A comparison of the survey's other

indexes also shows a positive relationship between company-level activity and the regional activity index, which is firms' appraisal of the region. The employment index has the highest correlation with actual employment, as one would expect.

See *The Logic of Diffusion Indexes.*

### Correlation with Our Coincident Indexes

The correlation of the survey's indexes with another indicator of New Jersey's economic performance, the Federal Reserve Bank of Philadelphia's state coincident indicator for New Jersey, suggests the survey is a potentially suitable signal of the area's economy.

Although not as timely as surveys, the coincident indicators were intended to fill the delay of several months between the release of official state GDP and other hard data on the state such as employment, work hours, and personal income. The coincident indexes combine four state-level indicators to summarize current economic conditions in a single statistic.

For the 25-year history of the survey, the statistical correlation between its

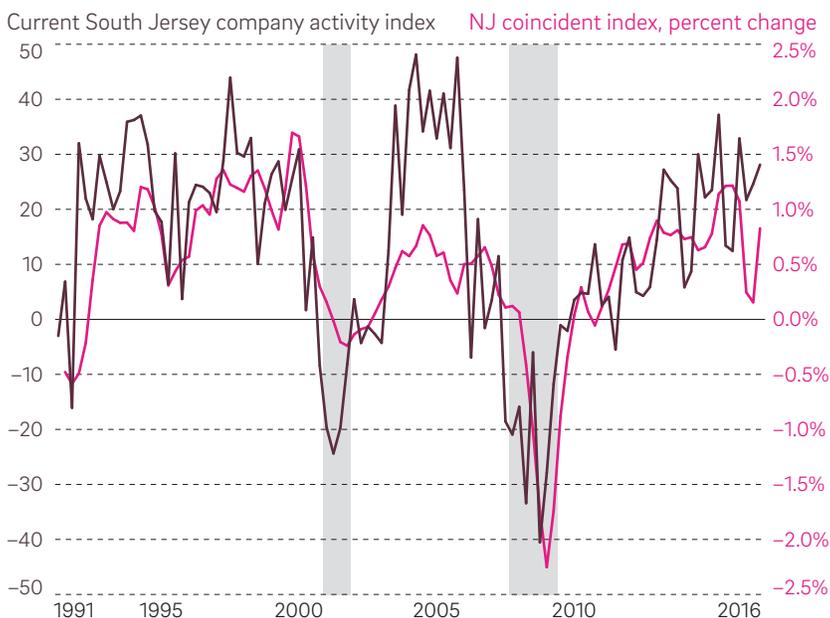
current company activity index and the quarterly change in the New Jersey coincident index is 0.60 (Figure 9), with 1.00 indicating a perfect correlation. The survey's index closely traces the declines during the two recessions. In fact, for both recessions, the survey index had dipped slightly below zero slightly ahead of the coincident index. Likewise, during recovery periods the index moved back above zero around the same time as the coincident index and closely followed the official start and end dates of U.S. recessions.

These patterns indicate that the survey's indicators could be useful in tracking and forecasting turning points in the regional economy. The Philly Fed's manufacturing survey indexes also have significant predictive power in explaining monthly changes at both the state and national levels. Similarly, the manufacturing survey's current activity index is useful in predicting changes in the New Jersey coincident index.<sup>5</sup> The findings support the idea that incorporating the survey's indexes into our state or regional coincident indexes could provide useful information, since they provide timely data that are correlated with business activity.<sup>6</sup>

FIGURE 9

### South Jersey Index Signaled Recessions Before State Index

Current company activity index and New Jersey coincident index.



Source: Federal Reserve Bank of Philadelphia Research Department.

### The Logic of Diffusion Indexes

For each question in the South Jersey Business Survey, we calculate a diffusion index to gauge whether most firms are experiencing increases or decreases for each indicator. We first calculate the percentages of firms reporting increases, decreases, and no change, then subtract the percentage decrease from the percentage increase. The resulting diffusion index can theoretically vary from 100, when all firms report an increase, to -100, when all firms report a decrease. The midpoint is 0, when the percentage of firms reporting increases equals the percentage reporting decreases.

However, the survey responses have never been unanimous, so the diffusion index's values have always landed somewhere between -100 and 100. The index values computed by other Federal Reserve Banks have been similar. The closer the index is to either extreme, the more

diffuse, or widespread, is the reported increase or decrease in the indicator.

By measuring the diffusion, or spread, of survey responses, diffusion indexes reflect the way changes in the pace of economic activity are propagated across firms. For example, in an economic expansion, the first effects are usually felt by just a few firms. When they experience a pickup in business, they step up production to meet the stronger demand. They buy more raw materials and machinery, hire more labor, and so forth. This process repeats itself at the firms that supply materials to the first few expanding firms, and the higher employment leads to higher incomes and more spending, which boost other firms and whole industries, spreading through the economy. As growth proliferates, statistical measures of the level of activity and sales begin to rise, confirming in detail the process first reflected by the increase in diffusion indexes signaling the beginning of the expansion. Over the survey's 25-year history, these characteristic patterns of change, especially during recessions and recovery periods, are its most distinctive feature (Figure 10).

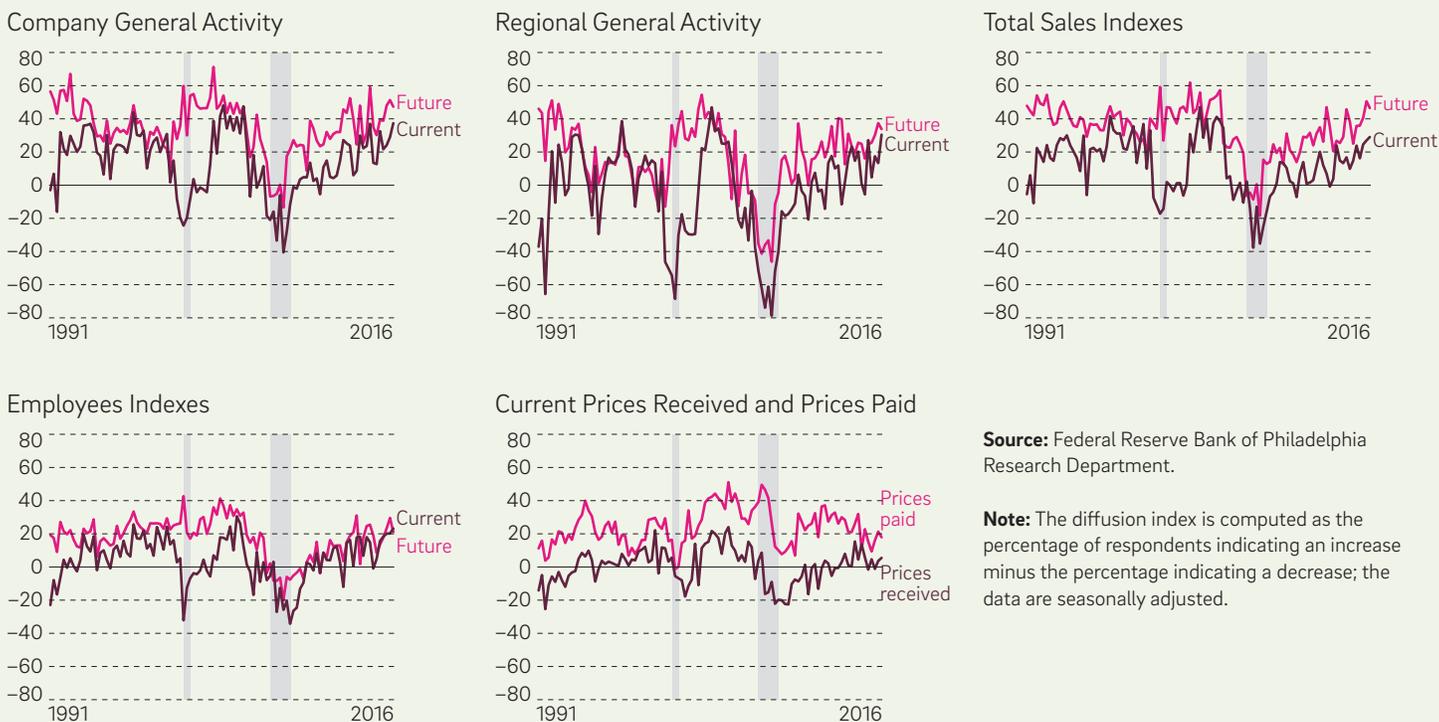
How successful is the South Jersey survey's diffusion index in predicting actual outcomes, such as official employment for the region? Our model (and the logic of constructing a diffusion index) suggests that the index will be positive when reflecting growth and negative when reflecting contraction. Statistics of goodness of fit summarize the discrepancy between expected values and what is actually observed using a model as a framework. A goodness of fit measure, such as an R-squared statistic, which is derived from a linear regression, serves the purpose. The index and employment growth clearly have a positive correlation, with a 0.56 correlation coefficient (Figure 11).

To model the relationship, a regression line is fit to the relationship, which is also shown. The linear fit appears to describe the relationship expected. In addition to the positive slope that is expected, the y-intercept value is near zero (0.1). Therefore, the model that fits the relationship best suggests that a value of zero for the diffusion index is associated with a near-zero growth in employment. Also, this provides a quantitative relationship between the index and actual employment.

FIGURE 10

### Consistent Patterns of Change, Especially Around Recessions

Diffusion indexes of the South Jersey Business Survey, Q2 1991–Q4 2016.



**Source:** Federal Reserve Bank of Philadelphia Research Department.

**Note:** The diffusion index is computed as the percentage of respondents indicating an increase minus the percentage indicating a decrease; the data are seasonally adjusted.

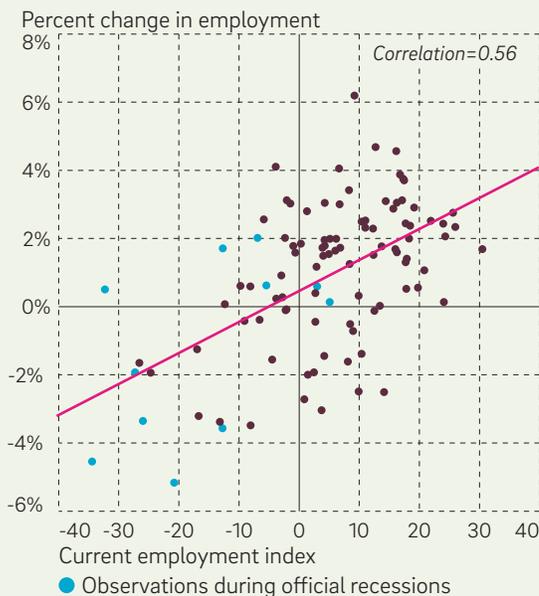
Another way of looking at the result is that the index yields the correct direction of change about 75 percent of the time. Moreover the  $R^2$  value of .31 can be interpreted as the share of variation in employment growth explained by the diffusion index alone. This shows that the diffusion index could be useful in forecasting employment. Of course, including other information about employment trends can improve this forecast even more. In more basic terms, the index can improve forecasting ability, which is the best measure of value, statistically speaking.

The Philadelphia Fed also produces diffusion indexes for other regional surveys that we conduct, notably the Manufacturing Business Outlook Survey, which has been conducted monthly since 1968 and is widely followed as a barometer of both regional and national manufacturing conditions. We added the Nonmanufacturing Business Outlook Survey in 2011. The Federal Reserve Banks of New York, Richmond, Dallas, and Kansas City have built upon the success of the Philadelphia Fed and now produce similar indexes for manufacturing and nonmanufacturing sectors in their districts.

FIGURE 11

### A Clearly Positive Correlation with Employment Growth

Quarterly employment percent change vs. employment index.



Sources: Bureau of Labor Statistics via Haver Analytics; Federal Reserve Bank of Philadelphia Research Department.

## Conclusions

Considering its simple design and modest statistical sophistication, the South Jersey Business Survey has provided useful insight into the region’s real-time business conditions, especially for business services. Its value as a regional economic analysis tool is in keeping with the many other business surveys that are used to supplement hard data on economic performance. The cyclical behavior of the survey’s indexes and their significant correlation with other measures of economic performance, such as employment and our coincident indicators, suggest they will continue to be useful measures of regional economic performance.

The documented usefulness of the survey also supports using this framework to survey other regions where greater coverage and more timely data are desired. For instance, obtaining a larger sample, expanding its coverage to adjacent regions, and weighting the results by size and industry characteristics are possible ways of making the survey more informative. Using its indexes to supplement the measures used to construct state or metro area coincident indicators is another potential application. The support of the Chamber of Commerce Southern New Jersey is important to assure the survey’s continuation; both the chamber and the Philadelphia Fed benefit. The chamber provides a continually updated pool of potential respondents, and the Philadelphia Fed returns information useful to businesses along with the opportunity for chamber members to contribute to public knowledge about the regional economy. [E](#)

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## Notes

**1** Therefore, there are two forms of selection bias—selection upon joining the organization and selection upon filling out the survey.

**2** Vanessa Van Grinsven and her coauthors considered both the cost of participating (time and effort) and motivating factors to better understand response behavior.

**3** See its website, [http://www.chambersnj.com/CCSNJ/About\\_Us/CCSNJ/About.aspx?hkey=8c8c81c4-8b8e-4f58-ba62-abaaf8368e1e](http://www.chambersnj.com/CCSNJ/About_Us/CCSNJ/About.aspx?hkey=8c8c81c4-8b8e-4f58-ba62-abaaf8368e1e).

**4** The three-county Camden division is part of the larger Philadelphia metropolitan statistical area but can be analyzed as a distinct subregion.

**5** A statistical regression model was used to evaluate the relationship between the quarterly change in the coincident and the diffusion index. See my 2008 report with Leonard Nakamura and my 2013 *Business Review* article with Tim Schiller. When used as an explanatory variable, the diffusion index is statistically significant in explaining changes in the coincident index. Moreover, it provides useful and timely information when controlling for the information provided by the coincident indicator by itself. That is, it can improve forecasting performance when included in a forecasting model.

**6** Maria Arias and her coauthors, for example, use available statistics capturing various aspects of local activity in constructing indexes for the 50 largest U.S. metropolitan statistical areas.

# Research Update

Visit our website for more abstracts and papers of interest to the professional researcher produced by economists and visiting scholars at the Philadelphia Fed.

## Market Discipline in the Secondary Bond Market: The Case of Systemically Important Banks

The authors investigate the association between the yields on debt issued by U.S. systemically important banks (SIBs) and their idiosyncratic risk factors, macroeconomic factors, and bond features in the secondary market. Although greater SIB risk levels are expected to increase debt yields (Evanoff and Wall, 2000), prevalence of government safety nets complicates the market discipline mechanism, rendering the issue an empirical exercise. Their main objectives are twofold. First, they study how bond buyers reacted to elevation of SIB-specific and macroeconomic risk factors over the recent business cycle. Second, they investigate the degree to which the proportion of variance in yields explained by SIB and macroeconomic risk factors changed across the phases of the cycle. Their data include over 8 million bond trades across 26 SIBs. The authors divide their sample period into the pre-crisis (2003:Q1 to 2007:Q3), crisis (2007:Q4 to 2009:Q2), and post-crisis (2009:Q3 to 2014:Q3) sub-periods to contrast the findings. They obtain several results. First, bond buyers do react to changes in the SIB-specific risk factors (leverage, credit risk, inefficiency, lack of profitability, illiquidity,

and interest rate risk) by demanding higher yields. Second, bond buyers' responses to risk factors are sensitive to the phase of the business cycle. Third, the proportion of variance in yields driven by SIB-specific and bond-specific risk factors increased from 23 percent in the pre-crisis period to 47 percent and 73 percent, respectively, during the crisis and post-crisis periods. These findings indicate that the force of market discipline improved greatly during the crisis and post-crisis periods, at the expense of macroeconomic factors. The strengthening of market discipline in the crisis and post-crisis periods, despite the unprecedented regulatory intervention in the form of quantitative easing programs, the Troubled Asset Relief Program, large bailouts, and generally accommodative fiscal and monetary policies adopted during these periods, demonstrates that regulatory intervention and market discipline can work in tandem.

Working Paper 17-05. Elyas Elyasiani, Temple University; Jason M. Keegan, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department.

## How Data Breaches Affect Consumer Credit

The authors use the 2012 South Carolina Department of Revenue data breach as a natural experiment to study how data breaches and news coverage about them affect consumers' interactions with the credit market and their use of credit. They find that some consumers directly exposed to the breach protected themselves against potential losses from future fraudulent use of stolen information by monitoring their files and freezing access to their credit reports. However, these consumers continued their regular use of existing credit cards and did not switch lenders. The response of consumers exposed to the news about the breach only was negligible.

Supersedes Working Paper 15-42. Working Paper 17-06. Vyacheslav Mikhed, Federal Reserve Bank of Philadelphia Payment Cards Center; Michael Vogan, Moody's Analytics.

## Self-Fulfilling Debt Crises, Revisited: The Art of the Desperate Deal

The authors revisit self-fulfilling rollover crises by introducing an alternative equilibrium selection that involves bond auctions at depressed but strictly positive equilibrium prices, a scenario in line with observed sovereign debt crises. They refer to these auctions as "desperate deals," the defining feature of which is a price schedule that makes the government indifferent to default or repayment. The government randomizes at the time of repayment, which the authors show can

be implemented in pure strategies by introducing stochastic political payoffs or external bailouts. Quantitatively, auctions at fire-sale prices are crucial for generating realistic spread volatility.

Working Paper 17-07. Mark Aguiar, Princeton University; Satyajit Chatterjee, Federal Reserve Bank of Philadelphia Research Department; Harold Cole, University of Pennsylvania; Zachary Stangebye, University of Notre Dame.

## Regime Shift and the Post-crisis World of Mortgage Loss Severities

The average loss rate for conventional mortgages rose from less than 10% pre-crisis to more than 30% during the crisis, reaching and sustaining greater than 40% post-crisis. Using a novel database that contains the components of mortgage losses, the authors identify a regime shift in loss severities caused by various government interventions and changes in business practices in the servicing industry. This regime shift helps explain the persistently high loss severities post-crisis, even after a strong recovery in the housing market. The authors' findings have implications for loss modeling, pricing, and, potentially, mortgage credit availability.

Working Paper 17–08. Xudong An, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Larry Cordell, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department.

## The Impacts of Financial Regulations: Solvency and Liquidity in the Post-crisis Period

This paper discusses the new financial regulations in the post-financial crisis period, focusing on capital and liquidity regulations. Basel III and the capital stress tests introduced new requirements and new definitions while retaining the structure of the pre-2010 requirements. The total number of requirements increased, making it difficult to determine which constraints are binding. The authors find that the new common equity tier 1 (CET1) and Level 1 high-quality liquid assets (HQLAs) are the binding constraints at large U.S. banks, especially for banks that are active in capital markets activities. Banks have been holding more CET1 and a larger share of Level 1 HQLAs since the financial crisis of 2007 to 2009. The authors also find that the market pricing of bank debt appears to have responded to changes in liquidity measures, especially at large capital markets banks. The Basel III regulatory capital ratios appear to have little direct influence on spreads.

Working Paper 17–10. Colleen Baker, independent consultant; Christine Cumming, Federal Reserve Bank of New York (retired); Julapa Jagtiani, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department.

## Endogenous/Exogenous Segmentation in the A-IRB Framework and the Pro-cyclicality of Capital: An Application to Mortgage Portfolios

This paper investigates the pro-cyclicality of capital in the advanced internal ratings-based (A-IRB) Basel approach for retail portfolios "and identifies the fundamental assumptions required for stable A-IRB risk weights over the economic cycle. Specifically, it distinguishes between endogenous and exogenous segmentation risk drivers and, through application to a portfolio of first mortgages, shows that risk weights remain stable over the economic cycle when the segmentation scheme is derived using exogenous risk drivers, while segmentation schemes that include endogenous risk drivers are highly pro-cyclical. Also analyzed is the sensitivity of the A-IRB framework to model risk resulting from the selection, at the quantification stage, of a data sample period that does not include a period of significant economic downturn. The analysis illustrates important limitations and sensitivities of the A-IRB framework and sheds light on the implicit restrictions embedded in recent regulatory guidance that underscore the importance of rating systems that remain stable over time and throughout business cycles.

Working Paper 17–09. José J. Canals-Cerdá, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department.

## Identification Through Heterogeneity

The authors analyze set identification in Bayesian vector autoregressions (VARs). Because set identification can be challenging, they propose to include micro data on heterogeneous entities to sharpen inference. First, the authors provide conditions when imposing a simple ranking of impulse-responses sharpens inference in bivariate and trivariate VARs. Importantly, they show that this set reduction also applies to variables not subject to ranking restrictions. Second, the authors develop two types of inference to address recent criticism: (1) an efficient fully Bayesian algorithm based on an agnostic prior that directly samples from the admissible set and (2) a prior-robust Bayesian algorithm to sample the posterior bounds of the identified set. Third, they apply our methodology to U.S. data to identify productivity news and defense spending shocks. The authors find that under both algorithms, the bounds of the identified sets shrink substantially under heterogeneity restrictions relative to standard sign restrictions.

Working Paper 17–11. Pooyan Amir-Ahmadi, University of Illinois at Urbana–Champaign; Thorsten Drautzburg, Federal Reserve Bank of Philadelphia Research Department.

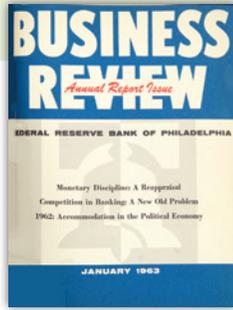
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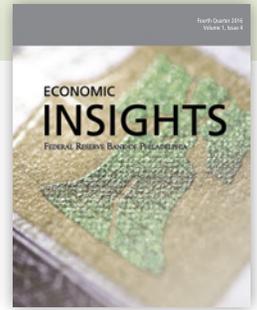
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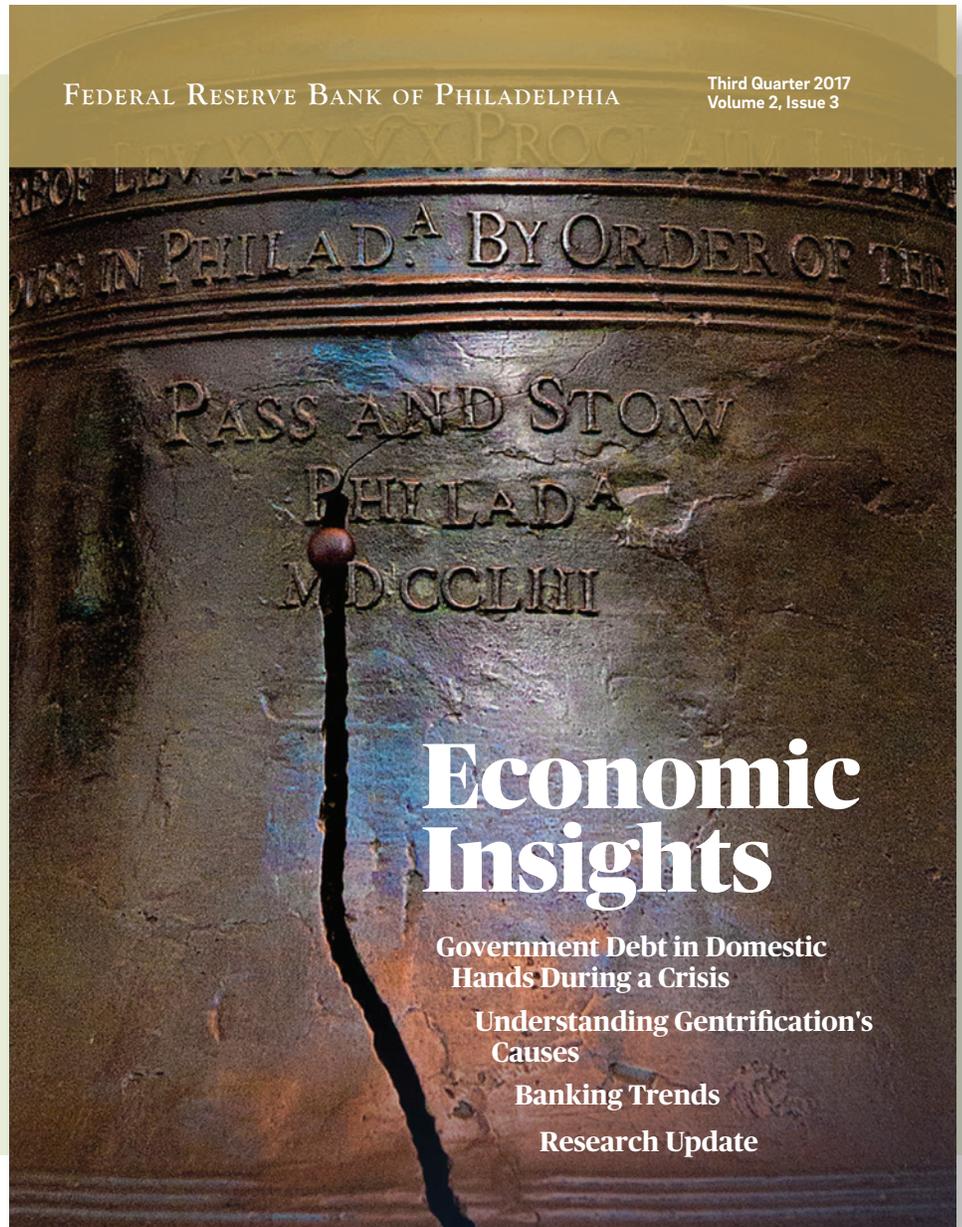


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**Featured Article: Making Sense of Urban Patterns**

In cities worldwide, density peaks near city hall and thins out the farther one travels in all directions. Jeffrey Brinkman explores what drives this pattern, what sparks big shifts such as the postwar suburban migration and today's taste for city life, and why it all matters for urban policy.

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