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St. Louis Fed President

James Bullard discusses the Federal Reserve's monetary policy framework review

Economic Forecasting

How does the Federal Reserve stack up against the private sector?

Working from Home

PAGE 16

Who is likely to telecommute? What are the implications of increased telecommuting?

PAGE 4

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What's behind Rising Returns to High-Quality College Education?

Students at high-quality colleges have had rising graduation rates and incomes over time. Increased sorting between students and colleges may help explain these gains.





Finance and Developr	ment: Evidence from Firm-Level Data	
An analysis of cross-cou	untry data sheds light on the link between fin	ance
and economic developm	nent	1
Economic Forecasting	g: Comparing the Fed with the Private Se	ctor
Fed forecasts have gener	rally been more accurate than private forecas	ts,
but the reason isn't clear	r	1
Working from Home:	More Americans Are Telecommuting	
Surprisingly, the averag	e telecommuter drives more miles annually t	han
the average worker who	has to travel to a workplace	
DISTRICT OVERVIEW		
Moving In, Moving Ou	t: The Migration Pattern of the Eighth Dis	strict
Education and income of	differed between those leaving and those ente	ring
the District states from	2013 to 2017.	
NATIONAL OVERVIEW		
Financial Markets Sig	nal Concern about U.S. Economic Growth	
Markets have been incre	easingly worried about the risk of recession,	
but economic data have	been mixed.	
	E	

ONLINE EXTRA

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Intellectual property rights protection is key to promoting international technology transfer. "Adoption of foreign technologies is an important channel in the process of development of countries that are far from the technology frontier. As these countries learn from foreign technologies, they gain the ability to eventually become innovators themselves and to start pushing the technology frontier."

-Ana Maria Santacreu, Economist, and Makenzie Peake, Research Associate

www.stlouisfed.org/on-the-economy/2019/september/ intellectual-property-rights-protection-economic-growth



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Corporate Debt since the Great Recession

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"While there is no consensus among economists on the degree to which corporate borrowing can affect the economy, it is worth noting that a large proportion of loans have recently been extended to firms with relatively high probabilities of default."

—Miguel Faria-e-Castro, Economist, and Asha Bharadwaj, Research Associate

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> Ana Kent, Policy Analyst, and Lowell Ricketts, Lead Analyst, both with the Center for Household Financial Stability

www.stlouisfed.org/open-vault/2019/august/wealth-inequality-in-america-facts-figures

FRED Blog (https://fredblog.stlouisfed.org/)



Households' Lightening Debt Load

Data on the financial burden of U.S. households

"With one exception (in the fourth quarter of 2012), total debt obligations are at the lowest they've been since these data were first collected. And this is especially true of mortgage debt."

-Christian Zimmermann, Assistant Vice President of Research Information Services

https://fredblog.stlouisfed.org/2019/10/households-lightening-debt-load



Federal Reserve Bank of St. Louis President James Bullard discussed the Federal Reserve's monetary policy framework review in a St. Louis Fed Timely Topics podcast that was released Aug. 14, 2019. The following excerpts are from the podcast. They have been lightly edited for clarity and length.

I would say that it's best practice among central banks to review their policymaking framework on a regular basis, let's say five or seven years.

What does the Federal Reserve's monetary policy framework review entail?

I would say that it's best practice among central banks to review their policymaking framework on a regular basis, let's say five or seven years. This was pioneered by the Bank of Canada. I think this gives an opportunity to think about changes that might be made outside of the normal policy cycle because you don't want this to get wrapped up with current-day decision-making on monetary policy. This is more long-run thinking about monetary policy strategy.

What is the Fed's current strategy for meeting its dual mandate of price stability and maximum employment?

I think most people would describe the current strategy as inflation targeting. The Fed named an official inflation target in January 2012. We conduct policy to try to maintain that rate of inflation over time, but we also adjust appropriately to meet the employment side of our mandate. Ideally, we'd be able to hit both at the same time.

The only problem with this framework is that it may lead to inflation being too low on average over time because, as we found out in the last 10 years, the policy rate can hit the effective lower bound. And when it does that, then you have to resort to other types of policies like quantitative easing and so on. Because of that, people are thinking about: Well, are there ways to better manage the monetary policy framework going forward?

What are some possible alternative strategies that the Fed is discussing during this review?

The key alternative would be to target the price level instead of targeting the inflation rate, which sounds like a minor change. But what it would say is that you pay attention to the fact that you might miss your inflation target, let's say, to the low side for a while. Then you might make up for that by missing your inflation target to the high side for a while so that, on average, you still hit the inflation target. That's often called price-level targeting as opposed to inflation targeting, which has a subtle difference. In inflation targeting, if you were below target, you would just try to go back to the target. You wouldn't try to go above the target.

So, the good thing about price-level targeting type strategies is that you hit the inflation rate better on average during the long run. This better cements inflation expectations, and so you get better policy out of that. I would also say that price-level targeting is closely related to nominal GDP targeting, which is another version of the same idea basically.

The review also looks at ways in which the Fed communicates monetary policy. What do you think is going well?

The U.S. has begun to meet an international standard by having press conferences after every meeting. I think markets always want to know what the Federal Reserve is thinking, what the Federal Open Market Committee is thinking. Even if nothing is happening, they want to know, "OK, nothing is happening." So, we've begun to do that this year, and I think it does provide better communication on the whole. So, I think it's working well.

Are there further improvements in communication that you'd like to see?

The Committee has a Summary of Economic Projections, with the so-called dot plot, which is put out once a quarter. I don't think our communication there is as good as what foreign central banks have. The Bank of England and the European Central Bank put out more comprehensive descriptions of their forecasts—usually their staff forecasts—and then the policymakers themselves can comment on the staff forecast, which I think is maybe one way that we could change the system that we use. So, I think there are some improvements that could be made.

This monetary policy framework review includes *Fed Listens* events throughout the Federal Reserve System. What is the purpose of holding these events? Can you describe the setup for the upcoming meeting here

in St. Louis in September and what you hope to learn from that meeting?

We wanted the framework review to get input from a wide variety of sources, and we're certainly doing that. We'll basically talk to anybody who is interested in this, but, in particular, constituents in the various parts of the country. We're doing that in the Eighth District.

What we're going to do for our *Fed Listens* event is bring all our councils together on a single day into St. Louis and get the whole shebang at one time. That's a special event. But it just reflects part of what we do all the time here at the St. Louis Fed, which is try to stay in close touch with economic actors on the ground and see what's happening in their lives and their businesses on a day-to-day basis in order to allow that to be an input into monetary policy.

What will policymakers at the Fed do with the information gathered during this whole review?

I think the code word here is evolution, not revolution. I don't think we want to give the impression that we're going to overturn the current Fed operating framework or strategic framework overnight. I don't think that's realistic or desirable. But I do think that many of these ideas will feed into future monetary policy as we go forward and creep in in various ways. Some of them might be more visible than others, but I would not expect a manifesto to come out that radically reorients Fed policy.

This is not necessarily meant to suggest that there are big changes afoot. But it is meant to be thoroughgoing, get lots of input and think about these issues deeply on a calendar basis, something like five or seven years. Because otherwise you might go 50 years and you never changed your framework, and it gets badly out of date and it really doesn't work very well. But because you've never thought about the strategy, you've never changed it. And if you are going to change it, you would have to change it in small ways in order to make progress.

Anything else about the Fed's monetary policy framework review?

I just think this is such a good kind of corporate practice. So, I do think it's a good thing that we're doing. When you think about the crisis 10 years ago, we had to do a lot of improvisation, on-therun changes in monetary policy, new tools being introduced. That causes a lot of volatility. People aren't really sure how this is going to work. Policymakers themselves aren't really sure how it's going to work. So, I think it's very useful to try to do as much as you can in good times so that when bad times come again, you've at least got some basis to go ahead and make decisions.

I think it's very useful to try to do as much as you can in good times so that when bad times come again, you've at least got some basis to go ahead and make decisions.

(This article was published online Aug. 29.)



To listen to Bullard's full podcast, go to www.stlouisfed.org/ timely-topics/bullard-discussesmonetary-policy-frameworkreview.

What's behind Rising Returns to High-Quality College Education?

By Oksana Leukhina and Joseph McGillicuddy



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KEY TAKEAWAYS

- Research has focused on the financial returns to a college degree, but few studies have looked at whether the quality of the college also matters.
- An analysis of college students in the early 1980s and the early 2000s suggests that attending a high-quality college leads to higher graduation rates and income.
- These gains from college quality also appear to have risen over time.
- These rising gains may be due to a growing learning ability gap between students attending low-quality schools and those at high-quality schools.

While financial returns to a college degree have been widely studied, less is known about how much it matters where one goes to college. Yet, more than ever, college quality is perceived to be a decisive factor in determining a child's future success. This was the motivation behind the recent "Varsity Blues" scandal, in which affluent parents were accused of bribing college officials to guarantee their children's acceptance into top schools.

But many more parents pour significant resources into improving their children's college prospects without resorting to illegal means. For example, private SAT tutors can cost hundreds of dollars an hour, and college application consultants charge tens of thousands of dollars for their services.¹ One may wonder whether financial gains associated with entry into highly selective schools justify the higher tuition and college prep costs. What is the financial gain from choosing a top-tier academic school over a lower-ranking college closer to home or even a community college? How has it evolved over time? These are important questions for policymakers and for high school students facing their most important financial investment decision. We investigate these questions.

Data Sources on Student Outcomes and College Quality

As our data sources, we employed the 1997 and the 1979 National Longitudinal Surveys of Youth (henceforth, NLSY97 and NLSY79).² NLSY97 is an ongoing survey that tracks the lives of 8,984 millennials, many of whom entered college around 2000. The NLSY79 follows an older cohort that comprises 12,686 baby boomers, many of whom entered college around 1980.

In each survey round, the individuals answer questions on a variety of topics, including education and income. These two are the only surveys that contain complete earnings histories for at least 15 years following college graduation and allow us to identify colleges that students attended and degrees received. All survey participants were also administered an aptitude test that covered numerical operations, vocabulary, paragraph comprehension and logical reasoning.³

To rank these colleges on "quality," we compiled a comprehensive data set of over 3,000 colleges and universities in the U.S. and collected information on their average SAT scores and freshmen enrollment in 2000. The main source for this information is the Integrated Postsecondary Education Data System.⁴ For colleges with missing reports, we used average SAT scores published in *Barron's Profiles of American Colleges* and *American Universities and Colleges*.

We categorized all colleges into four types. The lowest type (Type 1) comprises community colleges offering a transferable associate degree. Four-year institutions are ranked in terms of their freshmen's average SAT score, from lowest to highest, and they are split into three groups based on freshman enrollment. Type 2 comprises the lowest-ranked colleges that account for a third of all freshmen; Type 3 comprises the middleranked colleges and Type 4 represents the top-ranked colleges, each with a third of enrolled freshmen.

We will refer to higher-type colleges as higher-quality colleges because better SAT averages not only indicate better learning (and networking) opportunities from one's peers but also strongly correlate with measures of instructional quality (e.g., faculty-student ratios and faculty salaries).⁵ We chose to include community colleges in our analysis because over a third of college entrants start in a community college, with 95% of them stating their ultimate goal is a bachelor's degree.⁶

According to our classification, highertype colleges host a more strictly selected group of students, provide higher-quality instruction and cost more. We can now identify the quality type of each college attended by each survey participant. We use responses from both surveys to analyze how postsecondary education decisions and their effects on future earnings have changed over time.

Pitfalls in Assessing Financial Gains from a Specific College

A great deal of college information is available to today's high school students, such as college graduation rates and average post-graduation salaries.⁷ Students should take caution when using graduation rates and salary data to compare financial gains or losses from enrolling in different colleges. This is because student bodies can differ vastly across colleges with regard to *learning ability—a term that refers collectively to all student characteristics at the time of high school graduation that matter for both their academic success and labor* What is the financial gain from choosing a top-tier academic school over a lower-ranking college closer to home or even a community college? How has it evolved over time?

ABOUT THE AUTHORS

Oksana Leukhina (left) is a senior economist at the Federal Reserve Bank of St. Louis. Her research interests include growth, labor and demographic economics. She joined the St. Louis Fed in 2017. Read more about the author and her research at https://research.stlouisfed.org/econ/leukhina.

Joseph McGillicuddy (right) is a senior research associate at the Federal Reserve Bank of St. Louis.



*market success (e.g., college preparedness, work ethic, grit, ambition).*⁸

Such student composition differences partly account for graduation outcomes and salary differences across colleges and must be adjusted for when inferring personal gains from selecting one school over another.

If the highly selected Harvey Mudd College students, nearly all of whom major in science, technology, engineering and mathematics (STEM) fields, report earning \$89,000 shortly upon graduation, while the graduates of the less selective University of California, Irvine earn \$60,000, a student admitted to both schools who plans to study engineering should not conclude that choosing UC Irvine over Harvey Mudd would entail giving up a third of post-graduation salary.

Likewise, she should not interpret the average graduation rates (92% for Harvey Mudd and 88% for UC Irvine) to mean that her graduation probability would decline by 4 percentage points. The higher graduation rates and earnings of the Harvey Mudd students partly reflect the student composition effect—they are (on average) higher achievers who do not shy away from the more lucrative STEM fields.

To more accurately assess the expected salary associated with choosing UC Irvine over Harvey Mudd, the student in our example should compare graduation rates and average post-graduation salary for a very specific set of students—engineering majors with similar to her own high school performance, family income and parental education. Doing so would largely reduce the expected salary loss suggested by the naive calculation.

Effects of College Quality: The NLSY79 Cohort

Let's start with a few facts about this cohort. About half of the NLSY79 high school graduates enrolled in college and about half of those who enrolled earned a bachelor's degree. College graduates went on to earn 70% more over their lifetime than their peers who never entered college. However, this earnings gap grossly exaggerates financial gains from a college degree. After appropriate adjustments are made for student composition differences, the average gain from graduation measures at 35%.⁹

For the purpose of our analysis of

Figure 1

Graduation Rates by College Quality



SOURCES: National Longitudinal Survey of Youth, 1979 and 1997; Integrated Postsecondary Education Data System; Barron's Profiles of American Colleges; American Universities and Colleges; and authors' calculations.

NOTES: The left-hand panel plots graduation rates for college freshmen with aptitude test scores in the lowest quartile among high school graduates in the 1979 or 1997 cohort by the quality of the first college they attended. The right panel does the same but for freshmen with test scores in the highest quartile among high school graduates in their cohort. The lowest quality (Type 1) comprises community colleges offering a transferable associate degree. Four-year institutions are categorized into Types 2 through 4 according to where they rank in terms of their students' average SAT score, from lowest to highest.

college quality effects, we approximated student learning ability (as defined earlier) by aptitude test score percentile. This measure is practical but imprecise, and we will discuss the implications of this imprecision later. We adjusted for student composition effects by comparing outcomes across colleges for students with similar test scores.

Consistent with the intuition from the simple example discussed above, we found that the effects of high-quality colleges are exaggerated if one fails to adjust for student composition differences.

At first glance, school quality appears to have a massive influence on the probability that a student graduates from college: Only 20% of the older cohort starting out at a community college (Type 1) obtained a bachelor's degree within six years, while the top (Type 4) schools saw 86% of their freshmen graduate, suggesting that a choice of a Type 4 college over a community college path increases graduation probability by 66 percentage points.

However, this simple analysis exaggerates the causal effect that college quality has on graduation rates. Part of the reason that the graduation rate is higher at better schools is because their students are, on average, of higher learning ability (as defined earlier)—Type 1 students scored in the 54th percentile of all high school graduates, while Type 4 students scored in the 83rd percentile.

If we compare graduation rates for students with similar aptitude test performance—thereby making an adjustment for student composition effects—we find that, on average, a student's probability of graduating increases by 50 percentage points when he or she chooses a Type 4 college path over a community college path to a bachelor's degree. Even though the effect is significantly reduced, it remains very large.

A similar narrative emerges when we look at how college quality affects earnings after graduation. After adjusting for work experience, we found that students who graduated from a Type 4 school earned 8% more per year than those who graduated from a Type 2 school.

However, if we make an adjustment for student composition effects using test scores, we find that Type 4 graduates earned only 5% more per year relative to their peers graduating from Type 2 colleges. As in the case of graduation outcomes, we find that college quality effects on post-graduation earnings are significantly reduced after making this adjustment, and these effects are fairly small. Note that college quality mattered greatly for graduation outcomes. Where the degree came from mattered less for earnings outcomes.

Aptitude test scores also held a strong predictive power on both graduation rates and post-graduation earnings. When comparing students entering the same type of college, we found that students with test scores in the top quartile (fourth) among high school graduates attained a bachelor's degree at a rate that was 47 percentage points higher and earned 25% more when compared with students scoring in the bottom quartile (first).

How Did the Effects of College Quality Change over Time?

What can we say about the younger cohort who entered college in 2000—the cohort that faced greater returns to a college degree and showed greater enrollment rates? We found that the importance of college quality as a determinant of graduation rates and post-college earnings increased, while the importance of aptitude test scores declined.¹⁰

Figure 1 helps visualize the increasing importance of college quality for graduation outcomes. The left-hand panel of Figure 1 plots graduation rates by college quality for freshmen scoring in the lowest quartile of the test score distribution. The positive relationship between college quality and graduation rates is steeper for the younger cohort—mainly because students with low test scores performed better at higher-quality schools.

The right-hand panel tabulates graduation rates for students in the top quartile of the test score distribution. Again, the positive relationship between college quality and graduation rates is steeper for the younger of the two cohorts—mainly because high-scoring students performed worse at lower-quality schools.

Let's summarize the average effects for all students in a given cohort. While the older cohort faced a 50 percentage point increase in graduation probability when choosing to enroll in a Type 4 college over a community college, the younger cohort enjoyed a much larger gain of 63 percentage points.

Figure 2

Graduation Rates by Aptitude Test Score Quartile

For Students Attending Community College

For Students Attending Top Colleges



SOURCES: National Longitudinal Survey of Youth, 1979 and 1997; Integrated Postsecondary Education Data System; Barron's Profiles of American Colleges; American Universities and Colleges; and authors' calculations.

NOTES: The left-hand panel plots graduation rates for college freshmen who entered community colleges (Type 1) by the quartile of their aptitude test scores among high school graduates in their cohort (NLSY79 or NLSY97). The right panel does the same but for freshmen who entered top four-year colleges (Type 4). Four-year institutions are categorized into Types 2 through 4 according to where they rank in terms of their students' average SAT score, from lowest to highest.

The same trends appear in post-graduation earnings. As discussed earlier, the older-cohort students graduating from a Type 4 school went on to earn 5% more than their peers who graduated from Type 2 schools. The younger cohort, however, experienced a 10% gain—a full doubling of the return to college quality.

Figure 2 helps visualize the declining importance of aptitude test scores for graduation outcomes. It plots graduation rates against the test score quartile, for students attending the same college type.

The left-hand panel shows graduation rates for students who entered community colleges, and the right-hand panel shows graduation rates for students who entered the highest type colleges.

The positive relationship between test scores and graduation rates is weaker for the younger cohort—predominantly because high-scoring students starting at community colleges became less likely to transfer and graduate. The right-hand panel also reveals a weakening of the relationship between graduation rates and test scores—but the effect is mainly due to the low-scoring students performing better in top-type schools.

Thus, the younger cohort saw a decline in the importance of test score quartile as a determinant of graduation and earnings. Let's consider the average results for all students in a given cohort. Whereas the high-scoring students in the older cohort attained a bachelor's degree at a rate that was 47 percentage points higher than that of their low-scoring peers, this gap dropped to 26 percentage points for the younger cohort—a decline by nearly a factor of 2. Similarly, the younger cohort saw the importance of test score quartile as a determinant of earnings reduced by a factor of 2.

What Explains the Rising Importance of College Quality?

We argue that it is highly likely that a large part of the rising importance of college quality can be attributed to rising sorting on learning ability. If the relative learning ability of students enrolled in top-quality colleges increased, this change would manifest itself in our analysis as increasing returns to college quality, in both graduation outcomes and earnings.

Let's try to unpack this statement. In a 2018 paper, Lutz Hendricks and Oksana Leukhina found that aptitude test scores are fairly imprecise measures of student abilities. This means that by comparing outcomes across college types for students with similar test scores, as we did here, we

Figure 3

College Sorting: Where Did Students Enroll?



by an influx of students with lower test scores from families of medium to higher incomes.¹¹ As a result, the variation in learning ability among college entrants increased. With less room to increase operating capacity, four-year schools increased their admission standards, and lower-ability students became more likely to enroll in community colleges with open-door admission policies.

college enrollment (from 46% of high school graduates to 57%) characterized

Second, tightening financial constraints may have also played a role in increasing sorting. We documented that the average tuition paid by freshmen increased by a factor of 3 for the younger cohort, from \$4,000 to \$13,552.¹² Even though the amount of grants and scholarships also increased, the direct cost of college more than doubled, from \$3,628 to \$8,624. (See Endnote 12 for details.)

In the meantime, the increase in the borrowing limits for subsidized Stafford loans did not keep up with the rising college costs. The borrowing limit for the first year of college barely changed at all, increasing from \$2,500 in 1982 to \$2,625 in 2000, although the annual loan limit increased more for subsequent years in college.

As a result, the younger cohort had to rely more heavily on family transfers, work more hours while in college and enroll in less-expensive colleges. Such downgrading of college choice would disproportionately affect the less-collegeready students as they tend to come from lower-income families. In addition, low-ability students with limited financial resources would be more likely to downgrade their college choice when faced with less time left to study, as it would be more difficult for them to keep up with school work in top colleges.

Finally, it is possible that the true return to a degree from higher-quality schools increased, perhaps as a result of increased expenditures on faculty, advising and career services. As a result, we would expect to see upgrading of college choice predominantly among the high-ability students—as these students can more easily keep up with stricter learning standards.

All of these factors have likely contributed to the widening in the learning ability gap between top- and bottom-quality institutions. As a result, the performance

SOURCES: National Longitudinal Survey of Youth, 1979 and 1997; Integrated Postsecondary Education Data System; *Barron's Profiles of American Colleges; American Universities and Colleges;* and authors' calculations.

NOTES: The left-hand panel plots the fraction of college freshmen with aptitude test scores in the lowest quartile among high school graduates in the 1979 or 1997 cohort who attended each type of college during their first year. The right panel does the same but for freshmen with test scores in the highest quartile among high school graduates in their cohort. The lowest quality (Type 1) comprises community colleges offering a transferable associate degree. Four-year institutions are categorized into Types 2 through 4 according to where they rank in terms of their students' average SAT score, from lowest to highest.

are not comparing students with the same learning ability.

It is likely the case that low-scoring students who were accepted and enrolled in higher-quality schools are of higher learning ability than what their test scores suggest—they may have simply had a bad day when they took their tests. Thus, even though we made adjustments for student composition effects in terms of test scores, our measure of returns to college quality partly reflects the remaining student composition effects in terms of learning ability.

We will argue that this part has become more important over time as the ability gap between top- and bottom-quality colleges has widened. Let's refer to the size of this gap as the strength of student sorting across college types. We will first explain what factors could potentially drive the increase in student sorting on ability and conclude by showing some evidence of this phenomenon.

Potential Explanations for the Rise in Student Sorting

First, the younger cohort faced a significantly greater college graduation premium, which resulted in the rise of

Figure 4

Freshmen SAT Percentiles by Quality of Four-Year Colleges



SOURCES: Integrated Postsecondary Education Data System, *Barron's Profiles of American Colleges, American Universities and Colleges*, and authors' calculations.

NOTES: The figure plots average freshmen SAT score percentiles in 1982 and 2000 for all four-year schools that existed in both years by decile of college quality. Four-year institutions are ranked in terms of their freshmen's average SAT score, from lowest to highest, and they are split into ten deciles, or groups, based on freshman enrollment. For example, Decile 1 comprises four-year schools of the lowest quality that account for 10% of enrolled freshmen, and Decile 10 consists of four-year schools of the highest quality that represent 10% of enrolled freshmen.

of students attending top-quality schools rises in terms of both graduation rates and earnings relative to the performance of students at bottom-quality schools. Put differently, a choice of a high-quality college has become a better indicator of higher student ability and would manifest as rising returns to college quality.

Evidence of Rising Student Sorting

Consistent with the explanations above, we found evidence of increased student sorting. Figure 3 compares college sorting between our two cohorts. The left-hand panel shows the fraction of lowest-scoring students who began college at each type of school. In both groups, a majority of students started at community colleges, but that share increased from just over a half of the older cohort to nearly threequarters of the younger cohort.

In contrast, the right-hand panel shows that a larger share of highest-scoring students in the younger cohort enrolled as freshmen in the top two college types.

While most of the action seems to concentrate in the rise of the community college track among lowest-scoring students, we also saw a substantial increase in sorting among four-year schools. Figure 4 plots the average freshmen SAT score percentile by college quality (defined by the decile of their rank, using the methodology in the section titled "Data Sources on Student Outcomes and College Quality") for all four-year schools. We clearly see the relative decline of student ability in lowerquality schools.

Conclusions

We showed that the effects of high-quality colleges are exaggerated if one fails to adjust for student composition differences. When making the adjustment, the effects appear smaller and work mainly through increasing one's graduation chances where one's degree comes from matters less for post-college earnings.

However, we also demonstrated that returns to college quality increased over time and argued that a large part of this increase is explained by the widening learning ability gap between students attending low-quality schools and students attending high-quality schools. We put forward several plausible explanations for this phenomenon, such as tightening financial constraints and the rising graduation premium. More work is needed to disentangle the role of these factors.

(This article was published online Oct. 25.)

ENDNOTES

- ¹ See www.bloomberg.com/news/articles/2019-03-12/ college-arms-race-goes-too-far-with-wealthy-gamingthe-system.
- ² This research was conducted with restricted access to Bureau of Labor Statistics (BLS) data. The views expressed here do not necessarily reflect the views of the BLS.
- ³ This standardized test was not a college entrance exam like the SAT or ACT.
- ⁴ See https://nces.ed.gov/ipeds for more information.
- ⁵ Based on authors' calculations.
- ⁶ See Bowen et al.
- ⁷ See, for example, https://nces.ed.gov/ipeds/use-thedata for college characteristics or www.payscale.com/ college-salary-report for salary information.
- 8 This ability should not be seen as merely the result of innate intelligence or academic potential. Learning ability can be shaped by many factors, including disparities in economic and educational opportunities,
- all of which are outside the scope of our analysis.
- ⁹ See Hendricks and Leukhina.
 ¹⁰ See also Dillon and Smith.
- ¹¹ Based on authors' calculations and consistent with Philippe Belley and Lance Lochner, "The Changing Role of Family Income and Ability in Determining Educational Achievement." *Journal of Human Capital*, Winter 2007, Vol. 1, No. 1, pp. 37–89.
- ¹² In 2000 dollars. Because tuition is not reported in NLSY79, we obtained tuition estimates for the older cohort from the High School and Beyond survey, conducted by the National Center for Education Statistics.

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Finance and Development: Evidence from Firm-Level Data

Figure 1

By Matthew Famiglietti and Fernando Leibovici



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KEY TAKEAWAYS

- Access to financial markets is associated with economic development, but the reasons why aren't clearly understood.
- An analysis of World Bank data suggests that manufacturing firms' difficulties in accessing credit and loans distort their long-term investments.
- Further analysis reveals that in countries where manufacturing firms have more difficulty accessing credit, the average firm tends to be smaller.

Income differences between the richest and poorest countries are vast. Understanding the forces that account for these disparities and designing policies to promote economic development are two key goals of development economics.

One channel that receives considerable attention in both the policy world and academic circles is the role of access to financial markets. In aggregate cross-country data, gross domestic product (GDP) per capita—a standard measure of a country's economic development—is systematically correlated with various measures of financial market development, such as the aggregate credit-to-GDP ratio.

The question, however, remains: To what extent do such correlations reflect the causal impact of financial markets on economic development? In other words, to what extent might differences in financial market development account for differences in income per capita across countries?

In this article, we investigate the relationship between finance and development by using firm-level data from the World Bank Enterprise Surveys. These data allow us to investigate the underlying channels through which differences in



SOURCES: World Bank Enterprise Surveys, Penn World Tables and authors' calculations. NOTES: GDP per capita data are scaled logarithmically. Real GDP is based on 2011 dollars. Identified countries were selected to illustrate geographic diversity.

financial market development might affect overall economic development. Moreover, shedding light on such channels allows us to learn about their implications for the effective design of policy.

These surveys are firm-level surveys conducted by the World Bank across many countries. The data used in this article are based on surveys conducted over the period 2006-2014 across 141 countries. We restricted our attention to manufacturing firms in order to maximize the comparability across countries at different stages of economic development and, thus, with different sectoral compositions of production.

The surveys ask each firm a large number of questions ranging from firm characteristics—such as the number of workers, the total value of sales and the

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The Relationship between Internally Financed Fixed Assets and Real GDP Per Capita

Countries with a higher share of fixed assets that are internally financed tend to have lower real GDP per capita.

SOURCES: World Bank Enterprise Surveys, Penn World Tables and authors' calculations. NOTES: GDP per capita data are scaled logarithmically. Real GDP is based on 2011 dollars. Identified countries were selected to illustrate geographic diversity.

firm's age—to the type of issues faced that may hinder their growth—such as corruption, financial markets and access to inputs.

Access to Finance

We began by investigating the relation between economic development and the extent to which firms have access to financial markets. To do so, we plotted the relation between real GDP per capita and the share of firms with a line of credit or loan from a financial institution. (See Figure 1.) We found that countries with higher real GDP per capita have more firms that rely on external finance through a financial institution.

These findings suggest that firms in poorer economies are likely to find the lack of access to finance as a hindrance for their operations and growth. Indeed, the World Bank Enterprise Surveys also asks firms to classify the extent to which this is an obstacle: none, minor, moderate, major and very severe. Consistent with the evidence presented in Figure 1, we found that wealthier countries have considerably lower shares of firms with financing difficulties.¹

Short- vs. Long-term Finance

How might differences in access to financial markets affect economic development? One possibility is that financial markets play an important role in paying for short-term working capital expenditures, such as the prepayment of intermediate inputs or wages. It is possible that limits in access to such financing prevent firms from operating and growing successfully.

Another channel through which financial markets might play an important role is the financing of long-term investments such as buildings, machinery, and research and development.

Figure 2 plots the relation between real GDP per capita and the share of fixed assets that are financed internally, such as through firms' retained earnings or accumulated cash holdings.

We found a negative relationship between these two factors, which is consistent with finance's role in development. The countries are clustered around a regression line that is relatively steep, indicating a strong correlation. That is, countries with a higher share of fixed assets that are internally financed tend to have lower real GDP per capita.

A similar analysis was performed for the share of working capital financed internally, but we found that the relationship is stronger for fixed assets.

We interpret this finding as evidence that differences in access to finance are likely to affect economic development by distorting firms' long-term investments. This is intuitive, as fixed assets generally consist of large-scale investment projects that have very high fixed costs, such as structures. In countries with better access to financial markets, one would expect firms to take advantage of credit for these types of investments.

Differences in Firm Size: Access to Finance vs. Real GDP Per Capita

Insofar as differences in financial market development lead to disparities in economic development by distorting firms' long-term investments, we should expect

Economic Forecasting: Comparing the Fed with the Private Sector

By Amy Y. Guisinger, Michael T. Owyang and Hannah G. Shell



KEY TAKEAWAYS

- The Fed needs to forecast the U.S. economy to properly conduct monetary policy. Evidence suggests the Fed has generally been more accurate than private forecasters.
- · Economists offer several reasons why the Fed may have an advantage, including more timely access to economic data and knowledge about the path of future monetary policy.
- Evidence also suggests an erosion of the Federal Reserve's forecasting advantage.

Before the Federal Reserve can prop-erly conduct monetary policy, it must first evaluate the state of the economy. To that end, the Fed expends considerable resources in generating forecasts of macroeconomic variables, including the growth rate of gross domestic product (GDP), the inflation rate and the unemployment rate. Many of these forecasts are contained in the Greenbook (now called the Tealbook¹), which is distributed to members of the Federal Open Market Committee (FOMC) a few days prior to the meetings at which they set monetary policy.

Academics seem to have spent nearly as many resources studying the Fed forecasts as the Fed has spent creating them. One robust finding is that the Fed forecasts have been, on average, more accurate than many private sector forecasts.²

Why might the Fed have an advantage over the private sector forecasters? Three reasons are often cited:

- The Fed simply devotes more resources to forecasting or has better forecasters.
- The Fed has access to more timely information.

• The Fed knows about the path of future monetary policy, but the private sector does not.

Federal Reserve and Private Sector Forecasts

The Federal Reserve produces a number of different forecasts. One example is the Summary of Economic Projections, an anonymized survey of the Fed's Reserve bank presidents and the Board governors, which is commonly discussed in the media covering monetary policy.

The Greenbook forecasts, on the other hand, are produced by the Board of Governors staff. To construct the Greenbook forecasts, the board staff uses both econometric models and subjective assessments. Moreover, the Greenbook forecasts are constructed using a "suggested path" for monetary policy. (Economists call forecasts constructed in this manner "conditional" or "scenario" forecasts.) These forecasts do not necessarily reflect the opinions of any single member of the FOMC nor the FOMC as a whole, as they are calculated before the committee makes a decision on policy.

The Greenbook forecasts are made publicly available five years after the FOMC meeting for which they were constructed.³ Prior to the 1980s, the Greenbook forecasts were available monthly; after 1981, the Greenbook was produced only for FOMC meetings, which have changed their timing and frequency over the years. (Currently, the FOMC meets eight times a year.)

While the Greenbook includes a number of forecasts, academic research has typically concentrated on these three series:

- Output growth—GDP or gross national product (GNP) growth, depending on when the forecasts were made
- Inflation—The rate of change of the GNP or GDP deflator, the consumer price index (CPI) or the personal consumption expenditures price index, depending on when the forecasts were made
- Unemployment rate

Private sector forecasts are constructed by banks, firms and private forecasting consultants. One private sector forecast that many academic studies use is the Survey of Professional Forecasters (SPF) consensus forecast, which is constructed from a number of individual private sector forecasts.

In the late 1960s, the National Bureau of Economic Research and the American Statistical Association began collecting the individual forecasts that make up the SPF. The SPF was taken over by the Federal Reserve Bank of Philadelphia in 1990, at which point the collection of forecasts became publicly available.⁴ The survey is quarterly, meaning that the private sector forecasts do not always correspond in timing to the Greenbook forecasts produced by the Fed. The Federal Reserve Bank of Philadelphia aggregates the individual forecasts to form a consensus forecast, which is often taken to be a market representative forecast.

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Forecasting Inflation: The Fed's Greenbook vs. SPF



SOURCES: Federal Reserve, Federal Reserve Bank of Philadelphia and authors' calculations.

NOTES: The deflator is for either gross national product (GNP) or gross domestic product (GDP), depending on when the forecast was produced. This chart plots the actual deflators and the year-ahead deflator forecasts from the Survey of Professional Forecasters and the Greenbook whenever forecast releases occurred in the same month. Data start in the fourth quarter of 1968 and end in the fourth quarter of 2012.

Are Fed Forecasts Better than Private Sector Forecasts?

Given the volume of resources that the Fed devotes to forecasting, it is perhaps not surprising that academic studies have found Greenbook forecasts to dominate many private sector forecasts, including the consensus SPF forecast. In their 2000 study, economists Christina and David Romer compared the Greenbook's forecasts for the compounded annual rate of change in the GNP deflator, which is one measure of inflation, with the SPF consensus forecast for the period 1968 to 1991. (In 1991, the Greenbook switched from forecasting the GNP deflator to forecasting the GDP deflator.) The Romers found that the Fed, generally, was more accurate forecasting inflation than the private sector.

The accompanying figure plots the oneyear-ahead Greenbook forecasts for the change in the deflator for GNP and then GDP, the one-year-ahead SPF forecasts for the change in the GNP/GDP deflator, and the released value (third release) for the change in the GNP/GDP deflator over the period starting in the fourth quarter of 1968 and ending in the fourth quarter of 2012.⁵

Using only observations when there were Greenbook and SPF forecasts in the same month, we calculated that the Fed's forecasts are more accurate than the SPF's, with the mean squared error of the Greenbook forecast being 3.40 compared with 4.77 for the SPF forecast. The Romers' result extended to forecasts of output growth, but the results were neither as stark nor as robust.

Why Does the Fed Have a Forecasting Advantage?

There are a number of reasons why the Fed might have a forecasting advantage over the private sector. One reason—and the reason advanced by the Romers—is that the Fed simply devotes more time and resources to forecasting than does the private sector. While this might be reasonable on its face, it does not explain more recent findings that the Fed's forecasting advantage has appeared to decline over the years.⁶

A second reason is that the Fed has access to data in a more timely fashion than does the private sector. For example, the FOMC has access to the current value of industrial production before it is released to the public because the Fed constructs it. This informational advantage, however, lasts only a few days and is often dissipated by the time the private sector forecasts are collected. This explanation is discounted by studies, such as the one by the Romers, that argue that accounting for the possible discrepancy in the information set does not alter the Fed's apparent informational advantage.

A third reason stems from the fact that the Fed forecasts are made conditional on a path for future policy. If the Fed knows the monetary policy but the private sector does not, the Fed would have an informational advantage. This explanation could also account for the erosion of the Fed's advantage: The Fed has taken steps to increase transparency in recent years, thus giving the private sector more information about the likely path for policy. The Romers discounted this explanation, though, arguing that the Fed's apparent informational advantage shows up in short-term forecasts. Given that monetary policy is generally thought to be only effective at long and variable lags, the Romers argued that the Fed's forecasting advantage at short horizons suggests that knowing the path of policy is not the source.

After the Romers' article, studies published by economists Edward N. Gamber and Julie K. Smith as well as Federal Reserve Bank of San Francisco economist Pascal Paul, suggest that the Fed's forecasting advantage has eroded. Are any of these hypotheses consistent with a decline in the Fed's forecasting advantage? If the Fed's forecasting advantage is due to its knowledge of the future path of monetary policy, the Fed's increased communication and transparency that began in 1994 may have contributed to the private sector "catching up" with the Fed.

Gamber and Smith also argued that the nature of forecasting has changed over time. Since 1984, the volatility of many U.S. macroeconomic variables, including GDP and inflation, has declined. During the same period, economists have found that it has become harder to beat even the simplest forecasting models.⁷ In this sense, if the Fed's forecasting advantage stemmed from its devotion of more resources to forecasting than the private sector, but sophisticated models are no longer advantage to decline.

Julie K. Bennett, a research associate at the Bank, provided research assistance.

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ENDNOTES

¹ Prior to June 2010, the staff at the Board of Governors produced both the Greenbook and the Bluebook in preparation for FOMC meetings. In June 2010, the staff at the Board of Governors merged the content to form the Tealbook. For more information, see www.federalreserve.gov/monetarypolicy/fomc_ historical.htm.

(continued on Page 23)

Working from Home: More Americans Are Telecommuting

By Iris Arbogast, Charles S. Gascon and Andrew Spewak



KEY TAKEAWAYS

- The share of Americans who primarily work from home has risen in recent decades, from 0.7% of full-time employees in 1980 to 3% in 2017.
- The share of telecommuting workers differs among cities, and this appears to be due to variations in the mix of occupations.
- In 2017, the average worker who usually telecommutes drove more miles annually than the average worker who has to travel to a workplace.

Working from home takes many forms, from a technology worker operating out of a home office to a manager occasionally working away from the office. And the number of American employees who participate in this work arrangement has grown significantly since 1980.

The impact of this growth in telecommuting could have many potential impacts on the economy, including effects on traffic congestion and where households choose to locate. These effects could also be very different from city to city and for different demographics of employees. For example, the share of workers who telecommute can vary across ages, parental status, occupations and education levels, and by whether one lives in a metropolitan area.

In this article, we first focus on understanding the important drivers of telecommuting. We next answer the question: Who is likely to be a telecommuter? Finally, we discuss the implications for worker commutes and housing choices.

The Rise of Telecommuting

For our analysis, we use the decennial census and the Census Bureau's American

Community Survey (ACS), which ask respondents about how they usually commute to work.¹ In 2017, 3% of full-time workers answered that they primarily "worked at home" in response to this question.² This number omits work done at nonresidential settings, such as coffee shops or coworking spaces, and is thus likely a lower bound on the actual number of employees who work outside the traditional workplace.³

Furthermore, the share of employees who work from home just a few days per month is significantly higher than the share of people who primarily telecommute. For example, using data from the Federal Highway Administration's 2017 National Household Travel Survey (NHTS), we found that an additional 7% of full-time workers telecommuted four days or more per month.

According to the census data, about 500,000 full-time employees primarily worked from home in 1980, accounting for 0.7% of the workforce. By 2017, this number had increased to 3.4 million employees, or 3% of the workforce. The growth in telecommuting, however, is not linear. As depicted in Figure 1, the share of full-time employees working from home slowly increased until around 2005, after which growth accelerated.⁴

Key Drivers of Telecommuting

Technological advancement seems like the most obvious factor leading to the increased ability to work from home. However, we at least must consider the Figure 1

A Growing Share of U.S. Employees Working from Home



SOURCES: IPUMS USA and authors' calculations.

NOTES: The data are for full-time employees who usually work from home and for the period 1980 to 2017. The data exclude self-employed people.

possibility that other factors may also be at play.

Since 1980, the economy has experienced a considerable shift in employment away from manufacturing and production jobs and toward service sector jobs. Manual work is typically difficult to complete off-site, so it is not surprising that the share of workers who telecommute in production occupations and construction and extraction occupations is the lowest across all occupational groups (about 1% each in 2017). A shift in employment away from these and other jobs with a relatively low share of telecommuting would increase the overall telecommuting

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Figure 2

Percentage of Telecommuters in Metropolitan Statistical Areas, 2017



NOTE: The data are for full-time employees who usually work from home.

rate in the economy absent of any new technologies.

Similarly, 5% of workers in management, business and financial occupations and 4% of workers in sales and related occupations telecommuted in 2017. A shift toward jobs like these with a relatively high share of telecommuting would also increase the overall telecommuting rate, again even without any technological advancement.

Using a shift-share analysis, we backed out the effect of shifts in occupations away from jobs with a relatively low share of telecommuting and toward those with a relatively high share of telecommuting. We found that only about 2% of the growth in telecommuting since 1980 can be explained by occupational shifts. Technological advancement likely explains the rest.

Turning our attention to the regional level, Figure 2 shows the share of telecommuters in metropolitan statistical areas across the U.S. in 2017. Telecommuting shares range from below 1% in Houma, La., to nearly 9% in Boulder, Colo.

We analyzed the factors that explain why some areas have a higher rate of telecommuting compared with others. While occupation was not a key driver of national growth in working from home over time, we did find it important for explaining geographic variations in telecommuting. Once we controlled for income, a region's occupational mix was a significant predictor of the telecommuting share in metro areas.

To illustrate, in the four largest metro areas in the Eighth Federal Reserve District,⁵ St. Louis and Louisville, Ky., had telecommuting shares of 3.1% in 2017, followed by Little Rock, Ark., at 2.7% and Memphis, Tenn., at just below 2.2%.

Part of the differences in these telecommuting rates can be explained by the share of workers in management, business and financial occupations. For example, in St. Louis, 18.6% of workers are in these occupations, which tend to have a higher portion of employees working from home, while only 14.8% of workers are in these occupations in the Memphis metro area.

Looking toward the future, while telecommuting rates likely will continue to grow with further technological advancement, employees in some occupations may never be able to work from home. For example, there will always be a need to have someone physically in an elementary school classroom to ensure discipline, such as calming children when they're too loud. In 2017, specific occupations with a particularly low share of workers Once we controlled for income, a region's occupational mix was a significant predictor of the telecommuting share in metro areas. telecommuting included upholsterers, explosives workers, dentists and ambulance drivers.

Who Is Likely to Be a Telecommuter?

In addition to occupation, a worker's age and level of education and whether one has children or lives in a metro area are important in predicting the likelihood of someone telecommuting. As a worker's age increases from 25 to 40, the likelihood that the person telecommutes increases slightly, then remains stable through age 65. Moreover, workers with children under 5 in the house are about 14% more likely to telecommute. However, gender does not appear to impact telecommuting rates.

Worker education is an especially important determinant of telecommuting, as those with over 16 years of schooling (i.e., college educated) are 58% more likely to work from home, holding everything else constant. Location also seems to play a major role, specifically residence in a metropolitan area. Controlling for other factors, workers in metro areas are 74% more likely to telecommute than those in nonmetro areas.

When all these various effects are combined, they help explain why some people are much more likely to telecommute than others. To give an example, a college-educated 40-year-old with a young child and who works in sales in a large city is predicted as having a 5.2% chance of being a telecommuter. Meanwhile, a high schooleducated 20-year-old with no children and who works in production in a rural area is predicted as having a 0.03% chance of being someone who works from home. The key factors outlined above explain almost all the variation in telecommuting rates across regions of the country.

Implications of Increased Telecommuting

Typically, people choose where to live based on factors such as the commute time to work, housing prices and amenities like local schools, parks and restaurants. When workers have to commute five days per week, they likely will place great emphasis on living relatively close to where they work. However, now that the increase in the prevalence of telecommuting means that fewer people have to physically travel to work every day, people may place more emphasis on affordability, local amenities and other factors when deciding where to reside.

In an analysis of the NHTS, we found that the average worker who usually telecommutes drove almost 18,000 miles in 2017. Meanwhile, the average worker who typically has to travel to work at an office drove just under 15,000 miles in 2017. While we cannot infer causality from these results alone, these numbers do suggest that telecommuting has not eliminated driving time for most employees and could even increase it.

That may seem odd at first, but consider how the ability to telecommute impacts where people want to live. Imagine a group of workers who commute 40 minutes each day, five times a week, for a total of 200 minutes. If their employers give them the ability to work from home twice per week, they have to commute only three days per week.

Some workers would choose to stay exactly where they are and commute only 120 minutes per week. But the data suggest that some workers would actually choose to move farther away from their work location. After all, if they have to travel to work only three times per week, they may not mind a longer commute and may rather move farther out to where housing is often more affordable and amenities often better than in the city center. Even though people commute fewer times per week, their commute could be longer in this scenario, and they may need to travel further for other amenities, resulting in an increase in overall driving.

Conclusion

Although current trends suggest continued growth in telecommuting arrangements for employees, the implications for cities remain unclear. The impact on economic development could be very different from one region to the next due to factors such as relative differences in housing costs. Moreover, we need a better understanding of how workers value their commute: For example, is the total time spent commuting more important than the number of trips? Lastly, what will new technology bring? Autonomous vehicles could make commuting less inconvenient, reducing the desire to work from home, but they may also lead to congestion that could increase commute times. M

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ENDNOTES

- ¹ We access the data through IPUMS USA, a data set from the University of Minnesota that provides easily accessible, well-documented data on individual responses to the decennial census and ACS.
- ² We exclude self-employed workers from our analysis.
 ³ Working in these nonresidential settings is covered by the Telework Enhancement Act (2010), which defines telework as a "work flexibility arrangement under which an employee performs the duties and responsibilities of such employee's position, and other authorized activities, from an approved worksite other than the location from which the employee would oth-
- erwise work." However, the available data on the U.S.
 labor force focus on only people who work from home.
 ⁴ The sampling frequency changed from every 10 years to every single year beginning in 2005, so it is possible the growth rate began its acceleration prior to 2005 but after 2000
- ⁵ Headquartered in St. Louis, the Eighth Federal Reserve District includes all of Arkansas and parts of Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee.

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Moving In, Moving Out: The Migration **Pattern of the Eighth District**

By Sungki Hong and Hannah G. Shell



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KEY TAKEAWAYS

- Population growth is an important component of economic growth. Migration is one way that a community can increase its population.
- From 2013 to 2017, migration helped some metro areas in the Eighth District, but its overall effect on the population of the District states was relatively small.
- · During that time, the educational attainment and income of people moving into the District states were slightly lower than those of people leaving.

Population growth is an important component of economic growth. An increase in the population means more workers in the labor market. It also brings more potential customers for products and services. Moreover, a steady increase in the population helps maintain a healthy age structure between workers and retirees that is needed for a sustainable public pension system.

However, the U.S. population growth rate has been declining in recent years. Between 2017 and 2018, the population grew only 0.62%—the country's lowest growth rate in 80 years.¹

This slowdown in population growth could be a drag on overall economic growth and could cause firms to curtail expenditures on capital investment for future production. Some economists argue that an aging population contributes to a long period of low economic growth,

ABOUT THE AUTHORS

Migratory Flows for Select Metropolitan Statistical Areas in the Eighth District, 2013-2017



SOURCES: American Community Survey, Integrated Public Use Microdata Series (IPUMS) and authors' calculations.

more commonly referred to as secular stagnation.2

There are several factors that drive media focus on migration across countries

In this article, we provide an overview of the migration patterns of the Eighth Federal Reserve District³ from 2013 to 2017. We analyze migration patterns both into and out of select metropolitan statistical areas (MSAs) within the Eighth District and into and out of the states that make up the District as a whole. We also examine the demographics of individuals moving into and out of the District.

Measure of Migration

Individual migration data are calculated from the American Community Survey (ACS) five-year sample released in 2019, which covers 2013 to 2017. The five-year



ACS data are a 5% sample of the U.S. population, covering more individuals than the ACS's typical annual 1% sample. Microdata for the ACS are accessed from the Integrated Public Use Microdata Series (IPUMS). We define migration as movement to a different home within a state, between states or from abroad.

In our analysis, we first calculated the total migration flows of 10 select District MSAs.⁴ Next, we calculated the Eighth District's total migration flows and the demographics of those flows. For the purpose of this article, we looked at statelevel data for the District states (Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee) rather than the data for only the parts of those states that lie within the District's boundaries.

Migration by District MSA

The accompanying figure presents the migration patterns for the selected District MSAs. The figure shows the total population size in 2013 (on the right axis) and the average annual migration rate in and out of the MSAs between 2013 and 2017 (on the left axis).

Among these metros, the Clarksville, Tenn., MSA experienced the highest turnover rate between 2013 and 2017: Relative

population growth. Besides the natural birth and death rates, migration also plays an important role. Recent debates in the but tend to ignore migration at the state and county levels within the U.S.

https://research.stlouisfed.org/econ/hong Hannah G. Shell (right) is a senior research associate at the Federal Reserve Bank of St. Louis

Migration Flows by Demographics: The Eighth District States, Annual Averages for 2013-2017

	People Moving into District	People Moving out of District	Net Migration
Age			
Younger than 16	148,405	137,792	10,613
16-24	208,374	182,631	25,743
25-34	210,722	187,211	23,511
35-64	240,898	221,579	19,319
65+	59,052	57,051	2,001
Education			
High School or Less	459,023	397,981	61,042
Some College	153,948	147,360	6,588
College Plus	254,480	240,923	13,557
Median Wage and Salary Income	\$36,197	\$37,880	

SOURCES: American Community Survey, Integrated Public Use Microdata Series (IPUMS) and authors' calculations.

to its population size in 2013, 10.2% moved into the MSA annually on average, while 9.5% moved out.⁵ Meanwhile, the St. Louis MSA saw the smallest turnover in population, with 3.0% moving in and 3.2% moving out annually on average.

Both the Fayetteville, Ark., MSA and the Columbia, Mo., MSA benefited the most from the net influx from migrations. The average annual net increase from migration was equal to 2.5% and 2.3% of the 2013 population in these MSAs, respectively. For the rest of the MSAs, the inflows and outflows were roughly the same.

Migration by Demographics

With the individual-level data, we can decompose the migration flows by characteristics. (See accompanying table.) One important aspect to consider is age. As mentioned above, the age structure affects the economy through the channel of labor supply and consumption-saving decisions.

Using District states as the unit of analysis, we found that net migration into the District is positive, though it accounts for a very small fraction of the total population.

We then broke down migration flows into five different age groups: younger than 16, 16-24, 25-34, 35-64, and 65 and older. The age group of 35 to 64 had the largest annual migration average into and out of the District, while the 65-plus group had the smallest. We saw some differences in the annual migration averages across the age groups, but the net flows into and out of the District were mostly the same.

Next, we examined the migration pattern by level of education attained. We divided the sample into three groups: high school or less, some college, and college plus. We define high school or less as those whose last grade completed was 12 or less, some college as those with one to three years of higher education, and college plus as those with four years or more of higher education.

While net migration for all three education groups was positive, our analysis showed notable differences in inbound and outbound migration. Among people with some college or college plus, those moving in roughly equaled those moving out. For people with high school or less, however, those moving in noticeably outnumbered those moving out.

Finally, we looked at the migration by income groups, measuring income on the individual level by using wage and salary income earned in the year before migration (inflation-adjusted to 2017 values). We found that there was a difference between the income of people entering the District and the income of those leaving. The median income of people moving in was \$36,197, while the median income of people moving out of the District was \$37,880. This difference could be attributed to the education level of migrants (as mentioned above), since people with some college or college plus have higher income on average.

Conclusion

The size of the District's population did not change much due to migration between 2013 and 2017. Some MSAs, like Fayetteville and Columbia, benefited from the net migration.

Inbound and outbound migration flows exhibited different socio-economic characteristics. People lacking any college education made up a larger proportion of those moving into the District (52.9%) than those moving out (50.6%). Those moving out of the District also earned a slightly higher income than those moving into the District.

Devin L. Werner, a research associate at the Bank, provided research assistance.

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ENDNOTES

¹ See Frey.

- ² See the Economist.
- ³ Headquartered in St. Louis, the Eighth Federal Reserve District includes all of Arkansas and parts of Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee.
- ⁴ In this context, people who move from one residence to another within the same MSA are not counted since they are not migrating into or out of that metro area. Conversely, those who move from a residence outside the MSA to one inside of it (or vice versa) are counted, regardless of whether the migration occurs entirely within the Eighth District. For example, movement to Columbia, Mo., from Memphis, Tenn., would be counted as migration in the MSA-level analysis, but this movement would be excluded in the District-level analysis since that movement is neither into nor out of the District.
- ⁵ We use the annual 1% ACS for 2013 from IPUMS to calculate 2013 population data at the MSA level. It is likely that Clarksville's high migration rates as a percentage of its total population are due to its small size and proximity to a military base—Fort Campbell. Similarly high rates are also found in college towns: Columbia is home to the University of Missouri, and Fayetteville is home to the University of Arkansas.

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Financial Markets Signal Concern about U.S. Economic Growth

By Kevin L. Kliesen



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KEY TAKEAWAYS

- Economists look at many different indicators to assess the likelihood of a coming recession. For the U.S., some key indicators have been mixed.
- The combination of high uncertainty, an inverted yield curve and a pullback in manufacturing activity has often been an accurate predictor of recession.
- In contrast, consumer spending and hiring remain healthy. But if these two pillars of growth begin to crack, the likelihood of recession will rise further.

Financial markets, and some economists, are becoming increasingly concerned that the U.S. economy will soon slide into recession. To help insure against a further erosion in activity, the Federal Open Market Committee (FOMC) reduced its policy rate—the federal funds rate target range—at the conclusion of its July 30-31 meeting, and Federal Reserve Chair Jerome Powell hinted that further cuts may be forthcoming.

Similar concerns are shared abroad. Germany, Europe's locomotive, appears headed for a recession—a development likely to trigger another round of easing by the European Central Bank. Meanwhile, the powerhouse of Asia—China—has weakened mostly because of a tit-for-tat tariff war with the United States. The pace of growth in Canada and Mexico, the two largest U.S. trading partners, has slowed noticeably since 2016-17.

Accordingly, the key question for policymakers, as former Fed Chairman Alan Greenspan put it during the 1998 global

Probability of a Recession over the Next 12 Months

Using a Recession Probability Model Based on the Treasury Yield Curve



SOURCES: Federal Reserve Bank of New York and Haver Analytics.

NOTES: This model, produced by the Federal Reserve Bank of New York, uses the difference between 10-year and three-month Treasury rates to calculate the probability of a recession in the U.S. 12 months ahead. The data point for the month of August is the average through Aug. 16. Gray areas represent recessions as defined by the National Bureau of Economic Research.

financial crisis, is whether the U.S. can remain an oasis of prosperity while storms rage all around.¹

Mixed Signals

On July 1, the current business expansion, which began in June 2009, became the longest in recorded U.S. history. The economics profession generally does not believe that expansions die of old age. Instead, expansions usually end for wellknown causes—such as oil price shocks, a collapse in asset prices, or actions by monetary or fiscal policymakers. Often, it's not a single event that triggers a recession, but the accumulation of several shocks that tends to boost uncertainty about the economic outlook.

Economists and policymakers have known for decades that high levels of uncertainty can trigger changes in economic behavior that lead to slower growth. For example, consumers tend to increase precautionary saving and delay purchases of big-ticket items. Likewise, businesses postpone plans to expand their capital stock or slow their pace of hiring. Disruptions in the real economy also can adversely affect financial markets. All of these developments have occurred to some extent over the past year or more. The trade tussle between the U.S. and China, which exhibits few signs of ending, appears to be one key factor that explains the upsurge in uncertainty that has fueled an emerging global slowdown.

A yield curve inversion is another signal that markets expect weaker growth over the near term. Briefly, an inversion occurs when yields on long-term Treasury securities (e.g., the benchmark 10-year note) fall below yields on short-term securities (e.g., the three-month Treasury bill). The yield curve inversion itself is not the shock that causes the recession, but it is the market's response to other events—such as the trade tussle—that leads U.S. and global participants to shift monies from "risky" assets like stocks to "safe" assets like U.S. Treasury securities. And indeed, long-term interest rates have fallen precipitously.

As seen in the accompanying figure, the probability of a recession occurring over

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Kevin L. Kliesen is a business economist and research officer at the Federal Reserve Bank of St. Louis. His research interests include business economics, and monetary and fiscal policy analysis. He joined the St. Louis Fed in 1988. Read more about the author and his research at http://research.stlouisfed.org/econ/kliesen. the next 12 months was at a little more than 35% in mid-August, according to a model produced by the Federal Reserve Bank of New York. This model uses the measure of the yield curve noted above to predict recessions. However, there are other indicators not captured in the model to assess the likelihood of a coming recession.

Three key indicators that are sensitive to the state of the business cycle are housing construction, consumer spending and labor markets. Here there are mixed signals. Ominously, real residential fixed investment has declined for six consecutive quarters. However, other indicators such as home sales and homebuilder confidence levels do not show the same degree of deterioration. Indeed, many homebuilders continue to report that supply issues (lack of labor and available building lots) outweigh demand concerns.

By contrast, consumer confidence remains high, and individuals continue to spend at healthy rates. Over the first half of 2019, real personal consumption expenditures rose at about a 2.75% annual rate. Strong retail sales growth continued into July, setting the stage for solid growth in the third quarter. Consumer spending has been bolstered by strong growth of real after-tax incomes (up 3.5% over the past year) and healthy labor market conditions. Indeed, weekly initial claims for state unemployment insurance benefitsoften termed the labor market's canary in the coal mine-remain low and indicate firms are not reducing their workforce in a fashion that would be consistent with the early stages of a recession.

Although the perilous combination of high uncertainty, an inverted yield curve and a pullback in manufacturing activity has often been an accurate predictor of recession, healthy consumer spending and continued strong hiring by firms suggest that the economy is in good shape. However, if these two pillars of growth begin to crack, then the likelihood of recession will rise even more. Fortunately, inflation remains contained, giving the FOMC the room to reduce rates further if necessary.

Kathryn Bokun, a research associate at the Bank, provided research assistance.

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¹ See the remarks by Alan Greenspan at the Haas Annual Business Faculty Research Dialogue, University of California, Berkeley, Calif., on Sept. 4, 1998. www.federalreserve.gov/boarddocs/speeches/ 1998/19980904.htm.

ECONOMY AT A GLANCE Data as of Aug. 16, 2019.



the red line is the 10-year growth rate.









Rates on Federal Funds Futures on Selected Dates



Interest Rates



federal funds rate of 0.25% to 0.5%. The observations plotted since then are the midpoint of the range.





Average Land Values Across the Eighth District



On the web version of this issue, 11 more charts are available, with much of those charts' data specific to the Eighth District. Among the areas they cover are agriculture, commercial banking, housing permits, income and jobs. To see those charts, go to www.stlouisfed.org/ economyataglance.

Finance and Development *(continued from Page 13)*

to observe systematic differences in firm size. In particular, countries with better financial markets should then have relatively larger firms, even controlling for the overall level of economic development.

We examined the extent to which this is the case in Figure 3 by plotting the relation between the average size of manufacturing firms and the share of these firms that report finance to be a problem, as described above. To test the robustness of these results, statistical tests were done to estimate the effect that access to financial markets has on firm size while controlling for GDP per capita; our results were robust along this dimension.

We found that the share of firms that report access to finance as a problem is statistically significant in explaining cross-country differences in firm size. To illustrate the economic significance of this finding, consider a 10 percentage point increase in the share of firms that report access to finance to be a problem. Our findings suggest that such a difference in the share of firms with financial problems would then be associated with close to a five-worker decline in the average number of workers per firm across countries.

Conclusion

The findings documented in this article suggest that differences in financial market development are systematically associated with disparities in economic development. Access to firm-level microdata from the

Economic Forecasting (continued from Page 15)

- ² Accuracy is often measured by computing the average of the squared forecast error (the difference between the forecast and the realization) over a period of time. A lower value of the average of the squared forecast error indicates a higher level of accuracy.
- ³ The Greenbook forecasts that are publicly available can be found on the Federal Reserve Bank of Philadelphia's website, www.philadelphiafed.org/ research-and-data/real-time-center/greenbookdata/philadelphia-data-set.

Figure 3

The Relationship between Firm Size and Access to Credit



SOURCES: World Bank Enterprise Surveys, Penn World Tables and authors' calculations.

NOTES: Some countries are not shown because the size of the average firm is outside the range of 20 to 100 employees. Identified countries were selected to illustrate geographic diversity.

World Bank Enterprise Surveys allowed us to learn more about the underlying nature of this relationship.

In particular, we documented that distortions to long-term investments are a more likely channel through which financial underdevelopment may feed into economic underdevelopment. Moreover, we found evidence consistent with this possibility, as differences in the degree to which firms report difficulties accessing

finance are strongly correlated to differences in firm size.

(This article was published online Sept. 5.)

ENDNOTE

¹ These findings are available from the authors upon request.

- ⁴ The Survey of Professional Forecasters is available on the Federal Reserve Bank of Philadelphia's website, www.philadelphiafed.org/research-and-data/realtime-center/survey-of-professional-forecasters.
- ⁵ Both the Greenbook and the SPF changed their measure of the deflator forecasts two times during the sample period. In the start of the sample (1968-1991), the deflator was measured as the price index for GNP; from 1992 through 1995, it was the price index for GDP; and from 1996 onward it's the chain-weighted GDP price index.
- ⁶ See Gamber and Smith.
- ⁷ For example, a univariate autoregressive forecast (a forecast built using only lags of the variable being forecasted) is hard to beat when it comes to forecasting inflation post-1984.

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