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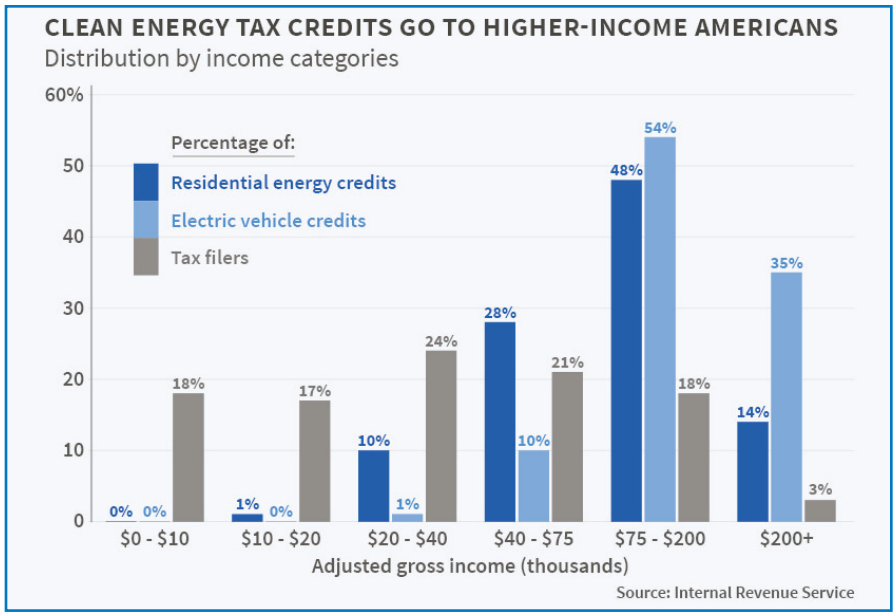
INSIDE THIS ISSUE

The Distributional Impact of Alternative Energy Incentives

In an effort to encourage households to adopt renewable energy technologies, most states subsidize renewable electricity as well as electric cars. The federal government has provided some $18 billion in tax credits to individuals since 2006. While distributional factors are only one of many considerations in the design of these programs, new research indicates that existing credits and subsidies have primarily benefited higher-income Americans.



In **The Private Net Benefits of Residential Solar PV: The Role of Electricity Tariffs, Tax Incentives, and Rebates** (NBER Working Paper No. 21342), Severin Borenstein analyzes residential electricity use data from 2007 to early 2014 for customers of Pacific Gas and Electric—the utility with the most residential solar customers in the United States. He examines incentives for installing residential solar photovoltaic (PV), which include direct payments, tax credits, and reduced electricity bills. The bill savings are determined in part by the residential electricity tariff design and by the crediting of solar production under "net energy metering."

He finds that solar installations are concentrated among the heaviest electricity-consuming households, probably because California's steeply tiered tariff structure—higher marginal electricity prices for higher-use households—gives such customers a larger incentive to reduce their electricity purchases than it does to their lower-consuming neighbors. On average, high-usage households are in higher income brackets than low-usage households. Further contributing to the disparity in benefits realized by high-use and low-use households is the tendency of smaller users to install larger solar systems than their consumption requires, which reduces their savings per kilowatt hour.

Borenstein's estimates suggest that the net value of installing solar PV was greater for the higher-income households that installed solar during most of the 2007–14 period. But since that time, the situation has begun to change. The California Solar Initiative subsidies ended in 2013, and the cost of solar PV panels has dropped significantly in the last 18 months. With current incentives for residential solar PV, including the benefits of accelerated depreciation on third-party-owned systems, which now account for over two-thirds of new residential installations, a far larger set of customers is benefiting than at the end of the sample studied here.

Considering the full cost, net present value calculations suggest that residential solar PV remains a fairly expensive source of electricity. That may become more important in California, as the tax credit is scheduled to decrease to 10 percent for businesses and to zero for individuals at the end of 2016. Increasing-block prices in California already have been reduced, with the highest

tier now about double the lowest, rather than about triple, as it averaged between 2007 and 2014. Proposed changes by the California Public Utilities Commission would compress the tiers further. Borenstein says his analysis demonstrates that electricity rate design has played a major role in creating incentives for residential solar adoption and in how those incentives are distributed across households of different incomes. He notes that the differentials he documents would have been largely absent under a flat rate structure.

Incentives for installing residential solar are not the only way government has attempted to promote residential "clean energy" investments. In a systematic assessment of federal income tax incentives, **The Distributional Effects of U.S. Clean Energy Tax Credits** (NBER Working Paper No. 21437), Borenstein and Lucas W. Davis find that on a national level, taxpayers in the top income quintile have received the majority of all such tax credits. (See graph on previous page.)

> Program designs, ranging from electricity-pricing strategies to rules defining eligibility for tax breaks, have given most clean-energy benefits to higher-income Americans.

The research finds that taxpayers with adjusted gross income in excess of $75,000 have received about 60 percent of all credit dollars aimed at energy-efficiency, residential solar, and hybrid vehicles, and about 90 percent of all credit dollars aimed at electric cars.

Based on comparisons to previous work on the distributional consequences of pricing greenhouse gas emissions, the authors conclude that tax credits are likely to be much less attractive on distributional grounds than market mechanisms to reduce the gases.

The authors also identify horizontal inequities in these programs, situations in which otherwise similar households are affected in different ways. These tax credits are non-refundable, so millions of mostly lower-income taxpayers are ineligible because they have no tax liability. From an efficiency perspective, there is nothing fundamentally different between filers with and without tax liability and from a distributional perspective this reduces both horizontal and vertical equity.

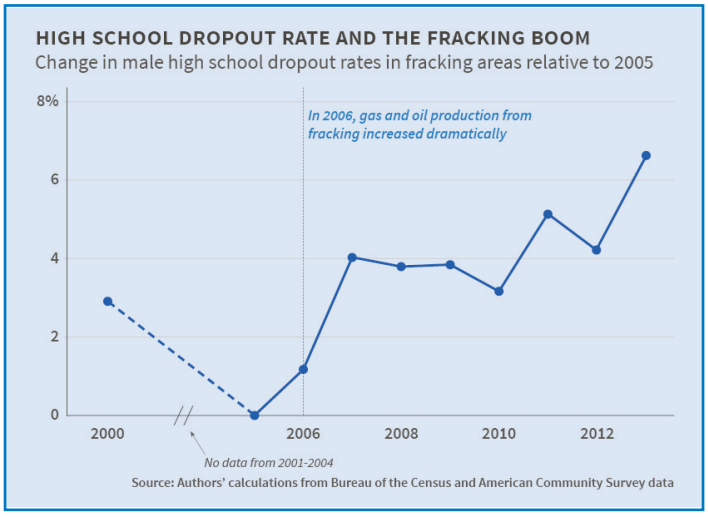
—Matt Nesvisky

Fracking, Tight Labor Markets, and High School Dropouts

A defining feature of the U.S. labor market since the 1970s has been a rising premium for skill. The disparity between the wages of high- and low-skill workers has increased in part because the economy has evolved in a way that has raised the relative demand for high-skill workers. But over the past decade, the advent of horizontal drilling and hydraulic fracturing has fueled a structural transformation of some local economies. In locations as diverse as North Dakota, Pennsylvania, and Texas, these technologies have sharply increased the demand for low-skill workers.

In **Who Needs a Fracking Education? The Educational Response to Low-Skill Biased Technological Change** (NBER Working Paper No. 21359), Elizabeth U. Cascio and Ayushi Narayan find that the new extraction technologies have raised local incomes, especially for low-skilled workers, while also increasing high school dropout rates among male teens. They take advantage of the timing of fracking's widespread introduction and of variation in shale oil and gas reserves across locations to document a correspondence between the rising dropout rate and the higher wages available to dropouts.

> New energy extraction technologies have increased local incomes, especially for low-skilled workers, while also raising high school dropout rates for young men.



The authors find that local labor demand shocks from fracking have been biased toward low-skilled workers and toward men, reducing the male return to high school completion. This lends empirical support to the notion that fracking represents low-skill-biased technological change. They also find that fracking has increased high school dropout rates of male teens, but not female teens. Absent fracking, they estimate that the male-female gap in high school dropout rates among 17- to 18-year-olds in the average area with fracking would have narrowed by about 11 percent between

2000 and 2013. Instead, it was unchanged.

The findings imply that there may be long-lived labor market consequences associated with energy-related economic booms. The decision to drop out of school could well be a rational one in the face of increases in the relative wages of low-skill workers. Nevertheless, the authors suggest that some students could be making a mistake by putting too much weight on the present, and that this may have implications for future productivity and the social safety net. By the end of their data sample, in 2013, even though the price of oil remained high, the labor demand from fracking also no longer appeared to favor dropouts. This suggests the possibility that the relatively large income benefits of fracking for high school dropouts were only temporary. Further work is needed to explore potential differences in the impact of skill-biased technological change on wage differentials and educational decisions at other points in the skill distribution.

—Les Picker

Cheap Talk, Round Numbers, and Signaling Behavior

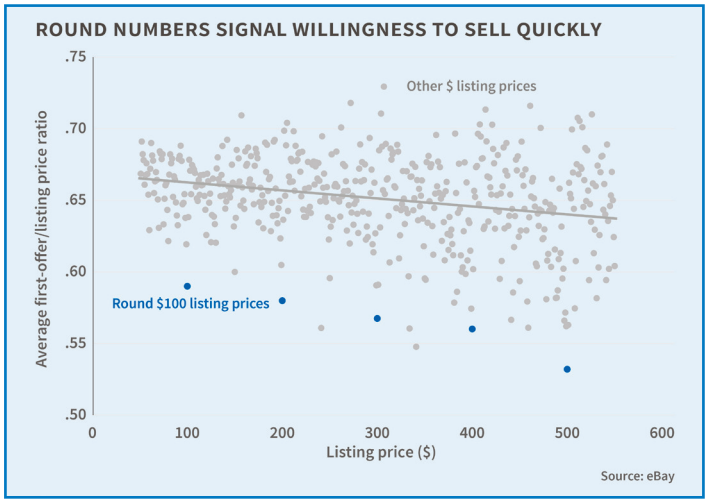
In the marketplace for ordinary goods, buyers and sellers have many characteristics that are hidden from each other. From the seller's perspective, it may be beneficial to reveal some of these characteristics. For example, a patient seller may want to signal unending willingness to wait in order to secure a good deal. At the same time, an impatient seller may want to signal a desire to sell a good quickly, albeit at a lower price.

This insight is at the heart of **Cheap Talk, Round Numbers, and the Economics of Negotiation** (NBER Working Paper No. 21285) by Matthew Backus, Thomas Blake, and Steven Tadelis. The authors show that sellers on eBay behave in a fashion that is consistent with using round numbers as signals of impatience.

The authors analyze data from eBay's bargaining platform using its collectibles category—coins, antiques, toys, memorabilia, and the like. The process is one of sequential offers not unlike haggling in an open-air market. A seller lists an initial price, to which buyers may make counteroffers, to which sellers may make counteroffers, and so on. If a price is agreed upon, the good sells. The authors analyze 10.5 million listed items, out of which 2.8 million received offers and 2.1 million ultimately sold. Their key finding is that items listed at multiples of $100 receive lower offers on average than items listed at nearby prices, ultimately selling for 5 to 8 percent less.

Items listed at multiples of $100 ultimately sold for 5 to 8 percent less than items with non-rounded prices, but received offers faster and were more likely to sell.

It is tempting to label such behavior a mistake. However, items listed at these round numbers receive offers 6 to 11 days sooner and are 3 to 5 percent more likely to sell than items listed at "precise" numbers. Furthermore, even experienced sellers frequently list items at round numbers, suggesting it is an equilibrium behavior best modeled by rationality rather than seller error. It appears that impatient sellers are able to signal their impatience and are happy to do it, even though it nets them a lower price.



One concern with the analysis is that round-number pricing might provide a signal about the good being sold, rather than the person or firm selling it. To address this issue, the authors use data on goods originally posted with prices in British pounds. These prices are automatically translated to U.S. dollars for the American market. Hence, the authors can test what happens when goods intended to be sold at round numbers are, in fact, sold at non-round numbers. This removes the round-number signal while holding the good's features constant. In this setting, they find that buyers of goods priced in non-round dollar amounts systematically realize higher prices, though the effect is not as a strong as that in their primary sample. This evidence indicates the round numbers themselves have a significant effect on bargaining outcomes.

The authors find additional evidence on the round-number phenomenon in the real estate market in Illinois from 1992 to 2002. This is a wholly different market than that for eBay collectibles, with much higher prices and with sellers typically receiving advice from professional listing agents. But here, too, there is evidence that round-number listings lead to lower sales prices. On average, homes listed at multiples of $50,000 sold for $600 less.

—Andrew Whitten

Upcoding: Evidence from Medicare on Risk Adjustment

In 2014, some 50 million Americans were covered by health insurance companies that received public subsidies for patients who were considered high health risks. The subsidies were introduced over the previous decade to dissuade insurance companies from cherry-picking the healthiest customers in order to minimize their claim exposure and maximize profits.

But in addressing one problem, did government agencies introduce the potential for a new one? Are insurance companies gaming the system by encouraging doctors to overstate their diagnoses in order to increase subsidies?

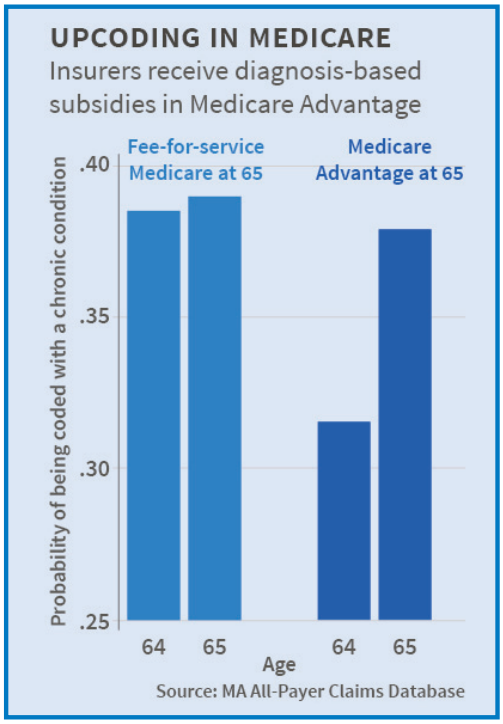
The evidence suggests that may be the case, according to Michael Geruso and Timothy Layton in **Upcoding: Evidence from Medicare on Squishy Risk Adjustment** (NBER Working Paper No. 21222).

The authors studied Medicare Advantage, the largest health insurance market in the United States in which the public subsidizes the premiums of customers likely to require costly medical care. Through the Advantage option, seniors enroll in a private insurance plan, such as a health maintenance organization or a preferred provider organization, instead of relying on the traditional fee-for-service system. The private plans generally offer lower out-of-pocket costs and additional benefits, such as vision and dental care. But with the savings comes a tradeoff: enrollees are limited to a designated list of health care providers.

Demand for Medicare Advantage plans increased sharply in the wake of the 2006 Medicare Modernization Act, which included a new prescription drug benefit. Geruso and Layton found that as private insurance plans increased their market penetration, the overall average risk scores for seniors increased for reasons that could not be explained by declining health or regional differences. Further, they concluded that the "coding inflation" correlated with how closely tied the doctors were to the insurance plan, with the risk scores for enrollees in physician-owned plans 16 percent higher than otherwise would be expected.

> As private insurance plans increased market penetration, risk scores for seniors increased for reasons not explained by declining health or regional differences.

Risk scores are based on an aggregation of a patient's medical diagnoses from the previous year. As coding is not an exact science, the process can be affected in subtle ways, such as how doctors' staffs are trained to interpret medical notes. By providing electronic forms pre-populated with the prior year's diagnoses, insurers can influence doctors to retain them. Further, an insurer might directly or through the doctor arrange annual checkups for enrollees with high risk scores so as to keep their diagnoses on the books. Finally, an insurer may directly compensate a doctor for more intense coding by risk adjusting the doctor's capitation payment, effectively tying the doctor's payment to the patient's diagnoses.



The researchers acknowledge that the costs of upcoding may be offset by the benefits to the patients of more attentive care, including visits to the patients' homes. However, they note, "regulators have expressed serious concern that such visits primarily serve to inflate risk scores."

Concerns about what would come to be known as upcoding became so pronounced by 2010 that the government began applying a deflator to risk scores. Without adjustment, upcoding in 2014 could have cost Medicare $10.5 billion or $640 per Medical Advantage enrollee. But even with adjustment, the authors estimate that upcoding still cost the public $2 billion last year, an average of $120 per enrollee. Since the deflator was applied uniformly, aggressive upcoders retained a larger share of their subsidies.

The authors note that upcoding may be distorting consumer choices, particularly in highly competitive markets. In such cases, insurers pass along a larger share of their subsidies to enrollees in the form of lower out-of-pocket costs and greater benefits. As a result, even more consumers enroll in Medicare Advantage, but their savings come at the expense of taxpayers as a whole.

The authors based their findings primarily on national Medicare statistics broken down on a county level. As a supplement, they analyzed data in Massachusetts in 2011–12. They focused on people who switched from employer-paid health plans to Medicare upon turning 65. The reported health status of those who selected Medicare Advantage appeared to "immediately and dramatically worsen" relative to that of consumers who elected the fee-for-service system. By drilling down to examine coding for particular conditions, the researchers found that the greatest differences occurred on the extensive margin. For example, a Medicare Advantage patient showing bor-

der-line signs of diabetes was more likely to be diagnosed with the disease.

In their conclusion, the authors recommend that risk subsidies be linked to more broadly based data, such as a multi-year look at patient history. They also call for study of other risk-adjusted markets, noting the spread of risk adjustment to health insurance marketplaces under the Affordable Care Act.

—Steve Maas

Ethnic Complementarities in Academic Collaborations

After decades of isolation, the Chinese under Vice Premier Deng Xiaoping's "Open Up" reforms sent thousands of college students abroad. Deng's goal was to close the education gap between China and the rest of the world that had been exacerbated by the Cultural Revolution.

The sudden influx of Chinese students to universities outside China offers an opportunity to test the "ethnic magnet" hypothesis, which posits that people who share cultural and linguistic backgrounds are likely to have a more powerful collaborative experience than those who do not.

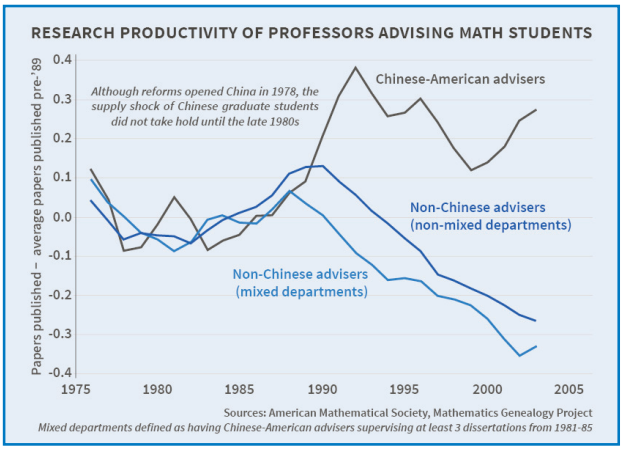
Ethnic Complementarities after the Opening of China: How Chinese Graduate Students Affected the Productivity of Their Advisors (NBER Working Paper No. 21096), by George J. Borjas, Kirk B. Doran, and Ying Shen, provides support for this hypothesis by studying the effect on the relative productivity of mathematics professors in the United States.

Using publication rates as a yardstick, the authors find that the productivity of advisers of Chinese heritage in mathematics departments increased as the result of the "supply shock" of Chinese students. These gains were almost exactly offset by a decline in productivity by non-Chinese professors in the same departments.

The authors assess the productivity of doctoral advisers before and after 1989, the year in which Chinese doctoral students became a significant presence in U.S. Ph.D. programs in mathematics. In order to ensure that the sample group includes only mathematicians who were already established prior to the Chinese influx, the sample group is restricted to professors who had published at least one paper before 1986.

The researchers culled data from the American Mathematical Society's listings of publications, the Mathematics Genealogy Project's records of adviser/advisee pairs, and the FamilyEducation.com listing of common Chinese surnames. They find that Chinese students gravitated toward Chinese-American professors. Those professors saw a slight increase in their mentoring load, but more importantly the mix of their students became markedly more Chinese.

> Rising numbers of Chinese graduate students raised the productivity of faculty with Chinese heritage and correspondingly reduced publications by the non-Chinese.



The authors find that pairing a Chinese student with a Chinese mentor increases the likelihood of a collaborative paper by 17 percent. In addition, such ethnic pairings also appear to increase the professors' non-collaborative work by stimulating them to tackle new avenues of research.

After the increase in the number of Chinese graduate students, Chinese-American professors increased their average annual production of research papers to 1.7 from a previous average of 1.5. Production by non-Chinese professors declined from an average of 1.4 papers per year to 1.3 during the same period.

That decline, the authors say, is related to the fact that the universities kept the overall number of doctoral slots in mathematics Ph.D. programs roughly constant despite the increased supply of well-qualified graduate students from abroad. The effect was to crowd out American students. With the Chinese students opting for Chinese professors, other faculty members had fewer advisees and consequently fewer opportunities to co-author papers. Furthermore, as their mentor load declined, those professors may have been assigned more administrative tasks, cutting into their research time.

The study found no significant differences among the Chinese-American and other professors when it came to the quality of their work, as measured by the number of times their papers were cited by other researchers. It also found that Chinese and non-Chinese students had similar careers after receiving their Ph.Ds.

The researchers conclude that American universities missed out on a singular opportunity to boost mathematical knowledge because, had they accepted more doctoral students in response to the increased supply of Chinese applicants, the gains of Chinese professors would not have come at the expense of non-Chinese faculty.

—Steve Maas

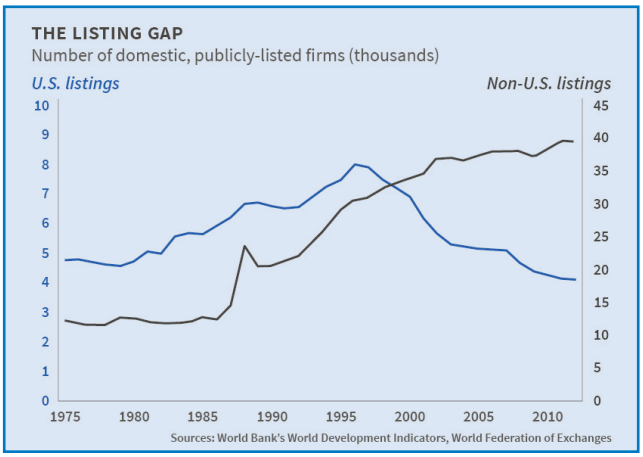
Why Are There So Few Public Companies in the U.S.?

One of the most important choices a firm must make is whether or not to sell shares to the public. This choice is influenced by many factors, including prevailing economic conditions, government regulations, firm characteristics, and listing requirements on the major stock exchanges. However, many aspects of this choice remain unknown. In **The U.S. Listing Gap** (NBER Working Paper No. 21181), Craig Doidge, G. Andrew Karolyi, and René M. Stulz investigate firms' decisions to list and delist on public exchanges.

The researchers examine the puzzling recent tendency for U.S. firms to avoid or withdraw from public status. Every year between 1996 and 2012 saw a decrease in the number of exchange-listed firms. The total number fell from 8,000 to 4,100 over this period, while the rest of the world saw an increase from 30,700 to 39,400. The authors dub the result the "U.S. listing gap" and seek to explain it. They show that the gap exists relative to previous trends in the U.S. as well as current trends in other countries with similar investor protection, economic growth, and wealth. Roughly half of the gap is due to an unusually small number of new lists; the other half is attributable to an unusually large number of delists.

The authors consider and reject a number of potential explanations for this pattern. It is not the case that the total number of U.S. firms (public or private) is falling; it is rising. Further, the gap cannot be explained as a consequence of the Sarbanes-Oxley Act or other regulations enacted in the early 2000s, as the trend was already well underway by that time. The authors also rule out changes in firm size and industry composition as explanations. The percentage of listed firms fell in all size groups and in 48 out of 49 industry classifications. The gap does not appear to be the result of changes in NASDAQ listing requirements in 1996, although there is a break in the relationship between the number of new startup firms and the number of new listings around that time. Absent this break, the authors calculate there would have been 9,000 more new lists in 1996–2012.

> The total number of listed companies fell from 8,000 to 4,100 from 1996 to 2012, while the rest of the world saw an increase from 30,700 to 39,400.



One factor that may explain the decline in listings is the unusually large number of mergers occurring in the U.S. after 1996. The authors estimate that had the U.S. maintained its historical merger rate, it would have retained 45 percent of the listings that disappeared after 1996. It remains a puzzle, though, why the merger rate increased in the U.S. during this period.

The authors note that it is not clear whether the listing gap is a reason for worry. While many research studies use the size of a nation's stock market as a proxy for financial sophistication, and find that this measure is correlated with economic growth, it is possible that private firms are replacing public firms in the U.S. because they are more efficient. This possibility would suggest the U.S. is entering an entirely new phase of development in which a shrinking stock market may indicate increased prospects for growth.

—Andrew Whitten

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