The **NBER** *Digest*

NATIONAL BUREAU OF ECONOMIC RESEARCH

January 2023

INSIDE THIS ISSUE

- Investors' Willingness to Pay for ESG Funds
- The Impact of NAACP Lawsuits on Racial Gaps in Teachers' Pay
- Privatizing Infrastructure: Evidence from Airports
- What Accounts for the Proliferation of Billion Dollar Startups?
- High-Speed Rail Enables Chinese to Avoid Unhealthy Environs

Health and Social Outcomes of Veterans Deployed in Combat Zones

In the two decades since US service members first deployed to Iraq and Afghanistan, the suicide rate for veterans, adjusted for age and gender, has risen nearly twice as quickly as that for nonveterans. Inflation-adjusted disability compensation per veteran has more than quintupled, reaching an average of $4,700 in 2021.

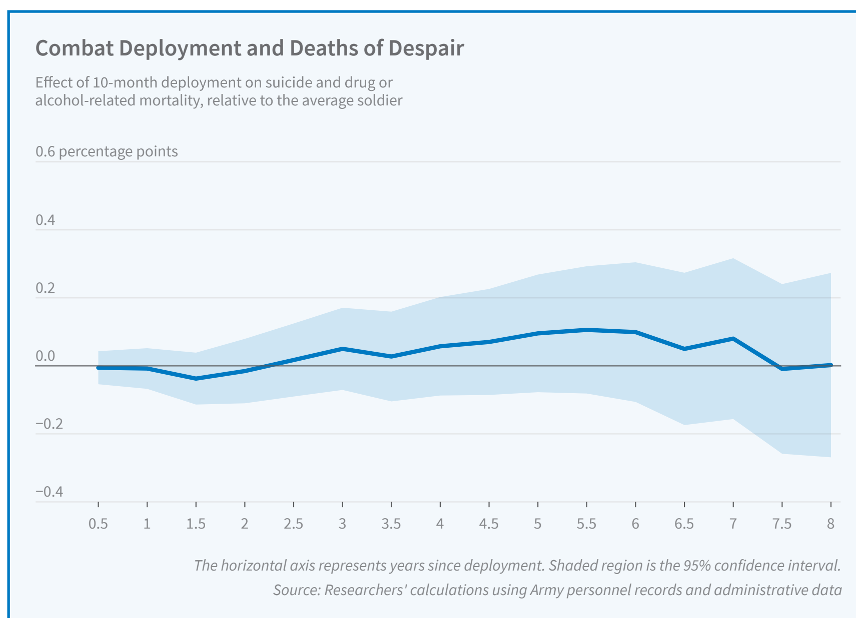
A new study using data on the cohorts of military recruits between 2001 and 2011 challenges the widely held belief that these developments, and other measures of decline in the long-term well-being of veterans, are due to combat deployment.

In The Effects of Combat Deployments on Veterans' Outcomes (NBER Working Paper 30622), Jesse M. Bruhn, Kyle Greenberg, Matthew Gudgeon, Evan K. Rose, and Yotam Shem-Tov find little evidence connecting hazardous combat exposure to post-deployment suicide, incarceration, or financial or educational status. They show that combat deployments cannot explain the recent rise in disability compensation or noncombat deaths. Instead, they attribute much of the increase in noncombat deaths among veterans to shifts in demographic and pre-service characteristics of soldiers, and point to policy changes as a possible driver of rising disability payments.

The study finds that a typical combat deployment of 10 months increases the likelihood of a veteran receiving disability payments eight years later by 9.4 percentage points. This is relative to a base of 37 percent for all veterans, and amounts to an annual payment increase of $2,602 (in 2021 dollars) per person.

The average combat deployment increases the likelihood that a soldier dies within eight years by 0.5 percentage points, or 30 percent. Of those deaths, 91 percent result from combat injuries. The study finds no statistically significant evidence that deployment results in an increase in deaths of despair, such as by suicide or through substance abuse, or that it affects misconduct, incarceration, or credit scores. Deployment appears to have a small positive effect on enrollment in college in the early post-deployment years, but that effect disappears within eight years and there is no discernible effect on the attainment of college degrees.

> A study finds little evidence to connect hazardous combat situations to post-deployment suicide, incarceration, or other outcomes.



The horizontal axis represents years since deployment. Shaded region is the 95% confidence interval.
Source: Researchers' calculations using Army personnel records and administrative data

Deployments in brigades that suffered high casualty rates are associated, as would be expected, with significant increases in disability payments and trauma, but are not tied to higher noncombat deaths or other adverse outcomes.

The researchers attempt to capture as many factors as possible that could explain the rapid rise in disability payments and the decline in veteran well-being. They combine information on deployment rates and combat intensity with data on age, race, sex,

standardized test scores, moral character waivers, marital status, and educational attainment at the time of assignment to assess the extent to which changes in these characteristics across cohorts can explain the concerning trends in veteran outcomes.

The researchers find that while increased combat exposure can explain part of the rise in disability for earlier cohorts, it cannot account for the continued rise in disability among post-2011 cohorts. The recent rise in disability likely stems from changes in the compensation system that expedited the claims process, reduced evidentiary standards, and better informed veterans about benefits. The researchers find that 32 percent of the variation in noncombat deaths across cohorts can be explained by observable demographic characteristics, or shifts in who is serving, rather than direct effects of combat.

— Steve Maas

Investors' Willingness to Pay for ESG Funds

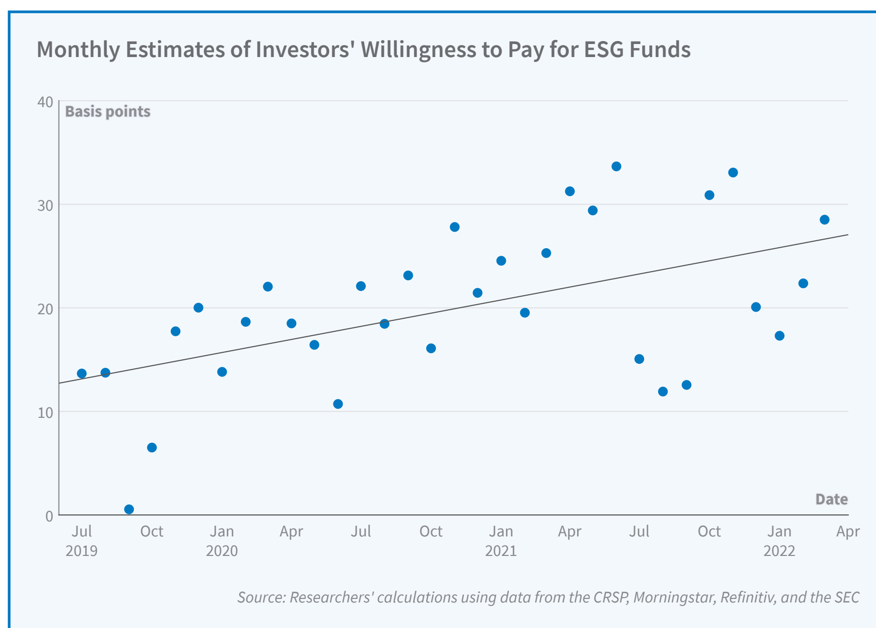
Between 2019 and 2022, the share of index funds with an environmental, social, and governance (ESG) mandate nearly doubled, from 3 percent to 5 percent. ESG mandates instruct funds to consider the environmental and social consequences of potential investments in addition to their expected financial returns. Many financial intermediaries, boards of directors, and corporate executives are acting as if their investors value ESG, but without quantifying the premium households are willing to pay.

In How Do Investors Value ESG? (NBER Working Paper 30708), Malcolm Baker, Mark Egan, and Suproteem Sarkar find that investors are willing to pay a premium to invest in index funds with ESG mandates. These funds track rules-based indices that resemble their non-ESG index counterparts, but that have been constructed to underweight or exclude the stocks of firms with low ESG ratings. Firms with high ESG ratings will correspondingly receive higher portfolio weight in ESG-screened funds.

The researchers compile data on fund assets, flows, and returns from the CRSP Mutual Fund database, and link this information with data on ESG mandates and ratings from Morningstar, Refinitiv, and fund prospectuses. They use these data to estimate investor demand for index funds, and in particular, whether an investor who has chosen to invest in a particular class of funds, such as US large-capitalization equities, opts for a fund with or without an ESG mandate.

The findings suggest that investors are willing to pay 20 basis points more per year in fees — 0.2 percent of their assets invested in the fund — to invest in an ESG rather than a non-ESG fund. This is likely to be an underestimate of their willingness to pay for ESG *stocks*, which are held in fund portfolios, since there is significant overlap between the stock holdings of ESG and non-ESG funds. On average, 68 percent of the stocks held by ESG funds are the same as the stocks held by matched non-ESG funds. Adjusting for this overlap, the researchers conclude that investors are willing to pay an extra 63 basis points to invest in ESG stocks. Willingness to pay is also higher in parts of the country and for employees in industries where concerns about climate are more salient. The fees charged by ESG funds, however, are only 5.9 basis points higher than those of non-ESG funds, suggesting that only a small proportion of investors' willingness to pay for ESG investments is captured by intermediaries in the form of higher fees.

> Mutual funds with environmental, social, and governance mandates are proliferating, and investors appear willing to pay a premium to invest in these funds.



The researchers consider two potential explanations for investors' higher willingness to pay for ESG funds. One is that this reflects a nonmonetary psychological or social preference for ESG investments; even if the financial returns are the same on ESG and non-ESG funds, or even lower on ESG funds, investors would still prefer to own them. The other explanation, one advanced by some institutional investors, is that investing in ESG funds is a win-win proposition in the sense that ESG funds can generate higher financial returns while also furthering social priorities. This second perspective could be justified if there is a shift over time toward sustainable business practices and preferences, and if

the higher future payoffs associated with these practices are not currently reflected in the share prices of firms that score highly on ESG metrics. The researchers test whether ESG funds generate higher financial returns than their non-ESG counterparts, but the limited length of their historical sample prevents them from drawing firm conclusions.

—Shakked Noy

The Impact of NAACP Lawsuits on Racial Gaps in Teachers' Pay

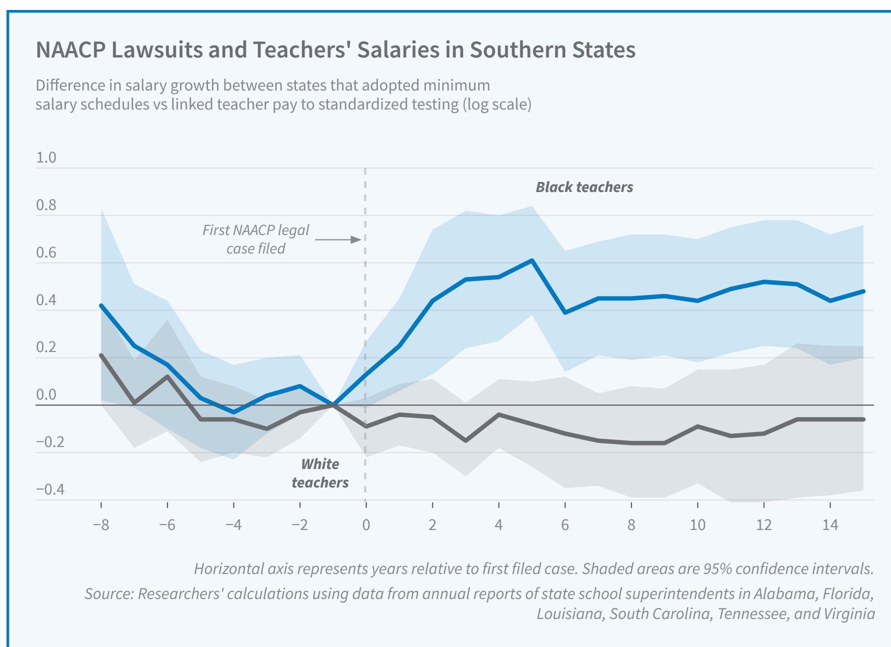
Between 1890 and 1950, public school systems in states of the deep South were racially segregated by law. Disenfranchisement of Black voters enabled White-dominated state and local governments to funnel substantially fewer resources to schools for Black students than to those for Whites. One consequence of this relative underinvestment was the emergence of a large pay gap between Black teachers, who worked in schools attended by Black students, and White teachers, who taught only in schools for Whites.

In 1936, the National Association for the Advancement of Colored People (NAACP) launched a series of lawsuits aimed at closing this race-based gap in teacher salaries. Many of the lawsuits were successful, and due to a combination of direct legal compulsion and the indirect threat of further legal action, several Southern states responded by reforming their teacher pay policies.

In Legal Activism, State Policy, and Racial Inequality in Teacher Salaries and Educational Attainment in the Mid-Century American South (NBER Working Paper 30631), Elizabeth Cascio and Ethan Lewis study the effects of these reforms on the teacher salary gap and the educational outcomes of Black children in affected school districts. They find that states that adopted objective minimum pay schedules for teachers largely eliminated racial gaps in salaries. On average, White teachers in these states were paid 60 percent more than Black teachers in the five years preceding the NAACP lawsuits. This gap narrowed to 2 percent in the decade after the suits. Moreover, the increase in Black teachers' salaries induced by the reforms was associated with an increase in the likelihood of Black students continuing from middle school to high school. The high school graduation rate of Black students was unaffected.

States that adopted universal minimum teacher salary schedules largely eliminated previously wide discrepancies in the compensation of White and Black teachers.

The researchers study six states affected by the NAACP lawsuits: Alabama, Louisiana, Tennessee, Virginia, Florida, and South Carolina. These states varied in their institutional responses to the lawsuits. The first four adopted top-down schedules of minimum teacher salaries, removing much of the pay-setting discretion of school districts and largely eliminating racial gaps in teacher salaries. Florida and South Carolina, in contrast, implemented policies linking teachers' pay to their scores on the National Teacher Examination, a large-scale standardized test. While superficially race neutral, these policies had a different impact: Black teachers tended to score lower on the test, so these policies did not do as much to narrow racial salary gaps. The average Black-White pay gap, more than a decade after these reforms, was 8 percent.



This policy variation across states, as well as heterogeneity in the impacts of the reforms across counties within states, allows the researchers to estimate the causal effects of changes in Black teachers' salaries on the educational outcomes of Black children. They draw on newly digitized data from school superintendents' statistical reports as well as information in the 1940 and 1960 censuses.

The researchers focus on two outcomes: students' continuation rates from middle school to high school, and high school completion rates. Their estimates suggest that a 10 percentage point reduction in the racial gap in teacher salaries reduced the racial gap in continuation from middle to high school by between 3.7 and 5 percentage points. In the four states adopting objective minimum pay schedules, the narrowing of the teacher salary gap can explain a third to half of the narrowing in the high school continuation gap between Black and White students, which fell

to 5 percentage points by 1960. By contrast, in Florida and South Carolina, where pay gaps remained, the gap in high school continuation rates was 11 percentage points in 1960. The convergence between White and Black continuation rates over the 1940–60 period was due both to an increase in continuation rates for Blacks and to a decline for Whites.

— Shakked Noy

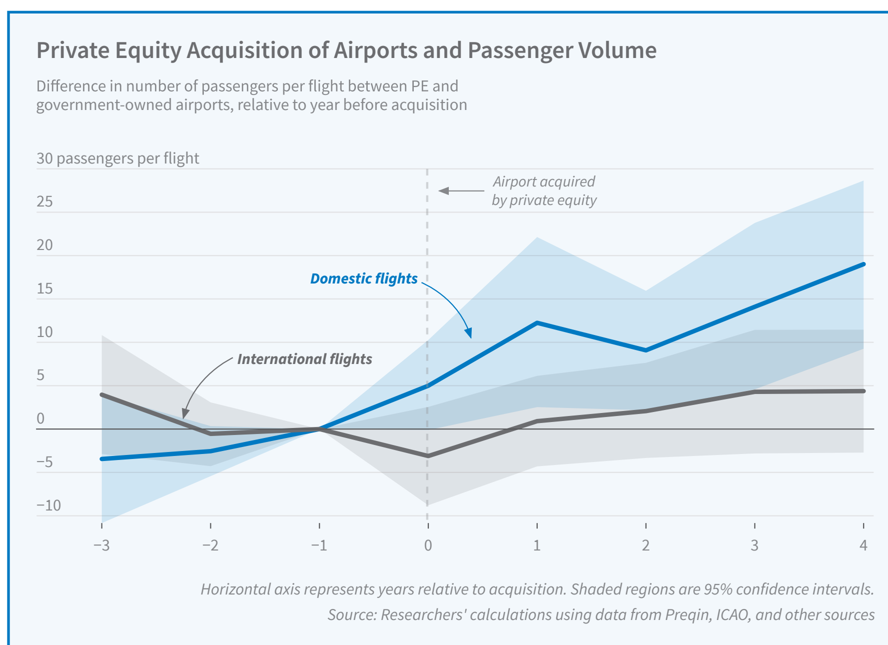
Privatizing Infrastructure: Evidence from Airports

Privately owned and operated airports are prominent examples of companies running traditionally public infrastructure. As of 2020, nearly 20 percent of the world's airports had been privatized. Private equity (PE), usually through dedicated infrastructure funds, is playing an increasing role in privatization, purchasing 102 airports out of a total of 437 that have ever been privatized.

> When private equity funds buy airports from governments, the number of airlines and routes served increases, operating income rises, and the customer experience improves.

In All Clear for Takeoff: Evidence from Airports on the Effects of Infrastructure Privatization (NBER Working Paper 30544), Sabrina T. Howell, Yeejin Jang, Hyeik Kim, and Michael S. Weisbach compare the performance of 2,444 airports in 217 countries under three types of ownership: public, PE, and non-PE private. They find that between 1996 and 2019, airports owned by PE funds improved their performance across many dimensions.

A key metric of airport efficiency is passengers per flight. The more customers an airport can serve with existing runways and gates, the more services it can deliver and the more earnings it can generate. When PE funds buy government-owned airports, the number of passengers per flight rises an average 20 percent. There's no such increase when non-PE private firms acquire an airport. Overall passenger traffic rises under both types of private ownership, but the rise at PE-owned airports, 84 percent, is four times greater than that at non-PE-owned private airports. Freight volumes and the number of flights, other measures of efficiency, show a similar pattern. Evidence from satellite image data indicates that PE owners increase terminal size and the number of gates. This capacity expansion helps enable the volume increases and points to the airport having been financially constrained under previous ownership.



After privatization, the number of airlines and routes served by airports increases. At airports acquired by non-PE private firms, there are pre-trends in these outcomes before privatization, suggesting that those airports were on track to experience improvement regardless of privatization. With regard to airlines, PE firms tend to attract new low-cost carriers to their airports, which in turn may lead to greater competition and offer consumers better service and lower prices. With regard to routes, PE acquirers increase the number of new routes, especially international routes, more than other buyers. International passengers are often the most profitable airport users, especially in developing countries.

A PE acquisition is also associated with a decline in flight cancellations and an increase in the likelihood of receiving a quality award. When an airport shifts from non-PE private to PE ownership, its odds of winning an award rise by 6 percentage points. The average chance of winning such an award is just 2 percent.

The fees that airports charge to airlines rise after airport privatizations. When the buyer is a PE firm, there is also a push to deregulate government limits on those fees. For example, after three Australian airports were privatized in the mid-1990s, the price caps governing airport revenues were replaced with a system of price monitoring that allows the government to step in if fees or revenues become excessive.

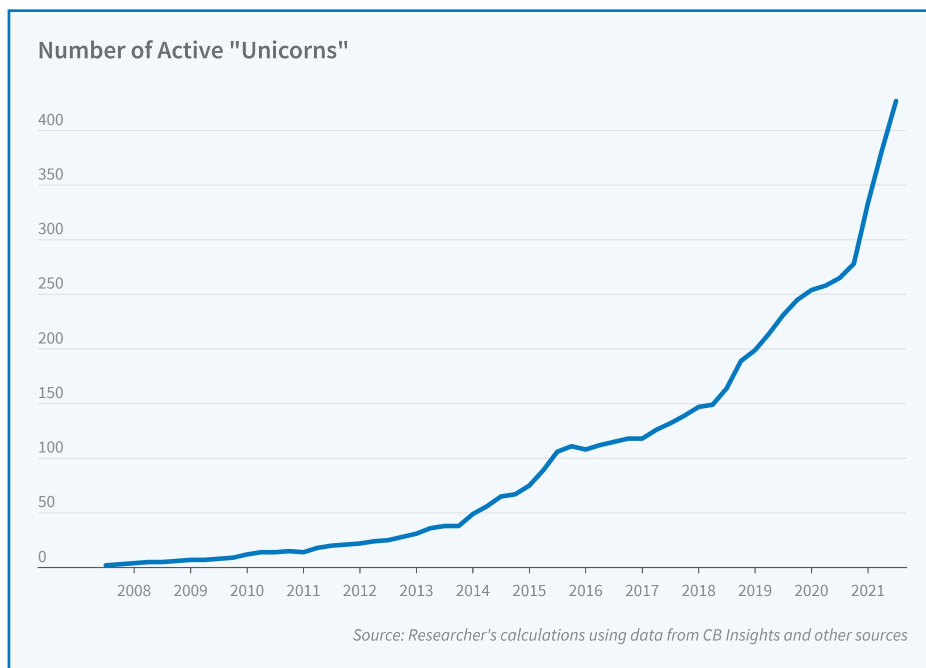
The net effect of a PE acquisition is a rough doubling of an airport's operating income, due mostly to higher revenues from airlines and retailers in the terminal rather than cost-cutting. The driving forces behind these improvements appear to be new management strategies, which likely includes greater compensation for managers, alongside investments in new capacity as well as better passenger services and technology.

— Laurent Belsie

What Accounts for the Proliferation of Billion Dollar Startups?

Unicorns — startup businesses that are valued at at least $1 billion before going public — essentially did not exist before the 2000s. Their numbers have recently surged. These firms break with the traditional startup trajectory by going public later and at valuations far above those of other startups. They also attract late-stage funding not from venture capitalists but from large institutional investors who are more patient, more open to raising the large sums necessary for the firm to keep growing, and more willing to allow company founders and initial shareholders to cash out before the initial public offering (IPO).

In The Unicorn Puzzle (NBER Working Paper 30604), Daria Davydova, Rüdiger Fahlenbrach, Leandro Sanz, and René M. Stulz find that of the 639 US startup firms that achieved $1 billion or more in valuations between 2000 and the third quarter of 2021, 427 remain active unicorns and 212 have exited. Among the exits, 137 went public, 110 through IPOs, 18 through special purpose acquisition companies, and 9 via direct listings. An additional 44 unicorns exited through mergers and acquisitions. Only 21 of the firms that reached unicorn status during the study period failed, either filing for bankruptcy or agreeing to a merger at a value below 25 percent of their unicorn round valuation.



Many of the unicorns in the sample are still private, but for those that have gone public, the returns to investors have been substantial. The researchers calculate the returns to investors who provided capital in the "unicorn round," when the firm was valued at close to $1 billion, for unicorns that have subsequently gone public.

Very valuable startup businesses are delaying initial public offerings and attracting institutional investors willing to fund their growth as private firms.

For these firms, which are clearly a select subsample, the average IPO share price was 3.7 times the price in the unicorn round, and the median realized return to investors was 1.6 times the coincident return on the S&P 500 stock index.

Compared to other startups, unicorns spend heavily on advertising, information technology, human capital, and customer relations. Three in five unicorns in the study's sample distribute their products via the internet, where network and scale effects are especially important.

There is concentration of unicorns across lines of business and geographically. More than a quarter of these companies are in the business products and services industry, a sector that accounts for only 6 percent of all publicly listed companies. Unicorns are also disproportionately likely to be headquartered in Silicon Valley.

In the traditional world of venture-financed startups, an IPO offers a firm access to public markets, which enables it to raise funds to grow and to use its publicly traded stock to buy other companies. IPOs also enable startup owners to diversify their holdings by selling shares.

Unicorns delay IPOs because the type of businesses they are in make it more expensive to go public early. Unicorn status also reduces the benefits of going public as it opens the door to more sources of funding besides venture funding.

The researchers present evidence that the costs of going public sooner are particularly high for unicorns. Going public requires disclosures that are costly for unicorns because of their business model, which relies heavily on organizational capital and network effects. Their intangible assets take time to build and can easily be expropriated by competitors at early stages of development. Therefore, they are easier to develop and protect when a company is private.

The period under study ended at the peak of a bull market, which boosted valuations and led to the creation of some unicorns. Although the rate of creation has dipped as stock market valuations have retreated, the rate of unicorn creation in the second quarter of 2022 was still higher than in any previous quarters except the first three of 2021, which supports the researchers' thesis that shifting business models are important factors in this trend.

— Laurent Belsie

High-Speed Rail Enables Chinese to Avoid Unhealthy Environs

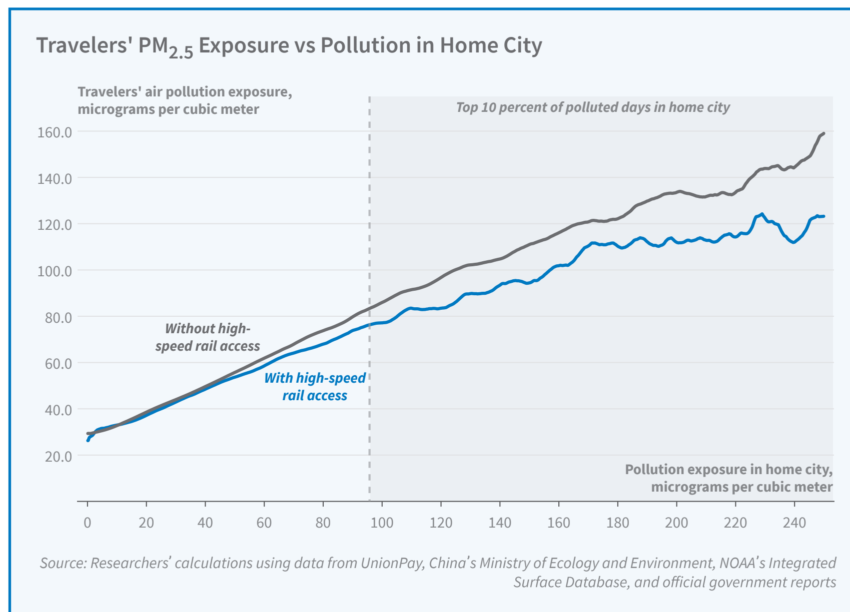
The social costs of climate change and local pollution depend crucially on the extent to which humans can adapt to extreme environmental conditions. Individuals can adapt in various ways to short-lived adverse environmental conditions, such as elevated air pollution levels. Some may remain indoors or avoid strenuous activities. Others may leave town when pollution is especially bad.

Over the past 15 years, China has built the largest high-speed rail network in the world, with tracks stretching twice the length of the networks in all other countries combined. Between 2010 and 2019, the annual number of passenger trips via the network rose from 290 million to 2.3 billion. One contributory factor has been "haze-avoidance tourism" — the use of short-term intercity travel to avoid extremes in pollution and temperature.

In Improved Transportation Networks Facilitate Adaptation to Pollution and Temperature Extremes (NBER Working Paper 30462), Panle Jia Barwick, Dave Donaldson, Shanjun Li, Yatang Lin, and Deyu Rao estimate the extent to which improved transportation infrastructure has reduced exposure to adverse environmental conditions. They draw on in-person credit and debit card transactions from UnionPay, China's only interbank payment network, to trace travel flows between pairs of cities on a daily basis. They match these data to localized meteorological and atmospheric records.

Access to high-speed rail allows travelers to reduce their exposure to air pollution by 7 percent and to extreme temperatures by 10 percent.

The researchers find that during periods of extreme environmental conditions, travelers from cities tied into the high-speed rail network are more likely to go to more hospitable destinations than those from cities without network access. The gap widens as hometown conditions deteriorate. Across all environmental conditions in the home city, access to high-speed rail reduces travelers' average exposure to air pollution by 7 percent and to extreme temperatures by 10 percent.



Source: Researchers' calculations using data from UnionPay, China's Ministry of Ecology and Environment, NOAA's Integrated Surface Database, and official government reports

Shifts in longer-term travel patterns, such as for vacations, account for 71 percent of reduced exposure to extreme pollution and 83 percent of reduced exposure to extreme temperatures. The remainder arises from day-to-day avoidance of unexpected environmental extremes. Passengers traveling relatively longer distances on high-speed rail account for 43 percent of reduced exposure to extreme pollution and 50 percent of reduced exposure to extreme temperatures in the dataset. The remaining effects are due to the greater access that high-speed rail provides to a wider choice of destinations with better environmental conditions, holding distance constant.

By reducing their exposure to adverse environmental conditions, Chinese city-dwellers are living longer and healthier lives. Based on the value of a statistical life for a Chinese traveler, the reduced exposure to air pollution made possible by increased access to high-speed rail translated into nationwide life expectancy gains worth about $2.2 billion in 2015, along with aggregate health savings of about $5 billion per year.

— Steve Maas

NBER

The National Bureau of Economic Research is a private nonprofit research organization founded in 1920 and devoted to conducting and disseminating nonpartisan economic research. Its officers are:

James M. Poterba—President and Chief Executive Officer
John Lipsky—Chair
Peter Blair Henry—Vice Chair
Robert Mednick —Treasurer

The NBER Digest summarizes selected Working Papers recently produced as part of the NBER's program of research. Working Papers are intended to make preliminary research results available to encourage discussion and suggestions for revision. Neither the Working Papers nor The Digest have been subject to peer review or review by the NBER Board of Directors.

The Digest is free. It is not copyrighted and may be reproduced with appropriate attribution of source. Please provide the NBER's Public Information Department (caradin@nber.org) with copies of anything reproduced.

Requests for Digest subscriptions, changes of address, and cancellations may be sent to Digest, NBER, 1050 Massachusetts Avenue, Cambridge, MA 02138-5398 (please include the current mailing label), or emailed to subs@nber.org. Print copies of the Digest are only mailed to subscribers in the US and Canada; those in other nations may request electronic subscriptions at www.nber.org/drsubscribe/.

Individual copies of NBER Working Papers are available online free of charge to affiliates of subscribing organizations, such as universities and colleges, and to employees of NBER corporate associates. All visitors to the NBER website receive three free downloads each year, after which there is a charge of $5 per downloaded paper. To place an order, please email the NBER's Subscriptions Department at subs@nber.org or call (617) 588-1405. A full subscription to the NBER Working Paper series entitles the subscriber to all new papers, recently more than 1,200 per year. The standard annual rate for a full digital subscription is $2,995; the online academic rate is $1,375. Partial subscriptions are also available; rates may be found at nber.org/wpsubscribe.html