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## Climate Change and Economic Growth over The Last Half Century

**I**n **Climate Change and Economic Growth: Evidence from the Last Half Century** (NBER Working Paper No. 14132), researchers **Melissa Dell, Benjamin Jones, and Benjamin Olken** use year-by-year fluctuations in temperature and precipitation over the past half century to examine how these variables affect aggregate economic activity. Using data for 136 countries over the period 1950 to 2003, the authors find that higher temperatures have large negative effects on growth – but only in poor countries. For such countries, the results suggest that a temperature increase of one degree Celsius for one year reduces economic growth by about 1.1 percentage points. Analysis of decade or longer climate shifts shows similar, substantially negative effects of higher temperature on growth in poor countries.

The researchers note that temperature could affect economic activity in poor countries in two ways: by influencing the level of output, for exam-

ple through crop yields, or by influencing the growth rate of output, for example by affecting investment or the

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“Higher temperatures have large negative effects on economic growth in poor countries.”

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institutions that influence productivity growth. Their results show persistent effects of temperature shocks, suggesting that higher temperatures reduce growth rates, not simply the level of output.

Underlying these aggregate effects, there is also evidence that higher temperatures substantially reduce agricultural output, industrial output, investment, innovation, and political stability. These broad ranging effects suggest the importance of various channels not usually considered in assessments of the potential impact of climate change, and help to explain how temperature might affect not simply the level of output, but also growth rates in poor countries.

These findings have implications for long-standing debates about the role of climate in economic develop-

ment, and for more recent debates about the possible impact of future climate change. By showing that changes in temperature have large effects on growth in poor countries, the authors demonstrate that climate is still relevant for economic development. Looking forward, they show that, even allowing for rapid adaptation to climatic change, the negative impacts of climate change on poor countries may be larger than previously thought. Overall, the findings suggest that future climate change may substantially widen income gaps between rich and poor countries.

— Matt Nesvisky

## The Causes of Rising Income Inequality

**I**t's one of the biggest socioeconomic questions in America today: why is income inequality rising in the United States, especially between the

top 10 percent of workers and everybody else? In **Controversies about the Rise of American Inequality: A Survey** (NBER Working Paper No.

13982), authors **Robert J. Gordon** and **Ian Dew-Becker** provide a comprehensive survey of seven aspects of rising inequality that are usually dis-

cussed separately: changes in labor's share of income; inequality at the bottom of the income distribution, including labor mobility; skill-biased technical change; inequality among high income groups; consumption inequality; geographical inequality; and international differences in the income distribution, particularly at the top.

They conclude that changes in labor's share of income play no role in rising inequality of labor income: by one measure, labor's income share was almost the same in 2007 as in 1950.

However, there are gender differences in income inequality: between 1979 and 2005, for example, the income gap between women working for the median wage (the 50th percentile) and low-earning women (at the 10th percentile) grew much more than it did for men at those income levels during the same period. That suggests that the decline in the real value of the minimum wage over that time played a causal role, the authors argue. That's not surprising, in one sense, since women are, roughly speaking, twice as likely to work for the minimum wage as men are.

If women were more affected by the minimum wage, men bore the brunt of the decline in unionization over the last three decades, the survey finds. One study the authors cite suggests that the fall in organized labor's share of the workforce can explain 14 percent of the rise in the variance among male wages between 1973 and 2001 (but it had no apparent effect on the variance of female wages).

There is little evidence on the effects of imports. And, the ambiguous literature on immigration implies a small overall impact on the wages of the average native-born American, a significant downward effect on the wages of high-school dropouts, and a potentially large impact on previous immigrants who work in occupations in which immigrants specialize.

The authors introduce two new issues, disparities in the growth of price indexes and in life expectancy

between the rich and the poor. "While the poor may do better when price indexes are corrected, they do much worse when their health outcomes are considered," the authors write. They cite evidence that between 1980 and 2000 the life expectancy of the bottom 10 percent of earners increased at only half the rate of the top 10 percent.

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"Changes in labor's share of income play no role in rising inequality of labor income: by one measure, labor's income share was almost the same in 2007 as in 1950."

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"This may be the most important single source of the increase in inequality in the United States, and it combines not only unequal access to medical care services and insurance, but also to differences in personal habits and environment related to education and income," the authors conclude.

The most controversial section of the survey looks at the question of why the rich have gotten so much richer. In a 2005 study, the authors found that the top 10 percent of earners saw their share of overall income rise from 27 percent in 1966 to 45 percent in 2001. But that study also documented that fully half of that increase came from the relative gains made at the very top of that spectrum—those at the 95th percentile and above. That study also distinguished between "superstars," whose incomes were market-driven, and CEOs, whose incomes were "chosen by their peers." In their new survey, the authors carve out a third group—high-income professionals, especially lawyers and investment bankers, whose pay is market-driven but who don't enjoy the benefits of "audience magnification," whereby the superstars can fill entire arenas or sell recordings to millions of people. Their point: income inequality is growing even among the top 10 percent of earners as the superstars and CEOs increase their pay faster than lawyers and investment bankers. But at least the pay of the superstars, lawyers, and investment bankers is market-driven. The pay of CEOs is not.

Their review of the CEO debate places equal emphasis on the market, in showering capital gains through stock options, and an arbitrary management-power hypothesis based on numerous non-market aspects of executive pay. "CEOs, through compensation committees and inbreeding of boards of directors, have a unique

ability to control their own compensation," the authors write. "Furthermore, if a director approves a higher compensation package, that may subsequently lead her to receive more compensation at her own firm."

They cite one study of 1,500 firms that found that the compensation earned by the top five corporate officers in 1993–5 equaled 5 percent of their firms' total profits during that period; by 2000–2, that ratio had more than doubled to 12.8 percent. The trend was caused in equal parts by arbitrary pay decisions by corporate boards and by the showering of stock options on CEOs, they conclude.

Furthermore, the survey cites a study showing "ample evidence that firms work to disguise the magnitude of CEO pay," such as lifetime health-care, below-market-rate loans, and above-market-rate loans when CEOs defer their compensation, to lessen shareholder outrage. Such research "is important because it tells shareholders what to expect and where their outrage constraint should be set," the authors write.

The U.S. skewing of pay at the very top contrasts with other countries, especially Japan. There, the income share of the top 0.1 percent peaked at 9.2 percent in 1938, reached stability of close to 2.0 percent after 1947, and ended up at 1.7 percent in 1998. Initially, America also saw an initial peak (8.2 percent in 1928) fall to a low (1.9 percent in 1973). But then the income share of America's top 0.1 percent rebounded (7.3 percent in 2000).

Canada and the United Kingdom mimicked the U.S. pattern, though their most recent upturns were less dramatic. France, like Japan, has seen the income share of its very top earners stay quite stable since the mid-1940s.

Why the disparity? America's CEOs have had their pay inflated by generous stock options and having their pay set by peers on corporate boards, the survey finds, as well as institutional differences between

the United States and other nations, including such things as regulations, unions, and social norms.

—Laurent Belsie

## Gasoline Prices Affect Fuel Economy

**I**n **How Do Gasoline Prices Affect Fleet Fuel Economy?** (NBER Working Paper No. 14450), authors **Shanjun Li, Roger von Haefen, and Christopher Timmins** rely on a unique dataset of passenger vehicle registrations in twenty U.S. Metropolitan Statistical Areas (MSAs) from 1997 to 2005 to study changes in the vehicle fleet and how gasoline prices may influence fleet composition choices. Gasoline prices can affect fleet fuel economy in two ways: by shifting purchases of new autos toward more fuel-efficient vehicles and by speeding up the scrapping of older, less fuel efficient vehicles.

The authors estimate that a 10 percent increase in gasoline prices from 2005 levels will generate a 0.22 percent increase in fleet fuel economy in the short run and a 2.04 percent increase in the long run — ten times the short-run effect. The \$4 per gallon gasoline prices observed in early 2008 could result in a sizable increase in fleet fuel economy — that is, an increase in average fleet miles per gallon, or MPG — of 3.27, or 14 percent,

relative to 2005. There also would be a large accompanying reduction in gasoline consumption if these high prices were to remain permanent.

The fleet fuel economy in the United States is currently the lowest among the industrialized nations and

political support for curbing U.S. fuel consumption has increased dramatically in recent years.

In the 1970s, record-high gasoline prices and government policies led to increases in fleet fuel economy that were partially undone by reced-

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is falling further behind. In 2002, the average fuel economy of the U.S. vehicle fleet was about 13 MPG below that of countries in the European Union and 21 MPG below that of Japan. Many policy instruments — such as increasing the federal gasoline tax, tightening Corporate Average Fuel Economy (CAFE) standards, subsidizing the purchase of fuel efficient vehicles such as hybrids, and taxing fuel-inefficient “gas guzzling” vehicles — purport to deal with the effects of gasoline consumption. With volatile gasoline prices and growing concern about global climate change, local air quality, and energy security,

ing gas prices in the 1980s and 1990s. The authors suggest that recent high gasoline prices could reverse these trends, resulting in the development and diffusion of fuel-saving technologies that could not be achieved politically through gasoline tax increases. The United States consumed 7.6 billion barrels of oil in 2006, roughly one-quarter of global production, with gasoline accounting for 44 percent of oil consumption. Therefore, how the U.S. passenger vehicle fleet responds to changes in gasoline prices may have important implications for climate change, local air pollution, and a host of other issues.

—Lester Picker

## Understanding Fertility within Developed Nations

**T**here's reason to hope that advanced nations facing demographic decline — such as Japan, Spain, and Italy — could see their populations rebound. A big catalyst for the change:

husbands beginning to do more housework and child care.

That's the surprising conclusion of **Will the Stork Return to Europe and Japan? Understanding Fertility**

**within Developed Nations** (NBER Working Paper No. 14114). Co-authors of the study, **Bruce Sacerdote, James Feyrer, and Ariel Stern** find that where men perform relatively more of those

chores — and where female labor-force participation was highest three decades ago — fertility rates rose from their historic lows. This male-driven rebound in child-bearing already appears to have happened in the United States, the Scandinavian countries, and the Netherlands. Other nations may follow suit as women gain more status in the workplace through better job opportunities and higher pay. “The increase in women’s status may eventually reverse fertility trends in Europe and Japan.... In particular, men in all high-income countries appear to be taking on a larger share of household duties, which could lead to a large positive increase in fertility,” they conclude.

This represents a dramatic reversal from initial stages of a demographic transition, in which fertility falls as women have higher relative wages outside the home. In the United States, for example, women in the 1950s and 1960s earned low wages (relative to men) outside the home and were expected to shoulder all the household and child-care duties. In 1955, American women averaged about 3.5 births apiece. But as more women entered the workforce and their job opportunities and pay rose, so did the opportunity cost of staying at home. Fertility plunged. By the 1980s, the U.S. fertility rate had fallen by nearly half from its mid-1950s level — to 1.8 births per woman.

The rest of the developed world shared the same pattern. By 2005, total fertility rates were as low as 1.3 children per woman in Italy, Spain, Germany, and Japan — far beneath the population’s replacement rate of 2.1 children. “The last 30 years have witnessed a social change unprecedented in human history: a variety of high-income nations have experienced fertility

declines so large that these countries are far below replacement-level fertility,” the authors write. “While other cultures have had brief episodes of less-than-replacement-level fertility, this is the first time in recorded history that large populations with high and growing per capita income have failed to reproduce themselves over an extended period of time.”

But some nations have seen a rebound, even as women’s pay and job

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opportunities continued to grow and began to rival those of men. The authors surmise that with increased household bargaining power, which comes from more equal wages, women are able to push some (though not necessarily half) of household and childcare duties onto men. This, in turn, removes some of the disincentives to having more children. By 1995, for example, the U.S. fertility rate had recovered from its 1980s lows to roughly replacement levels.

This change in women’s status is not just correlated with higher fertility, the authors contend — it drives it. Other potential fertility drivers, such as population density and housing prices, don’t appear to matter much, they find. However, government policies that ease the burden of childcare — such as tax breaks for families with children and publicly provided day care — do appear to play a role. France is widely credited with boosting childbearing from 1.7 births per woman in 1995 to 1.9 births today by boosting per-child subsidies 70 percent in real terms from 1980 to 2000.

“However, given the large cost of raising a child in wealthy, modern societies, it is somewhat hard to believe that the current subsidy levels can make a significant impact,” the authors conclude. Peer effects may multiply the modest fertility effects of social programs because people tend to do what they see their friends and families doing. Also, even a small boost in fertility could convince societies and businesses to create more family-friendly programs and

incentives, further boosting the number of births.

Such findings could have ramifications beyond Europe. Asian nations undergoing development are seeing their fertility rates fall even further and faster than the West did. Women in South Korea, Singapore, and Hong Kong average fewer than 1.5 children. “A massive convergence in national fertility rates is leading to a world that looks very much like the low-fertility European countries in terms of the number of children per woman,” the authors conclude. “The social structure in these countries and the division of child care has led women to choose to have fewer children than did their mothers, but we see no reason why these social factors cannot also work in the other direction and lead to future increases in fertility. However, we readily confess that much remains to be learned about the effects of men’s and women’s allocation of childcare and household responsibilities and about the effects of pro-family government subsidies on changes in fertility rates.”

— Laurent Belsie

## Happiness Is More Evenly Distributed Among Americans

Despite robust economic growth over the past three decades,

Americans do not report being any happier today than they were thirty years

ago. Yet in **Happiness Inequality in the United States** (NBER Working

Paper No. 14220), **Betsey Stevenson and Justin Wolfers** find that happiness is more evenly distributed among Americans—in other words, the happiness gap has narrowed. Examining data for 1972 to 2006, Stevenson and Wolfers find that two-thirds of the black-white happiness gap has disappeared, and the male-female gap has vanished entirely—and may have even reversed. However, paralleling changes in the income distribution, differences in happiness by education have widened substantially.

Stevenson and Wolfers analyze data from the General Social Survey, which was administered annually until 1994 to a nationally representative sample of about 1,500 respondents and continues biannually with samples of about 3,000 respondents. The survey asks: “Taken all together, how would you say things are these days—would you say that you are very happy, happy, or not too happy?” Examining the data decade by decade, the authors show that the decline in happiness inequality occurred during the 1970s and the 1980s with fewer people reporting that they were “not too happy” and a counterbalancing decline in the percent of people reporting that they were “very happy.”

The decline in happiness inequality ceased, and around one third of it was undone, in the 1990s and the first half of the 2000s as happiness inequality rose during the period.

In contrast, income inequality rose sharply in the 1980s throughout the income distribution, with further growth occurring at the top of the income distribution in the 1990s and 2000s. The broad changes in happiness inequality are not consistent with the observed changes in income inequality, but Stevenson and Wolfers show that change in the distribution of hap-

is the fact that the gap in average happiness between whites and non-whites has largely been eroded as happiness has risen among non-whites and fallen slightly for whites. Whites, however, remain happier on average than non-whites, a fact that is largely explained by their higher educational attainment. Turning to gender, the authors show that gender inequality in happiness has

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“Between 1972 and 2006, two-thirds of the black-white happiness gap disappeared, and the male-female gap vanished entirely.”

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piness across educational groups *is* consistent with observed patterns of wage inequality. Happiness has risen among college graduates, fallen among those with some college, and fallen even more sharply among those with a high school degree or less.

The authors decompose the decrease in happiness inequality into the proportion that was driven by a fall in inequality within groups versus that stemming from changes in inequality between groups. This decomposition reveals that much of the decline in happiness inequality occurred within demographic groups and, as such, is not explained by the differences in happiness stemming from observable characteristics such as age, education, race, gender, or marital status.

However, the authors do highlight some important changes in the distribution of happiness between demographic groups. Perhaps most striking

decreased. Looking at men and women separately, the authors also show that happiness inequality for both men and women narrowed in the 1980s and 1990s, then widened in the 2000s. Finally, the authors show that happiness inequality across age groups has narrowed over time. The average happiness of prime age and older Americans has fallen over time, while the average happiness of the young has stayed the same. Because average happiness typically rises with age, these patterns have meant a reduction in inequality between age groups. The authors note too that the dispersion of happiness also increases with age, with greater differences in happiness among older Americans. These patterns parallel the variance in both income and consumption by age. However, these differences in happiness have narrowed over the past 35 years.

## Gold Standard Does Not Always Bring Credibility

Adopting a new gold standard, or some other hard currency peg, is often touted as a good way for poor, developing nations to attract foreign investors. But if the last era of globalization is any guide, the benefits of doing so are nil. Rather than a “good house-keeping seal of approval,” adoption of a gold standard by the poorest developing countries a century ago served as a “thin

film” of credibility—and foreign investors often saw through such maneuvers, according to **Niall Ferguson and Moritz Schularick** writing in **The “Thin Film of Gold”: Monetary Rules and Policy Credibility in Developing Countries** (NBER Working Paper No. 13918).

This study challenges research over the past decade that has suggested that, prior to World War I, the gold standard

helped nations who adopted it because they could borrow money at lower interest rates than countries that didn’t use the standard. By examining interest rates and economic control variables for 57 countries from 1880 through 1913 (more than twice the number of countries examined in previous studies), the authors found that while developed nations did see a benefit from adopting

the gold standard, developing nations did not. “History shows that monetary policy rules are no short-cut to credibility in situations where vulnerability to economic and political shocks, not time-inconsistency, are overarching concerns for investors,” they conclude.

In the late nineteenth and early twentieth centuries, the world saw a spate of globalization that in some ways rivals today’s global capital flows. By 1913, foreign investments in Argentina, Chile, and South Africa stood at around 200 percent of those nations’ gross domestic product (and at 100 percent or more for the GDPs of Brazil, Mexico, Egypt, and Malaysia), roughly twice the levels of today. Some 40 percent of Britain’s capital flows between 1880 and 1913 went to countries other than the comparatively rich settler economies. Today, only 10 to 15 percent of global capital market flows go to less developed nations.

Some researchers have looked at that period and concluded that adhering to such a strict monetary rule as the gold standard allowed nations to lower their risk premiums by up to 40 basis points. Other studies found that fiscal policy and economic fundamentals played the key role, not the gold standard. Looking at a wider dataset—34 independent countries and 23 British colonies—and using a wide variety of assumptions and regressions, Ferguson and Schularick found a more nuanced answer. The colonies received lower interest rates based

on their links to Britain, not their fiscal condition or adherence to the gold standard. The remaining 16 relatively developed countries saw a reduction in risk

“...Monetary policy rules are no short-cut to credibility in situations where vulnerability to economic and political shocks, not time-inconsistency, are overarching concerns for investors.”

premiums of up to 50 basis points when they had a gold standard. But the 22 less developed countries from Eastern Europe, Latin America, and Asia saw no such benefit, no matter which of the several regression measures the authors used.

It’s even questionable that adherence to the gold standard was really the key to lower interest rates for the developed nations, the authors write. Instead, other factors were at work, they suggest. For example, these nations “were twice as open, they traded about twice as much with other gold standard countries, their exports were less dominated by primary products, and they were better integrated into world markets as measured by their considerably smaller shipping distances from London. Their income levels, in other words, can be seen as a proxy for a number of other characteristics that were likely to bolster market confidence in their long-run commitments to gold.”

By contrast, poor developing countries could make the commitment to gold but didn’t necessarily have the

credibility to convince lenders that they would stick with it. Investors of that time focused instead on the nations’ vulnerability to the ups and downs in

world agricultural markets, global trade, and world economic growth.

Another reason poor countries didn’t get better lending terms was the political risk involved. “[T]he credibility gains through gold standard adoption may have been low in poor countries simply because political instability was high,” the authors write. “[W]here the political and social fabric of a country is still crisis-prone, its monetary regime is likely to be a second-order concern for the market.”

They conclude: “In the last era of globalization, as today, investors priced country risk on the basis of a complex mixture of economic fundamentals and political factors such as colonial status.... The key historical lesson from the ‘natural experiment’ of the gold standard era is that in the poor periphery—where policy credibility is a particularly acute problem—rule-bound monetary policy did not result in credibility gains.”

—Laurent Belsie

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