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The Jack Rabbit of Depression, or Do economic slumps benefit environment? Jesse H. Ausubel and Paul E. Waggoner ¹

We are accustomed to the idea that growth consumes resources and endangers nature. Conversely, the present economic slump made us wonder could poorer be cleaner?

We considered two sources of atmospheric concern, carbon dioxide and sulfur dioxide emissions from coal, oil, and gas, for two periods of economic decline, the Great Depression and the Recession that followed World War II. We found for the United States in these two cases that neither economic crisis caused a lasting change in the pattern of emissions.

First note the overall pattern of economic growth and emission from 1900-2007 (Figure 1). Since 1900, Gross Domestic Product (GDP), the combination of population and affluence (measured as GDP per capita), has multiplied steadily except for the switchbacks of the Depression and post—War Recession.

Meanwhile, energy use and carbon dioxide emissions gradually loosened their coupling to GDP, so that an increment of GDP in 2007 elicited a smaller increment of energy or carbon dioxide than 50 or 100 years earlier. Sulfur dioxide has uncoupled. Sulfur dioxide emissions chart a century-long arc, a classic case of a “Kuznets curve” in which environmental damage first grows with GDP and then symmetrically declines. An increment of GDP now seems to evoke a decrement of sulfur dioxide.

Zooming into the period 1920-1940 provides detailed evidence of the environmental effect of poor economic performance on both consumers and producers of energy (Figure 2). Energy use intensity relates energy consumption to GDP and summarizes the behavior of consumers, while emission per energy use summarizes the performance of producers. As consumer grew more affluent from 1920 to 1929 they beneficially reduced energy intensity, a case of the dematerialization that usually accompanies a good becoming less of a luxury and more like a staple. During 1929-1930 American consumers reversed their energy intensity to the level of 1924, as income fell much more than energy use. From 1930 to 1932, energy use fell even more than affluence, lowering energy intensity. Trends in affluence and energy intensity

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then reversed themselves until 1935. Finally in 1935, intensity of use resumed its beneficial dematerialization while affluence grew.

Meanwhile, the line for carbon emission per energy of producers moved even more erratically during 1920-1940. As affluence grew from 1920 to 1929, the line zigzagged around a favorable direction of decarbonization. Then, when Depression reversed affluence, carbon emission per energy not only lost the gains of the Roaring Twenties but rose in 1933 to 1.3 times the 1920 level. The erratic movements may indicate patchy reversion to use of coal rather than the newer cleaner fuels, oil and gas. Reversion to wood if included in the calculus would raise the carbon emission per energy even higher. By 1937 US carbon emission per energy had recovered the 1929 level. The sulfur emission path for both consumers and producers circles back less jaggedly. By 1940, both consumers and producers attained some of the progress that seemed programmed into the energy system earlier, having lost perhaps a decade in Jack Rabbit behavior. The suffering of the Great Depression bought no special environmental benefits in carbon and sulfur emission. With fewer zigs and zags, the story of the post-War Recession resembles the Great Depression.

Viewed over the span of a century, trends in sulfur dioxide and carbon dioxide emissions appear little changed by economic slumps. While a slump may depress consumption, it also may depress spending and investments that increase conservation and efficiency. A few years' progress may be lost in the chaos, but mainly the system seems to absorb the shocks and resume its long-term pattern. If affluence now recedes, carbon dioxide emissions will likely drop in the short-term but their uncoupling will take many more decades. The 20th century USA experience suggests that, environmentally, we have little to fear but not much to hope from the incipient depression.

Figure 1: Century-long multiples of emissions, energy use, and population plus affluence (GDP) for the United States.

The economic slumps of the Great Depression and post-War Recession appear as switchbacks that do not fundamentally change trajectories.

Data Sources: U.S. Census Bureau. 1975. Historical Statistics of the U.S. and various years Statistical Abstract of the U.S.; Energy Information Agency, various years; Carbon Dioxide Information Analysis Center. 2008; and U. S. Environmental Protection Agency. 1985 and 2008.

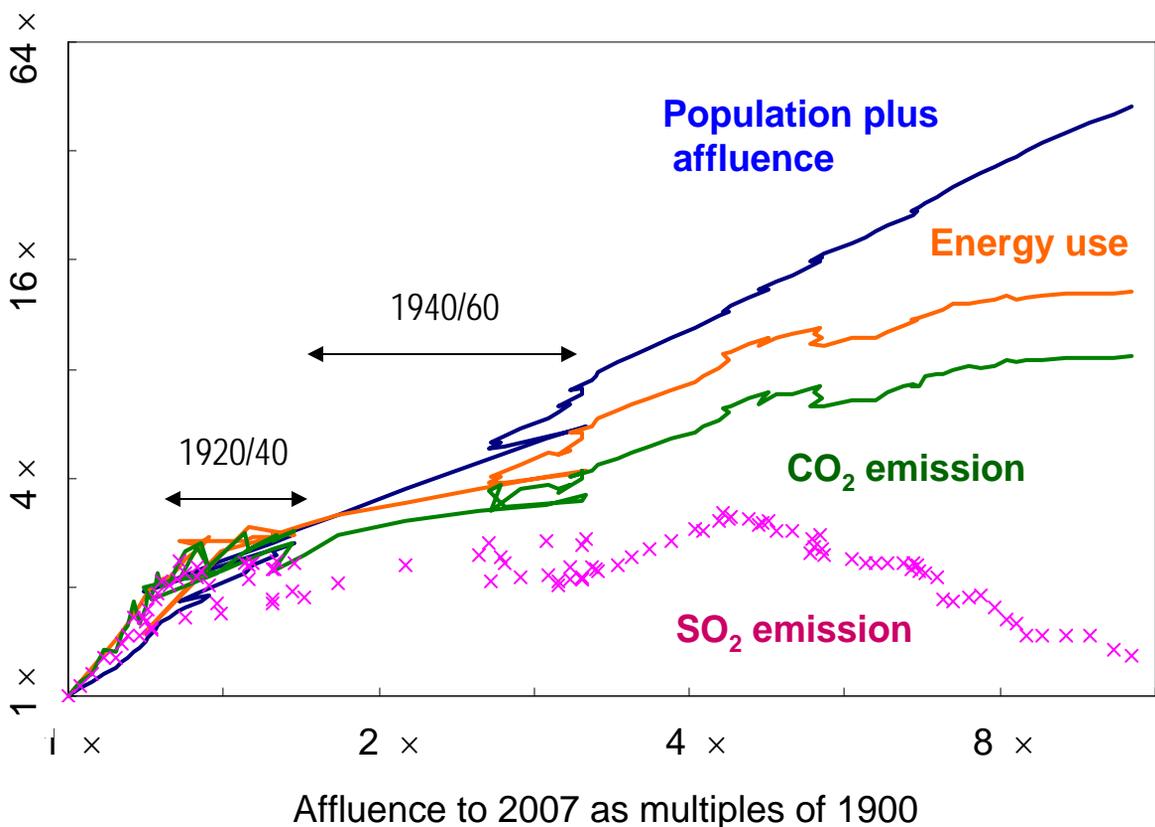
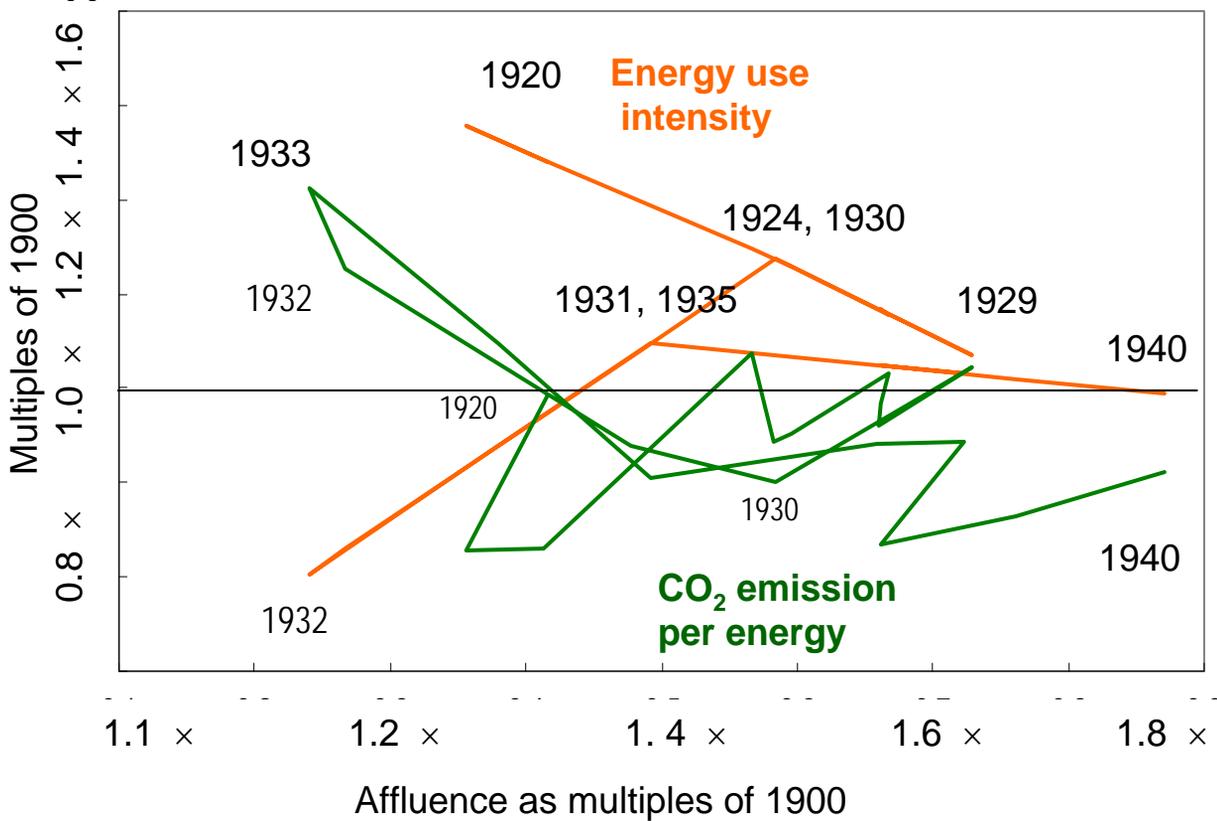


Figure 2: The erratic movements of energy use intensity (energy per GDP) and CO₂ emission per energy during the Great Depression. A downward from left to right would chart environmental progress.

Data sources: As the first slide.



Text to help explain Jack Rabbit animation

- *Introduction*
- Will the Subprime Bust sharpen or soften environmental impact? Look for the answer in the hops of blue and green “rabbits” representing energy use and carbon emission before, during, and after the Great Depression. The rabbits hop right as income dollars increase, the blue energy rabbit hops down if consumers use fewer \$ for energy, and the green carbon rabbit hops down if producers emit less carbon from energy. A steady movement from upper left to lower right would indicate both economic and environmental progress.
- *During the 45 seconds of the animation of only the blue \$ for energy.*
- Beginning in 1920, the blue energy rabbit hopped left during a brief recession but soon hopped right as income increased, also heading down to less energy used per dollar of income. In 1929 the good times crashed, the energy rabbit retreated left along his path to more \$ for energy but turned down to the pit of 1933--hard times and little energy. From the pit he headed up and right to more \$, and at first more \$ for energy. But in the late 1930s he resumed his former route right to higher income and downward to less \$ for energy.
- *During the 45 seconds of the animation showing both blue \$ for energy and green carbon per energy.*
- The green carbon rabbit of carbon from energy now hops a more erratic route, while the blue energy rabbit repeats his trip. The surprise was the rise of carbon emitted per energy produced during the pit of 1933. After 1933 the green carbon rabbit headed right to more income but slightly lower for less carbon from energy. After 9 aimless and costly years, the rabbits weathered the Great Depression to return to the paths of richer actors striking lighter blows per dollar than did poorer ones.

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