Productivity and the Environmental Accounts.

Brookings Institution
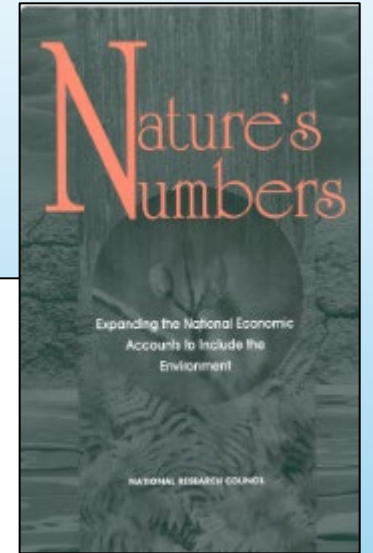
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Nicholas Z. Muller

Carnegie Mellon University

NBER

Environmental Accounting.

1. Since Nordhaus, Tobin (1973) economists recognized importance of environmental services to comprehensive measure of economic output.

2. Nordhaus & Kokklenberg (1999) suggested air pollution and GHGs

3. Subse... relative to GDP.

   a. Mull... en, Azev...

Fig. 2 | Gross External Damages as a share of Gross Domestic Product across different income groups. Data in each panel covers countries in the titled income group, as per their the World Bank defined income status in 2018, and weighted by their annual Gross Domestic Product.

High Income

Upper Middle Income

Low Middle Income

Low Income
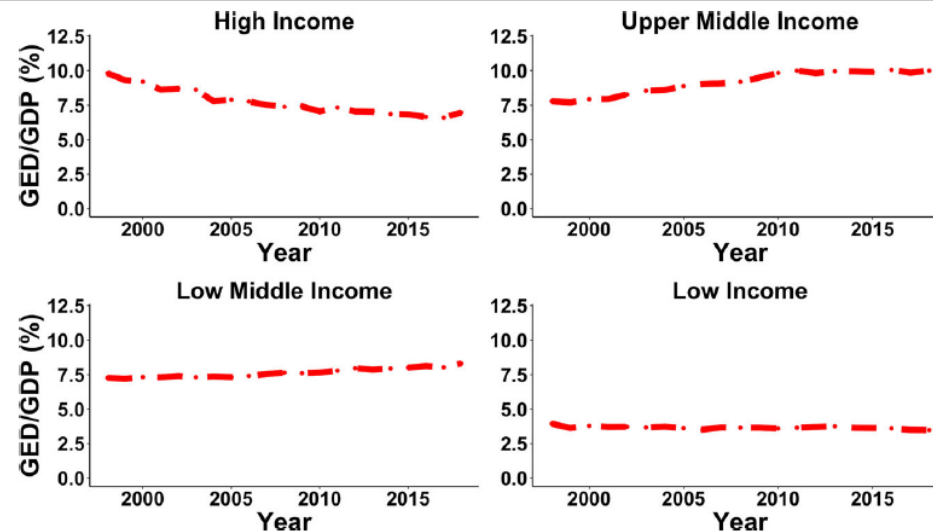
Environmental Policy and Productivity.

1. Landmark Environmental Policies:
   a. Clean Air Act (1970), Clean Water Act (1972), National Environmental Policy Act (1969), Safe Drinking Water Act (1974)
2. Costs associated with CAA implementation and compliance have been large: between 2000 and 2020 > $1 trillion.
3. Associated capital/labor allocation and the post-1970 productivity slowdown (Gordon, 2016).
4. Benefits largely accrue outside of the market boundary.
   a. Premature mortality risk.
5. Standard measures of productivity (GDP/hour worked) likely to capture cost not benefits.
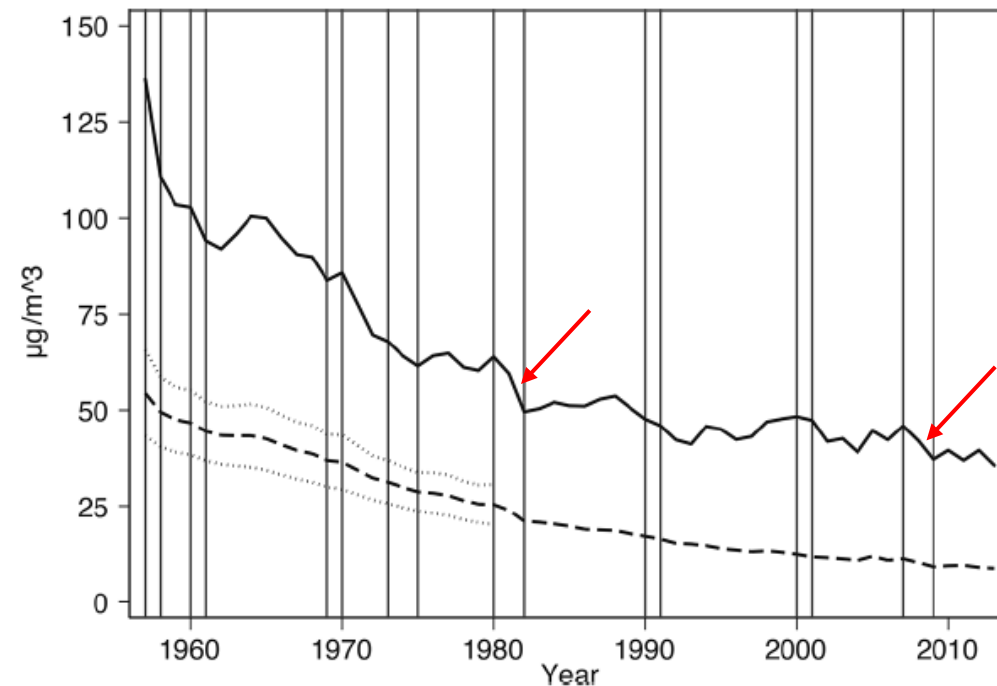
Air Quality Trends in the U.S.

Fig. 7.1   Total suspended particulates (TSP) and PM2.5 national average concentrations

Dash = PM2.5 (95 percent confidence intervals on predicted values prior to 1980); solid = TSP

Vertical lines demarcate NBER recessions.

Source: Muller (2020).

GHG Emission Trends in the U.S.
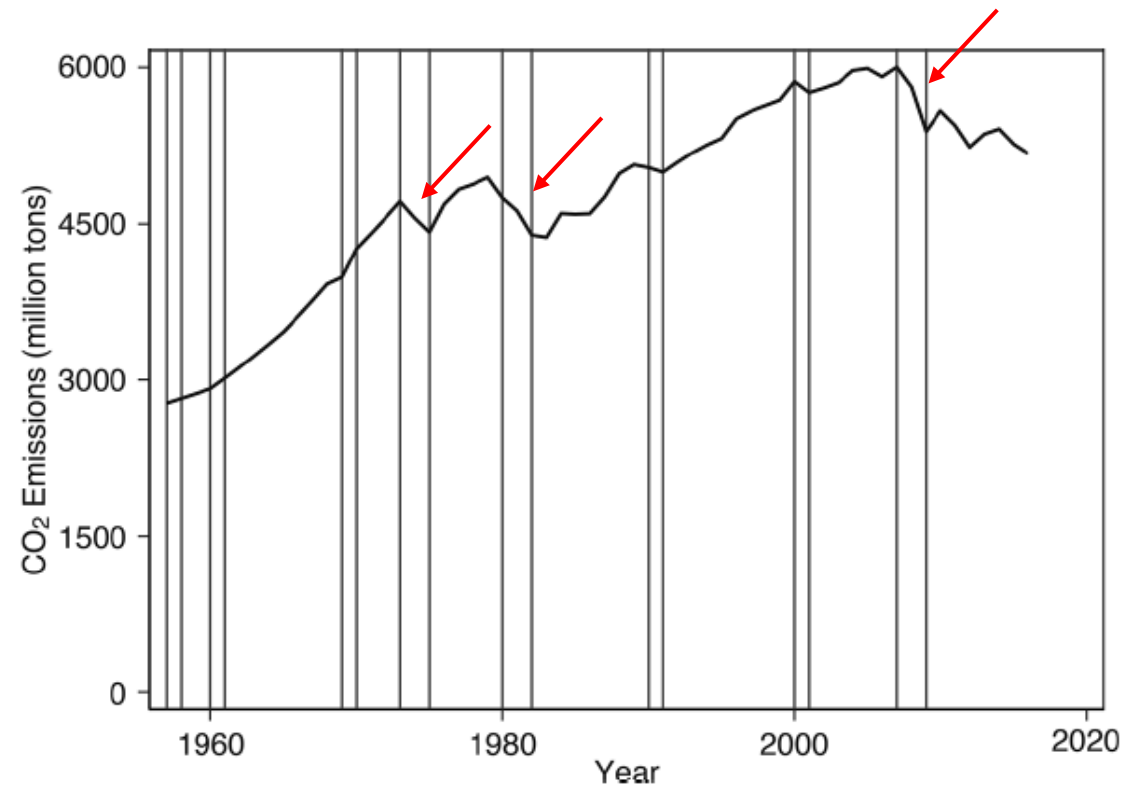

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Fig. 7.2 CO2 emissions in the US economy
Source: US DOE 2019.

Estimating Pollution Damages.

1. Monetization enables deduction from GDP.

2. Air pollution **damage** comprised of adverse effects on human health.

   a. Primarily premature mortality risk – sensitive to Value of a Stat. Life.

   b. USEPA (1997; 1999; 2010), Muller, Mendelsohn, and Nordhaus (2011).

3. GHG **damage** product of social cost of carbon (SCC) and emissions of CO_2e.

   a. SCC is the present value of expected future damage of a current emission ($/ton).

   b. Federal Interagency Working Group (2016; 2021).

4. Combined damage deducted from GDP, to estimate Environmentally-Adjusted Productivity (EAP).

Productivity and Pollution Damage.

Table 7.3	Annual growth in productivity and pollution damage		
	GDP (1)	GED (2)	EAP (3)
1957–2016			
Annual Growth	1.68***[A] (0.021)[B]	−1.04*** (0.153)	2.38*** (0.037)
1957–1970			
Annual Growth	2.27*** (0.0914)	4.57*** (0.353)	1.10*** (0.230)
1971–2016			
Annual Growth	1.64*** (0.0255)	−1.76*** (0.0531)	2.44*** (0.0479)

[A] = growth expressed in (%). Coefficients from log-linear, OLS regression of GDP, GED, and EAP on year.
[B] = standard errors in parentheses.
* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$
Column (1) regresses GDP/hour worked in natural log form on year.
Column (2) regresses EAP/hour worked in natural log form on year.
Column (3) regresses GED/hour worked in natural log form on year.
Gross external damage (GED), environmentally adjusted productivity (EAP)
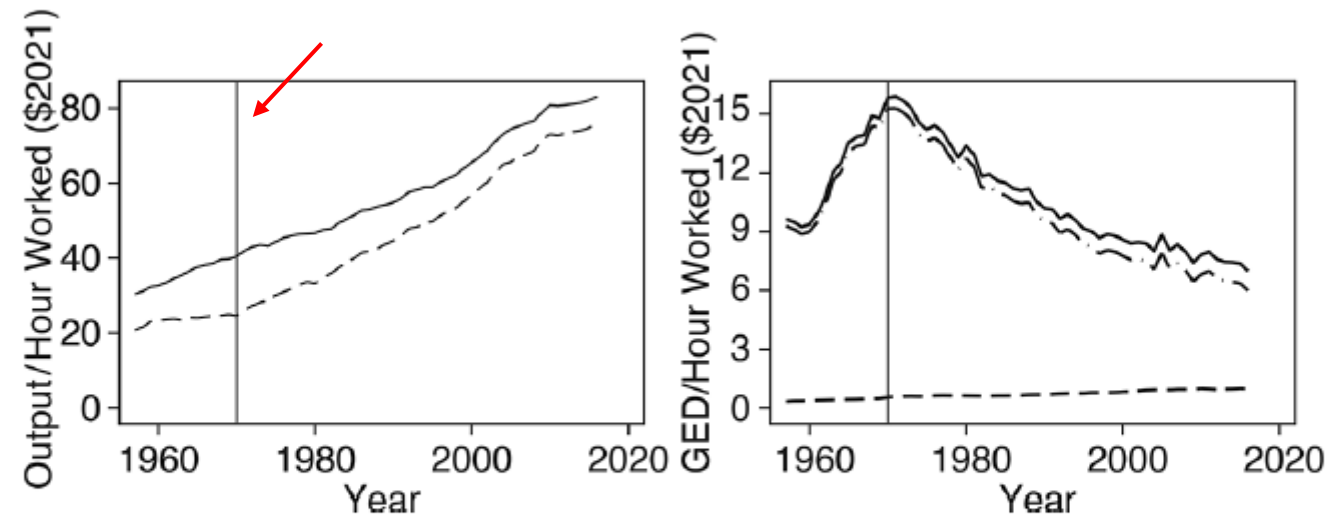
Productivity and Pollution Damage.

Fig. 7.4   Productivity, wages, and pollution damage

The left panel plots GDP/hour worked and EAP/hour worked. The right panel plots total pollution damage GED/hour worked (solid), air pollution GED/hour worked (dash-dot), and CO2e GED/hour worked (dash).

Source: FRED (2021a, 2021b, 2021c, 2021d) and author's calculations.

Conclusions.

1. Including Air Pollution and GHG damages into standard measures of output appreciably affects productivity estimates.

2. Environmental policy changes realigned difference between GDP/Hour Worked and EAP.
   a. Damages increasing prior to 1970, falling thereafter.

3. Importance of the business cycle – damages are pro-cyclical.

4. Since the 1950s in the U.S. EAP driven by air pollution.

5. Future impacts likely driven by GHGs.