

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

SciVerse ScienceDirect

journal homepage: [www.elsevier.com/locate/envsci](http://www.elsevier.com/locate/envsci)

# Why has public R&D on alternatives to fossil fuels decreased in industrialized countries?

Michael G. Smith, Johannes Urpelainen \*

Columbia University, Political Science, 420 W 118th St, 712 IAB, New York, NY 10027, United States

## ARTICLE INFO

Published on line 8 November 2012

## ABSTRACT

Why has public investment in R&D on alternatives to fossil fuels decreased in industrialized countries? The conventional wisdom holds that the culprit is electricity deregulation. We test this hypothesis against data on public energy R&D in industrialized countries, 1980–2007. The data show some weak support for it. However, the data show a stronger association between decreasing public energy R&D and the declining economic importance of heavy industry. These findings suggest that policy initiatives aimed to correct deregulation's ills are only partially helpful.

© 2012 Elsevier Ltd. All rights reserved.

## 1. Introduction

The International Energy Agency (IEA) has recently warned that current levels of public investment in new energy technologies are not sufficient to address contemporary problems of energy security and environmental deterioration (IEA, 2010). While new energy technologies could reduce the cost of mitigating climate change and leverage private capital for technology programs, industrialized countries such as the United States have reduced their public investment in energy R&D (Nemet and Kammen, 2007). In many countries, this decrease applies to a wide variety of energy technologies, from nuclear power to renewables and energy conservation.<sup>1</sup>

Why has public R&D on new energy technologies decreased over time? One influential position is that the deregulation of the electricity sector is a key cause of decreased public energy R&D (Dooley, 1998; Nemet and Kammen, 2007). As industrialized countries have deregulated the electricity sector, their governments have also reduced their budget appropriations for energy R&D. As Dooley (1998, 551) argues,

“[o]ne of the first effects of deregulation is to encourage utilities to reduce their overall investment levels in energy R&D, in part because of a general need to cut costs, in part because of the risk of ratepayer-financed investments becoming public rater (sic) than proprietary assets.” Given this reasoning, electricity deregulation seems a plausible, though perhaps partial, explanation for the decrease in public energy R&D: if public utilities have stronger incentives to invest in research and development, then a government's decision to deregulate should be accompanied by a decrease in public energy R&D.

If this hypothesis were valid, then any medicine to electricity deregulation's ills should focus on countering the perverse incentives that deregulation produces. This observation would have major policy implications. For example, advocates of increased public energy R&D should focus on providing governments with countervailing incentives.

But is the hypothesis valid? Or is something else responsible for the decrease in public energy R&D? In this article, we show that an association between deregulation and public energy R&D indeed exists. Our dataset covers direct public

\* Corresponding author.

E-mail address: [ju2178@columbia.edu](mailto:ju2178@columbia.edu) (J. Urpelainen).

<sup>1</sup> As Dooley (1998) and Margolis and Kammen (1999) note, private energy R&D has also decreased. This article focuses on the determinants of public energy R&D.

energy R&D expenditures in 20 industrialized countries, 1980–2007.<sup>2</sup> The analysis begins at the time when public energy R&D peaked, so the empirical analysis is suited for explaining the decline of, if not the initial interest in, public energy R&D. Certain estimations shows that deregulation in the electricity markets has resulted in the decrease of public energy R&D over time, though the association is weak. Equally important, the data more strongly show that decreasing public energy R&D is associated with the reduced importance of heavy industry for the national economies of industrialized countries. Heavy industry is highly dependent on inexpensive power, so governments overseeing large heavy industries have strong political-economic incentives to invest in public energy R&D. Therefore, decreases in the heavy industry's national importance cause governments to reduce public energy R&D.

These results have worrying policy implications. While the incentive problems that deregulation causes can be addressed through institutions that shape governments' incentives, our findings suggest that the problem is much more fundamental than deregulation. As the heavy industry's national importance decreases, political demand for public energy R&D simply increases. Unless proponents of public energy R&D can find powerful constituencies to support their cause, industrialized countries may not be able to increase their public energy R&D.

The article is organized as follows. In the next section, we document the precipitous decline in public energy R&D and discuss our hypotheses. We then present our empirical research design, findings, and robustness checks. The conclusion discusses the implications of our empirical research.

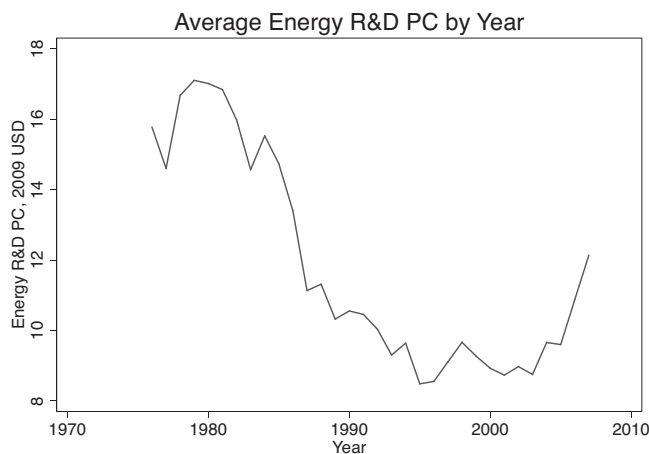
## 2. The incredible shrinking energy R&D budget

Energy R&D covers a wide range of activities intended to reduce the cost and negative externalities of energy production. Fossil fuels notwithstanding, the two major forms of energy R&D are energy efficiency and new generation technologies. Public investment in energy R&D is warranted because companies do not fully internalize the social benefits of new energy technologies (Fischer and Newell, 2008; Margolis and Kammen, 1999). For example, solar photovoltaics allow enhanced climate mitigation but companies cannot appropriate the full societal benefits of climate mitigation. Therefore, the private sector underinvests in solar photovoltaics.

In industrialized countries, public energy R&D increased dramatically following the 1973 and 1979 oil shocks (Bobrow and Kudrle, 1979; Dooley, 1999, 2008). Empirically, the decline in public energy R&D since the waning of these shocks is well documented. Fig. 1 shows how the time path of public energy R&D in industrialized countries, excluding fossil fuels and measured in per capita terms, for the years 1976–2007.<sup>3</sup> The figure shows how public energy R&D peaked in the aftermath of

<sup>2</sup> Indirect expenditures, such as tax credits, are excluded.

<sup>3</sup> The data are from the IEA. They cover energy efficiency, renewable energy, hydroelectric and nuclear power, fuel cells, and storage and conversion.



**Fig. 1 – Averaged energy R&D per capita by year, 2009 USD. Note that this figure reports data between the years of 1976 and 2007.**

the 1979 energy crisis and then underwent a steep decline. Most strikingly, except for a modest increase in recent years, levels of energy research never recovered even though at least three factors provided governments with incentives to invest in new energy technologies: first, since the year 2000 oil prices have been high. Second, concerns about climate change and energy security have resurfaced. Finally, industrialized countries are now much wealthier than they were three decades ago.

Why such a decline? The conventional wisdom is that the deregulation of energy utilities plays a key role in explaining decreasing investment (Dooley, 1998; Nemet and Kammen, 2007). The argument runs as follows. When governments give up direct control of energy utilities, these energy utilities' incentives to invest in public energy R&D decreases. On the one hand, the government is no longer using state ownership and regulation to ensure that energy utilities internalize the societal benefits of energy technology innovation in their decision making. On the other hand, the energy utilities also face more stringent resource constraints than before deregulation because they must compete in the free market for consumers. Given these incentives, public energy R&D should decrease.

As to empirical evidence, Sanyal and Cohen (2009) show that during the period 1990–2001, R&D by electricity utilities in the United States indeed decreased as deregulation progressed. Their study differs from ours in three ways. First, they begin in the year 1990. By that time, energy R&D had already decreased substantially. Second, they focus only on the United States. Finally, they do not account for the alternative deindustrialization hypothesis.

If the conventional wisdom is valid, then the following hypothesis should hold:

### Hypothesis 1 (Deregulation).

*Deregulation of electricity utilities reduces public investment in energy R&D.*

The second hypothesis examined pertains to deindustrialization. Of all sectors of the economy, heavy industry is

Download English Version:

<https://daneshyari.com/en/article/7468389>

Download Persian Version:

<https://daneshyari.com/article/7468389>

[Daneshyari.com](https://daneshyari.com)