

BOOK REVIEWS

Monetary Policy and Crude Oil: Prices, Production, and Consumption, by Basil Oberholzer (Edward Elgar Publisher, 2017), 304 pages, ISBN-13: 978-1786437884.

This is an unusual book. It is part literature review, part text book, and part academic research article primarily geared toward macro/monetary economists. From that standpoint, it is a difficult read. Not difficult in the sense that the topic is so esoteric that it is known only to a handful of economists, but rather difficult in the sense that it attempts to weave together a coherent economic narrative from these three parts. It succeeds on some level, but reading it is like reading a 250-plus page research article. It's tough sledding at times.

The book is mostly about monetary policy and crude oil prices, production, and consumption. However, in the first two chapters, the discussion ranges from the Club of Rome and the limits to growth, to Hotelling's rule, to price speculation versus fundamentals, the role of crude oil inventories, to bank credit and traditional bank intermediation, to the shadow banking sector, to the transmission of monetary policy—from both conventional and unconventional policy—and the endogeneity of money. In short, there is a lot going on, and the reader very quickly gets lost in the minutia of academic debates—both philosophical and empirical—that spans multiple cross-sections of the economic and finance literatures. At some point, the findings of article X pitted against the findings of article Y become cumbersome. If there is a reader that wants a comprehensive review of the academic literature, then read the first third of the book. If a reader wants some empirical results, then skip to the middle third of the book. If the reader is looking for the author's policy positions on reducing fossil fuel consumption, then turn to the final third of the book. Most of my comments will concern the first and second thirds of the book.

A second aspect of the book is that it is written under the banner of "New Directions in Post-Keynesian Economics." Admittedly, this reviewer is mostly unfamiliar with this school of thought. Any rudimentary knowledge of the school I acquired in graduate school has long since been fully depreciated. For those similarly unfamiliar with the school, post-Keynesians eschew neoclassical economics and seem to be more inclined to favor government intervention to achieve their policy goals. This view comes through loud and clear in the policy prescription part of the book.

In Part I of the book, the first two chapters present facts and the theory of monetary policy and crude oil. The first chapter is mostly about data. Chapter 2 ("Monetary policy and crude oil: a theoretical analysis") is the meatier of the two chapters and effectively, though at considerable length, provides a foundation for the rest of the book. In particular, the book compares and contrasts the neoclassical approach with an alternative approach (post-Keynesian) in terms of monetary policy, financial markets, and the intersection of the two. In the neoclassical approach, market prices are based on fundamentals and the monetary authority determines the supply of money. By contrast, in the alternative view, prices do not necessarily change because of fundamentals. As such, the efficient markets hypothesis gets some rough treatment throughout the book. Central to the alternative view is the assertion that there is a bi-directional causality between financial markets and the real economy. Under this assumption, the monetary authority has no control over the money (money is endogenous and the policy rate or federal funds rate is exogenous). Although the endogeneity of money is not an extreme assumption, it is nonetheless a strange argument to make given that the Federal Reserve is in the process of reducing its balance sheet, and thus reducing the level of the monetary base (high-powered money). Admittedly, the author uses money in the generic sense, rather than defining it in terms of M1 or M2.

In the alternative view, the supply and demand for oil (fundamentals) are not the only factor influencing the crude oil price. Monetary impulses matter importantly. For instance, when the

central bank changes the policy rate, this changes the investment cost of corporations. The lower interest rate spurs an increase in the demand for loans or corporate bonds to finance capital expenditures. But that's not the only financial asset affected in this approach. Expansionary (contractionary) monetary policy increases (decreases) the demand for crude oil futures market contracts, which then influences the spot price of oil. The financialization of crude oil futures markets—which has a speculative element—is thus an important aspect of the alternative framework. To be clear, through speculation, monetary policy affects crude oil production and consumption. To his credit, the author, nonetheless, provides solid references in support of the neoclassical view.

Chapter 3 is a short chapter that discusses U.S. monetary policy and the global crude oil market. There is a discussion that: (i) compares and contrasts conventional monetary policy with unconventional monetary policy—that is, of the policies adopted by the Federal Reserve during and immediately after the financial crisis; (ii) a discussion on the relationship between crude oil and other fossil energy sources (e.g., natural gas); a discussion on the dichotomy between U.S. monetary policy and the global crude oil market that focuses almost entirely on how Federal Reserve policy affects the global economy. Another part of the chapter discusses market pricing of crude oil. Although part of the discussion is useful—such as how the spot price of West Texas Intermediate (WTI) is linked to the futures price—parts of the chapter sometimes lack focus. For example:

Neoclassical theory assumes an efficient market mechanism that sets the price of a good where supply meets demand. Yet, in reality, things are less clear. Supply and demand are not curves given by nature and the crossing point is not unique. Rather, there are many individual suppliers and demanders who agree on the transfer of goods at a bargained price. Since many deals take place, many different prices exist. The market mechanism leads in fact to an indeterminacy of prices. (p. 119)

The author goes on to state that “it is doubtful whether a true market price ever exists, since the market consists of individual deals such that a single price is quite hypothetical.” Well, okay. Most students in a principle of economics class understand that a single commodity (crude oil) with many different producers, of differing quality, sold in different markets, can have different prices. But what's the point? The point, evidently, is to argue that a unique equilibrium price is an “abstract assumption,” so that there are many ways for the assessed price to deviate from the “invisible price.” One could make this argument about most, if not all, commodity markets or other markets where financial assets are traded in large volumes on a global basis. As empiricists, we take the data—however imperfect—as they are. The author does not suggest that the empirical analyses that use a single oil price—whether at a daily, weekly, monthly, or quarterly average—is garbage, thankfully! But as will become clearer in Chapter 4, the lack of trust in a single market price will be used in a unique way to support the author's priors based on his preferred model.

The empirical analysis begins in Chapter 4. This review cannot begin to do it justice in the limited space available. First, the author begins with a theoretical analysis of the crude oil market using a stock-flow consistent (SFC) model. The SFC model appears to be the workhorse model of post-Keynesian economics. As a result, it will be unfamiliar to most readers. It certainly was unfamiliar to this reviewer. Interested readers are directed to an Appendix, which lays out the model in detail. In the SFC model, a reduction in the interest rate by the monetary policy increases the demand for oil futures contracts (open interest) and then increases investment in the oil industry. Thereafter, the price of oil increases and oil consumption falls. Regardless of one's view of price determination in the spot market, a highly questionable assumption of the model is the sensitivity of oil industry investment to changes in interest rates. In general, as Sharpe and Suarez (2015) show, the empirical evidence for this assertion in the literature is far from conclusive.

The author uses some more conventional econometric methods in the main empirical portion of Chapter 4 to test the theoretical results from the SFC model. Namely, he uses a five-variable

structural vector autoregression (SVAR) to model the effects of monetary policy on the crude oil market during periods of conventional (2000 to 2008) and unconventional (2009 to 2014) monetary policy. He further tests for causality using a battery of Granger causality tests.

One of the author's main conclusions is that there exists a "price puzzle" in the crude oil market during the conventional period, but less so in the second period: an increase in the Fed's policy rate raises the price of crude oil—the opposite effect hypothesized in the SFC model. One criticism of the analysis in the unconventional period is that the author had to search for an alternative to the federal funds rate during the period of the zero lower bound. The author chose to use the volume of securities held by the Fed on its balance sheet. One could have easily used a shadow fed funds rate, such as the one estimated by Wu and Xia of the Atlanta Fed, as a robustness check.¹

Another criticism of the empirical results is that the author, being chagrined that the SVAR results did not line up with the SFC model, chose to construct a "fundamentals component" of the oil price. It is defined as the difference between a simulated oil price that one would estimate if determined solely by industrial production, oil production, and the exchange rate, and the true price. The author then finds that this variable—a residual not explained by fundamentals—produces the desired result in line with the theoretical analysis (pp. 176-77). I want to be fair to the author and his methodology. However, to this reviewer, it is akin to torturing the data to producing the desired result.

While reading the empirical section, one thought kept returning again and again. Namely, the shale fracking and unconventional oil revolution in the United States and Canada has ushered in a new regime in crude oil markets. It has upended OPEC policy. It has not only made the United States the largest (or second-largest depending on the time period) oil producer in the world, but U.S. oil producers are now exporting U.S. crude and natural gas in relatively large quantities. It is difficult to see how the Fed had any influence over the shale revolution. If anything, oil prices collapsed after 2014 because of increasing output from the United States—a period when the Fed was slowly normalizing policy (raising rates). This development alone makes this reviewer wonder whether a third period is needed to see whether the results from the previous two periods still hold. Of course, the author had to end the book at some point, so that's understandable on some level.

Finally, the last two chapters discuss economic policy positions and options to address, among other factors, "climate change and environmental contamination." The author comes at it from the perspective that, more or less, climate change is an existential threat to the world's economies. Although he acknowledges that a high oil price would reduce the demand for oil and spur development of alternative energy sources, he also recognizes that it would spur increased exploration and development of new crude oil supplies. Nonetheless, the author argues that it is "desirable that the quantities [produced and consumed] are as small as possible." So how to accomplish this feat without sacrificing economic growth?

One option is government intervention to establish limits on oil production. Given that most of the world is a net oil consumer, this sounds like a Herculean problem. A second option is through some type of energy tax. In an era of increased nationalism and populism that has diminished the power and influence of "global elites," that too seems like a hard sell (witness recent events in France). His solution is self-admittedly radical: Make the price of oil exogenous through government fiat. One way is to have the "political authority" sets a price target by intervening in the crude oil market—sometimes selling and sometimes buying. But he argues a better approach would be to have the central bank "offer to purchase all crude oil futures contracts at the price it has set as a target." Breathtaking, indeed. In the United States, at least, the Fed could not do this unless the Federal Reserve Act was amended. It would also, as even the author admits, raise serious questions about the independence of the central bank given its balance sheet implications. The result has utopian elements:

1. See https://www.frbatlanta.org/cqer/research/shadow_rate.aspx.

The oil price thus become exogenous and the oil industry, as well as the rest of the economy, align production and consumption, respectively with it. This allows stable conditions in the economy: supply and demand follow long-run patterns and so does investment in the oil industry. Overinvestment does not occur anymore. Since there is no oil price risk, speculative activity in the futures market becomes meaningless and hence no leverage should build up. A price bubble cannot take place anymore due to price exogeneity. This may seem radical. (p. 224)

Radical, indeed. This may work in the sterile environment of a model, but the probability that this type of radical government intervention succeeds seems pretty close to zero. The global coordination problem itself most likely renders it infinitely intractable in a world of sovereign governments and changing political dynamics. In short, the author, like other advocates of plans to address climate change—or any other problem—provides no serious discussion of costs and benefits to the global economy, whether in terms of per capita real GDP growth, inflation, unemployment, or other key economic metrics. It is all assumed to just work out. To paraphrase another famous economist (Larry Summers) on this issue, it is hardly immoral for policymakers to seek environment benefits at the lowest possible cost.

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The Revolution in Energy Technology: Innovation and the Economics of the Solar Photovoltaic Industry, by Xue Han and Jorge Niosi (Edward Elgar Publishing, 2018). 147 pages, ISBN13: 9781788115650.

Decade after decade of cost reduction, innovation, and the recent Chinese entry into solar photovoltaic cell (PV) manufacturing have been impressive. These authors focus on this PV technological revolution with the goal of answering questions relating to drivers of this evolution, the global diffusion of solar technologies, and its relationship to China and other developing countries.

In the introductory two chapters, the authors lay out the theoretical framework for their five analytical chapters on innovation – the sectoral system of innovation (SSI). In SSI, agents influence or create, produce and sell a set of products in a sector. Agents (large firms, small firms, public research organizations, universities, and governments) may come from within the producing firm or from outside.

The two main streams in SSI models are sector lifecycle models (which may be product lifecycle or industry lifecycle) and history-driven models. In the lifecycle models, a radical innovation causes the entry of new producers and demand growth with an emphasis on innovation. This eventually leads to a concentrated market and a reduction in innovation. Alternatively, in the history-driven models, a sector may continue to see innovation decade after decade with branching into new products and new markets, which actually may be closer to what we see in the solar PV market.

Since the literature specifically relating to the PV manufacturing sector is not extensive, they also review the literature for related questions in other industries drawing heavily from studies on information, biomedical, and nano- technology. Their tests of the resulting hypotheses from the literature are not formal tests but verbal discussion with numerical support.

They define some of the historical features of the PV sector from their data set. Patent counts are taken from the United States Patent and Trademark Office because it has more photovoltaic patents, it includes more detailed information including the inventor's location, and many patentees in other countries also patent in the United States. PV related publication counts are taken from Scopus. Solar cell efficiency, government policies related to solar PV in Germany, Japan, and the United States and first generation, second-generation, and third-generation solar PV technologies are briefly considered.

The basic hypothesis investigated in chapter three is whether the historical model of continued innovation that has cascaded as time has passed is more appropriate than the lifecycle models for solar PV. As is the case for other science based industries, they conclude in favor of the cascading model being driven by a widening number of producers and consumers entering into the industry including China, Japan, South Korea, and India, scientific discovery stimulating innovation, and increasing new uses for the product.

China has followed other countries into the production of solar PVs, and within six years of entry in 2001 became the leading producer. In playing catch-up, new countries can take three different patterns—following the leader's paths, skipping stages of earlier innovators, or following their own path. In chapter four, the authors conclude that China's catch up is either path skipping or path creating. Governments can support such technology catch-up with vertical technology policies, which target one sector in support one specific technology, or with horizontal technology policies, which support a broader class of technological objectives and sectors including R&D programs. The authors find evidence of horizontal support more at the provincial than at the national level but do not find particularly innovative or more workable support government policies than earlier leaders: Germany Japan, and the United States.

China's PV sector was stimulated by Chinese returning from educational experience in more developed countries. The sector has not been particularly innovative and is largely supporting first-generation technology. Where they have shone is in their capabilities of using a highly-skilled cheap labor force, low-cost local manufacturing automation equipment, and low administrative costs to become the most cost-competitive global manufacturer.

PV and other high-tech industries tend to be geographically clustered in large metropolitan areas. For example within the technological leaders, the United States has clusters in Boston and Los Angeles, Japan in Tokyo and the Kyoto-Osaka area, Korea in Seoul, Germany in Munich, and Taiwan in Taipei. In chapter 5, the authors consider what sorts of factors may have led to such clusters. Anchors considered for the development of such clusters are big corporations acting as system integrators, clusters of supporting firms that foster innovation, and high tech knowledge centers in the form of R&D intensive firms, research universities, and government research organizations. Clusters were generally found to be in large metropolitan areas and had a strong corporate anchor with research universities and government research not playing a strong role. Exceptions include Taiwan, where a government research organization was a strong entrepreneurial driver, and Australia, a much smaller producer, where a research university provided entrepreneurial impetus for the development of the industry. U.S. clusters with more diversity have proved to be more resilient than European ones in the face of the Chinese onslaught.

In some high tech industries, most notably biotechnology, star scientists have played a key role. In chapter 6, the authors investigate the rolls of star scientists, university spinoffs, and venture capital in the development the PV industry. The authors generally find that star PV scientists do not exclusively focus on the PV sector and do not act as entrepreneurs for university spin-offs, although star scientists may provide advisory support for the PV industry. Nor is the PV industry an important target for venture capital.

The authors follow with two short chapters on implications and a short concluding chapter with a sum up, some vague policy implications and suggestions for future work. In chapter 7, they sum up their conclusions from their hypothesis testing in chapter 3-6 and further note that the solar

PV industry is not a classic high-tech sector driven by science, rapid technological progress, venture capital and star scientist entrepreneurship. However, its growth has been too rapid to be considered a traditional sector either. It has some similarities to its parent industry—semi-conductors. User firms tend to produce the majority of the innovation, while the most widely produced technology (the first generation) has not been superseded in the bulk solar power market.

For centuries, a radical innovation could lead to a whole host of incremental innovations. In chapter 8, the authors return to more discussion of information cascades. Instead of one radical innovation leading to numerous incremental add-ons, information cascades are radical changes with the incremental innovations radical as well. They attribute this acceleration of the innovation process in high-tech industries to increasing numbers of innovating countries and organizations, faster digital dispersal of data, faster transportation, more channels of information flow including technology transfer, alliances, partnerships, and imitation, cross pollination between sectors, and innovation systems at the national, regional and firm level. They argue that government grand challenge policies can lead to innovation cascades.

Chapters 3–6 suggest some interesting ideas and I have a better overview of the evolution of the PV industry. These chapters seem to have been stand-alone published papers and could have used more editing to weed out redundancies. A table of abbreviations would have been helpful for this reader. The investigation of hypotheses are case studies of different questions in different chapters using numerical counts, reasoned arguments, while other variables are not held constant. The conclusions, although suggestive, could be much more convincing if more formal statistical testing can be developed.

As I was unfamiliar with much of the literature studying innovation in high tech industries, I appreciated the fairly extensive lit reviews as well as the more focused information and analysis on the global PV industry. The book would be of interest to those who want to learn more about diffusion of technology as well as those who want to know more about the solar PV industry. It would be suitable for a general audience as well as those with a more specialize interest in either innovation or in the solar PV industry. As all countries have used policy to promote the industry, students interested in industrial policy might like the book as well.

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Mapping Power: The Political Economy of Electricity in India's States, edited by Navroz K. Dubash, Sunila S. Kale, Ranjit Bhavirkar. (Oxford University Press, 2018) 400 pages, ISBN 978-019-948-7820

The social sciences do not inform the discipline of energy studies nearly as much as they could, and indeed should (Sovacool 2014). The dominant school of thought in this discipline, driven by tenets of neo-classical economics, provides few solutions to the issues plaguing affordable electricity access in the developing world. Over multiple decades, the “standard liberalization prescription” (Joskow 2004) has been found to be limited in its value, particularly to developing countries such as India (Jamash et al. 2005).

This book provides convincing evidence that the social sciences and politics matter. It brings to the fore that conviction by way of gathering rich empirical evidence both on electricity reform efforts and political developments, from a diverse set of fifteen states in India. The focus on states contributes to bridging a crucial gap that exists in literature today, as most existing studies on India's electricity sector address the country level. Furthermore, this work is a vital contribution towards not just informing India's policy pathways, but also towards a methodological blueprint to understand the levers that drive electricity sector development across much of the developing world.

Summary: Framework and Analysis

The stated aim of the book is to understand the relationship of politics to electricity outcomes. The rich empirically-grounded analysis that this volume contains helps, as the editors note, to move beyond establishing *that* politics matters, to *how* politics matters. At the outset, their state-level analyses are motivated by the question: *To what extent has the design and application of reforms addressed the particular politics of each state's electricity sector?* Based on preliminary work, the editors identify four politically salient categories that are crucial in their analysis of the success of reform measures.

- Demand for access and service quality
- Demand for subsidies
- Cost of supply
- Financial space (a term they coin to describe an amalgam of factors that determine financial management of political demands in a state)

The first two factors represent political demands placed on the system, and the last two represent levers of the states to manage those political demands. Interactions between the politically salient factors mentioned above, and reform measures such as introducing regulators, privatization, and renewable-purchase obligations, are informed by and analyzed within the larger context of the state's political economy, under the premise that electricity policy shapes and is shaped by the larger state economy. In their analyses, they include factors such as electoral politics, state finances, the rural-urban divide, and policy interventions in agriculture. The framework also accounts for the role of central government interventions.

State-specific chapters are informed by extensive semi-structured interviews, supported by the available quantitative data. Along with a historically-informed narrative for each state, the less patient of readers are helpfully provided with a one-stop timeline depicting key political events alongside key events in the electricity sector in the state.

The brilliance of this volume is best encapsulated in the final chapter, where the authors present a characterization of the various states in a figure along two axes: along the vertical axis lie political outcomes termed, “vicious cycle,” “accommodation and equilibrium,” and “virtuous cycle,” and along the horizontal axis lie electricity service outcomes (access and quality) that can either be high or low. By placing each state in the appropriate location in the grid, the authors summarize both outcomes: the findings in a comprehensive snapshot, and more importantly, a map of sorts that policy makers and policy analysts can use to explore strategies that help a state transition from one part of the grid to another.

For instance, the pathway that leads to a virtuous cycle for low outcome states is one that Bihar and West Bengal are currently on – political leaders push for better electricity outcomes as rural constituencies mobilize around electricity access. High outcome states, on the other hand, find themselves presented with a more contingent pathway to move to a virtuous cycle; such a move would require “designing a politically feasible strategy out of entrenched deadlocks,” as Gujarat, Andhra Pradesh, and Delhi (briefly) did. States such as Punjab and Rajasthan are characterized as being trapped in a negative spiral fed by “competitive populism.” Although salient factors pertinent to successful electricity outcomes are illuminated by such a characterization, it is not a “solution set.” The authors acknowledge that “the intent is not to provide a mechanistic toolkit, but rather a framework for dialogue and understanding of how to map power, which is the first step to productively reforming electricity politics.”

For the reader who is simply interested in an overview of the book's main contributions to thinking on India's power sector, reading the introductory and concluding chapters would suffice. Such a reader would nevertheless miss the intricate dynamics at play within each state, and be less equipped to think through for instance, what factors the aforementioned grid-based characterization

is contingent on. For readers interested in specific states, there is a wealth of information to look forward to within each chapter, including both historical and contemporary analyses.

Discussion

The contributions of this volume are significant and many. Both in terms of methodology and scope, the book bridges critical gaps in literature. Due to a federal structure, Indian states have much independence in scripting their own electricity sector pathways, while embedded in a common institutional framework that the Union government provides.

Such a setting provides a rich playground for comparative learning that few authors have previously taken advantage of at this scale; notable exceptions at a smaller scale are (Dubash and Rao 2008; Kale 2014). An all-India perspective is of limited assistance when vital policy levers lie at the state level, as many earlier works indicate (Kumar and Chatterjee 2012; Maithani 2015; Pargal and Banerjee 2014; Parikh and Parikh 2011; Tongia 2003).

Theoretically, this work provides a powerful narrative that counters, and to an extent, complements the dominant literature in this discipline, which is based on welfare economics and assumes a benevolent policy-maker whose only interest lies in increasing social welfare. A recent report by the World Bank on “cost of distortions in the power sector” is a fine example of such work (Zhang 2017). Another major contribution of this work is its relevance to power sector reform in other developing regions of the world, which have a reasonably comparable polity to India. For instance, there has been much recent interest in developing “new regulatory and business model approaches to achieving universal electricity access” for Sub-Saharan Africa, which could gain by bringing to bear the framework and methodology employed in this work (MIT 2019; Rahnama and Perez-Arriaga 2018). Additionally, it provides rich information that could inform further institutional analysis.

I discern several missed opportunities - opportunities to seize what I consider “low-hanging fruit.” As in most edited works, each author brings in their unique style of writing and to some extent, analysis as well. Although there is much to value in such diversity as the editors point out, an explicit reflection of each author’s analytical journey would have been an important contribution too. For instance, in the chapter on Uttar Pradesh the author Jonathan Balls contemplates, “There is a shortage of evidence on the relative importance of political interference versus administrative incapacity in explaining persistently high levels of theft. Politicians are more likely to be re-elected when theft in their constituencies has risen, but there is little empirical evidence of how and to what degree this theft is enabled.” Such reflections on shortcomings of method, data, or evidence, had they been consistently done, could have informed future work and perhaps also further sharpened the volume’s concluding analysis.

Another missed opportunity, in my view, was to explicitly demonstrate the relevance of the volume’s findings to emergent challenges of the new century for the power sector. The authors acknowledge that “understanding problems of the past is essential to addressing challenges of the future;” challenges that include the integration of low-cost renewables, the transition of the energy sector to a low-carbon future, and possibly changing current regimes of management of the grid. Their conclusions indicate immense faith in the power of low-cost renewable electricity - including as a political opportunity to address electricity access, as a long term transition to a lower cost regime that could allow greater financial space for distribution companies. These inferences in my view are premature and uncharacteristically bereft of the institutional analysis they bring to bear in reaching other conclusions on electricity outcomes. Perhaps this is a reflection of their approach, which does not include a specific focus on “new-age” challenges.

Nevertheless, as someone trained in modelling socio-technical systems and decarbonization pathways in particular, I wholeheartedly agree that the rich empirical and strategic analyses in the book is essential fodder for any analytical effort towards evaluating future pathways for the

power sector in India. For the optimist, this missed opportunity presents prospective ideas that future researchers or a future edition could take advantage of.

This book is an ambitious and substantial contribution to current day thinking on the challenges of India's power sector. It is methodologically well-grounded in relevant theory and data, and provides a powerful counter-narrative to the dominant approach of understanding power sector reform especially in the developing world. For the student, policy analyst, politician, energy-system modeler, or the arm-chair enthusiast, this book is sure to be enlightening and for the large part, engaging as well. I expect that this volume will become staple reference for works on India's power sector for years to come.

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