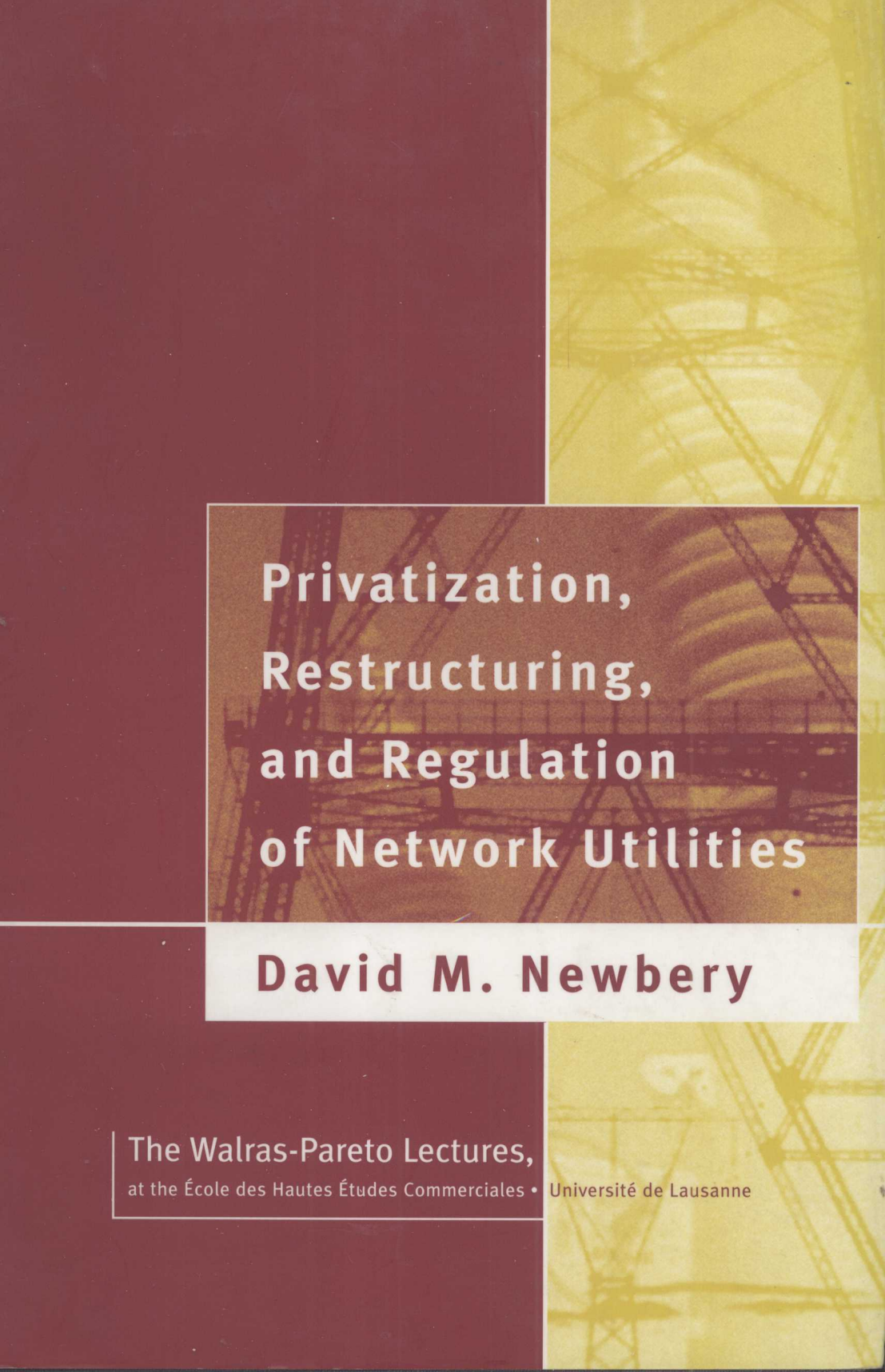

# Privatization, Restructuring, and Regulation of Network Utilities

David M. Newbery

The Walras-Pareto Lectures,
at the École des Hautes Études Commerciales • Université de Lausanne

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**The Walras-Pareto Lectures, at the École des Hautes Études Commerciales, Université de Lausanne**

1. Mathias Dewatripont and Jean Tirole, *The Prudential Regulation of Banks* (1994)

2. David M. Newbery, *Privatization, Restructuring, and Regulation of Network Utilities* (2000)

# Preface

This book is the direct response to the invitation to give the Walras-Pareto Lectures in Lausanne in November 1995. Then it was rather more than a century since Pareto succeeded Walras to a chair at Lausanne, and 86 years since the University honored Walras as the first economist to establish the conditions of general equilibrium and thus as the founder of the School of Lausanne. As I am not a general equilibrium theorist, I searched in *The New Palgrave* to see whether my interests overlapped those of the distinguished Lausanne economists that the lectures commemorated. I found that Walras had strong "scientific socialist" views on natural monopolies, which he believed should be nationalized. Railways were the quintessential nineteenth-century example of a network utility, and Pareto's first writings appear to have been on the advantages and drawbacks of public and private ownership of railways. He rapidly abandoned his early plans to become a railway engineer, and his support for free trade led in due course to his exposition of social optimality, a guiding principle for the continental approach to public utility pricing. I therefore take some comfort that these lectures are on a fit subject to honor both Walras and Pareto.

The invitation to give the lectures allowed me to reflect on the continued excitement of studying policy toward network industries and, more generally, on the boundaries between the market economy and the state. Thirty years ago, at the start of my career, I was absorbed by developments in optimal tax theory and social cost–benefit analysis. These gave clear insights into what should be done and how to evaluate the merits of policy choices. They indicated clearly that what should be done was frequently not done. Why that was has been an absorbing topic ever since. The simplest explanation was that agents were not provided with the right incentives. The same techniques of optimal tax theory could be applied to examine the problems of motivating agents

to act in the interests of the principal, and they led directly to modern theories of regulation. These were fine if there was no choice of market structure, but if network services could be made competitive, the problems of information, incentives, and transferring the gains to consumers appeared to be there for the taking. The last fifteen years have demonstrated the truth and limits of that insight.

Interest groups might be more concerned with private gain than the social good, and they compete to control the regulatory institutions. Competition over networks differs from conventional market competition in a variety of ways, while managing the interface between the regulated and competitive sectors remains key to successful liberalisation. Just how important the institutions of capitalism for regulating market behavior has been underlined by events in transitional economies since the fall of the Berlin Wall just a decade ago.

This has been an exciting time to be an applied economist. I feel privileged to have worked in areas of such great intellectual fascination and practical importance. I was able to follow the British electricity experiment from the start, at the same time as working with colleagues here and abroad on Central Europe's transition to the market economy. As so often, the historical accidents of time and place played a large part, but I have been fortunate in my colleagues and in the intellectual support of Churchill College and the University of Cambridge.

I am of course also indebted to the University of Lausanne for the invitation that prompted this book, and for the warmth of their hospitality during a very pleasant brief stay presenting the lectures. Much of my work of network utilities has been supported by the British Economic and Social Research Council under a series of projects (000231811, 000233766, and 000236828) on privatizing and regulating network utilities. I am indebted to my colleagues who worked on these projects: Richard Green, Christopher Doyle, Maria Maher, Michael Pollitt, and Tanga McDaniel. Collaborative work with Rich Gilbert on the credibility of regulatory regimes, published in *The Rand Journal of Economics*, 1994, appears in chapter 2. The University of California commissioned joint work with Richard Green that appears as Newbery and Green (1996), which features extensively especially in chapter 4. Chapter 6 draws on Green and Newbery (1992), Newbery and Pollitt (1997), and parts of my recent articles listed in the bibliography appear with varying degrees of modification throughout the book. I am indebted to Richard Gilbert, Richard Green, and Michael Pollitt for permission to reproduce collaborative work.

Claude Henry has been supportive and remarkably patient in dealing with a manuscript whose first draft was available in December 1995, but whose redrafting to reflect the rapid developments of the last few years has had to be fitted into brief intervals between the normal pressures of academic life and the administrative responsibility of running the Department of Applied Economics, whose support has nevertheless been invaluable. Sharon Swann has provided secretarial support, while seminar and lecture invitations around the world have provided invaluable feedback, as well as welcome distractions from completing the task.

Cambridge, England
August 1999

# Abbreviation and Units

| | |
|---|---|
| AGR | advanced gas-cooled reactors |
| ATM | asynchronous transfer mode |
| bcm | billion cubic meter |
| BG(C) | British Gas (Corporation) |
| BT | the incumbent British Telecoms company |
| CATV | cable television |
| CCA | current cost accounting |
| CCGT | combined cycle gas turbine |
| CfD | contract for differences |
| CEE | Central and Eastern Europe |
| CEB | Central Electricity Board |
| CEGB | Central Electricity Generating Board |
| cm | cubic meter |
| $CO_2$ | carbon dioxide |
| CPS | carrier preselection |
| CPUC | California Public Utilities Commission |
| CV | coefficient of variation = SD/mean |
| DEA | data envelopment analysis |
| DGES | Director General of Electricity Supply |
| DGFT | Director General of Fair Trading |
| DGSS | Director General of Gas Supply |
| DGT | Director General of Telecommunications |
| DTI | Department of Trade and Industry |
| EC | European Commission |
| ECNZ | Electricity Corporation of New Zealand |
| EdF | Electricité de France |
| EFA | Electricity Forward Agreement |
| ESI | electricity supply industry |
| EU | European Union |

| | |
|---|---|
| FCC | Federal Communications Commission |
| FERC | Federal Energy Regulatory Commission |
| FFL | fossil fuel levy |
| FGD | flue gas desulphurisation |
| GATS | General Agreement of Trade in Services |
| GATT | General Agreement of Trade and Tariffs |
| GCV | gross calorific value |
| GDP | gross domestic product |
| GNP | gross national product |
| GOAL | Generator Ordering and Loading (program for scheduling generation) |
| HFO | heavy fuel oil |
| HSHC | Hungarian State Holding Company |
| ICOR | incremental capital output ratio |
| IMF | International Monetary Fund |
| IONU | investor-owned network utility |
| IP | Internet protocol |
| IPP | independent power producer |
| ISO | independent system operator |
| JTC | Jamaica Telephone Company |
| LD | long distance |
| LDC | local distribution company (usually of gas) |
| LNG | liquified natural gas |
| LOLP | loss of load probability |
| LRMC | long-run marginal cost |
| LTI | long-term interruptible (gas contract) |
| MAR | market to assets ratio |
| MFJ | modified final judgement |
| MIT | Ministry of Industry and Trade |
| MJ | MegaJoule (heat unit) |
| MMC | Monopolies and Mergers Commission |
| MTS | message telephone service |
| MVM | Magya Villamos Muvek (the Hungarian power company) |
| NBP | national balancing point |
| NCV | net calorific value |
| NFFO | nonfossil fuel obligation |
| NFPE | nonfinancial public enterprise |
| NGC | National Grid Company Plc |
| NIE | Northern Ireland Electricity Plc |
| $NO_x$ | nitrogen oxides |

| | |
|---|---|
| NOPR | Notice of Proposed Rulemaking |
| NTS | national transmission system |
| OECD | Organization for Economic Cooperation and Development |
| OFT | Office of Fair Trading |
| PE | public enterprise |
| PGT | public gas transporter |
| PJM | Pennsylvania–New Jersey–Maryland interconnection |
| PNU | public network utility |
| PPA | power purchase agreement |
| PPP | pool purchase price |
| PSP | pool selling price |
| PSTN | public switched telephone network |
| PUC | Public Utilities Commission |
| PWR | pressurized water reactor |
| PX | power exchange |
| R&P | restructuring and privatization |
| RAB | regulatory asset base |
| RBOC | Regional Bell Operating Company |
| REC | regional electricity company |
| ROR | rate of return |
| RPI | retail price index |
| SB(M) | single buyer (model) |
| SD | standard deviation |
| SMP | system marginal price |
| SRMC | short-run marginal cost |
| $SO_2$ | sulfur dioxide |
| SOE | state-owned enterprise |
| SPA | State Property Agency |
| TCC | transmission congestion contract |
| TELRIC | total element long-run incremental cost |
| TFP | total factor productivity |
| TO | transmission operator |
| TPA | third-party access |
| UUROR | used and useful rate of return |
| VAT | value-added tax |
| VOLL | value of lost load |
| WEM | wholesale electricity market |
| WTO | World Trade Organization |

**Units**

| | |
|---|---|
| kW | kilowatt |
| MW | megawatt = 1,000 kW |
| GW | gigawatt = 1,000 MW |
| kWh | kilowatt hour |
| MWh | megawatt hour = 1,000 kWh |
| GWh | gigawatt hour = 1,000 MWh |
| TWh | terrawatt hour = 1,000 GWh |
| kbs | kilobits = 1,000 bits per second |
| Mbs | megabits = 1,000 kbs |
| BTU | British thermal unit |
| MBTU | million BTU |
| therm | 100,000 BTU |

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# 1 Introduction

Network utilities are public utilities that require a fixed network to deliver their services, and include gas, electricity, water, rail, and fixed link telephony. They are economically of high importance—the value added of the privatized U.K. network utilities in 1995 was 5 percent of GDP, with a market value of 15 percent of GDP. The networks of these utilities are classic natural monopolies; they create rents that are fought over. The networks are durable and fixed, so the rents persist. The capital of the network of the utility is large and sunk, so once created the balance of bargaining advantage shifts from investor to consumer. Finally the networks of gas, water, electricity, and telecoms are directly linked to the consumer, giving their owner potentially large exploitative power. These consumers are numerous, are politically important, and have no choice of network. In the telling phrase of Albert Hirschman, they cannot exit and so will use their voice.

The problem facing investors and consumers is to devise an institution that will balance these interests and powers. The tension between the investor and consumer can be side-stepped by state ownership, which has the coercive power to finance the sunk capital without requiring the assurance of a future return from the utility. Alternatively, it can attempt to reconcile private ownership with consumers' political power through regulation. Either way, network utilities operate under terms set by the state.

Economists since Adam Smith have argued that competition not only provides incentives for firms to minimize production costs but also restrains prices and ensures that consumers will satisfy their wants at least cost. This claim fails for natural monopolies. They either face no effective competition and hence are under little pressure to cut costs or keep prices low or, if competitors enter, wastefully duplicate facilities, raising costs and prices. Either way, the market will fail to satisfy

consumer needs at least cost. The conventional analysis of network utilities starts from this market failure, which justifies regulation or public ownership to restrain prices and restrictions on entry to avoid costly duplication. The task is then to devise rules for setting prices and meeting demand that encourage efficiency.

This book takes a rather different approach. It argues that designing price-setting rules is only a part of the policy agenda for network utilities. Network utilities pose special problems of ownership and regulation whose solution is constrained by the institutional endowment of the country. Public policy toward these utilities will inevitably reflect deeper political and cultural features of society, as will the institutions that evolve in response to these factors. How these utilities should be regulated, structured, and even owned, may vary over time in response to changing circumstances. Utility policy may respond to changes—in the balance of political power, in the relative power of competing interest groups, in technology, in risks (e.g., of supply disruptions), in international competitive pressure, or in investment needs. Most of the time the balance of forces will be such that the existing governance structures of these utilities will be in equilibrium, but occasionally the balance is disturbed sufficiently that change becomes possible or likely. The growth slowdown and loss of confidence after the oil shocks of the 1970s ushered in one such period of disturbance, eventually opening the prospect of fundamental reforms in utility governance.

The post–oil-shock period has witnessed a sea-change in our view of the legitimate role of the state in economic activity. The boundaries of the state started to shift with privatization in Chile and Britain, and they changed dramatically with the transition from state socialism to the market economy in Eastern Europe. Legitimacy is not just about public versus private ownership, but about control—whether the state should exercise control directly though ownership or indirectly through regulation, or whether economic activity should be guided by the market, subject only to general competition policy. The wave of deregulation that started in 1978 in the United States showed that markets were better than regulators at reducing prices and increasing efficiency, and this cast doubt on the social value of regulation. Economists learned that the information they had assumed to be costlessly available for directing utility policy was sadly incomplete. Regulation was therefore unavoidably inefficient, and regulatory failure had to be balanced against the costs of market failure.

This book argues that societies have to evolve satisfactory regulatory institutions to deal with the special problems of network utilities. The most basic requirement is that these utilities should be able to finance their investment and meet the demands made upon them. Economies with different institutional endowments have evolved different solutions, notably in the form of ownership, and some have been considerably more successful than others. The simplest way to ensure an adequate supply of investible funds is to give the utility a protected franchise monopoly or to give it access to the tax powers of the government.

The next problem is ensuring efficiency in operation, and responsiveness to new technological possibilities. Here competition is more effective than regulation, but it is in apparent conflict with the protected franchise, and the associated tendency to vertical integration that this encouraged. The great innovation of the post–oil-shock period was not so much privatization as liberalization and/or restructuring. If regulation could be confined to the core natural monopoly network, and competition introduced for the services supplied over the network, then efficiency and innovation could be encouraged.

From this perspective the most important problem to address is to choose the right structure for the utility that will limit the need for necessarily inefficient regulation. The evidence presented below suggests that there may be little difference in efficiency between state-owned network utilities and vertically integrated private network utilities subject to cost-of-service regulation. The key innovation that makes a difference to performance is to introduce competition into the services supplied over the network. This may be done either by vertical separation or liberalizing access to the network. Vertical separation has the advantage that given adequate competition, regulation can be confined to the network. Liberalization requires more complex regulation to prevent the network owner from exploiting his incumbency advantage. Apparently quite modest reforms that allow entry and remove the protected franchise can precipitate far-reaching changes in the whole system of regulation, with further consequential changes for the structure of the utility. The traditional concerns of utility regulation of ensuring efficient pricing and operations remain for the core network, but the appropriate choice of regulatory instruments and institutions has been transformed by liberalization and restructuring.

Not all network utilities lend themselves to liberalization and competition. The costs of moving water any significant distance through