

# David Michael Garrood Newbery (1943-)

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### Abstract

David Newbery is one of the very best micro-economists that Cambridge has produced in recent decades. David has made many contributions to economics over the years, in development economics, public economics, industrial organization, economic regulation, transport and energy economics. We discuss his work in three general parts. The first focuses on his early work. This includes his work with Nobel Laureate, Joe Stiglitz, on commodity price stabilisation, with Richard Gilbert on patenting and with Nicholas Stern on taxation in developing countries. The second looks at his work on the pricing of transport and energy, particularly with respect to efficient road pricing and optimal energy taxation. This includes work with Nobel Laureate, Eric Maskin, and Larry Karp. The final part reviews his work on liberalised electricity market design, both in terms of the operation of wholesale electricity markets and the regulation of network monopolies.

**Keywords:** Optimal tax theory; Road User Charges; Energy taxation; Electricity Reform

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# David Michael Garrood Newbery (1943-)<sup>1</sup>

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## 1 Introduction

Starting with Alfred Marshall, Cambridge Economics has distinguished itself in the field of microeconomics at least as much as it has in macroeconomics or econometrics. David Newbery is one of the very best micro-economists that Cambridge has produced in recent decades. As recently as July 2014 he was the highest ranked of any Cambridge economist in the rankings of top UK economists (on RePEc),<sup>3</sup> even though he had retired (formally) from the Faculty in 2010.

David has made many contributions to economics over the years, in development economics, public economics, industrial organization, economic regulation, transport and energy economics. He has published over one hundred academic papers and been co-author or co-

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<sup>2</sup> The author acknowledges the very helpful comments of Robert Cord, Richard Green and David Newbery.

<sup>3</sup> <http://ideas.repec.org/top/top.uk.html>. Accessed 21 August, 2014.

editor of eight books.<sup>4</sup> This makes summarising his work rather challenging!<sup>5</sup> I am however grateful to the guidance given by Richard Gilbert in his short (but very informative) tribute to David in the special issue of *The Energy Journal* that Richard Green and I edited in 2008 to celebrate David's 65th birthday (Gilbert 2008). In this issue, Stephen Littlechild also makes the point that as Professor of *Applied Economics* David listed *economic theory* at the beginning of his (long) list of interests (Littlechild 2008: 43), emphasising that David's micro-foundations are at the root of all his work.

David is a Cambridge economist through and through having studied Economics at Cambridge and spent all of his working life as a member of the Faculty of Economics between 1966 and his formal retirement in 2010. Since then he has continued to serve as Director of the university's Energy Policy Research Group and continues to have his main office in the Faculty of Economics. His intellectual inspiration at Cambridge was undoubtedly the great economic theorist Frank Hahn – they were both fellows of Churchill College – of whom he wrote an affectionate obituary (Newbery 2013). However, Frank remained somewhat surprised by David's development from a theorist into an applied economist!

David came up to Trinity College, Cambridge, in 1960 and studied Mathematics for two years (having skipped Part I and moved straight to Part II). Unsure of whether to continue to Part III in Maths, he had a brief conversation with Jim Mirrlees, who fortunately convinced

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<sup>4</sup> See <http://ideas.repec.org/e/pne15.html>. Accessed 26 May 2015.

<sup>5</sup> I draw on the CVs available at

<http://www.econ.cam.ac.uk/people/crsid.html?crsid=dmg&group=emeritus> and

<http://www.fondation.dauphine.fr/la-fondation/lequipe/personne/prof-david-newbery/>.

Accessed 26 May 2015.

him to do an additional two-year Part II in Economics. He graduated with a First in 1965. He subsequently received his Ph.D. from Cambridge in 1976 (on the basis of published work). David was elected to a teaching fellowship at Churchill on graduation in 1965, but took up a one-year post in Tanzania, working in the Treasury on an ODI Nuffield fellowship. This was to prove a formative experience in his sustained interest in the application of sound economics to developing countries throughout his career. On his return to Cambridge he became a lecturer in the Faculty of Economics, rising to become Professor of Applied Economics in 1988. David served as the final Director of the Department of Applied Economics (DAE) from 1988 to 2003. Although continuously employed at Cambridge throughout his career, David had a highly significant two-year period at the World Bank between 1981 and 1983 as Chief of Public Economics. He has also had sabbaticals at Stanford, Yale, Princeton, the IMF and Berkeley.

David has worked with many great economists who passed through Cambridge at some point in their career. He is a co-author with two Nobel Laureates: Joe Stiglitz (2001 for analysis of markets under asymmetric information) and Eric Maskin (2007 for mechanism design theory). He was supervised by a third, Jim Mirrlees (1996 for theory of incentives under asymmetric information) and with Mirrlees had a fourth, Richard Stone (1984 for the development of systems of national accounts) as his Ph.D. examiner. In addition, he has co-authored with Antony Atkinson, Richard Gilbert, Larry Karp and Nicholas Stern. Joe Stiglitz refers to several of his joint papers with David in his Nobel Prize Lecture (Stiglitz 2002). David has held international honours as President of the European Economic Association (for 1996) and President of the International Association of Energy Economists (IAEE) (for 2013). In the Queen's Birthday Honours of June 2012 he was awarded a CBE (Commander of the British Empire) for 'services to Economics.' He was elected a Fellow of the British Academy (FBA) in 1991 and received his higher doctorate, a Doctor of Science (Sc.D.), from

the University of Cambridge in 2001. In 2002 he was the recipient of the International Association for Energy Economics' Outstanding Contributions to the Profession Award.

He has helped develop generations of Churchill undergraduates, including Richard Smith who has been Chair of the Faculty of Economics at Cambridge. His doctoral students have included Richard Green, Professor of Sustainable Energy Business at Imperial College, and Karsten Neuhoff, Professor of Climate Policy at DIW Berlin. He has played a formative role in the careers of many others who have worked with him at the early stages of their careers (including myself!). David was a popular university lecturer, known for his stimulating, but challenging lectures on topics in applied welfare economics, where he brought the joys of the Treasury's Green Book on public project appraisal (and other topics which we will get to shortly) to successive cohorts of economics undergraduates.

David is an example, *par excellence*, of someone who has combined funded academic research and the production of high quality papers in social science. In the 1980s he was part of the highly successful ESRC research grant looking at *risk, information and quantity signals (the so called 'Risk Project,' led for 15 years by Frank Hahn up until 1991)*. From 1989 to 2010 he led ESRC funded projects on utility and then electricity market reform, culminating in the award of £2.38 million (in 2005) for the creation of the Electricity Policy Research Group (EPRG). In addition, David won several other competitive research grants, including from the EPSRC and the European Union. David has also contributed as an advisor to many government agencies and departments (most notably the regulatory agencies for energy, water and railways, Department of the Environment and the Department of Energy and Climate Change) and acted as a consultant on numerous projects. He served as a member of the Monopolies and Mergers Commission (the UK's competition authority) from 1996-2002. In 2001, he helped establish a consultancy firm – Cambridge Economic Policy

Associates (CEPA) – where he is currently acting Chairman of the Board of Directors and Vice President. David has also travelled to many countries to speak and advise: notably Hungary, Poland, the Czech Republic, Bulgaria, Russia, Kenya, Tanzania, South Africa, Brazil, Argentina, Bangladesh and India. David’s capacity for economic work – theoretical, applied and practical – is prodigious.

David has also made more than his fair share of contributions to the intellectual life of Cambridge, being a regular in the coffee room at the Faculty and at the Lunch table at Churchill College. I have been in many a meeting which either began in or repaired to the coffee room on the 4th floor of the Austin Robinson Building because it was 11am or 4pm (i.e. coffee/tea time!), or whose beginning or end was defined by the need for David to cycle off to Churchill to be at lunch between 1 and 2pm. David’s delight in the discussions which arise in those settings is and always has been obvious. His commitment to Churchill culminated in him being elected President of the Senior Common Room in 2010. My own experience as a fresh-faced lecturer in the Faculty of Economics was David’s boundless enthusiasm about what he *just* learnt, and therefore *had* to share. It was David who taught me that the key to being a happy (and productive) academic was to find continuing joy in the *latest* factoid that one could glean about one’s topics of interest!

It is difficult to categorise David’s contributions to the literature, but I have divided this review into three parts.<sup>6</sup> The first focuses on his early work, partly arising out of his ODI Fellowship in Tanzania and culminating with his period in Washington at the World Bank. This includes his work with Joe Stiglitz on commodity price stabilisation, with Richard Gilbert on patenting and with Nicholas Stern on taxation in developing countries. The second

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<sup>6</sup> I draw on the citation counts in Google Scholar (<http://scholar.google.co.uk/>) to identify David’s most significant contributions to the literature. Accessed 26 May 2015.

looks at his work on the pricing of transport and energy, particularly with respect to efficient road pricing and optimal energy taxation. This includes work with Eric Maskin and Larry Karp. The final part reviews his work on electricity market design, both in terms of the operation of wholesale electricity markets and the regulation of network monopolies. This includes significant work with Richard Gilbert and work arising from his leadership of research projects at the DAE. I don't aim to be comprehensive (I ignore David's work on Hungarian transition and his recent interest in the economics of wind farms!). I do aim to give a flavour of the significance of David's thinking in these areas highlighted by his citation counts.

## **2 Earlier theoretical work, mostly on developing economies**

David's early work shows his commitment to the application of economic theory to problems of practical interest, the problems being largely those faced by developing countries. The genius of much of this work is that it starts from the fundamentals of microeconomic analysis and sees how far we can get in the face of the particular problem being addressed. David's work demonstrates that neoclassical economics in practice is not – as it is so often characterised by its critics – about the blind application of textbook models in spite of real world complexity. It is about providing a place to start in getting a conceptually tractable handle on what might otherwise be too easily (and lazily) characterised as a unique problem by those who dismiss microeconomic theory as being too abstract to have practical value.

David's early theorising drew on his experiences in Tanzania combined with his interest in the advanced theory being produced by his colleagues, notably Tony Atkinson, Jim Mirrlees and Ken Arrow. Thus in Newbery (1970) David offers an elegant two-page mathematical proof of a point made by Atkinson (1970). that the empirical measures of inequality (such as

the Gini coefficient) are unreliable at the national level. David's paper proves that "[t]here exists no additive utility function which ranks income distributions in the same order as the Gini coefficient" (Newbery 1970: 264).

David's lifelong interest in project appraisal is well demonstrated in his 1976 book (with Scott and MacArthur) on *Project Appraisal in Practice. The Little-Mirrlees Method Applied in Kenya*. Little and Mirrlees' (1968) book on social cost-benefit analysis in developing countries made the argument that when conducting a project appraisal of costs and benefits in an underdeveloped economy, world (or border) market prices should be used for traded goods, not local market prices. This correctly reflects the true opportunity cost of goods traded in international markets, whatever their local valuation. However, the shadow price of labour, important for non-traded goods and services in a developing country, that should be used in social cost-benefit analysis is usually below the market wage. As a result, the shadow price that should be used for non-traded goods and services is somewhere between the local market price (evaluated at the official exchange rate) and the world market price. These values need to be estimated and this is what the authors' work does for Kenya. They argue that for developing countries, shadow prices are usually less than market prices at the official exchange rate because the official exchange rate is overvalued.

The book's empirical calculations include an evaluation of whether it is NPV (Net Present Value) positive to import grain to fatten cattle for export. The argument is that the world price of grain is low (due to agricultural subsidies), while the world price of beef is relatively high. Thus moving up the value chain (to produce beef rather than grain) can be beneficial for developing countries, even though the opportunity cost of grain is its world market price. One can see the value of sound microeconomics to the practical problems of developing countries shining through this sort of argument. As Schafer (1979: 395) quotes in his



excellent book review, the authors point out that social cost-benefit analysis is “an art which can only be learned by practising it.”

The influence of his Tanzanian experience is evident in another significant theoretical paper of David's on 'Risk Sharing, Sharecropping and Uncertain Labour Markets' (from 1977). Sharecropping describes a contractual situation where a tenant farmer pays the landlord a fixed share of the crop. Traditionally, this arrangement was thought to be economically inefficient (by no less than Adam Smith himself) because it reduced the marginal incentives to add inputs on the part of the farmer. David's paper sought to explain the circumstances under which sharecropping was actually an efficient arrangement. Like so much of good microeconomics, this paper is in the tradition of trying to explain why something so widespread – that looks like an example of inefficient underdevelopment – has actually a clear efficiency rationale. David's argument looks at sharecropping as a means to spread production risk and as a means to spread input price risk. What David shows is that if wages are correlated with output then sharecropping can be an efficient way of spreading labour (input) cost related risk. Here we see a forerunner of David's later work with Joe Stiglitz, in that he models a developing country world where formal risk markets for commodity producers do not exist and where other means have to be found by them to mitigate risk.

David's most cited work is his 1981 book with Stiglitz on *The Theory of Commodity Price Stabilization: A Study in the Economics of Risk*. This is a quite brilliant attempt to extend general equilibrium thinking to incorporate risk, in situations where risk markets are incomplete. This book was written in the context of international (i.e. World Bank) concern about the volatility of commodity prices and the impact of this on developing countries. This had led to calls for commodity price stabilisation (through the holding of international buffer stocks) to stabilise the incomes of developing countries. However, Newbery and Stiglitz

point out that it is not that simple and carefully attempt to analyse who gains and who loses and by how much. Rather cheekily, Dowie's review (1983) suggests the book might have been better titled "The Economics of Risk: A Study of Commodity Price Stabilization" (ibid., 230).

I can still recall the intellectual thrill of learning (as an undergraduate at Cambridge) the following example which lies at the heart of their insights. Imagine there are two countries producing a single agricultural commodity. There are no insurance markets. Output is perfectly negatively correlated between the two countries. There is unit elasticity of demand in each country. Should we act to stabilise the price of the commodity? No, because if we do that then we will stabilise the price but not the income of farmers in the country. It is income, not price, which enters utility functions. Indeed, the best thing for the farmers in the countries is that we leave the countries in agricultural autarky because in that case the prices will rise in inverse proportion to national agricultural output and hence agricultural incomes will be stable. This latter point is clearly made by Newbery and Stiglitz in their 1984 *Review of Economic Studies* paper.

The idea that price stabilisation will not be effective at stabilising income or consumption is at the heart of the book. The authors say it is written with three different audiences in mind – policy, agricultural and general economists (whose various messages are nicely reviewed in Behrman 1985). As is characteristic of David, it starts with the general equilibrium model and relaxes its assumptions in important ways that reflect reality and sees where this goes. In this case it provides an argument that a favoured intervention – price stabilisation through buffer stocks – is unlikely to work because the net gains are small, while the costs of speculative attacks if the operators of buffer stocks miscalculate are high.

David's second most cited work is his 1982 *American Economic Review* paper with Richard Gilbert on 'Preemptive Patenting and the Persistence of Monopoly.' This is another theoretical paper motivated by a real world example – that of the alleged patent thicket of unused patents created by Xerox to prevent its rivals from competing with its products. In the paper Gilbert and Newbery show that an incumbent monopolist has more incentive to come up with an unused blocking innovation than a rival firm. The paper characteristically starts with some classical? theory and shows the circumstances in which it does not apply.

Arrow (1962) basically argues that incumbent monopolies have less incentive to innovate than a rival firm seeking to gain the monopoly. This is because for a cost-reducing innovation the monopolist only gets the difference between the profit after the new innovation ( $\pi_2$ ) and its initial positive profit ( $\pi_1 > 0$ ;  $\pi_1 < \pi_2$ ). This is less than a rival, who if they can get the monopoly after an innovation gets the same profit ( $\pi_2$ ) but a higher increase in profit than the incumbent (who only gets  $\pi_2 - \pi_1$ ). What Gilbert and Newbery brilliantly show (another warm glow comes over me as I recall reading this argument for the first time as a graduate student!) is that in a differentiated product market the incentives to innovate are different. If the rival innovates it gains less than half of the initial monopoly profit of the incumbent, because the market is now a duopoly. On the other hand, if the incumbent prevents the loss of its monopoly by innovating its incentive to innovate is strictly greater than half of the monopoly profit, because it has stopped the market becoming a duopoly. QED: this suggests that there is a clear incentive for incumbents to create patent thickets if they can. However, in typical David style, the paper is careful to state that it is very difficult to decide in practice whether a particular R&D investment is pre-emptive.

While David was working at the World Bank he was involved with a project which led to his 1987 co-edited book *The Theory of Taxation for Developing Countries*, with Nicholas Stern.

This book focuses on the application of optimal tax theory to developing countries. As Toyne (1988) points out in his review, this book (at 694 pages) is actually two books in one: the first co-authored between Stern and Newbery; and the second an edited conference volume. The idea behind the book is to apply Diamond and Mirrlees (1971a, b) thinking on optimal taxation to developing countries. The book consistently suggests that developing countries have very inefficient tax systems (when evaluated from a Diamond-Mirrlees viewpoint) and addresses the important issue of how their tax systems should be reformed. As is characteristic of David's work, appeals to high theory when carefully applied rarely lead to definitive conclusions, though they can give clear guidance in particular cases. As Hines (1989) points out in his review, the editors manage to bring out a consistent message that optimal tax theory is an important reference point for tax reform. This is something very much reflected in David's undergraduate lectures on applied welfare economics, and links into the next batch of his work we review.

### **3 Optimal taxes and charges for transport and energy**

David's Directorship of the DAE beginning in 1988 coincides with the flourishing of his applied work, albeit strongly rooted in the micro-foundations of his earlier research. This work was very much focussed on transport and energy. Although his energy work is the better known of the two, I particularly appreciate his research on transport and start with this.

Following his work on optimal taxes in a developing country context, David became very interested in the pricing of goods in developed countries that were often mispriced by the standards of optimal tax theory. One such target of his writing was the pricing of road use, where David became a leading public advocate of the use of road pricing in Britain in the 1990s. Indeed, it was this work which attracted the most media attention in his career. I still

remember – in the early days of my own collaboration with David – waking up to hear him being interviewed about road pricing at a busy junction on BBC Radio Four’s flagship morning news programme.

David’s public views on road pricing arose directly from his writing. The central problem to be addressed was how to appropriately recover the costs of the road system from its users. This was addressed in his 1988 paper ‘Road User Charges in Britain’ (Newbery 1988a). This paper discussed the theoretical basis for road charging, calculated the likely amounts raised from optimal charging – for congestion, road damage and accidents – and compared this to the actual charges paid by road users. Among the themes that emerged were the fact that passenger cars should be heavily taxed because of their contribution to congestion and accidents, not because of their contribution to road damage (which is negligible), while optimal charging would only collect 40 per cent of the total damage costs imposed by heavy goods vehicles (HGVs). Overall, road-related taxes only recovered 70 per cent of total cost, indicating significant room for improvement in tax policy. David’s conclusions suggested that the failure to properly account for congestion and accidents in charging meant that decisions on future road investment were unlikely to be sensible. Indeed, a central implication of his work emerges here: new roads, which reduce congestion and accidents, while raising additional fuel taxes, were likely to be highly socially beneficial, and self-financing for the Treasury.

David continued his interest in road damage costs in his 1988 *Econometrica* paper: ‘Road Damage Externalities and Road User Charges’ (Newbery 1988b). This paper won the Frisch Medal of The Econometric Society in 1990, awarded every two years. This paper theoretically explored optimal road damage charging. What the paper shows is that under certain circumstances “the externality caused by vehicles damaging roads, which raises the

operating cost of subsequent vehicles, exactly cancels out when averaging over roads of different ages” (ibid., 313). This has the implication that if vehicles are charged per mile in proportion to the direct damage they cause, that would be optimal. This paper further shows that optimal charging of maintenance costs is likely to under-recover such costs while optimal charging for congestion will over-recover marginal capacity costs. Thus, considering both costs together might yield optimal charges which both provide optimal price signals and recover total road network costs. This holds out the possibility that rebalancing road user charges on an optimal tax basis might allow the road system to be self-financing.

This last idea was further explored in Newbery (1989). Here David shows theoretically and empirically how an optimal road user charge for maintenance and congestion will cover capital and maintenance costs for the road network in the UK. This is interesting because the road user charge should be levied on an equivalent standard axle (ESA) factor basis (which measures the damaging power of each vehicle axle), while congestion should be measured on a passenger car unit (PCU) basis (i.e. relative to the congestion of a representative car). On an ESA basis an HGV is orders of magnitude more damaging than a car, but in terms of congestion only represents 2-3 PCUs. David’s empirical results suggest that while current aggregate road charges may be in line with costs, the misalignment between actual charges and optimal charges means that road investment decisions are unlikely to be optimal. He thus advocates road pricing – well ahead of the Electronic Road Pricing in Singapore (which began in 1998) and the London Congestion Charge (from 2003).

David’s most comprehensive paper on road pricing is his *Oxford Review of Economic Policy* paper from 1990. This paper is familiar to generations of Cambridge undergraduates because it includes all of the key diagrams in David’s lectures on road pricing to final year students. In this paper a number of economically correct (but often unpopular with politicians and

environmentalists) arguments are strongly made. These include the facts that efficient road pricing would probably justify further road expansion (by correctly showing the positive NPV and self-financing nature of such investments) and reduce the quality-adjusted costs of public transport (a positive externality!). This point about public transport would be especially true if the extra revenues generated by substitution away from using correctly priced urban roads were spent on improving quality. This last point was amply justified by the subsequent positive experience of exactly this happening in the case of the London Congestion Charge.

Another key idea advanced by David (in Newbery 1994) was the idea that a public road authority should be created, drawing on the experience of private regulated network monopolies. The idea was that a commercial entity should be created to own and operate the road network in Great Britain. This entity (which would not necessarily have to be privatised) would have a balance sheet and could consider investment decisions on a commercial basis. The main point of doing this would be to allow proper financial decisions to be made about road investment, following the arguments in David's earlier papers about road charging. It would also allow a more sensible debate about the costs and benefits of road investment and allow the roads authority to borrow to invest where there were socially profitable (and often financially profitable) road projects. This is an idea whose time has not quite come, but it remains a powerful suggestion, which would free road investment from the political business cycle and represent a considerable supply-side benefit to UK plc.

A favourite paper of mine on road transport is David's 1995 piece discussing the Royal Commission on Transport and the Environment (Newbery 1995a). This Commission reported in 1994, recommending a substantial rise in fuel duty as part of the effort to avoid the forecast doubling of road traffic in the UK out to 2025. David's economic hackles are

rather wonderfully raised by this presumption that restraining road transport would be good for society. A particular focus of the paper is the ignoring, by the Commission, of the congestion externality and its overestimation of the emissions impacts of road transport. David sharply points out that doubling fuel duty, as the Commission recommended, would massively distort the relative taxes on emissions between sectors (by raising it by £600/tonne of carbon) and could not be justified on optimal tax grounds. He also makes the point, with which I still delight my own supervision students, that the problem in the UK – given the huge cost of road congestion to the economy – is *too few* roads, not too many!

Like his work on transport, David's initial interest in energy was linked to optimal pricing. David's early work in this area examined the dynamic consistency problem of government policy (similar to Kydland and Prescott 1977), applied to energy taxation. Fundamental to David's approach was the analysis of the pricing problem faced by oil importing governments. David's papers in this area took as a given that the producers had market power, but sought to model the impact of including the fact that consumers (large oil importing countries) *also* had market power. He did this in the context of the theory of exhaustible resources, where the producer price today had to be arbitrated against the price tomorrow, and hence a dynamic schedule of producer prices and taxes had to be calculated.

Newbery (1981) focuses on oil producers, modelling the oil market being characterised as a Stackelberg leader (cartel) facing a competitive fringe. This paper shows the extent to which the presence of the competitive fringe undermines the power of the cartel and provides incentives to renege on agreements among producers and with consumers.

The problem examined (with Eric Maskin) in 'Disadvantageous Oil Tariffs and Dynamic Consistency' (1990) was that the oil importing country with market power optimally wanted



to define a time series of import taxes (known as optimal open loop taxes) which maximised its social welfare. It would likely be optimal to commit to higher taxes tomorrow in order to drive down prices today. However, this would be subject to a time inconsistency problem, in that when tomorrow came it would be optimal to renege and reduce taxes – from their pre-announced level – in order to reduce consumer prices and increase oil consumption. This paper also suggests that the presence of low cost storage might act as a strategic commitment to solve the time inconsistency problem.

The theoretical modelling of the market power of oil importers is further explored with Larry Karp in their 1991 paper, ‘OPEC and the U.S. Oil Import Tariff.’ This paper notes the similar concentration of oil consumers and oil producers and models OPEC’s position in the oil market as being that of a symmetric duopolist with a competitive fringe, the authors noting “it is somewhat surprising that no-one has proposed this solution concept before” (ibid., 305). The importing countries in this case should impose optimal import tariffs. The overall impact of the interaction between the three players in the market is that the initial price falls. The optimal modelled US oil import tariff is initially around half the final US consumer price.

This paper was followed by another with Larry Karp in 1992: ‘Dynamically Consistent Oil Import Tariffs.’ This won the Harry Johnson Prize from the Canadian Economics Association in June 1993, for the best article published in the *Canadian Journal of Economics* in 1992. The paper continued David’s investigation of the dynamic inconsistency problem of oil taxation. It explores the differences between buyers and sellers of oil with market power. The results show that buyers with market power are more likely to be dynamically inconsistent while sellers are less likely to be so. The intertemporal price arbitrage of an exhaustible resource turns out to be a dominant effect which means that complicated intertemporal oil import tax variations, for large importers, have relatively small

effects on social welfare. Once again, the US could benefit from the imposition of significant oil import tariffs. This paper is a good example of David showing how sophisticated theory does not necessarily support complicated (i.e. time-varying) government pricing, but does support obvious pricing of externalities (in this case the consumption externality of oil imports into a large country).

In his 1992 paper, ‘Should Carbon Taxes Be Additional to Other Transport Fuel Taxes?’, David combines his interests in energy and transport. The title question arises because transport fuel is already heavily taxed – relative to other sources of carbon emissions – in the UK and many other countries. The answer, according to David, is that if anything the transport fuel tax should go up by at least the carbon tax content equivalent amount. This requires the maximisation of utility less the cost of gasoline, carbon emissions, road use and congestion, subject to the presence of one pricing instrument – fuel tax. This theoretical paper contains a rather brilliant tax argument to explain why:

A carbon tax will lead to a reduction in the fuel used per km driven because it will encourage greater fuel efficiency. This in turn will reduce the tax base on which the congestion charge per km is to be levied and raise the required road user charge per litre...’ (ibid., 54).

David’s most comprehensive paper on energy taxation is his 2005 ‘Why Tax Energy? Towards a More Rational Policy’ (Newbery 2005a). This paper brings together the insights from his work on both transport and energy. A central theme of the paper is that the differentials in energy taxes between countries and within countries on different fuels cannot be justified on optimal tax grounds and should be harmonised further. These differentials substantially distort trade, especially within the EU Single Market. The paper contains a good

summary of his work on optimal oil import taxes. This shows that the oil taxes in the EU were roughly optimal under certain assumptions, but that by implication natural gas and coal (given its relatively high carbon content) taxes were far too low, being close to zero in many countries.

‘Why Tax Energy?’ is an important question because as an intermediate good it is not clear why it should be taxed in a Diamond and Mirrlees (1971a, b) world. However, as David clearly argues, energy taxes can serve as optimal import tariffs, environmental externality prices and road user charges. But he expresses doubts about the ‘double dividend’ argument for energy taxation, which suggests that energy taxes increase overall welfare by allowing the reduction of other distortionary taxation. This is because tax rates relative to other goods are likely to be close to being welfare-optimal already especially when taking distributional arguments into account, while higher energy taxes worsen income distribution. As ever, David wants to take us beyond the simple theory to theory which has taken the empirical realities into account.

#### **4 Electricity market design**

From 1989 to his formal retirement David has led UK Research Council-funded energy market research and this has been the main focus of his research since then. His work in this area was substantially driven by real world events in the energy market in the UK, which made ‘the British Electricity Experiment’ a world famous case study in market liberalisation.

The British electricity industry was substantially restructured and privatised in 1990. A key feature of the process was the breakup of the monopoly Central Electricity Generating Board (CEGB). This involved separating the ownership of power plants from the transmission grid

and the creation of a competitive wholesale power ‘pool’ with half hourly price bidding by individual power plants to meet demand (i.e. a vertical and horizontal unbundling of the incumbent monopoly). David’s third most cited paper, published in 1992 with his then DAE colleague Richard Green, looked at ‘Competition in the British Electricity Spot Market.’ The CEGB was broken up, but the wholesale market was effectively a duopoly, with National Power and PowerGen controlling 90 per cent of the price-setting power generation plants in the pool.

Green and Newbery analyse the optimal bidding strategies of duopolists in such a power market using supply function equilibria (following Klemperer and Meyer 1989). In a supply function equilibrium setting the firms maximise profits by choosing a function that relates their output to the market price. Green and Newbery analyse this both theoretically and using reasonable parameter values for the British market. They show the difference between having two firms, rather than five in the market, in terms of company profits and deadweight losses. This paper provided early formal analysis of the failure of the government to break the CEGB up into enough firms to create a truly competitive market, a process that was eventually achieved by a combination of new entry and forced divestitures by 2001.

If the creation of a competitive wholesale market was one central plank of electricity liberalisation championed by David, a second general plank – also a favourite point of David’s – was the creation of an effective regulatory environment, where newly privatised network monopolies could invest in the knowledge that they would be allowed to recover a fair return via user charges subsequently. This was one of the central ideas behind the creation of independent regulatory agencies for utility industries, including electricity. Returning to his theoretical roots, David provided a convincing analysis of the economics of regulatory commitment, in a paper with Richard Gilbert in 1994 entitled ‘The Dynamic

Efficiency of Regulatory Constitutions.’ Newbery and Gilbert model the dynamic game played between the regulator and the private monopoly to show the circumstances under which appropriation of private returns was more or less likely. The nice point about this paper is that it models the fact that private companies are more likely to be present when they can provide the network service at lower cost (than if they were nationalised), investment requirements are growing and where the social discount rate is lower. All of these elements would make appropriation by the regulator less likely.

David spent much of the 1990s arguing for the introduction of more competition into the wholesale power market in Great Britain. Two influential papers which discussed this clearly were his 1995 ‘Power Markets and Market Power’ and his 1998 ‘Competition, Contracts, and Entry in the Electricity Spot Market.’ In Newbery (1995b) he focuses on the need to break up the incumbent duopoly (something which was to effectively happen later). In Newbery (1998) he analysed the role of fixed-price contracts between new entrant generators and incumbent suppliers in promoting competition in the face of large incumbent market shares in the wholesale pool. This pointed out how the ability of entrants to sign these contracts moderated the ability of incumbents to raise prices in the pool, hence mitigating market power. This theoretical proof was supported by the empirical observation of significant new entry into the power pool in England and Wales in the early 1990s, by new generators signing long-term contracts with suppliers.

David was very interested in the measurement of the benefit of electricity liberalisation and encouraged considerable work on this at the DAE. The earliest example of this was his paper with me, published in 1997 on ‘The Restructuring and Privatisation of the CEGB – Was It Worth It?’ This was an attempt at a comprehensive social cost-benefit analysis of the CEGB privatisation, drawing on earlier work for the World Bank (Jones et al. 1990). It was based on

putting the constituent parts of the CEGB back together after privatisation to construct a time series through privatisation of revenues and costs. This was then compared to a counterfactual of what might have been expected to happen in the absence of privatisation (based on trend costs and returns in the public sector). The differences between the actual and the counterfactual, including operating cost, investment and emissions effects, were then discounted to calculate an NPV of the privatisation, which we allocated between consumers, producers and the government. The overall result was a small but positive benefit from the privatisation (equivalent to a permanent reduction in costs of around 5 per cent), which went to the government and the producers (with consumers losing out). It was a result which was echoed in subsequent studies of electricity privatisations.

Much of David's later research was to draw on this initial work, as he sought to communicate the lessons of the British experience to an international audience. Among the most notable of his writings was his European Economics Association Presidential Address, 'Privatisation and Liberalisation of Network Utilities,' published in 1997. In this he highlights the role of economists in analysing the restructuring of network utilities, noting that "the gap between rather abstract theoretical models and the important specific features of each utility is narrowing" (ibid., 381) and no doubt with a glint in his eye, "the variety of experiments under way in an increasing number of countries...offers a tempting menu of problems to keep economists intellectually stimulated, financially rewarded, and socially productive" (ibid.).

David wrote 'Problems of Liberalising the Electricity Industry' in the *European Economic Review* in 2002 following the botched reform of the wholesale electricity market in California (supposedly based on the British model), which halted the progress of electricity market liberalisation in many countries. In this paper he highlights a favourite theme of his

later work: the importance of adequate transmission capacity to effectively increase the size of the wholesale power market. David has long had an interest in the role of transmission grids in liberalised power markets. A significant theoretical contribution on this is his 2004 paper with Richard Gilbert and Karsten Neuhoff on ‘Allocating Transmission to Mitigate Market Power in Electricity Networks.’ The authors explore the conditions under which generators with market power should be allowed to buy capacity on transmission grids. In general, transmission capacity could be (mis-)used to reinforce incumbent generators’ market power (via foreclosure) and hence David has been an advocate of the position that generators must use their transmission capacity or ‘lose it.’

David’s clearest summary of the lessons from the British experience with electricity liberalisation is in his 2005 paper, ‘Electricity Liberalisation in Britain: The Quest for a Satisfactory Wholesale Market Design’ (Newbery 2005b). This paper details the importance of the unbundling of transmission ownership from the ownership of power plants; the need to properly price access to transmission grids; the need to address market power in power markets; how transparent power pools can promote new entry; the need to understand whether the subsequent integration of generation and retail markets is beneficial for competition; and the superiority of the competitive wholesale markets and independently regulated natural monopoly networks over the fully vertically integrated incumbents observed in the US. David also discusses a favourite theme of his, whether the reform of the British wholesale market in 2001, which saw a compulsory power pool replaced by bilateral contracts and a balancing market, was beneficial. David argues, as he has done consistently, that this was a costly mistake, which did nothing to promote competition.

Much of David’s wisdom on liberalised electricity markets, and reflections on network utility reforms in general, is brilliantly distilled into his 2000 book, based on lectures he gave in

1995, *Privatization, Restructuring, and Regulation of Network Utilities*. The book remains one of the best introductions to both the theoretical and empirical economics of network industry liberalisation. David carefully distinguishes between the impacts of privatisation, competition and regulation. He contrasts successful liberalisation with both public ownership (as seen in pre-privatisation Europe) and traditional rate-of-return regulation (as practised in the US). David argues how each element can contribute to a successful liberalisation: privatisation makes it possible, competition handles the potentially competitive segments and incentive regulation can regulate the remaining monopoly networks. He draws extensively on his theoretical work on regulation and his empirical studies of electricity privatisation.

## **5 Conclusion**

Summing up David's contributions to the literature is difficult. However Vogelsang (2001) puts it rather nicely in his book review: "Newbery is a profound thinker. Without being overly formal, [his work] is therefore intense reading that requires pause from time to time, in order to absorb the material" (ibid., 484). The many fans of David's combination of a rigorous neoclassical thinking applied to the detail of real world microeconomic problems would recognise and appreciate this in all of his work.

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