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The Marginal Cost of Electricity: WHAT IS WATER WORTH?



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Winter is upon us and the nation's attention once again turns to the state of the southern hydro-lakes, watching to see if a power crisis is imminent. Last year a drought caused wholesale prices to increase dramatically, leaving many asking how can truly competitive prices be so high when water is free? Graeme Guthrie and Steen Videbeck explain there's more to the marginal cost of electricity than meets the eye.

In a genuinely competitive market, price should equal short-run marginal cost. After all, a firm will only produce goods when doing so increases its value, and its value goes up as long as the firm can sell the last unit of output produced for more than the cost of production. This ensures that the firm and society use resources efficiently.

So what is the short-run marginal cost of electricity? To answer this question we need to decide exactly what a firm gains and loses by generating electricity. Clearly it gains the revenue (quantity multiplied by

the spot price) from selling the generated electricity on the spot market, and it incurs the cost of generating this electricity. But this is only part of the story.

The economist's ideal electricity generator can be turned on and off instantaneously and uses a fuel which will never run out. Such a generator can be operated when the spot price is high (actually, higher than the marginal cost of generation) and turned off when the spot price is low. However, possibilities like this are rare in New Zealand, where 70 percent of generation capacity is hydro,

20 percent is gas, and three percent is coal-based. All of these fuels have special characteristics which complicate generating decisions.

The problem firms face is not *whether* to generate, but *when* to generate. The realities of hydro generation mean that the decision to generate today can affect a firm's ability to generate tomorrow. This linkage across time is what makes generators' problems so challenging.

As New Zealanders discovered in 1992, and rediscovered in 2001, the *to page 10*

TO DO OR NOT TO DO?

Whether 'tis nobler in the mind to expect a penalty...

The self-professed armchair economist SE Landsburg¹ once said that most of economics can be summarised in four words “people respond to incentives” – the rest is commentary.

That people respond to incentives sounds so obvious that we suspect that almost everyone would admit its validity as a general principle. What distinguishes economists, however, is our insistence on taking the principle seriously at all times.

An incentive is an inducement to take a particular action over some other alternative. Conversely, a disincentive puts us off taking an action that we might otherwise be inclined to take. In economic terms, incentives lower the price of taking an action and disincentives raise the price.

To economists, penalties look exactly like prices. People respond to higher prices by consuming less of the more expensive good, so presumably people respond to heavier penalties by doing less of the penalised activity, unless of course, they think they're unlikely to get caught. What the potential offender is really weighing up is the "expected penalty", that is, the penalty multiplied by the likelihood of getting caught, against the gains of committing the offence.

In deterring crime, policy-makers should also be concerned with the expected penalty rather than the severity of the penalty. If we can assume that greater monitoring increases the likelihood of catching an offender, the penalty need not be as severe to have the same deterrent effect. This provides an explanation for Jaimie Legge's finding (*Competition and Regulation Times*, page 8 this issue) that the fines for repeat offenders under the Fair Trading Act are lower than those for first-time offenders.

Penalties can take the form of fines, imprisonment or direct compensation to victims. From an incentive viewpoint, these are equivalent in the sense that they all raise the price of committing a crime. Direct compensation, however, has the advantage of returning the victim to their previous state before the crime was committed. Theft of money can be perfectly compensated, but in cases of personal injury to the victim, we can only assume that money can provide some compensation for a reduction in health. New Zealand's accident compensation scheme is based on this principle, but founders on the inherent difficulties of valuing personal injury and having to allocate compensation from a finite pool of collected levies, rather than directly from injurer to victim. Further, as Howell, Kavanagh and Marriott explain (see page 12) the no-fault scheme blunts the incentives on individuals to take due care to avoid injury to others. We should not be surprised to find both a higher number of accidents and a higher total cost of compensation under a no-fault compensation scheme than under, for example, a tort-based scheme which provides ex-ante incentives to take care based on expected penalties, unless we augment the no-fault scheme with greater monitoring and enforcement of health and safety standards.

People do indeed respond to incentives. This is why students responded to the offer of a free cell phone for enrolling in a work skills course (see page 7), while in offering students a free cell phone, the institution itself was merely responding to the incentives inherent in the tertiary education funding formula.

Economists take incentives seriously. What's more they are prepared to apply their economic

EDITORIAL



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PHOTO: IMAGE SERVICES

reasoning to a vast array of human endeavour. They invariably find that human behaviour, whether it be co-operative or non co-operative, is rationally motivated and strategic (see the article on Nobel Laureate John Nash on page 3). This issue of *Competition and Regulation Times* shows that focussing on incentives continues to find method in human madness.

¹ Landsburg, S (1993) *The Armchair Economist*. Macmillan.

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WHEN OSCAR MET NOBEL

Mystifying equations written on glass, hallucinations triggering rampant paranoia, cryptic newspaper collaged walls. These are scenes from the multi-Oscar winning film *A Beautiful Mind*, based on the extraordinary life of mathematician, schizophrenic and Nobel Laureate John Forbes Nash Jr. Steen Videbeck explains the famous theory behind a most beautiful mind.

In 1948, John Nash entered Princeton's mathematics PhD programme at the age of 20 with a recommendation letter that consisted of a solitary sentence: "This man is a genius". Within two years he had completed the 27 page doctoral thesis that would see him share the 1994 Nobel Prize in Economic Science.

While at the time not considered to be of great practical significance, the discovery, now called *Nash Equilibrium*, has gone on to fundamentally change the way people view interactive behaviour. It has been applied to such diverse areas as industrial organization, evolutionary biology, politics and sport, just to name a few.

For a theory to have such an impact on human thinking and win the Nobel Prize one would assume that it would have to be something approaching rocket science. But the brilliance of *Nash Equilibrium* is in its simplicity, not complexity. In fact it must have left many academics of the day muttering bitterly about their oversight.

So what is *Nash Equilibrium* and why is it so important?

Nash Equilibrium forms an important part of *Game Theory*, the study of strategic behaviour. A game is defined as anything that involves strategic interaction, i.e. it is not totally reliant on luck and involves two or more players. Thus games are everywhere, from avoiding bumping into people while walking down a busy street, to a group of countries negotiating nuclear disarmament. Games can be classified as co-operative (where players can collude) or non-co-operative (when they can't). *Game Theory* attempts to predict the strategies that rational players will adopt.

The field of *Game Theory* was founded by John Von Neumann, who together with Oskar Morgenstern developed a successful theory that found a solution to non-co-operative games with two players where one player won and the other lost (a zero sum game). While this was an important step in the development of the field, it was of limited use in the real world where most games involve more than two players and are not zero sum (i.e. one player's gain does not equal another player's loss). This is where Nash entered the scene, proving that an equilibrium exists for all games, including non-zero sum games and games with two or more players.

Nash Equilibrium occurs when each player's strategy is the best given the other players' strategies. In equilibrium no player has any incentive to change their strategy while the other players keep their strategy unchanged. Let's look at a simple example of *Nash Equilibrium*. Consider two ice cream retailers and their decision whether or not to advertise at a cost of \$100. If they both don't advertise they split the market 50:50 and each receive \$500. On the other hand if they both advertise they also split the market 50:50, but now each earns \$400 because of their advertising expenditures. If one advertises and the other

doesn't, the advertiser receives a 90% market share and receives \$800, while the non-advertiser gets \$100. What is the solution of the game? Well, if firm two advertises, firm one can choose not to advertise and get \$100, or advertise and get \$400; thus firm one should advertise. If firm two doesn't advertise, firm one can choose not to advertise and get \$500, or advertise and get \$800; thus firm one should advertise. The *Nash Equilibrium* of the game is that both firms will advertise, each receiving \$400.

Nash has made many other important contributions that are sometimes overshadowed by *Nash Equilibrium*. Amongst these are the *Nash Bargaining Solution*, a major discovery in co-operative game theory, and his many contributions to pure mathematics. Indeed his description of his Nobel Prize-winning contribution, as his "most trivial work" is testimony to the fact that he was no one-hit wonder.

Although his most famous theory was not complex, his life certainly was. His battle with schizophrenia lasted 25 years, impacting severely on his academic career. Indeed, one can only wonder if his research had not been disrupted by illness what more would have been achieved by such a beautiful mind.



THE SMALL COUNTRY COMPETITIVE DILEMMA: CAN A COUNTRY TRADE ITS WAY OUT?

Like New Zealand, Canada has a large neighbour. Patrick Hughes looks at the Canadian response to the small country competitive dilemma.

GUEST ARTICLE

In many smaller economies, domestic demand is often not sufficient to support more than one or two firms of minimum efficient scale. This raises a dilemma for competition policy. On the one hand, a firm with a smaller share of the relevant market is less likely to abuse any dominance it may have, or acquire dominance in the first place. On the other hand, a restrictive competition policy involves a significant cost for small countries if it leads to industries unable to compete internationally.

With a population of about 31 million people scattered across the second largest country by geographic size in the world, Canada is a relatively small, sparsely populated country. Historically, Canadian governments had resisted trade and investment liberalisation because of what I would term loosely defined concerns about national sovereignty. In spite of the fact that many commentators argued that this policy adversely affected domestic productivity (eg Eastman-Stykolt 1967),¹ the government took this policy further in the 1970s when it enacted the Foreign Investment Review Act. This Act explicitly restricted investments by non-Canadians.

The policy climate underwent a fundamental shift in the 1980s. In particular, Canada opened itself to international markets, hoping that US

Canada has a population density of about 3.3 people per square mile. Canada's third largest city by population, Vancouver, is about twice as far from the largest two cities, Toronto and Montreal as Paris, France is from Moscow. In comparison, New Zealand has a population density of about 14 people per square mile.

firms would provide competitive discipline for Canadian incumbent firms while still allowing firms to grow, even if that involved tolerating high domestic market shares. This shift can be discerned in the 1986 Competition Act. Significantly, the Act does not distinguish between mergers based on the nationality of the firm's ownership. In fact, by explicitly articulating foreign competition as a factor that could allow a merger, the Competition Act is founded in the North-South economic forces that had historically been resisted by government policy. That is, trade liberalisation was used to expand geographic markets.

Among the numerous countries that have opened themselves to international markets, Canada's geography is unique. Canada's population is spread over a narrow band within about 100 kilometres of the US border and Canadian cities are closer to US cities than other cities within Canada. As a result, foreign competition is perhaps a more potent force for competition policy in Canada than in any other country. Also, given Canada's geography, one cannot meaningfully think of liberalising trade in goods without also thinking about international foreign investment flows.

Much of the economic rationale for the shift in the Canadian government's approach to trade liberalisation can be found in the development of the Ownership-Location-Internalisation (OLI) model of multinational enterprises (MNEs) in the economics literature.² In the OLI model, more traditional sources of a firm and/or country's comparative advantage such as relative factor endowments are trumped by market size. This model predicts that MNEs evolve in order to take advantage of scope economies arising from intangible assets such as a patent, copyright, trademark, or product innovation that a firm has already created in a larger, home country market

THE OLI MODEL

The OLI model suggests that there are three conditions necessary for a firm to become a MNE:

Ownership advantage: The firm must have an intangible asset such as a patent, copyright, trademark, product innovation or production process.

Locational advantage: The firm must have an incentive to locate production in other countries.

Internalisation advantage: The firm must have an incentive to own rather than simply license or sub-contract with a foreign firm due to transactions costs.

Following the tradition of Coase (1937), it is predicted that MNEs organise their operations so as to minimise transactions costs and thereby maximise ownership, locational and internalisation advantages.

such as the US. Therein lies a remedy to the small country competitive dilemma. Even if Canada's demand is insufficient to support *de novo* or "Greenfield" entry, allowing US-based MNEs to use their already established intangible assets enhances competition in Canada without incurring significant up-front costs.

There is a strong case to be made that foreign competition in Canada has been intensifying over the past 15 years. Indeed, the industry structure in many Canadian industries now closely parallels the structure in the US. The telecommunications industry provides an example. Affiliates of US carriers such as AT&T, MCI/Worldcom and Sprint have roughly the same market shares in Canada as they do in the US and the market responds to common market developments and shocks. In addition, many would argue that the Canadian airlines market would evolve

toward the more competitive US structure if not for industry-specific restrictions on investment or entry by foreign carriers. It is now fair to say that advocating reductions in barriers to international trade and investment has become a cornerstone of Canadian competition policy.³

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While international trade in goods and capital has been successful in allowing Canada to escape the small country competitive dilemma, this is a solution that also has its challenges. The OLI model also predicts that foreign MNEs may charge higher prices and/or provide lower quality service to host countries such as Canada than they provide in their home markets. In some industries, this simply means that Canadian consumers incur additional transportation costs on products shipped from US plants. In other

industries, however, the impact often takes the form of an industry structure that is dictated by US market forces. Left entirely to market forces, Canadian consumers could find that flying from Vancouver to Toronto would require a stop-over at a US hub city such as Chicago, or that courier packages can be shipped considerably faster and more reliably to US than equally distant Canadian cities. That is, in the terminology of the OLI model, there are often "locational" disadvantages when domestic markets are served by MNEs based in other countries.

Given this, is there scope to fine-tune competition policy to maximise the locational advantages flowing to domestic firms and consumers? In posing this question, I am certainly not suggesting a return to protectionist trade and investment policies. Rather, the issue lies in the nature of the economies of scope. Once any sunk investment is made that allows more than one "product" to be produced, the price that should be paid by new, additional beneficiaries of the investment is ambiguous. That is, an argument can be made for either a price that just covers the incremental cost of the asset or a price that covers the incremental cost plus some fraction of the "joint" cost. Here, the issue lies in the distribution of locational advantages between home and host country consumers rather than a monetary price per unit. But the issues raised are quite similar.

Recent developments in the economics literature promise to shed more light on this question. In the 1980s and 1990s, the OLI literature evolved in isolation from models of equilibrium horizontal mergers (eg Williamson 1968 and Willig 1991).⁴ Thus, market structure is exogenous in most OLI models and, in many cases, it is simply assumed that the MNE has an initial monopoly in the home country. An important development toward bridging this gap can be found in a recent paper by Horn and Persson (2001).⁵ Importantly, these authors consider several combinations of possible market structures and allow the market to evolve through merger activity.

It would be premature to speculate on the



Patrick Hughes has nine years experience as an economist at the Canadian Competition Bureau. In this capacity, he provided analysis of competition cases and submitted economic evidence before the Canadian Competition Tribunal. More recently, Patrick has been with the OECD in Paris and Charles River Associates in Canada where he researched issues in numerous jurisdictions including New Zealand. He is also a lecturer in microeconomics at the University of Toronto.

results that will flow from this literature. It seems unlikely, however, that the overall conclusion that a country can, through its trade and investment policies, find a remedy to the small country competitive dilemma. Further refinement of the underlying economic theory may, however, enhance the scope for benefits to be captured and suggest ways in which the criteria traditionally used to evaluate mergers should be amended to reflect the economic challenges faced in smaller economies.

1 Eastman, H and S Stykolt (1967) *The Tariff and Competition in Canada* Toronto: MacMillan.
2 The origins of the OLI model can be found in, for example, John Dunning (1977) *Trade, Location of Economic Activity and the MNE: A Search for an Eclectic Approach*, in Ohlin, B, P-O Hesselborn and P M Wijkman (eds.) *The International Allocation of Economic Activity: Proceedings of a Nobel Symposium Held at Stockholm*. London: Macmillan.
3 Thus, for example, the Canadian Commissioner of Competition has recently argued for reduced foreign ownership limits and increased scope for participation of foreign firms in airlines, broadcasting and telecommunications.
4 Williamson, O (1968) *Economies as an Antitrust Defense*, *American Economic Review*. Willig, R D (1991) *Merger Analysis, Industrial Organization Theory, and Merger Guidelines*. *Brookings Papers on Economic Activity: Microeconomics*, pp 281-312.
5 Horn, H and L Persson (2001) *The Equilibrium Ownership of an International Oligopoly*, *Journal of International Economics*.

Tertiary Education in New Zealand: WHO IS BEING SERVED?

In a recent review of the not-for-profit sector, economist and academic, Edward Glaeser¹ contends that in the absence of competition, not-for-profit organisations are more often run in the interests of staff than in the interests of their clients or funders. However, he argues that competition acts as a powerful check on these interests and may serve to keep the not-for-profit organisation oriented towards its customers. ISCR Executive Director Lewis Evans and Victoria University Pro-Vice Chancellor (Commerce and International) Neil Quigley take a look at the tertiary education sector in New Zealand.

While the objective of for-profit firms is clear, what not-for-profit organisations are attempting to maximise is, according to Glaeser, “a significant and difficult question”.

What is clear is that:

- those who fund not-for-profits are usually not the owners of the revenues and assets of the organisation and often have no direct control over the organisation at all;
- not-for-profit organisations may have boards, but unlike the boards of for-profit firms, not-for-profit boards may not be ultimately accountable to donors or funders,
- board members of not-for-profit organisations normally cannot sell or transfer their control rights, so they don't own an asset which is tied to the organisation's success; and
- in firms where success is defined by financial profits, it is relatively easy to devise incentives to maximise managerial performance. But given the “soft” missions of many not-for-profit organisations, managerial incentives are inherently more difficult to devise and generally rely on the manager internalising the mission of the organisation.

What this means is that the CEO and management of not-for-profit organisations do not face the same clear incentives as for-profit organisations to enhance the objectives of their funders or to efficiently provide the services demanded by their customers. Glaeser comments that, given the weak nature of internal control in not-for-profit organisations, it is surprising that they function as well as they do. He concludes



IMAGE SERVICES

that it can only be the external discipline exerted by competition in the market for customers and funders that ultimately serves to limit the pursuit of staff and management interests and keep not-for-profit organisations honest.

Glaeser's analysis of the specific features that differentiate not-for-profit from for-profit organisations suggests that:

- not-for-profits will be more oriented towards the desires of their “elite workers” than for-

profit organisations;

- not-for-profits will be less oriented toward the interests of customers and their policies will be much less likely to shift with changes in consumer demand;
- these effects will be greater the wealthier the organisation and the less reliant it is on income from customers or new funding; and
- the more income constrained not-for-profits become, and as excess rents dry up, the more their CEOs will act like for-profit CEOs, in the interests of the source of funding.

Glaeser's analysis of not-for-profit universities in the United States suggests that in the days of donations and endowments, universities were driven by their donors in the interests of students but, as state funding grew, universities became wealthier and the links between ownership, provision of funds and organisational control were separated. Their wealth together with the disjunction between funders and controllers re-orientated university interests in favour of upper-level administrators and faculty. As Glaeser, an “elite worker” at prestigious Harvard University puts it, “professors (lecturers) have been able to reshape their jobs to fit their own scholarly ideals”. For example, Glaeser attributes the establishment of tenure to the ability of academics to define the functions and operation of universities in ways that serve their own interests.

New Zealand tertiary education funding does, to a significant degree, induce separation between the prime funders (the taxpayers) and the clients (students) from the management and staff of tertiary institutions. Glaeser would argue that better performance would flow from competition among these institutions. However, constructive competition typically requires the ability to differentiate both the quality and nature of the products and services offered. Given the highly regulated nature of the tertiary education sector,

competition also requires that governments recognise and promote the benefits of competition.

There is little variety in the fundamental strategies of New Zealand universities and differentiation comes only from the historical accidents of government allocation of programmes such as

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medicine and engineering to different universities. A partial explanation for this may be the size of the population (in a small country generalists flourish) but it is primarily a function of the absence of any differentiation in funding per student between the tertiary institutions. Additionally, there are constraints on the ability of universities to increase tuition fees (given the threat of punitive state-funding penalties if fees are raised above some threshold) and at least rhetorical opposition to competition between

tertiary institutions. Discouraging competition means discouraging universities from differentiating themselves on the basis of the quality of their staff or staff-student ratios. Further, the funding regime provides no incentives for University Councils to challenge staff about quality, or define strategic directions that will maximise the benefits obtained by future generations of students. In sum, the absence of clear incentives provided by funding mechanisms, the confusing objectives defined in the Education Act, and the large number of staff and current student representatives on Councils, limits the scope of the governance structure to focus on strategies that will maximise the long-term value of the university to society.

Where there is competition among tertiary institutions it is of the non-price variety (see the associated box on cell phones). To date there has been only one important exception to the policy of enforced homogeneity among New Zealand universities. Recruitment of international students has not been subject to fee restrictions and as a commercial activity it has made a significant contribution to the financial position of some universities. It has forced New Zealand universities (and other NZ institutions) to benchmark their standards and costs against those of universities in other countries, and it has facilitated differentiation and strategic choice. This loophole has just been shrunk by a tax placed on international students at each university. A following article (see page 11) considers whether any justification for this specific tax can be found.

Finally, Glaeser's work implies that policy makers believe that competition among tertiary institutions is weak and that fee restrictions best serve to limit the resources available to be captured by the interests of staff and current students. However, by limiting the opportunity for tertiary institutions to be tangibly rewarded for choices of strategic direction, the quality of New Zealand's tertiary system is almost certainly being compromised.²

¹ *The Governance of Not-for-Profit Firms, Harvard Institute of Economic Research, April 2002*

² *A scheme for allowing some variation/diversity within the state-fee is being considered.*



It was recently revealed that Te Wananga o Aotearoa provides free cell-phones to students on a state-funded work skills correspondence course. What type of funding system validates the use of taxpayer funds in this way? The answer lies in the current tertiary funding arrangements.

Tertiary education institutions in New Zealand are funded for the number of students enrolled in approved courses of study. The level of funding per student varies with certain types of programmes. Science students, for example, attract a higher level of funding than law students. But funding does not vary according to the nature of the institution.

This approach to government funding raises some important issues. Firstly, because it funds high cost and low cost institutions alike it does nothing to encourage investment in research excellence. Universities could dramatically reduce their staffing costs if the requirement on staff to undertake research was removed and that time be allocated instead to additional teaching.

Secondly, a flat rate of funding across institutions with differing costs raises the possibility that some institutions are being paid above their costs of teaching.

The distribution of free cell-phones is a classic example of an institutional response to funding some courses at fixed rates above their costs when there is competition for students. Institutions offer increments to the services they provide to attract students, competing away any surplus that would have been available as a result of the undifferentiated funding policy. In this case competition has given students, rather than institutions and staff, some of the benefits of inefficient tertiary funding.

SENSE AND SENSIBILITY

Are the penalties imposed under New Zealand's Fair Trading Act rational?

The theory of optimal penalties dates back to a paper on crime and punishment written by Nobel prize winning economist Gary Becker, published in 1968.¹ The economic approach holds that individuals, including criminals, make decisions by weighing up the respective costs and benefits of alternative courses of action. On the other side of the thin blue line, law-makers and social planners aim to minimise the harm caused by criminal activity, recognising that there are costs associated with detecting, convicting and punishing offenders. The theory of optimal penalties is thus concerned with efficiency – finding a balance between the harm caused by crime and the costs of deterrence.²

While the theory of optimal penalties is concerned with the efficient allocation of society's resources, optimal judicial sentencing is concerned with incentives, or more correctly, the *disincentives* to committing crime on potential wrong-doers. The State has two mechanisms for deterring crime – it can either increase the probability of detection and conviction, or increase the severity of punishment. Punishment may involve, among other things, the levying of fines, imprisonment, periodic detention, or community service.³

The theory of optimal penalties and judicial sentencing provided the theoretical framework for an ISCR and Commerce Commission study of the penalties awarded under New Zealand's Fair Trading Act. Specifically, the study's main researcher, Jaimie Legge, surveyed cases brought under the Fair Trading Act 1986 to see whether optimal penalty considerations really influence actual penalties in New Zealand.⁴

The Fair Trading Act is a core part of New Zealand's consumer protection and product safety legislation. Potential breaches (such as misleading advertising) are investigated by the Commerce Commission and may be brought to trial. Convictions result in fines of up to \$30,000 for individuals or up to \$100,000 for companies (though these maximums have never been awarded). Ideally, each sentence would be set at the point where the marginal costs of the offence to society (which, in the example above, could include direct financial or expectation loss) and the marginal costs of deterring the offence (funding for Ombudsmen or Commerce Commission investigations) are equal.

“ THE THEORY OF OPTIMAL PENALTIES IS CONCERNED WITH EFFICIENCY – FINDING A BALANCE BETWEEN THE HARM CAUSED BY CRIME AND THE COSTS OF DETERRENCE. ”

Legge collected data on 25 potential explanatory variables in sentencing decisions, both rational (based on optimal penalty reasoning) and irrational (everything else). The "rational" considerations included:

- benefit to the offender
- severity of punishment
- harm to society of the breach
- cost of conviction
- defendant's ability to pay
- defendant's previous offences
- maximum fine allowable, and

- level of the CPI (to account for the effects of inflation).

Since it is difficult to develop numerical values for some of these variables with any degree of confidence, they are often proxied by variables for which data is available, such as level of co-operation with the Commerce Commission, or a guilty plea.

"Irrational" variables – those assumed not to impact on optimal sentencing – included:

- number of "informations" (legalese for official allegation of breach) resulting in conviction
- court where the sentence is passed (District, High, Appeal)
- market share of the defendant
- origin of the complaint (consumer, competitor, Commerce Commission), or
- any pre-sentencing prejudicial behaviour.

The statistical evidence indicates that more than half of the variability in penalties can be explained by rational optimal penalty considerations, the most significant being intent, previous offences, CPI measures, ability to pay, and the perceived level of co-operation with the Commerce Commission. The number of informations was also significantly correlated to sentence levels, but this can be explained by its use as a proxy for other rational variables. The theoretical reasoning behind each finding of significance is explained below.

The intention to act illegally increases the optimal penalty. The harsher the penalty for unintentional breaches, the more people will cut back on legal and desirable (from society's point of view) behaviour out of fear of committing a breach by accident. Thus, penalties for unintentional breaches should be lower than for intentional breaches in order to reduce this chilling effect on legitimate behaviour while still deterring intentional breaches.

The number of previous offences, surprisingly, was negatively correlated with sentencing levels; offenders with previous records had lower sentences than those without. This apparent inconsistency, can

be explained by considering the two components of the deterrent effect – the probability of being caught and the severity of punishment. Known offenders are more likely to be monitored. Because more monitoring can be assumed to lead to a higher probability of being caught, these offenders face an increased expected cost of committing a crime, thus it may be efficient to impose

less severe penalties to achieve the same deterrent effect. Presumably prosecution costs also fall with repeat offending as the offender's previous record is a substitute for investi-

gation. Polinsky and Shavell (2000)⁵ argue that sanctioning repeat offenders more severely cannot be socially optimal with optimal deterrence. If the penalty exactly equals the harm caused

by the offence, and the offence is committed, the gain to the offender must have exceeded the penalty. Overall welfare is higher as a result of the offending. It will only be optimal to raise the penalty for repeat offending if there is under-deterrence. Legge says that this is unlikely to be the case with the Fair Trading Act as most of the offenders who breach the Act are cash constrained.

The significance of the CPI variable confirms that optimal penalties are real, not nominal – penalties in years with higher prices are higher in dollar terms. Ability to pay is a significant consideration, since wealthier defendants need larger penalties to deter them. Co-operation with the Commerce Commission is included as a rational variable as it provides an incentive reward on offenders' behaviour that reduces the costs of investigation and prosecution.

The higher the number of informations received about an offender, the higher the aggregate penalty. This may be due to the Commission tallying up the number of breaches in order to increase the penalty requested, or it may

be that judges use the number as a proxy for the extent of the damage to society.

Legge speculates that the origins of the Fair Trading Act may account for some of the variation in sentencing. The Act is an integration of the Product Safety Bill and the Fair Trading Bill. The Product Safety Bill was designed to

protect consumers from physical harm, whereas the Fair Trading Bill was designed to provide more accurate consumer information and thus protect consumers' financial interests and freedom of choice. Actions that harm consumers in a physical way or expose them to the risk of physical harm, traditionally attract a good deal more public censure than actions that, for example, fail to disclose all the conditions of an offer in an advertisement. Our sensibilities about physical harm might be expected to upwardly affect the size of penalties for breaches of the product safety provisions of the Act, compared to breaches of the consumer information provisions. Indeed this appeared to be the case in the early stages of the Act, as evidenced by the statement of Grieg, J:

"In my view, the more substantial fines are to be reserved for repeat offenders, for deliberate breaches, particularly if done for commercial gain, and cases where there is widespread and large-scale breach *with a real risk of damage or injury to consumers*."⁶ (Emphasis added.)

Finally, and perhaps most importantly, the results of the study indicate that there is a reasonable degree of consistency of judicial sentencing under the Fair Trading Act. From an economic perspective it is encouraging that more than 50% of the size of penalties awarded under the Act can be explained by optimality considerations.

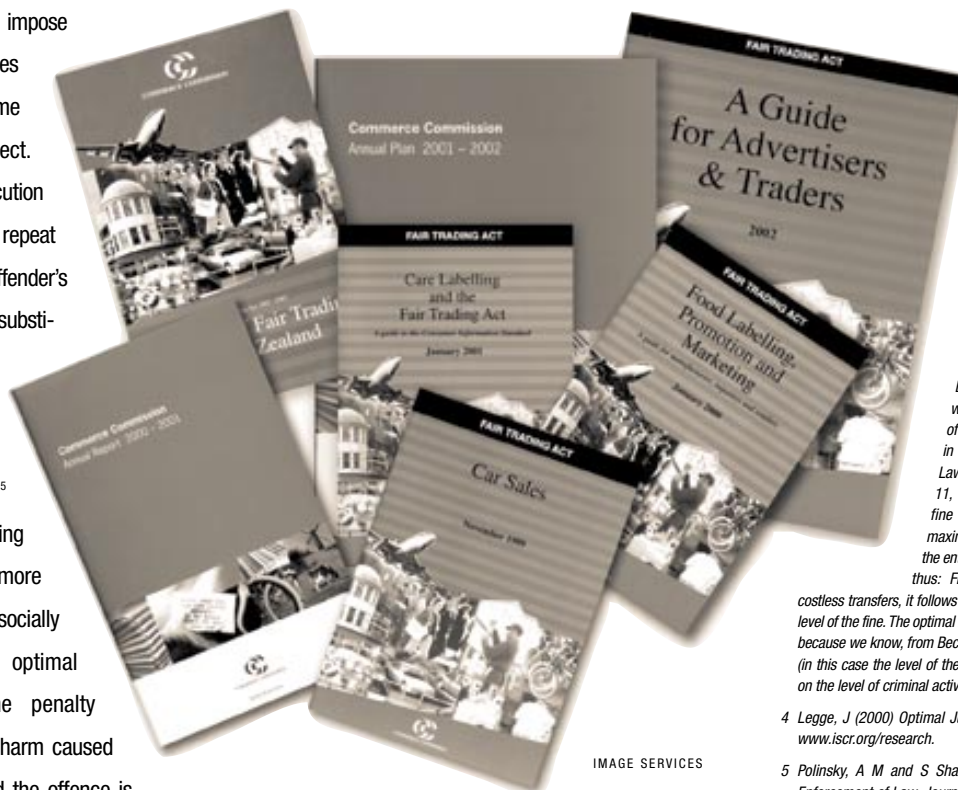


IMAGE SERVICES

1 Becker, G (1968) *Crime and Punishment: An Economic Approach*, *Journal of Political Economy* 76: 169-217.

2 Note that this is unlikely to be where the level of criminal activity is zero. At some point, the value of the additional resources required to deter remaining criminal activity will exceed the value of having that criminal activity deterred. Furthermore, marginal deterrence – the impact of additional resources on deterring crime – will be diminishing.

3 One of the more controversial insights from Becker's work is that fines should be used where possible as fines are a costless transfer of wealth. This insight was extended by Garoupa in 1997 [Garoupa (1997) *The Theory of Optimal Law Enforcement*, *Journal of Economic Surveys* 11, 267-295]. Garoupa shows that the optimal fine should be the maximum fine, and the maximum fine that can be imposed is equivalent to the entire wealth of the individual criminal. He argues thus: From the assumption that fines represent costless transfers, it follows that no cost is associated with increasing the level of the fine. The optimal level of the fine is, therefore, the maximum fine because we know, from Becker, that increasing the severity of punishment (in this case the level of the fine) has a positive, albeit diminishing, effect on the level of criminal activity.

4 Legge, J (2000) *Optimal Judicial Sentencing and the Fair Trading Act*. www.iscr.org/research.

5 Polinsky, A M and S Shavell 2000 *The Economic Theory of Public Enforcement of Law*, *Journal of Economic Literature*, VolXXXVIII, No.1.

6 LD *Nathans v Commerce Commission* (1988) 3 TCLR 362.

BROADBAND: Why is it Taking So Long?

High speed internet access (broadband) is taking longer to penetrate the Internet access market than originally projected by the OECD, telecommunication companies and industry observers. Analysis of a new data set suggests that this slow growth is not due to supply-side constraints but because of demand-side issues. The paper, *Broadband Diffusion: Lags from Vintage Capital, Learning by Doing, Information Barriers and Network Effects*, is available from the ISCR website www.iscr.org.nz

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inflows needed to fill our hydro storage lakes are unreliable. If fuel reserves are scarce, a decision to generate today can restrict the firm's ability to generate in the future, at least until the rain arrives. Delaying generation can be the better choice. Consider the problem faced by a hydro generator, where generation can begin and end at short notice. If hydro inflows are low and the generator decides to turn one unit of water into electricity, it has less water to play with in the future. Just imagine the angst if, soon afterwards, a cold snap hits, demand goes through the roof, and the spot price follows. If lake levels are already low, its earlier generation may leave the firm unable to meet this higher demand, and an opportunity to sell electricity at a higher price will have been lost. When there is enough uncertainty about future levels of the spot price, the generator should exercise its real option to wait – even if that means not generating when the spot price exceeds the (apparent) marginal cost of generation. If the price goes up, generation can occur when prices are high; if the price goes down, generation is further delayed. This strategy ensures that electricity is generated when it is most profitable to do so. This is good for the firm, which maximizes profit, and also good for society, as it ensures that scarce hydro reserves are used when they are most needed.

Just because the water is free does not mean that, once in the storage lakes, it has no value. In fact, when storage is low, or at times when there is great uncertainty about future supplies, the value can be very high indeed. The value of the water to the firm is the present value of the revenue the firm can earn by turning the water into electricity at some point in the future. Even though high prices might be unlikely on any given day, they will occur eventually. If the firm can wait long enough, it will be able to sell the electricity it generates at a high price. The marginal cost of hydro generation is not just the cost of actually turning a unit of water into electricity. To get a true measure of the marginal cost of electricity, we must add this option value of the water, reflecting the lowering of the value of

the firm's hydro reserves when generation occurs.

This would not be an important consideration if the generator had substantial storage, since generating today has no real impact on the firm's ability to generate in the future. Of course, if there was no storage there wouldn't be a problem either, because then the generator would not have a decision to make. What makes New Zealand hydro generators' decisions so difficult is that they have some storage, but not much – approximately seven weeks.

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Their great flexibility gives hydro (and gas) generators the ability to wait. In contrast, coal-fired power stations are notoriously inflexible – going on – and offline can take a number of days. Paradoxically, this inflexibility can also make waiting optimal. At least in the short term, once such a generator is brought online, it is difficult to reverse the decision. Therefore the generator needs to be confident that the spot price will remain at a high enough level to make ongoing generation profitable. Likewise, if the firm stops generating, it will not be able to resume generation immediately. The firm must be confident that the spot price will be low enough in the future that it will not regret its decision to go offline. Thus, there will be periods when an inflexible generator produces electricity despite low

spot prices, as well as periods when it is offline despite high spot prices.

Like any firm, an electricity generator can be thought of as owning a portfolio of real options. Whenever the firm generates electricity, the composition of this portfolio can change. Some real options will be lost – the ability to generate in the future can be compromised if fuel stocks are low; the ability to *not* generate in the near future can be lost if the technology is inflexible. Some real options will be gained – if the technology is inflexible, generating now preserves the ability to generate in the near future. The value of these options must be considered as part of the generation decision.

So, what is the marginal cost of electricity? The direct cost of actually converting fuel into electricity is certainly part of the marginal cost, but it is not the whole story. We must add in the option value of the fuel when there is one, as well as the value of options created by generating. We must subtract the value of options destroyed by generating. Only when all these components are included do we have a complete picture of the marginal cost of electricity.

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cont'd from page 12 are probably futile. Indeed, New Zealand's Earthquake Commission (EQC) originated from the Earthquake and War Damage Commission to offer certainty of compensation when unpredictability around the probability and magnitude of loss, and the exposure to a large number of claims in the event of earthquake or attack, meant that private companies would not, or could not, indemnify such losses without charging excessive premiums.

¹ Howell, B, J Kavanagh and L Marriott (2002) *No-fault Public Liability Insurance: Evidence from New Zealand*. Agenda. Vol 9, 2: 135-149.

² Press release by the Minister of Revenue and the Assistant Treasurer 30/4/02 *Doctor Insurance Guaranteed*
<http://assistant.treasurer.gov.au/atr/content/pressreleases/2002/038.asp>.

³ Wren, J (1999) *More Money or More Effectiveness and Efficiency*, Butterworths *Employment Law Bulletin* 5:83-88. New Zealand Department of Labour (2001) *The Costs and Benefits of Complying with the HSE Act 1992*, Occasional Paper 2001/4, Wellington.

A Tax to Subsidise Low Quality Providers in the EXPORT EDUCATION INDUSTRY

Victoria University Pro-Vice Chancellor (Commerce and International) Neil Quigley and ISCR Executive Director, Lewis Evans question the justification for a new levy on institutions involved in export education.

Export education is a \$1 billion per annum industry for New Zealand, with 50,000 fee-paying international students studying at our educational institutions in 2001. A compulsory levy on participants in this industry has been introduced, on the basis of a desire to promote the sustainable growth of export education and to “firmly establish New Zealand as a provider of quality international education”.

This compulsory levy is likely to have exactly the opposite effect.

The export education levy is a response to problems that a Ministry of Education policy paper¹ identifies as follows:

The risks are that insufficient quality assurance and poorly managed growth could damage New Zealand's reputation and the industry's long-term competitiveness and quality. Insufficient or poorly pitched promotion of New Zealand as an education destination also has significant opportunity costs and risks attached to it.

A levy is proposed as the preferred policy response:

because of the fragmentary and diverse nature of the industry and potential “free-rider” problems, a form of market failure exists in the development and promotion of the export education industry. This market failure means a lower than economically efficient level of investment in these activities occurs if the industry is left to its own devices.

This argument is novel, at least in its application to export education. In the past it has been used to justify primary producer boards and producer levies that have, until recently, been prevalent in agriculture. Little justification has been found for the producer board model and levies in agriculture, indeed, in recent years producer boards have been dissolved and levies



PHOTO: IMAGE SERVICES

are now much more limited. The application of the argument to export education is even harder to justify, as in the export education industry:

- there are no tariffs in other countries that have to be negotiated down;
- there is no sole foreign purchaser;
- the product is not perishable; and
- products are differentiated in a way that is apparent to prospective customers (even among the offerings of universities) so investment in individual marketing and brand awareness is efficient.

If New Zealand institutions are to increase their role as exporters of education services, it will be necessary to provide them with incentives to invest in excellence and to build reputations based around that excellence. This means investing in high quality teachers and in appropriate support and pastoral care for international students. Additionally, in the case of New Zealand's flagship education exporters it means investing in the research excellence that is the focus for their international reputations.

An institution that has invested in excellence in teaching and research cannot afford to adopt poor quality assurance practices or utilise low quality marketing because these would destroy

the value that is created by their investment in excellence in other areas. More importantly, in the case of a levy, an institution that has invested in quality operations and in building the value of its brand should not be required to subsidise institutions that have failed to invest in quality. The lack of support for the levy among quality New Zealand institutions in this market is strong *a priori* evidence that the occasional failure of a low-quality provider does not have negative externalities for quality providers in the market.

By taxing investments in quality, the most likely effect of the tax will be to discourage such investments and to encourage low quality providers who see that (with the support of funds from the levy) there is a viable market niche for them.

By operating in foreign markets New Zealand educational institutions are testing the quality and price of their services internationally. The education markets of all countries are developing rapidly. The possibility of New Zealand institutions keeping pace with these developments is limited by this specific tax.

¹ Ministry of Education (2001) *Export Education in NZ: A Strategic Approach to Developing the Sector*. August 2001.

NO-FAULT AT WHOSE COST?



PHOTO: LISA

What should governments do when the cost of public liability insurance becomes crippling? Study the New Zealand experience, say ISCR's Bronwyn Howell, Judy Kavanagh and Lisa Marriott in the latest issue of the Australian policy journal *Agenda*.¹

Public liability insurance indemnifies organisations against claims made by individuals for illness or injury, or loss or damage to property. The spiralling cost of public liability insurance has been a recurring problem in Australia and elsewhere for well over a decade. Events like the September 11 attack on the World Trade Center have both escalated and focussed greater attention on the problem.

When the cost of public liability insurance becomes prohibitive, organisations may prefer to self-insure and take a gamble on an uncertain outcome. When organisations can neither afford public liability insurance nor take the gamble, the absence of a market for public liability insurance will almost certainly restrict some beneficial activities. For example, Australians had very real concerns that medical practitioners would refuse to treat patients, out of fear of being held personally liable for adverse outcomes, when their medical practitioner liability insurer UMP/AMIL went into liquidation. The Federal Government was forced to underwrite the scheme in order to guarantee treatment.²

Increasingly, governments as insurers of last resort, are being called upon to address the problem, either by underwriting some public liabilities themselves or by legislating for compulsory

no-fault insurance schemes. No-fault insurance has attracted particular interest in Australia, however the researchers caution that any specific policy should be informed by both the economics literature on insurance and relevant experience.

No-fault schemes offer both greater certainty of compensation for individuals who incur losses and lower transaction costs, but limit the right to seek private redress, usually through a waiver of rights under tort law. The absence of any threat of tort action, particularly when combined with the loss of ability to individually risk-rate insurance premiums, severs the link between the care taken by potential loss-causers and the costs of their actions. Thus, no-fault schemes generally have to rely on greater monitoring and enforcement of wilful or careless behaviour, which then increases transaction costs. The trade-off between the loss of incentives and increased transaction costs is an empirical issue, and the New Zealand experience provides some evidence.

The New Zealand no-fault government-underwritten compensation scheme for personal injury by accident (ACC) scheme provides New Zealanders with certainty of compensation at an apparently lower cost than a tort-based system. However, there is evidence to suggest that the absence of ex-ante incentives available under tort

law has reduced the level of care. For example, New Zealand's workplace accident rates are high on a world basis and particularly high relative to Australia.³

This suggests that monitoring and enforcement of safety in New Zealand is low. While it is impossible to determine the actual amount of monitoring, enforcement and education undertaken, the evidence suggests that only \$50.3 million of government expenditure is directed toward accident prevention and safety awareness. This is an alarmingly low level of expenditure if it is intended to redress the loss of the ex-ante incentives to take care that are inherent in tort-based and risk-rated insurance systems.

Because of the potential for moral hazard actions to escalate in the absence of ex-ante incentives to take care, no-fault schemes may only be viable when there is no ability to manipulate the probability of an adverse event occurring, such as earthquake. Expenditure on incentives to reduce moral hazard need then only be geared towards minimising the size of the loss (for example, by inflating the value of the claim, or choosing to live in an earthquake prone area).

Similarly, a no-fault scheme may be a viable way of compensating losses from terrorist activities, as any ex-ante incentives that may be designed to alter the probability of the activity (based on criminal or tort law) *to page 10*