Politics, Property, and Prices:
The Political Economy of Tenure Review in New Zealand's High Country[*]

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Abstract

Ellickson (1991) argues that where the privileges and responsibilities of property ownership are concerned, the law does not always have the last word. In 1990, about 20% of the South Island of New Zealand consists of Crown land under long-term lease to pastoral farmers. 77 leaseholds have since been partially privatized through "tenure review," a complex bilateral exchange of property rights whereby lessees' acquire freehold title to part of their former leaseholds. Using data on tenure review "prices," we test and reject five competing hypotheses about the division of property rights pre- and post-tenure review. These prices can be seen as as lying on or below the lessees' demand curve for freehold land, and as consistent with the assumption that the land area under exchange does not matter. If Cabinet is the principal, the agency administering tenure review is the agent, and the contract negotiators retained by the agent are subagents, then tenure review outcomes are consistent with agency theory. Lessees derive rents from tenure review because the compensation of contract negotiators does not vary with outcomes; hence negotiators face incentives to close deals at any cost. Tenure review outcomes are also consistent with Ellickson's hypothesis that small groups prefer to resolve disputes by invoking informal norms rather than the law. These norms reduce transaction costs by speeding settlements and serve the collective goals of the small group.

"Some spheres of life seem to lie entirely beyond the shadow of the law."
(Ellickson 1991: 283)

I. Introduction: Land Reform in the New Zealand High Country.

When it comes to property, the law does not always rule. Since Coase (1960), scholars in the fields of political economy and law and economics have struggled with the question of what role the law plays in negotiating and determining how property rights are valued. This paper examine the relation between rival interpretations of the property rights arrangements arising under New Zealand high country pastoral leases, and the prices emerging under the ongoing land reform described below. Simply, we ask if any of five stated interpretations of the law is driving the pattern of pricing results; and if not, then what does? We then ask if the relative values of the property rights in exchange drive the prices paid in the land reform exchange. We draw on ideas from political economy to test the rivalry between the law, social norms, administrative convention, and contractual incentives in adjudicating property in New Zealand land reform.

Before reform, pastoral leaseholds amounted to 2.4 million hectares, or about 10% of the land area of New Zealand. The form and function of pastoral leases have evolved since the first one was granted in 1856. Current pastoral leases are governed by the Land Act, 1948, as amended by the Crown Pastoral Land Act (CPLA), 1998. The Land Act and the CPLA clearly state which property rights the Crown grants to the lessees, and which rights the Crown retains. The Land Act § 66(2) states that Crown pastoral land is "suitable or adaptable primarily for pastoral purposes only." (Land Act, 1948, §51(1)(d); Later amended and repealed by CPLA §104). In repealing and amending the Land Act provisions governing who holds which property rights, but the CPLA merely reiterated the Land Act's stipulations. The CPLA §4(a-d) states:

"A pastoral lease gives the holder—

(a) The exclusive right of pasturage over the land:
(b) A perpetual right of renewal for terms of 33 years:
(c) No right to the soil:
(d) No right to acquire the fee simple of any of the land." (replacing Land Act 1948 No 64 s 66(2))

A lease grants exclusive pastoral and occupation rights and ownership of land improvements to the lessee,[1] while the lessor retains control of all non-pastoral uses.[2] Under the terms of Land Act §117, The Crown may "resume" (i.e., extinguish) any portion or all of a pastoral lease if "the land is required for a road, or street, or any public purpose."[3] In the event of a §117 resumption, the lessee is entitled to compensation for "any improvements belonging to him," "for the value of his interest in the unexpired term of his lease or license over the land so resumed,"[4] and for "injurious affection"[5] caused by such a resumption.[6]

In 1992, certain pastoral lessees began to negotiate a division of their leaseholds with the Crown, with lessees acquiring freehold title to part of their former leaseholds, and the balance of the land reverting to full Crown ownership. Thus began, without fanfare, a major transformation in ownership and land use patterns that could eventually affect one-fifth of the South Island. Six years later, with the enactment of the CPLA, this informal process acquired a statutory basis and the name "tenure review." The CPLA also empowered a new government agency, Land Information New Zealand (hereinafter LINZ), to administer tenure review.

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1. Brookers Looseleaf Legal Service, 1995, para. 11.23.02. The Land Act, 1948 §2 defines improvement as: "substantial improvements of a permanent character, and includes reclamation from swamps, clearing of bush, gorse, broom, sweetbrier, or scrub, cultivation; planting with trees or live hedges; the laying out and cultivating of gardens; fencing (including rabbit proof fencing); draining, roading; bridging; sinking wells or bores, constructing water tanks, water supplies, water races, irrigation works, head races, border dykes, or sheep dips, making embankments or protective works of any kind; in any way improving the character or fertility of the soil; the erection of any building; and the installation of any telephone or of any electric lighting or electric power plant."
2. The leased land is a type of Crown land classified as "pastoral", or "land that is suitable or adaptable primarily for pastoral purposes only." (Land Act, 1948, §51(1)(d) (Later amended and repealed by CPLA §104))
3. Land Act §117(1)
4. Land Act §117(2)
5. Land Act §117(6)
6. A Land Act clause, oft-amended (most recently in 1994), also allows the Minister of Conservation to extinguish or diminish the value of some of the lessee's rights by designating any Crown land as a reserve "for any purpose which in his or her opinion is desirable in the public interest." The amended clause is silent on whether the Crown's exercise of this prerogative obligates it to compensate the lessee.

Tenure review allows a lessee to initiate voluntary negotiations with the Crown to extinguish his or her lease. The outcome of a completed tenure review vests the former lessee with freehold title to some fraction (which can exceed 99%) of the former leasehold; hence part of the former leasehold becomes a "freehold." The Crown resumes full control over the balance of the former leasehold, which becomes public conservation land under the stewardship of the Department of Conservation (hereinafter DOC). According to the CPLA, land "capable of economic use"[7] is to be privatised, while land with "significant inherent values" for conservation and recreation is to be managed as public conservation land (parks or reserves), "preferably" in full Crown ownership by the DOC.[8]

Tenure review resembles what the public policy and development economics literatures call "land reform" and (more recently) "privatisation," namely the transfer of economic assets from public to private ownership. But tenure review is more than a simple privatization. It is a complex bilateral exchange of property rights between the Crown and the pastorial lessee. The two parties start the process each holding a few proverbial property rights "sticks" over a section of leasehold land. After the exchange, each owns a more complete bundle of property rights, but over a smaller piece of land. There is no auction for the new freehold land, and the Crown may negotiate only with the lessee. Hence each party to the exchange is a monopolist.

Tenure review also often includes a cash equalization payment. After the parties agree to a land split, the Crown notionally purchases the lessee's interest in the land reverting to full Crown ownership, thus compensating the lessee for relinquishing his pastoral lease over that land. Likewise, the lessee notionally purchases the Crown's interest in that part of the former leasehold he will henceforth freehold, thereby acquiring title to that part.

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7. Crown Pastoral Land Act, 1998,§24(a)(ii)
8. Crown Pastoral Land Act, 1998,§24(a)(iii)

The prices of these notional purchases result from closed-door negotiations between a contractor acting on behalf of the Crown and the lessee, who may hire a lawyer or consultant to advocate his or her case. The Crown contractors are employees of three companies: Quotable Value, a New Zealand-owned "property information" firm[9]; DTZ, a "global real estate advisor"[10]; and Opus, an "international consultancy for infrastructure, … construction, water, environment, [and] asset development."[11]

According to LINZ officials, contractors are not paid a commission; hence contractors receive no monetary reward for negotiating a settlement that is favourable to the Crown, and are not penalized for agreeing to an unfavourable settlement. Instead contractors are paid when they complete a pre-specified list of tasks. A contractor is paid pre-arranged amounts for making measurable progress towards a settlement, and is paid a final amount when the deal is closed. LINZ officials and contractors state that no one acting on behalf of the Crown (government official, Cabinet minister) sets a reserve price on the Crown's interest. Moreover, both the lessee and the Crown can veto a settlement, in that they are free to walk away from tenure review negotiations at any time. While several lessees have exercised this option, Crown officials state that the Crown has never done so.

Contractors are instructed to be neutral in tenure review negotiations, to act as "referees."[12] Their role is "not advocacy,"[13] but to administer, in a purportedly apolitical fashion, a policy re-allocating the property rights over a natural resource. Indeed, several contractors have spoken to us as follows about their interactions with LINZ officials bearing on tenure review: "it is not our place to drive hard bargains. … The Commissioner and LINZ [officials] have always told us that money should not

9. www.qv.co.nz (accessed 14 February 2007)
10. www.dtz.com (accessed 14 February 2007)
11. www.opus.co.nz (accessed 14 February 2007)
12. Brower (2006).
13. Ibid.

stand in the way of a deal." "The Commissioner told us we should not hold up the deals for money."

In essence, we ask whether the law drives the outcomes of tenure review. Do the relative values of the property rights assigned by statute drive the prices paid when these rights are exchanged in land reform? We first examine the statistical relation between tenure review prices, and five publicly stated interpretations of the law bearing on who owns what property rights. The interpretations are by academic social scientists, farming advocates, and farm valuers. We test the findings for robustness against other potentially important auxiliary variables, including location, conservation covenants, government-imposed stock unit restrictions under the extinguished lease, and access easements across newly privatised land. Finally, we examine three other potential influences on prices: 1) legal institutions which might affect the power dynamics in the negotiation; 2) administrative institutions which might impose an inflexible formula on the price setting; and 3) incentives which might unwittingly encourage Crown negotiators to close a deal at any cost.

II. Property Rights in New Zealand Pastoral Leases.

A New Zealand pastoral lease assigns very specific bundles of rights to the Crown and the lessee. The rights and responsibilities conferred by pastoral leases stem from five sources: the lease agreement, the Land Act 1948,[14] the CPLA 1998, Crown Pastoral Land Standards (non-binding guidelines for property management written by the government agency acting as lessor or landlord), and the common law of leases and licenses.[15]

14. Sections 51-167 of the Land Act of 1948 govern the classification and alienation of Crown land. The Land Act, as modified by ensuing statutes, especially the 1998 CPLA, specifies which land interests are held by whom, which interests may revert to the Crown, and when compensation is owed the lessee or licence holder.
15. Brookers Looseleaf Legal Service. (1995). Land Law. In A. Alston (Ed.) (Vol. 2). Wellington, NZ: Brookers.

The pastoral lease grants the lessee rights of transfer,[16] exclusion, and enforcement, subject to Crown consent. But the lease divides the control and management bundle of use rights; the lessee controls pastoral use rights, while the Crown withholds all non-pastoral use rights by controlling the right to adjudicate their exercise while the land is under lease. These non-pastoral development rights include the right to subdivide and to develop industrially, to build recreational infrastructure such as golf courses, ski resorts, automobile racing courses, and marinas, to erect other structures lacking pastoral purposes, and even the right to fertilise, sow seeds, and irrigate. While the Crown has often granted consent for agrarian activities not narrowly pastoral, such as fertilizing, sowing seeds, and the occasional ski field; pastoral leases specifically prohibit commercial subdivision and industrial uses.[17]

Table 1.
Duties and Rights arising from Pastoral Leases.

Leaseholder's Rights	Leaseholder's Duties	Crown's Rights
Exclusive occupancy,[18] including the right to exclude trespassers.[19]	To farm the land "diligently."[20]	Discretionary consent over all non-pastoral uses of the land under lease.[21]
Exclusive pasturage,[22] including the right to graze sheep and possibly cattle, subject to Crown-imposed stocking limits	To practice "good husbandry."[23]	To control subdivision and other commercial development of land.
To own improvements to the land, and to recoup the	To keep the land free of rabbits and other pests, and waterways	Title, and the right to grant title.

16. Land Act, 1948, §93(1).
17. According to CPLA §6(a)(i-ii), the Crown may not charge rent for these non-pastoral uses because they are prohibited while the land is under lease.
18. Land Act §66(2). See also Commissioner of Crown Lands. (1994). *The Tenure of Crown Pastoral Land, The Issues and Options: A Discussion Paper*. Wellington.
19. The Trespass Act of 1986 applies to pastoral leases.
20. Land Act §99 (1)(a-c).
21. Land Act §66(2). See also: Commissioner of Crown Lands. (1994). *The Tenure of Crown Pastoral Land, The Issues and Options: A Discussion Paper*. Wellington.
22. Land Act §66(2), as amended by CPLA §4(a-d)
23. Land Act §99 (1)(a-c).

costs thereof (including the costs of fertilizer[24]) should a lease be terminated.	clear of weeds.[25]	
To sell or bequeath a leasehold to another private party, subject to Crown consent.[26] The Crown may invoke the "public interest" when declining approval.[27]	To avoid committing "waste."[28]	To control the number of stock grazed on the land.[29]
		To control irrigation and fertilization of the soil, and seeding of any kind.
		To charge the lessee rent, fixed at 2% of the value of unimproved land[30] for a period of 11 years.[31]
		To retain a reversionary interest in land upon termination of lease.[32]
		To control public use of waterways of a certain size, via the Queen's Chain.
		To control exploitation of subsurface minerals.

III. Legal, Economic, and Political Influences on Disputes Arising from Property and Economic Rents.

In examining the pricing outcomes of New Zealand land reform, we draw on and test theories from economics, political economy, and law and economics. First and foremost, tenure review

24. Commissioner of Crown Lands v Russell Emmerson, Otago Land Valuation Tribunal (unreported), 10 August 1999.
25. Land Act §99.
26. Commissioner of Crown Lands. (1994). *The Tenure of Crown Pastoral Land, The Issues and Options: A Discussion Paper*. Wellington.
27. Land Act §89(2).
28. Land Act §99(1)(a).
29. Land Act §66(3), superseded by CPLA §9(1-4).
30. Land Act §108.
31. For leases dated later than 30 November 1979, rent is set at 2.25% of the value of the land exclusive of improvements. The Land Valuation Tribunal resolves disputes over the amount of rent. Cf. Brookers Looseleaf Legal Service. (1995). Land Law. In A. Alston (Ed.) (Vol. 2). Wellington, NZ: Brookers.
32. The doctrine applies to all tenant-landlord situations where the landlord has a reversionary interest. See McCaffery (2001) and Posner (1992).

involves the law of property (Hinde et al, 2003), and the economics of property rights in land (Posner 1992: chpt. 3; Cooter and Uhlen 2000: chpts. 4, 5; Shavell 2004: chpts. 2-5). Different rights have different values. And economic value is in the eye of the highest bidder, not necessarily the current owner. Value in exchange can, and often does, far exceed the current owner's value in use.[33] *Hypothesis 1 tests whether any of several competing valuations of the property rights drive pricing outcomes*.

Ellickson (1991: 283; 1993: 1320) finds that when adjudicating disputes over property rights in land, "close-knit groups" often favor informal norms serving the group's collective interest over the strict letter of the law. Building on transaction cost economics (Demsetz 1967; Barzel 1997) and the organization theory of Williamson (1984), Ellickson (1991, 1993), and Bethell (1998) offer a rich historical and ethnographic understanding of property. Defying traditional law and economics, Ellickson's conception of property allows for the possibility that elements of politics and political economy might rival the supremacy of the law in the negotiation and interpretation of property rights.

After studying land disputes among cattle ranchers in northern California, Ellickson concludes:

> "To govern their workaday interactions members of a close-knit group tend to develop informal norms whose content serves to maximise the objective welfare of group members. This hypothesis suggests that people often choose informal custom over law not only because custom tends to be administratively cheaper but also because the substantive content of customary rules is more likely to be welfare maximizing." (Ellickson 1991: 283)

Hypothesis 2, and this paper generally, can be seen as testing whether the law or informal norms prevail in the adjudication of disputes over property rights.

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33. "Many goods are valued less by their current owners than they are by other individuals. Who owns these potential gains from trade? In the competitive, zero transaction costs model, the distribution of the gains is costlessly determined. The costless information (or the uniformity of commodities) necessary for such competition is, however, seldom encountered in reality. Opportunities for people to gain at the expense of others seem ubiquitous." (Barzel 1997: 152)

Tenure review is an example of the sort of controversial institutional change Ellickson (1993) addressed. It involves a reallocation of property rights over a leasehold by negotiation between the Crown and the lessee. To the extent that lessees try to influence the final negotiated outcome of the exchange, a variety of considerations of public choice theory arise. For example, if lessees' jockeying for advantage results in their acquiring title to land at a cost below the market price for comparable land, rent seeking comes into play (Mueller 2003: chpt. 15). It is reasonable to expect rational tenants to be rent maximisers;[34] they will seek to convert their leaseholds into freeholds on the best possible terms. It is less evident why a government would accommodate this form of rent-seeking. But tenure review is also administered by a bureaucracy (LINZ); thus the economic theory of bureaucracy (Mueller 2003: chpt. 16) enters the picture.

Tenure review is also an interesting problem for the economics of regulation. Regulatory structures which govern the relations between LINZ, the pastoral lessees, and the NZ public might lend themselves to regulatory capture by a concentrated group of rational regulated entities (Laffont and Tirole 1994: chpt. 1).[35] More specifically, tenure review gives rise to a concrete instance of the sort of agency problem discussed in principal-agent theory (Rasmussen 1989: chpt. 7). In principal-agent theory, the agent ignores or acts against the

34. "Rent" has two economic meanings, both pertinent to this study and hence a possible source of confusion. The everyday meaning of rent (more properly "hire price") refers to a payment made in exchange for limited use rights over a durable input for an agreed period of time. The other meaning of rent (more precisely, "economic rent" or more commonly "producer's surplus") refers to revenue net of opportunity cost. The opportunity cost of a firm (factor market) is the area under its marginal cost curve (supply curve). Economic rent requires that at least one of the following three conditions hold: (1) a rising marginal cost or input supply curve, (2) the ability to sell output (or an input) for a price exceeding its competitive price, or (3) the ability to purchase a productive input for less than its competitive price. See McCloskey (1985: §14.1).

35. Governments routinely dole out economic benefits, such as strategically sited public works, procurement contracts, and the privatization of government assets at less than "fair market value." At the start of a chapter titled "Regulatory Capture," Laffont and Tirole point out that such situations invariably give rise to the possibility that the allocation mechanism is structured to favor some private interests over others: "There has been much concern that the auction designer may prefer or collude with a specific buyer. Indeed, most military or governmental markets acquisition regulations go at great length to impose rules aimed at curbing favoritism… In our view the importance of the threat of collusion between auction designers and specific bidders depends much on what is being auctioned off." (Laffont and Tirole 1994: 559)

goals of the principal – perhaps willfully or in response to incentives. Unless information about the agent's compliance with the principal's goals is costless, the agent may act in a manner that serves his interest at the expense of the principal's. In tenure review, the Ministers of Land Information and of Conservation are principals, LINZ officials are agents, and the contractors LINZ retains to negotiate with lessees are sub-agents. The accountability of Ministers to the NZ public is a distinct principal-agent problem, covered by public choice theory, that we do not address here. Hypothesis 3 examines whether a problem of asymmetric information in closed-door negotiations creates a principal-agent problem in which the agents or sub-agents are motivated to ignore or subvert the Crown principal's directive to obtain a "fair financial deal for the Crown."[36] In other words, we examine whether the administrative institutions of tenure review unwittingly offer the incentive to close the deal at any cost.

In sum, tenure review touches on a number of topics in law, political economy, and economic theory. We examine one case of property interpretation and ask sequentially. Which of the following factors, singly or in combination, drive tenure review outcomes: a strict reading of the law, administrative rules, informal norms, or incentives for the negotiators?

IV. Hypothesis 1: The Relative Values of Property Rights Drive the Prices Paid.

Considerations of ownership and relative value of property rights and interests give rise to the primary hypothesis. We hypothesise that the Crown's economic interest in Crown pastoral land is a function of the relative value of property rights allocated under a pastoral lease. Expressed as a percent, the Crown's economic interest in the land (hereinafter CI) is that fraction of the land's capital value that the Crown owns while the land is under lease. For example, if a the freehold capital value of a leasehold section is $10 million, and the Crown's property interest in the section is worth $5 million, the CI is 50%.

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36. Cabinet Policy Committee. (2005). *South Island High Country Objectives*. Wellington: Cabinet Office.

Because the relevant property rights derive from statutes, they do not vary significantly by lease. If prices are grounded in some estimated values of the property rights, then we expect the CI for all tenure review settlements to be fairly similar. Variation across leases in the auxiliary variables will cause the CI to vary across settlements, but not on a regular pattern. A scatter plot of the CI (on y-axis) against percent privatized will consist of random deviations from a horizontal line. The value of CI at the vertical intercept of the horizontal line will be a function of the relative value of the property rights assigned by statute.

Hypothesis 1: The ownership arrangements and relative values of property rights in Crown pastoral land drive prices. In other words, the value of things exchanged drives price.

To measure the Crown's interest, we denote the amount each party agrees to pay the other, divided by the hectares obtained, as the *price* each party agrees to in order to buy out the interest of the other party in that part of the leasehold the buyer will retain. Until recently, the data needed to calculate these prices were confidential. In September 2006, the Minister of Land Information released these data for each tenure review settlement completed as of date. We employ these newly declassified data to test the relation between these prices and the hypothesized ownership of the property rights.[37]

Let the subscripts C and L respectively denote the Crown and the lessee. Let V_C be the negotiated *value* of what the Crown acquires from the lessee. V_C compensates the lessee for the extinguishing of his rights over land to be added to the nation's public conservation estate. Let V_L be the negotiated value of what the lessee acquires from the Crown. V_L compensates the Crown for the extinguishing of its rights over the land to be privatised. $V_C - V_L$, the

37. The Crown's interest analysed in this paper is calculated from data on tenure review settlements, which result from the negotiations between the Crown and lessees. From the outset, both parties to these negotiations have estimates of V_C and V_L made by professional valuers, a valuation exercise that tenure review requires. To date, we have obtained the estimated valuations for only a handful of settlements, and hence have yet to calculate the Crown's interest implied by such valuations.

aggregate "equalization payment," is the cash amount that changes as part of the deal. If $V_C > V_L$, the Crown pays the lessee, and vice versa if $V_C < V_L$.

Let the area in hectares going into freehold (retained by the Crown) be A_L (A_C). The *percent privatised* is $A_L/(A_C+A_L)$. A *price,* P, is a value divided by the corresponding hectares, so that $P_L = V_L / A_L$ and $P_C = V_C / A_C$.

It is important to keep in mind that many of the rights exchanged under tenure review, and whose value is therefor included in V_C and V_L, pertain to the entire leasehold and hence cannot be measured properly on a per hectare basis. Examples include the value of location, improvements, allowed stocking rates, covenants, grazing leases, and access easements. Rights that are indivisible function economically like fixed costs. Hence $P_C + P_L$ is not necessarily a good estimate of the value of a hectare of land under lease. We use the prices to estimate the Crown's economic interest, namely the proportion of the value of the land owned by the Crown, and not to estimate the total value of the land.

The relation between P_C and P_L reveals Crown's interest as negotiated in the settlements. CI is the ratio of the price per hectare paid by the lessee to acquire freehold title to leasehold land, to the total value of a hectare resulting from tenure review, or $P_L/(P_L+P_C)$. CI is necessarily bounded by 0 and 1; we will usually express it as a percent.

In 1995, at the dawn of tenure review, the New Zealand Treasury estimated the value of the Crown's economic interest in its entire 2.4 million hectare pastoral estate as follows:[38]

> "6 The fiscal impact of tenure reform is estimated to be as follows: ...
> Cash costs of buying out lessee's interest in pastoral leasehold land $36.4 million
> Expected return for Crown's lessor interest $50 million"

Given these numbers, we estimate the Crown's economic interest in the pastoral estate to be 50/(50+36.4)=58%. In other words, Treasury predicted that for every dollar a lessee pays to

38. New Zealand Treasury. (1995). *Pastoral Lease Tenure Reform: Financial and Economic Implications*. Wellington: New Zealand Treasury.

acquire freehold title, the Crown would be willing to spend \$0.72 on average to acquire the lessees' interest. We call this fraction, 36/50 = 72%, the "cumulative cost ratio." Treasury's estimate implies a cumulative equalization payment from Crown to lessees equal to $0.72A_CP_C - A_LP_L$. (If this amount were negative, the lessee would pay the Crown.)

V. Competing Claims to Property Rights: Defining and Modeling Hypotheses 1a – 1e.

Our starting premise predicts a positive relation between the value of the property rights each party gains through tenure review, and the price each party pays for acquiring those rights. To model this, we first estimate the value of the rights exchanged, then consider five assertions about ownership -- who holds which rights while the land is under lease. From these assertions of value and ownership of property rights, we construct a simplified model in which these relative values and ownerships drive prices. We then construct more robust predictions of the pricing patterns we expect to emerge from tenure review by incorporating auxiliary variables.

Let G and D be the monetary prices of grazing and development rights pertaining to one hectare under lease. The value of "development rights" is simply the highest value of the land under any use other than extensive pastoralism. Let k represent the difference in price between G and D. Hence:

$$D = kG. \tag{1}$$

Under a pastoral lease, grazing rights are wholly owned by the lessee, while who owns the development rights to land under a pastoral lease is at once the subject of vociferous public debate and a central empirical question of this paper. Because some argue that the ownership of development rights is shared between the Crown and lessee, we let α denote the fraction of D owned by the Crown under a pastoral lease. Under tenure review, the lessee buys the development rights previously retained by the Crown, so if value drives price:

$$P_L = \alpha D, \quad 0 \leq \alpha \leq 1. \tag{2}$$

In turn, the Crown pays the lessee G to buy his grazing rights, and $(1-\alpha)D$ to acquire that part of the development rights not already owned by the Crown. Hence:

$$P_C = (1-\alpha)D + G. \quad (3)$$

Now combine (1) through (3) to express the Crown's interest in terms of k and α:

$$P_L/(P_L + P_C) = \alpha D/(\alpha D + (1-\alpha)D + D/k)) = \alpha k/(k+1). \quad (4)$$

There is empirical data bearing on k. Stillman (2005) finds that land used for purposes other than extensive pastoralism is worth from 2.5 (for intensive pastoralism), to 10 (for lifestyle blocks), and 14 (for horticulture) times the value of land limited to extensive pastoralism.[39] We will assume that rights to develop land beyond pastoralism are worth between 2 and 10 times pastoral rights, so that $2 \le k \le 10$.

The Land Act forbids, and the CPLA reiterates, non-pastoral uses of leased land, except when the Commissioner of Crown Lands grants consent to such uses in specific cases, upon the lessee's request. From this fact, we conclude that the Crown controls development rights. However ownership of these development rights has been hotly debated in the New Zealand print media of late, and there are several interpretations which are inconsistent with out our contention that the Crown owns the full value of the development rights. We will model and test each of these interpretations without prejudice.

We have distilled a variety of public statements by Treasury, academic social scientists, the present Cabinet, farm valuers, and the High Country Accord (an advocacy group for Crown

39. Given that sections carved out of land privatised by tenure review have been advertised at prices as high as NZ$6 million per hectare (http://www.woodlotproperties.co.nz/Projects/properties.asp?ProjectID=13 (last checked 9 Jan, 2007), it seems conservative to infer from Stillman's findings that development rights are worth at most 14 times the value of extensive pastoral rights. Note that the $6M/ha freehold price includes the following sunk costs incurred when subdividing land: the legal services needed to obtain District Council consent to subdivide, hiring a landscape architect or other development consultant, building roads and reticulated services (electricity, water, and sewers), and advertising the subdivided sections. Hence the imputed value of development rights is less than the difference between $6M/ha under freehold and the price per hectare of the same land under leasehold.

leaseholders) into five mutually exclusive hypotheses, about who owns the development rights in the pastoral estate. These hypotheses are shown in Table 2.

Table 2.
Hypotheses Bearing on the Division of Property Rights between the Crown and Lessee.

Hypothesis	*Description*	α
H1a	Crown owns 100% of development rights[40]	1
H1b	Development rights are split equally between Crown and lessee[41]	0.5
H1c	Lessee owns 100% of the value of development rights[42]	0
H1d	Development rights on land under lease have no value[43]	0 and D=0
H1e	The Crown owns 58% of the total value of the leasehold land.[44]	

If H_1 is correct, each of these scenarios would yield a scatter plot of CI versus percent privatised consisting of noise deviations from a line with slope of 0 and a y-intercept equal to

40. This is Brower's (2006) interpretation, and reiterated by her as follows in an *Otago Daily Times* opinion piece, 15 May 2006: "The Crown owns the pastoral land, full stop. It has leased out only a few of the many rights it holds, not the soil and certainly not title. There is no shared value of subdivision rights. The Crown holds these rights, definitively and outright." Farming advocates have also argued in this manner when, in the past, the government has threatened to raise rents on pastoral leases to "market rates." In 2005, the *Otago Daily Times* reported the "farmer lobby group [High Country Accord] was not opposed to higher rents, but Mr Aubrey [the chair] said any rise should take into account that … land was subject to restrictions. [According to Mr Aubrey], 'To make an urban analogy, it would be like leasing a gorse-covered section in a town with no right to clear the gorse or right to build a house, with no services laid on such as water, power and sewage. You would have to ask the Crown for permission to undertake any work on the land.'" Wallace, N., "Government accused of `land grab"' *Otago Daily Times* (22 February 2005). Similarly, a North Otago farmer wrote in 2005: "Lessees have tight restrictions over what they can do with the land, including stocking rates, sowing pastures, and the application of fertilizer. It is a bit like renting someone a section in town then telling them they can't build a house, put in water or electricity, sow grass for a lawn or plant a garden." Ludemann, E., "Government plans a worry for farmers," *Otago Daily Times* (3 March 2005). See also Aspinall, J., "Paying fair rental for pastoral leases," *Otago Daily Times* (14 April 2005).
41. This interpretation was advanced in the *Otago Daily Times* by the chair of the high country subcommittee of New Zealand's premier farming advocacy organization, Federated Farmers, "[Brower] is concerned about lessees purchasing a 'Crown held bundle of use rights including subdivision, condominium construction, ski field development, viticulture, safari park development and automobile tyre testing.' It is true the lessees cannot utilize these opportunities without the consent of the Crown. But because of the occupation rights of a pastoral lessee, neither can the Crown utilize these opportunities without consent of the lessee. Therefore the value of these opportunities is shared between the two parties to the contract."
42. This is the interpretation advanced by a spokesperson for the High Country Accord, an advocacy group representing pastoral lessees. The "lessees' perpetual right of exclusive occupation prevents the Crown from exercising any of its non-pastoral rights not demised to the lessees. In effect, these potentially valuable unallocated rights have been alienated by the Crown." (Thomson 2006). This interpretation is also espoused in Armstrong et al (2006: 34), a report commissioned by LINZ and subsequently rejected by Cabinet in September 2006. "The Crown in effect gave away any potential to realise the value for significant inherent values [for conservation and recreation] or X factor premiums when it gave the lessee a perpetual right of renewal."
43. This is the interpretation of Evans and Quigley (2006: 3): "The value of the lessor's interest is no more than the present value of the stream of rental income from these leases, because the lessees have the rights to exclusive possession of the land, and this right is renewable in perpetuity at the discretion of the lessee." Armstrong et al (2005: 32-33) concur with this interpretation, concluding that D=0 because development rights cannot be exercised while a lease is in force, and because leases are "perpetually" renewable. Hence the Crown's interest is no more than the "very small" capitalized value of future rent.
44. Treasury (1995).

the value of the mean CI. Under H_1, this noise can be attributed to variation across tenure review settlements in the values of the auxiliary variables. The five proposed interpretations of property rights affect the vertical intercept of the line, but neither its slope nor shape. Hence if H_1 is correct, a scatterplot of CI versus PF will reveal both the mean CI and which of the five interpretations of the property rights best describes the prices.

In addition to this fundamental exchange of property rights, settlements require each party to purchase some auxiliary rights and values. About 10% of the newly freeheld land is subject to a covenant restricting development.[45] We assign a price to such land by stipulating that the farmer gains title but not development rights. Similarly, on about 10% of the land resumed by the Crown, the Crown grants the previous lessee a grazing license valid for a set period of time, so grazing rights to this land do not change hands at the time of tenure review.

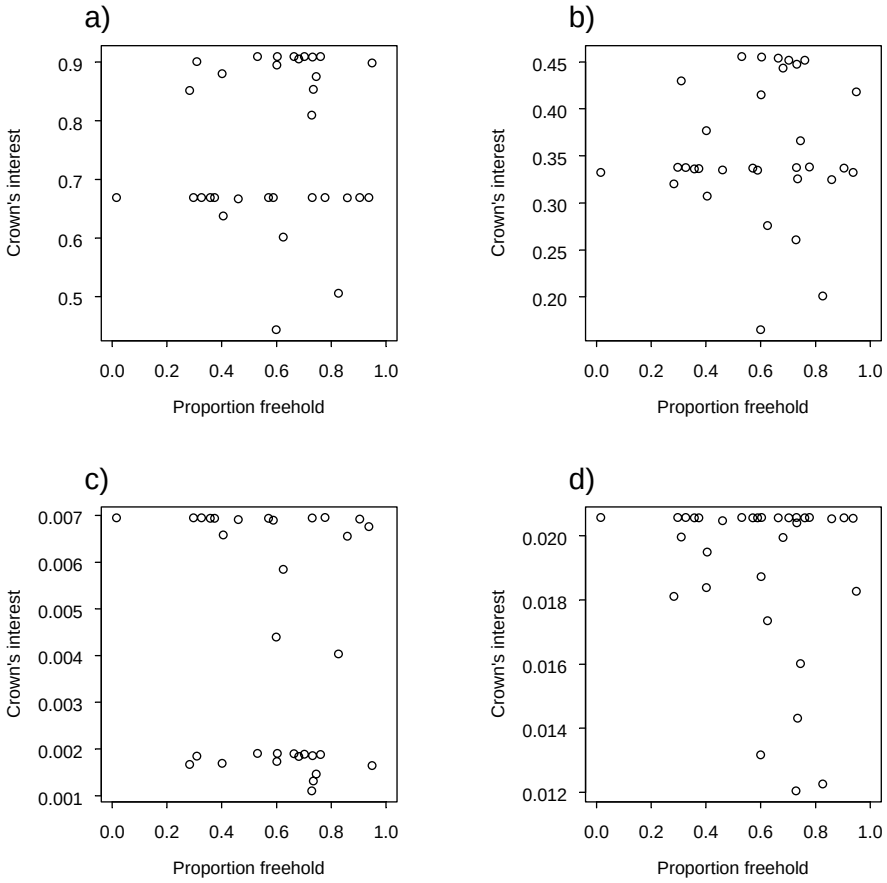
Finally, at least one access easement transects each piece of newly freeheld land. We model prices for access easements by assuming that the lessee buys the rights to develop the easement eventually, but the Crown retains title thereto.[46]

H1a-d yield the following four models, using hectares data from the 77 settlements completed between 1992 and 30 June 2006, and the following assumed values: G = \$1000;[47] D

45. In the USA, this is called a "conservation easement."
46. The competing property rights scenarios are modelled as follows:
    a) *Crown owns 100% of development rights*
        $P_{crown} = ((A_C + \text{Area.covenant})G + \text{Recreation.access}V_{access}) / A_C$.
        $P_{lessee} = (A_L V_{title} + (A_L - \text{Area.covenant})D) / A_L$.
    b) *Crown and lessee each own 50% development rights*
        $P_{crown} = ((\text{Crown.total} + \text{Freehold.covenant})\times(G+0.5D) + \text{Access.total}(V_{access}+0.5D)) / \text{Crown.total}$
        $P_{lessee} = (\text{Freehold.total}V_{title} + (\text{Freehold.total} - \text{Freehold.covenant} - \text{Access.total})0.5D) / \text{Freehold.total}$
    c) *Lessee owns 100% development rights*
        $P_{crown} = ((\text{Crown.total} + \text{Freehold.covenant})\times(G+D) + \text{Access.total}(V_{access}+D)) / \text{Crown.total}$
        $P_{lessee} = (\text{Freehold.total}V_{title}) / \text{Freehold.total}$
    d) *Development rights have no value while the land is under lease*
        $P_{crown} = ((\text{Crown.total} + \text{Freehold.covenant})G + \text{Access.total}V_{access}) / \text{Crown.total}$
        $P_{lessee} = (\text{Freehold.total}V_{title}) / \text{Freehold.total}$
47. \$1000/ha is an estimated value of the lessee's improvements and grazing rights, proposed by Evans and Quigley (2006), quoting farm valuers.

= $10,000 in prime locations[48] and $2000 otherwise;[49] V.access = V.title = capitalised annual rent.[50] These numerical values are based on empirical data, but are inessential to the simulation outcomes, shown in Figure 1.

Figure 1.



Note. Note that the scale of the vertical axis is not the same for all graphs. Assumptions: *G* = $1000; *D* = $10,000 in prime locations and $2000 otherwise; V.access = V.title = $21 (capitalisation of average rent). The four modeling scenarios are a) Crown owns 100% of development rights; b) Crowns owns 50% of development rights; c) Lessee owns 100% of development rights; d) development rights have no value.

48. A leasehold is a "prime location" if it includes any lakeshore, or if any part thereof lies within 30 km of Queenstown or Wanaka.
49. Our model assumes that land in any use other than extensive pastoralism will be more valuable than pastoral land. Land with a high location value (measured by close proximity to tourist centres of Queenstown and Wanaka, and lakefront land) will have a highest and best use of subdivision (hence carrying a value of about $10,000/ha); while other land will have a highest and best use of only intensive pastoralism (carrying a value of $2000/ha). Further, Quigley and Evans (2006) estimate that development rights in tenure review exchanges are worth $719/ha. Also see Quigley (2007).
50. We estimate this model using the actual annual rent per hectare for each former leasehold, not the annual rent summed over all former leaseholds, divided by the area of all former leaseholds in hectares. The latter calculation yields $0.86/ha/year.

VI. Modifying Hypothesis 1.

Hypotheses 2 and 3 modify the first. We first test the rivalry between social norms and statute noted by Ellickson (1991, 1993). In order to test Ellickson's findings, we hypothesize the opposite, namely that legal statute influences prices and the resulting Crown's interest more strongly than informal social norms. The 1998 enactment of the CPLA formalised the tenure review negotiation process, transforming it from a "gentleman's agreement" into a statutory process. We hypothesize that the outcomes of a negotiated gentleman's agreement will conform to convention and social norms, tacit or explicit, while the outcomes of negotiations under the aegis of one or more statutes will conform to the law. Hence in pre-1998 settlements which lack a statutory backstop, the Crown's interest will be more vulnerable to pressures – upward pressure from the Crown's agents, environmental, and recreation advocacy groups, and downward pressure from farming interests – than the Crown's interest calculated for post-1998 settlements. We therefore expect the pre-1998 results to display less noise, and tighter conformity to one of the five variants of H1 than the post-1998 results. Passage of legislation will minimise any "wiggle room" in negotiated values of the Crown's interest.

Hypothesis 2: Enacting legislation will reduce noise in tenure review outcomes.

Public choice theory (Mueller 2003) predicts that incentive structures for Crown negotiators will influence the pattern of the negotiated Crown's interest. The Crown sets no reservation price on land to be privatised. Contractors have no financial incentive to press for a settlement that is financially favourable to the Crown, and are instructed not to advocate for the Crown. Given these incentives, we hypothesise that Crown negotiators agree to undervalue the Crown's interest in order to close a deal. Given incomplete information about how well the agent adheres to the principal's goals, the Crown's interest could fall victim to the principal-agent problem. If so, the Crown's interest will not cluster around a horizontal line resulting

from a calculated ratio between relative values of property rights exchanged, but will cluster around the farmers' collective demand curve.

The farmer's theoretical demand curve will be a downward sloping demand curve, indicating that the marginal benefit of conversion to freehold declines as the percent privatized rises. For example, a lessee should be willing to pay more for privatising 5% of his leasehold given that he already has title to 20% of his former leasehold than when he already owns 80%. We also need to keep in mind that farmers are typically land rich and subject to credit rationing (because of the usual moral hazard), and hence are cash poor. Hence a farmer more likely to afford the 501st privatized hectare than the 5001st one.

Assuming that the marginal benefit to each party of each hectare of land will decrease as the number of hectares attained increases, we can construct each party's demand curve for land. In the Crown pastoral estate, land quality and the capacity for development beyond sheep grazing varies greatly. There might be a few leases in which 100% or 0% of the land is "capable of economic use" beyond grazing; but most will be a mix. Assuming that the CPLA accurately expresses the Crown's preferences for land, the farmer prefers (and obtains title to) the land "capable of economic use," which tends to be more productive, improved, and lower elevation. And the Crown prefers land with "significant inherent values" for conservation and recreation, tends to be less productive, unimproved, and above 1000m. Indeed, empirical spatial analysis of the land-split so far bears out these assumed preferences (Walker et al in review).

"Capable of economic use" and "significant inherent value" are not mutually exclusive. In each lease, there is a finite amount of land which clearly meets the threshold for privatization or for public conservation. The two descriptions and their overlap create 4 categories of land: 1) land which the farmer prefers to privatize which the Crown prefers to privatize (improved land with limited significant inherent values); 2) land which the Crown

prefers to conserve publicly and the farmer prefers to relinquish (glacier, scree, or otherwise unproductive land that is expensive to manage); 3) land which both parties prefer to keep (both productive and containing values for conservation); and 4) land which neither party wants. But in the past 15 years, land values and uses have changed in New Zealand (Chair Cabinet Policy Committee, "South Island High Country Objectives: Report Back." P. 2). Commercial recreation and tourism make remote, steep, glaciated, unproductive land potentially valuable to the farmer for any of the following non-pastoral uses: exclusive safari hunting parks (e.g. Mesopotamia Station), commercial ski, jointly-owned private reserve for an exclusive lowland subdivision (e.g. Closeburn, Wyuna Stations). Hence it seems fair to assume that bargaining will banish little land to category #4.

Hence the farmer's demand curve for land will be linear, but downwardly sloping. The farmer will be willing to pay more for the 1st hectare than for the 5001st, or the 7001st. Lessees' demand will also be influenced by how they perceive the Crown's interest, with demand and perceived Crown's interest being positively correlated. The highest demand curve will have a y-intercept at 100% of the lease value and a slope of –1.

Moreover, if the principal-agent problem described above is indeed the case, contractors will be willing to close a deal at any cost. We submit that the graphical representation of "at any cost" will be CI-PF scatterplots with a downward slope, with each point being a point on the lessee's demand curve for freehold land.

Hypothesis 3: Under asymmetric information, Crown negotiators are willing to close deals at any cost. Hence the Crown's interest is subject to a principal-agent problem. Hence a CI-PF scatterplot will trace out the farmers' demand curve for freehold land.

VI.1. Improvements.

Some advocates for lessees have suggested that the Crown compensation for the value of improvements explains the pattern of tenure review prices. We contest that assertion with the

following logical test. By statute, productive land "capable of economic use" is privatized, while land with "significant inherent values" for conservation, recreation, heritage, and landscape is to be conserved, "(preferably)" via full Crown ownership. There are two reasons why improvements are likely to be concentrated on newly privatized land: 1) farmers are likely to improve land that is more, rather than less, productive; more productive land is likely to be "capable of economic use," hence privatized. 2) According to DOC officials, improved land has less value for conservation than unimproved land; hence improved land is unlikely to be identified for conservation.[51]

Given these two reasons, the intensity of improvements *is* likely to covary positively with percentage privatized, and the correlation coefficient could be as high as 1. But as improvements will be most concentrated on privatized land, intensity of improvements is *not* likely to co-vary with the negotiated CI. A finding that intensity of improvements *does* positively co-vary with CI indicates one of two related problems: 3) the Crown is paying for improvements on land which the Crown does not resume. 4) The valuation methodology allows the value of improvements to a 100ha block to capitalize into the value of the entire leasehold, rather than into the value of the improved 100ha block itself. In this case, the improvement will boost the lessee's interest (and depress the Crown's) *regardless* of which party keeps that 100ha block in the tenure review land split. In a sense, the Crown and the lessee split the value of the improvement even in the very likely case that lessee keeps the improved block of land.

The only case in which improvements can explain the pattern of prices is the case in which 3 or 4 is true. Allowing the value of a localized improvement to capitalize into the value of the entire land section measuring thousands of hectares would seem to point to an

51. This assumption is consistent with information obtained from interviews with DOC officials (Canterbury and Otago) in charge of identifying pastoral land for conservation.

egregious book-keeping error. Hence the assertion that improvements explain prices relies on a broad-scale book-keeping error.

VII. Results.

We now test H1-H3 by estimating the relation between the Crown's interest (*CI*) and the proportion of the leasehold converted to freehold (*PF*, "proportion freeheld"). A fundamental distinction throughout the empirical analysis is whether a settlement was concluded before or after the 1998 enactment of the CPLA. Fig. 2 is a scatterplot of the CI versus PF

Figure 2.

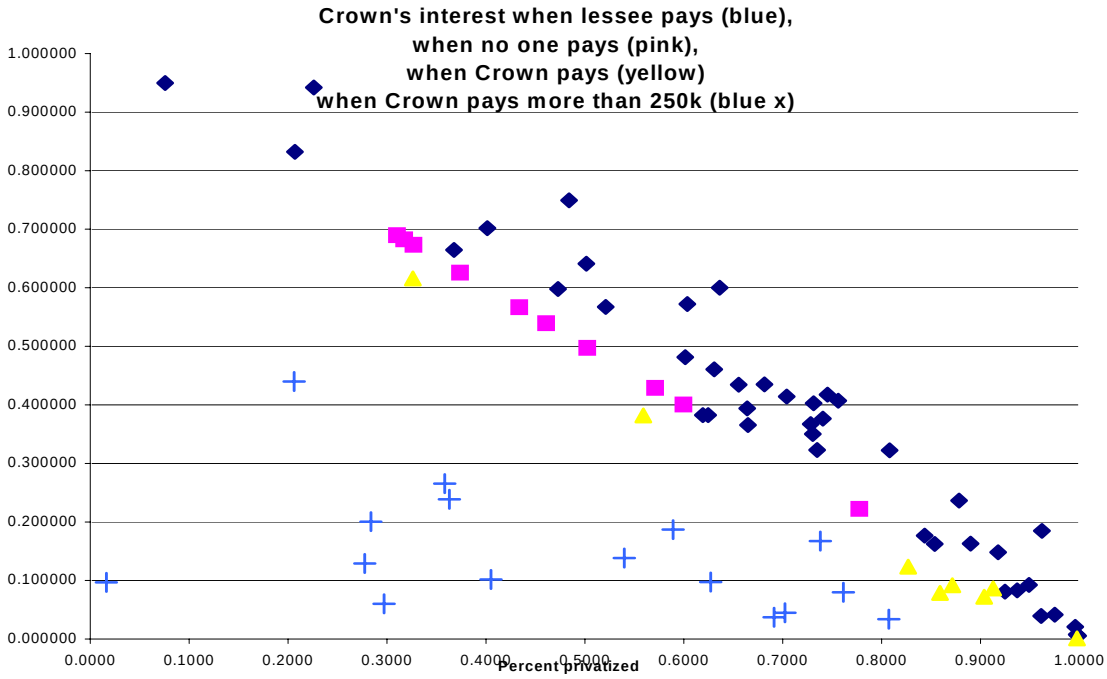
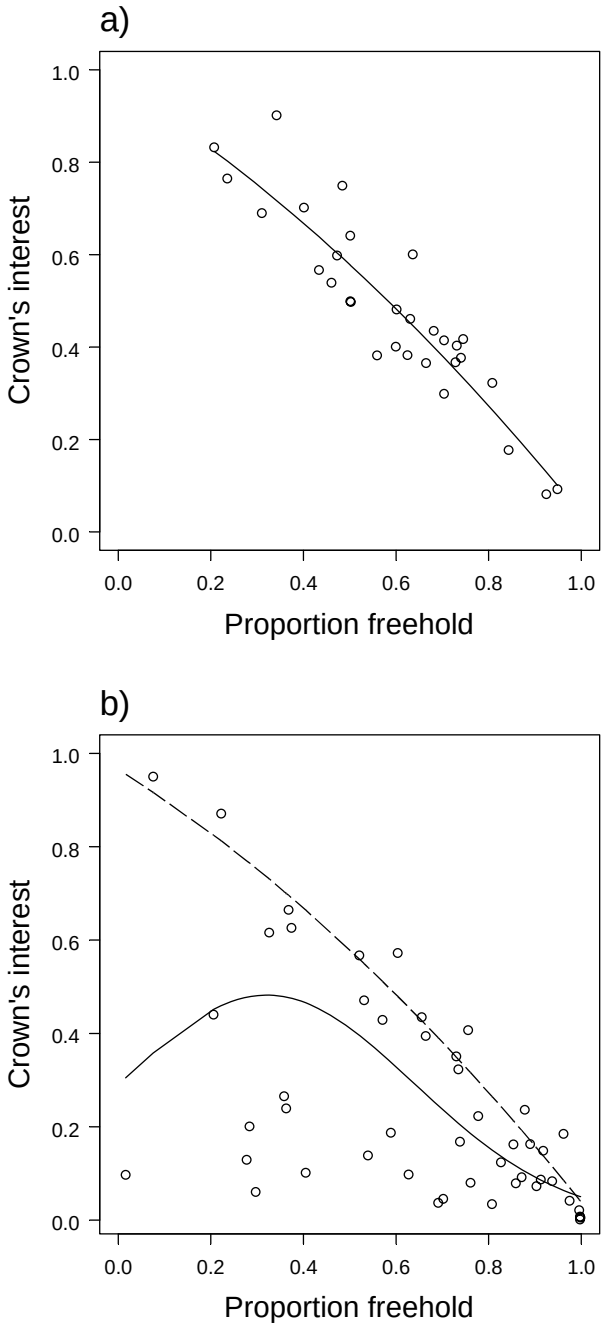


Fig. 2 reveals that the CI-PF relation is well described by a line with slope equal to –1, exception made of the points plotted with a '+'. These points correspond to the 16 settlements where *CI* is low and the Crown paid more than $250K to the lessee. We have been unable to identify any other characteristic of these settlements that would explain why they do not plot near the line with slope of –1 that well describes most of the data well. While datapoints

plotting below the diagonal seem to support H_{1c}, the bulk of the data reject each of H_{1a} through H_{1e}, which require that the estimated coefficient on *PF* be zero.

Fig. 3a (3b) scatterplots the data for the 30 (47) pre (post) CPLA settlements.

Figure 3.



Note. Crown's interest (*CI*) versus proportion freeheld (*PF*) for the (a) pre-CPLA and (b) post-CPLA settlements. Solid lines graph the best fitting estimated model.
a) Pre-CPLA: Linear regression. $R^2 = 0.841$, $F_{2,27} = 73.5$, $P<0.0001$.

b) Post-CPLA: 2nd degree polynomial quasi generalized linear model with log link, etimated with a correction for heteroskedasticity inversely proportional to PF. $R^2 = 0.372$, $\chi^2_2 = 20.37$, $P<0.0001$. The dashed line is the same as the solid line in Fig. 3a.

Fig. 3a suggests that a simple linear specification should fit the pre-1998 settlements well. The estimated equation is:

$$CI = 1.057 - 0.97PF. \quad N = 30. \quad \bar{R}^2 = 0.835. \text{ SER}=0.081. \text{ BIC} = -30.5. \qquad (5)$$
$$(0.05) \quad (0.08)$$

(5) does not support any variant of H1, which all predict that the estimated coefficient on *PF* will be zero. Instead, that coefficient is statistically indistinguishable from –1, which is inconsistent with tenure review outcomes being driven by the relative values of the property rights exchanged.

Fig. 3b suggests that the CI-PF relation post-CPLA is nonlinear. We estimate that relation as:

$$CI = -1.24 + 3.17PF - 4.93PF^2. \quad N = 47. \quad R^2 = 0.372. \text{ SER}=0.885. \text{ BIC} = 134.15. \quad (6)$$
$$(0.48) \quad (1.80) \quad (1.52)$$

(6) results from a GLM (generalised linear model) estimate with a log link function, i.e., the dependent variable was transformed to ln(*CI*+0.167). Fig. 3b also reveals that the variability in *CI* is inversely correlated with *PF*. This heteroskedasticity was corrected for by assuming that the variance is proportional to the square of the mean.

According to Figs. 2 and 3b, 16 of the 47 post-1998 settlements do not conform to the pre-1998 model (graphed as a dashed line in Fig. 3b). These settlements are all those whose net equalization payments are paid to the lessee and exceed $250K. The data for these settlements appear randomly scattered about a line with slope 0 rather than –1, a finding that is inconsistent with H_2. A horizontal line through these datapoints would have a vertical intercept of about 0.2 instead of about 1. We conclude that the post-CPLA data are best described by

two radically different *CI-PF* regimes, one for settlements in which the lessee receives more than $250K, and another regime for all other cases.

The discussion thus far suggests the following variables:

CPLA = 1 if the settlement was completed *post* the enactment of CPLA, and is otherwise 0.

NEPL = 1 if *NEP*>NZ$250K; otherwise 0.

NEPS = 1-*NEPL.*

We then ask if any measurable characteristics of the settlements explain this curious dichotomy in the data. These measurable characteristics are captured by the following auxiliary variables:

Ploc = 1 for the 34 settlements where the former leasehold includes frontage on one of the major South Island lakes (Tekapo, Wanaka, Wakatipu, Hawea, and Puka-ki), or if any part of the leasehold is within 30km of Queenstown or Wanaka. Otherwise 0;

RENT = Annual rent paid by lessee, divided by area of leasehold in hectares. Data are missing for 7 settlements;

SU = Stocking limit. Maximum number of sheep that LINZ allows to graze on the leasehold, divided by area of leasehold in hectares. Data are missing for 43 settlements, including all pre-CPLA ones;

EASE = $L \times 5 / A_L$, where L is length (in meters) of access easements over the freeheld portion. Easements are arbitrarily assumed to be 10 meters wide. Data are missing for 23 settlements;

Table 3 presents descriptive statistics for the data used in this study.

Table 3. Descriptive Statistics for Regression Variables.					
	N	*Minimum*	*Median*	*Mean*	*Maximum*
A_C	77	3	1421	2506	17722
A_L	77	42	2719	3432	19825
CI	77	0.001	0.322	0.326	0.901
EASE	54	0	5.9	9.7	62.1
P_C	77	8.8	158.6	441.1	5357
P_L	77	1.7	66.7	90.8	543
PF	77	0.016	0.665	0.638	0.998
RENT	70	0.07	1.00	1.22	4.54
SU	34	0.3	1.0	1.3	4.3
V_C	77	8	175	400	6193
V_L	77	1	165	225	1314

Fig. 4 shows the relation between *CI* and each of the four proposed auxiliary variables.

Figure 4.

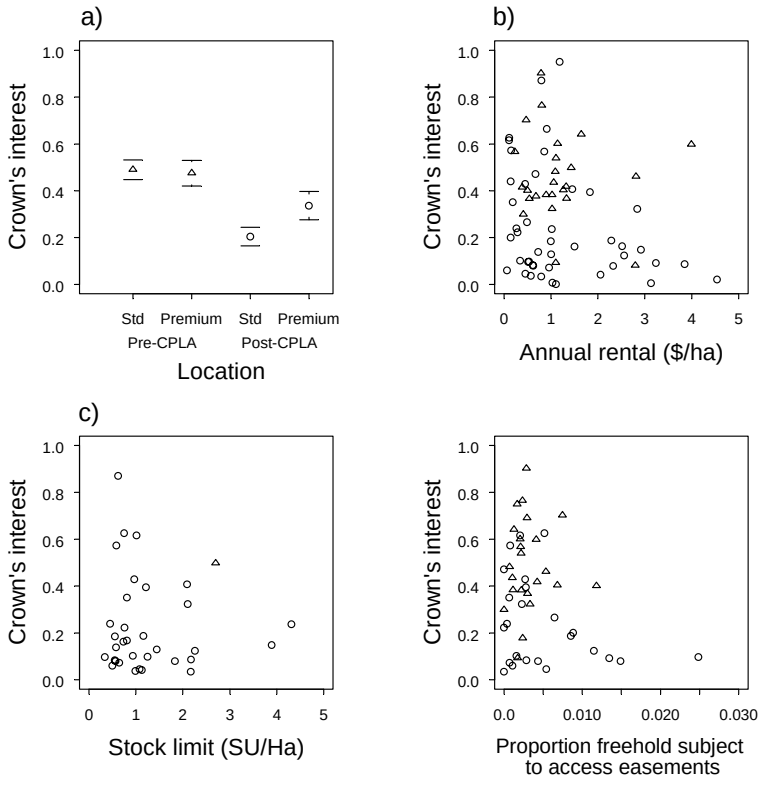


Figure 4. Relations between *CI* and auxiliary variables.
a) *Ploc*: Pre-CPLA, $t_{27.9} = 0.22$, $P = 0.83$; Post-CPLA, $t_{45} = 1.89$, $P = 0.07$.
b) *RENT*: Pre-CPLA, $F_{1,23} = 0.15$, $P = 0.70$; Post-CPLA, $F_{1,43} = 0.13$, $P = 0.72$.
c) *SU*: Post-CPLA only: $F_{1,32} = 0.023$, $P = 0.88$.
d) *EASE*: Pre-CPLA, $F_{1,21} = 0.02$, $P = 0.89$; Post-CPLA, $F_{1,22} = 2.48$, $P = 0.13$.

We now test more formally whether the auxiliary variables have any effect on the CI-PF relation by estimating variants of the following regression model:

$$CI = \beta_0 NEPS + \beta_1 PF{\times}NEPS + \beta_2 NEPL + \beta_3 PF{\times}NEPL + \beta_4 Aux + \beta_5 Aux{\times}CPLA + \varepsilon \qquad (7)$$

Aux×*CPLA* allows post-CPLA settlements to have an effect of *Aux* differing from that for pre-CPLA settlements. Table 4 presents estimates of (7). The estimate (4.5) will deviate slightly from (7) in a manner that will become clear.

Table 4. Testing the Auxiliary Variables.

	3.1	3.2	3.3	3.4	3.5
NEPS	1.07 (0.03)	1.01 (0.04)	1.00 (0.04)	1.01 (0.05)	0.91 (0.07)
PF×NEPS	-1.02 (0.05)	-0.99 (0.05)	-0.95 (0.06)	-1.00 (0.07)	-0.90 (0.08)
NEPL	0.20 (0.05)	0.20 (0.05)	0.21 (0.05)	0.23 (0.06)	0.16 (0.06)
PF×NEPL	-0.13 (0.09)	-0.17 (0.09)	-0.18 (0.09)	-0.20 (0.10)	-0.14 (0.10)
Ploc		0.07 (0.02)	0.07 (0.02)	0.09 (0.02)	0.07 (0.03)
Ploc×CPLA		-0.02 (0.03)			
RENT			0.00 (0.01)		
RENT×CPLA			-0.01 (0.01)		
EASE				0.001 (0.002)	
EASE×CPLA				-0.002 (0.002)	
SU					0.01 (0.02)
NOBS	77	77	70	54	34
$\bar{R}^2$	0.877	0.893	0.890	0.860	0.831
BIC	-76.3	-78.3	-70.8	-46.2	-30.5
P(*Aux.*=0)	----	0.003	0.43	0.52	0.47
P(*RESET*)	0.03	0.19	0.97	0.65	0.74
P(hetero.)	0.03	0.18	0.25	0.14	0.10
P(JB)	0.03	0.05	0.08	0.36	0.82

Note. The dependent variable is CI. Standard errors are enclosed in parentheses. NOBS = number of observations. $\bar{R}^2 = R^2$ adjusted for degrees for freedom. BIC=Bayesian Information (Schwarz) Criterion. *P*(*Aux*.=0) = *p*-value for an F test that the coefficients on the auxiliary variables are jointly 0. *P*(*RESET*) = *p*-value for RESET test[52] of misspecification. *P*(*hetero*.) = *p*-value for LM test of homoskedastic residuals. *P*(JB) = *p*-value for Jarque-Bera test for normality of residuals.

(4.1), the benchmark specification with no auxiliary variables, reveals the high explanatory power of the bifurcated regime that Fig. 3b suggests for the post-CPLA settlements. The estimated coefficient on *NEPL* suggests that the Crown's interest is 20%, a value consistent with the position of advocacy groups for pastoral lessees (see for example O'Connor quoted in (Hayman, 2003)), namely that the Crown owns substantially less than 100% of the development rights. The residual diagnostics for (4.1) leave a good deal to be desired.

(4.2) is (4.1) augmented by *Ploc* and *Ploc*×*CPLA*. The estimated coefficient on *Ploc* is highly significant, and implies that a good location raises *CI* by 7 percentage points. The effect on *Ploc* of enacting the CPLA was statistically zero. The remaining estimates in Table 4 all include *Ploc*. (4.3)-(4.5) show that *RENT* and *RENT*×*CPLA*, *EASE* and *EASE*×*CPLA,* and *SU* are all insignificant. (4.5) is subject to the caveat that *SU* features a disappointingly large number of missing values, in good part because the sample includes no pre-CPLA settlements. With one exception, the diagnostic tests in (4.2)–(4.5) all fail to reject the null at the 5% level.

H_{1d} implies that *CI* equals the capitalized value of future rent. But (4.3) rejects any effect of annual rent (*RENT*) on *CI*, and capitalized future rent is related to annual rent by a capitalization factor which we assume to be the same for all settlements. Hence we reject H_{1d}.

52. Let the fitted values and residuals from a regression of $\mathbf{y}$ on $\mathbf{X}$ be $\hat{\mathbf{y}}$ and $\mathbf{e}$, respectively, then estimate the auxiliary regression $\mathbf{e} = \mathbf{X}\boldsymbol{\beta} + \hat{\mathbf{y}}'\mathbf{I}\hat{\mathbf{y}}\delta + \boldsymbol{\eta}$. The RESET statistic for the original regression is the F statistic for a test of $\boldsymbol{\beta} = \delta = 0$. Under the null that the original regression is well-specified, and has residuals that are homoskesastic and free of outliers, the RESET statistic is distributed chi-square with 1 degree of freedom

VII.1. Fixed-cost ratio pricing.

A possible explanation for the findings in the previous section is something we propose to call a "fixed-cost ratio pricing structure." This structure begins with the assumption that the objective of tenure review negotiations is to structure settlements that minimize the amount of money that changes hands, i.e., on settlements whose values of V_C and V_L are not far apart. The numerical value of *CI* is simply an incidental consequence of this agreement.

Regressing ln*CL* on ln(A_L/A_C) over the 30 pre-CPLA settlements yields:

$$\ln CL = -0.339 + 0.96\ln(A_L/A_C). \quad N = 30. \quad R^2 = 0.839. \qquad (8)$$
$$(0.08) \quad (0.08) \quad P(\text{hetero}) = 0.79. \; P(\text{JB}) = 0.01. \; P(\text{RESET}) = 0.95.$$

An estimate of V_C/V_L is then exp(–0.339)= 0.712. This suggests that the lessee's interest in the land acquired by the Crown was valued at 71% of the Crown's interest in the land that was freeholded, *regardless of how much land was actually privatised*. Let $CI = P_L/(P_C+P_L) = (V_L/A_L)/(V_C/A_C + V_L/A_L)$. Assuming that the land is split evenly between Crown and lessee, so that $A_C=A_L$, we have $CI = V_L/(V_C+V_L) = 1/(V_C/V_L + 1) = 1/(0.712+1) = 0.584$, essentially the 58% implied by Treasury's 1995 estimate.

Now reestimate (8) for all 77 settlements, incorporating the intercept and slope dummies *NEPS* and *NEPL* of section VII:

$$\ln CL = -0.266NEPS + 0.94\ln(A_L/A_C) + 2.09NEPL - 0.77NEPL\times\ln(A_L/A_C). \qquad (9)$$
$$(0.09) \quad (0.04) \quad (0.14) \quad (0.12)$$
$$N = 77. \quad R^2 = 0.880. \quad P(\text{hetero}) = 0.00. \; P(\text{JB}) = 0.80. \; P(\text{RESET}) = 0.49.$$

VIII. Discussion.

Our results suggest support for Ellickson's Coasian hypothesis that when negotiating property, the law often does not serve as the starting point for negotiations. Further, the close

resemblance between the farmers' theoretical demand curve and the observed pattern of the CI suggests strong support for Ellickson's explanation for *why* the law often fails to serve as the initial or the ultimate arbiter of property disputes. When adjudicating the entitlements and responsibilities of property ownership – be it in land, livestock, or radio transmission frequencies – small and closed groups often construct norms to govern disputes, rather than adhering to the letter of the law. They do this not just for the Coasian reason that norms minimize transaction costs. The norms are also welfare-maximizing, in that they serve the collective goals of the group. In the case of tenure review, prices which fall neatly along a theorized demand curve certainly appear welfare maximizing. Indeed our results suggest that in most settlements bargaining both starts and ends with the farmer's demand curve for freehold land, not with the law. A histogram of the residuals from the dominant pattern reveal no significant residuals which favor the Crown, but the only significant residuals strongly favor the lessees, suggesting that negotiated outcomes may deviate from the norm, as long as the deviation benefits the lessee.[53]

The results are also consistent with an unexpected variant of H1e, one inspired by our reading of New Zealand Treasury (1995): a 70% fixed-cost ratio pricing mechanism. We hypothesized that property rights would drive prices paid per hectare, implying that who gets what land also drives prices. In H1e, we hypothesized that the Crown's interest in each lease would vary about a line of slope 0, vertical intercept CI = 58%.

We did not find this. But if we drop the apparently false assumption that area privatised influences the net equalization payment, then Treasury's estimate of the relative value of property rights exchanged explains most of our findings astonishingly well. For the

53. Interviews with Crown negotiators support this inference: "But who cares about the law. Market values are what people are willing to pay. You can argue the law till you're blue in the face. If they're not prepared to pay [to purchase the full value of the Crown's interest, including 100% of the development rights], there's no deal."

majority of settlements, the dollar value of the lessee's total expenditure is always about 70% of the Crown's total expenditure in the same lease, regardless of whether the lease is split 80-20 or 20-80.

Instead of the Treasury-implied calculation of $P_C/P_L = 0.72$ (which translates to an average Crown's interest in each hectare of 58%), most tenure review settlements have yielded a best-fit curve that is approximately:

$$(P_C A_C)/(P_L A_L) = 0.7,$$

resulting in a Crown's interest varying negatively, but directly, with percent privatised; see Figures 2a and 2b.

While we freely grant that one cannot infer causality from coincidence, an empirical 0.70 fixed-cost ratio is very close to Treasury's 1995 prediction of a 0.72 cumulative cost ratio. However, fixed cost and cumulative cost ratios are very different. If the prices stem from an administrative fixed-cost ratio formula that omits area privatized from the equation, this points to a recurrent bookkeeping error made by several contractors employed by three firms over a 10 year timespan. As bookkeeping errors go, omitting area privatized is perhaps no more egregious than asserting that land improvements drive prices. The fixed-cost ratio strikes us an an attempt to follow a strict standard economic interpretation of property in which different rights have different values. But the attempt is less than successful, because outcomes are also the result of pathologies highlighted in the economic theory of bureaucracy.

More specifically, in this case it is difficult to distinguish between the world of Ellickson and that of agency theory. Prices which fall along the farmer's demand curve (whether it is a fixed-cost ratio or not) suggest a bargaining structure in which Crown negotiators are willing to close the deal at any cost, regardless of their principal's directions. Indeed until September 2006, the prices stemming from negotiators' work were unobservable, as they were classified. The minister's decision to release the previously secret prices, and the

farmers' unhappiness with this decision, made headline news in all four major national newspapers. The dollar values and implications of the prices themselves did not make headline news until January 2007 (Steward 2007), but the minister's release and the farmers' reaction made headlines the very same week (Beston 2006).

Until the actual release, LINZ officials were quoted repeatedly stating that the prices would never be released as the CPLA prohibits their release.[54] Hence a situation in which the sudden release of agents' work results made national news suggests that prices might be subject to a problem of asymmetric information in which principals (and the public) cannot easily measure the quality of the output of agents.

Indeed sub-agents (Crown negotiators) receive instructions from the agent (LINZ officials) that price "should not be a constraint [on getting a deal]. This was quite a strong message. It came through loud and clear." Hence agents' instructions to sub-agents appear to ignore or subvert the principal's (NZ Cabinet) directive to attain a "fair financial return for the Crown" when disposing of Crown land (Cabinet Policy Committee 2005).

The Ellicksonian and principal-agent explanations are complementary, not mutually exclusive. Agents and sub-agents do follow principal's instructions to reach settlements, though not always as quickly as the principal would prefer.[55] They also seek consensus, as both parties must sign a deal to complete it. The quickest way for a sub-agent to find a deal that is agreeable to the farmer is to start negotiations at a point which is welfare maximizing to

54. LINZ official Paul Jackson interviewed by Television NZ in 2005 (aired 28 Feb 2007, in a program called "Rezoning GodZone.") asserted that the CPLA prohibits releasing the prices, but we are unable to find any passage in the text of the Act bearing on this claim. In response to multiple requests for the prices made over a year and a half by one of us (Brower), including three formal written requests invoking the Official Information Act (OIA), LINZ admitted that the CPLA says nothing about the privacy of prices, but argued that the OIA prohibits release of "commercially sensitive" data. In the end, the Minister of Land Information deemed the prices not "commercially sensitive." According to the *NZ Herald*: "Geoffrey Thomson, who chairs the High Country Accord, a group advocating for pastoral leaseholders, was surprised the figures had been released. 'My understanding was that [tenure review] was a private contractual [deal].'" Beston, A. (2006, 18-09-2006). Land-swap farmers sitting pretty says scientist. *New Zealand Herald*.

55. In 2003, cabinet set a deadline that all pastoral leases would have completed tenure review by the year 2008. But that deadline was later relaxed. (Wallace, N. (2003, 20 October 2003). Tenure review nearly completed; Environmental group calls for moratorium. *Otago Daily Times*.).

the farmer. The land-split negotiations take years, and are exogenous to the financial settlements. As financial settlements are agreed upon after the land-split, and the results were not publicly observable, then agreeing to a welfare maximizing norm which bears no resemblance to the law is welfare maximizing for the farmer, the agent, and the sub-agent. Whether this norm agreed to by the close-knit group benefits the principal, and the principal's electoral constituents is a different question. Hence the principal-agent situation appears to facilitate consensual agreement to an Ellicksonian welfare maximizing norm which "lies entirely outside the shadow of the law."

When financial results are confidential (albeit while the number of settlements is easily observable and well publicized in the media), agents have little incentive to direct sub-agents to drive a hard bargain. Moreover, sub-agents have no incentive to drive a hard bargain when doing so would violate their contracts.

In examining this discrepancy between the principal-agent and the agent-sub-agent relationships, we suggest that agency theory requires a slight revision. The agent-sub-agent relation runs quite smoothly. When told to disregard cost as a factor, sub-agents do just that. Similarly in 2005, there was public pressure on Cabinet to demand a "fair financial return to the Crown." In 2005, the elected agent heard and heeded the public agents' collective direction. Communication lines break down between Cabinet and the bureaucracy – not between the public and the Cabinet, nor between the bureaucracy and the contractors. Agency theory's "contracting out," as well as managerialism's policy-operations split, are designed to mitigate the pathologies suggested by agency theory, and some (Boston et al. 1991, Boston 1996, Gauld 2007) contend that New Zealand government agencies have followed these suggestions to the letter. But contracting out of an agency already divided by the policy-operations split introduces an unnecessary and potentially detrimental third-party. Contracting out of an agency designed around a policy-operations split steeped in the myth that

administration can and should be apolitical and neutral seems to exacerbate, not mitigate, the principal-agent problem. In this case, the sub-agents respond to contractual incentives, but the agents are constructing those incentives with an eye to closing many deals with unobservable costs. Making the sub-agents responsible to the political principal, rather than to the purportedly apolitical agent would seem to better serve the goals of the ultimate principal – the public. In contractual relations, three is a crowd.

These results bear examination with regards to equity, as the prices are more welfare maximizing to those who receive the most land than to those who receive the least land. The more a farmer privatises, the more generous the price. Hence lessees emerging from tenure review with title to a large fraction of their former leaseholds effectively acquire land at large discount relative to lessees retaining a small fraction of their leaseholds. The Crown appears to be offering a bulk discount when disposing of land.

Adding Ellicksonian norms to the question of equity, our findings suggest that new legislation might alter the smooth functioning of welfare maximizing informal convention. The introduction of statute changed the nature of Ellickson's small and closed group negotiating a property dispute. Prior to 1998, tenure review was extra-legal and under the table, but enjoyed support from all interested parties – conservation groups, recreation groups, farmers, and the government. All parties saw tenure review as making them better off and hence wanted it to continue. Any party left aggrieved by a settlement had the option of calling for a judicial review, which risked resulting in tenure review's being declared illegal and ceasing. Hence before the CPLA took effect, all interested parties held an effective veto option. As such, pre-1998 settlements required unanimous consent of all parties (Brower 2006: 37-38; Brower, in review a).

By contrast rather than all interested parties enjoying fairly equal power, the post-CPLA negotiation dynamics feature insiders (vested interests with monopoly veto power) and

outsiders (other interested parties and the New Zealand taxpayers). If the small and closed group changes with a law change, we expect that both its collective goals and the conventions designed to suit them, will change.

Prior to 1998, the collective goal appeared to be settlements requiring that very little money change hands. After 1998, there appear to be two goals and a pricing regime associated with each. One goal is the fixed cost ratio established before 1998. The new goal unique to post-1998 settlements appears to result in large (i.e., exceeding $200,000) payouts from the Crown to lessees.

Finally, we turn to the apparent dichotomous post-1998 results. Despite testing a legion of possible explanatory variables, we cannot statistically predict the difference between the two regimes. Explanatory variables tested and eliminated, include: year in which a settlement became final; stated desire for that lease for a planned park; other permutations of location (riverfront, varying distances from Queenstown/Wanaka/Dunedin, proximity to existing National Park, potential for viticulture); contracting firm; years required to achieve a settlement; personal stock unit allowances. We intend to grapple further with these dichotomous results in future research.

IX. Conclusion.

A strong and consistent negative correlation between the negotiated Crown's interest and percent privatized suggests that the law is neither the initial nor the final arbiter of tenure review prices. We reject the hypothesis that prices paid are driven by the value of property rights exchanged. Instead, we find persuasive evidence that the majority of settlements (both before and after passage of the CPLA) were driven by one of the following complementary norms:

(a) A fixed-cost ratio pricing method of 0.70, or

(b) A principal-agent-subagent problem in which the subagents are directed by the agent to take actions that violate the interest of the principal.

These findings are consistent with Ellickson (1991) and agency theory. Conventions and norms, as accepted by a small and closed group negotiating contentious property claims, appear to drive the pre-1998 results remarkably well. But when new legislation changes the membership of the small and closed group, the collective goal of the group appears to diverge into two distinct goals. The majority of settlements continues to follow the pre-1998 goal: a property rights exchange resulting in a minimal cash payout. A significant minority of post-1998 settlements, however, feature relatively large payouts by the Crown to lessees.

While rational lessees will, understandably, seek to maximize rent,[56] it is less reasonable to expect the Crown to facilitate this rent-seeking. Crucially, negotiators retained by the Crown lack incentives either to suppress rent-seeking or to maximize the principal's (the Crown) financial interest in the land. A process facilitating rent-seeking certainly maximizes the welfare of the vested interest. Hence agency theory and Ellickson's hypothesis yield the same prediction, which our results support: when it comes to property, the law is not always the starting point for negotiations. Our results are consistent with tenure review negotiations beginning—and ending—with the lessee's demand for freeholding the land he leases.

Coase (1960), Ellickson (1991), and others have argued that the law can be a costly way to adjudicate disputes over property. Relying on norms rather than the letter of the law can lower transaction costs in property negotiation. While norms may be efficient, Ellickson points out that they can be less equitable than the law, as norms tend to serve the goals of the political insiders to the detriment of political outsiders and of Parliament. According to Ellickson:

> "Norms have their limits, and law has its place. … First, the hypotheses of welfare-maximizing norms provides no basis for expecting that norms will serve certain ends, such as corrective or distributive justice, that policymakers might regard as

56. Employed here in the sense of current economic theory, and not of business practice.

> relevant, or even paramount. Second, because there is no reason for thinking that a group's norm-making process will give weight to the interests of those outside the group, a legal system properly can decline to pay any respect to how a group customarily treats outsiders." (Ellickson 1991: 284-5)

If the Crown wants to prefer equity to efficiency, it should emphasise statutory definitions of property rights over socially-accepted norms when negotiating entitlements and responsibilities stemming from property ownership.

In tenure review, as in principal-agent, everyone is at fault but there is no one individual to blame. Tenure review outcomes should not be placed on the lessees' doorstep. In negotiations, both the lessee and the Crown hold a powerful bargaining card: each is a monopolist. But to date, only one side has seen fit to exercise that card. In any two-party negotiation, the failure of any party to exercise its monopoly power is a tacit form of surrender. Our findings are also not intended to impugn the contract negotiators. Contractors uphold the terms of their contract – no more and no less, and are not violating the law.

Nevertheless, tenure review outcomes defy legal and economic logic. Tenure review displays pathologies reminiscent of a principal-agent problem. Agency theory suggests a small revision to the applicable governance structures: contracting out and the policy-operations split do not mix. Governments mindful of agency theory might do well to choose one or the other in order to avoid a middleman whose actions can be inefficient, even detrimental. Having a subagent contracted to the purportedly "apolitical" operations side of an policy-operations split exacerbates problems stemming from asymmetric information and a lack of accountability.

In sum, this paper is a test of the rivalry between law and social convention in resolving competing claims over land. Tenure review outcomes provide quantitative empirical support for Ellickson's conclusion that: "Contrary to standard law-and-economics analysis, in many contexts legal entitlements do not function as starting points for bargaining." (Ellickson 1991: viii) When it comes to property, the law does not always rule.

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Appendix 1: Property Rights in Land.

Real property is not a physical object, but a bundle of rights and duties which is often, if not always, split amongst multiple parties (Goldstein, 2004; McPherson, 1978; Raymond 1997, 2003). A property right creates a legal relation between the "owner," and a thing, called "property" (Cooter and Uhlen 2000: chpt. 4). If the owner is not a government entity, the property is "private." A property right confers one or more of the following prerogatives on the owner. The owner may:

- Dispose of and manage the property as (s)he sees fit, without being answerable to anyone (*control and management*);
- Enjoy exclusive use of the property, and may permit or exclude others from enjoying the property (*excludability*);
- Alienate (sell, gift, or bequeath) the property to anyone, on mutually agreeable terms (*transferability*);
- Call on the police power of the state to sanction violations of a property right, and invoke the judicial power to arbitrate disputes arising under a property right (*enforceability*) (Cooter and Uhlen 2000: chpt. 4).

Appendix 2: Deriving the Fixed-Cost Ratio Curve, Intercept, and Slope

Define $CL = P_C / P_L$, so that:

$$CL = \frac{V_C / A_C}{V_L / A_L} \tag{A1}$$

Rearranging yields:

$$CL = \frac{V_C}{V_L}\frac{A_L}{A_C} \tag{A2}$$

Log both sides of (A2) to obtain:

$$\ln CL = \ln\left(\frac{V_C}{V_L}\right) + \ln\left(\frac{A_L}{A_C}\right) \tag{A3}$$

Now assume that each settlement results in the same value of V_C/V_L. Under this assumption, the first term on the rhs of (A3) becomes a constant, and (A3) is now a linear equation with slope of 1 and intercept equal to $\ln(V_C/V_L)$.

Under fixed cost ratio pricing, the relative value of the property rights exchanged, and the legal ownership of those rights, do not drive tenure review outcomes. Moreover, this pricing method is inconsistent with any legal understanding of property rights in land and natural resources. Nevertheless, the Crown and its contractors appear willing to alter the numerical value of *CI* in each settlement as if they were subject to a fixed-cost ratio pricing method.

Figure 5.

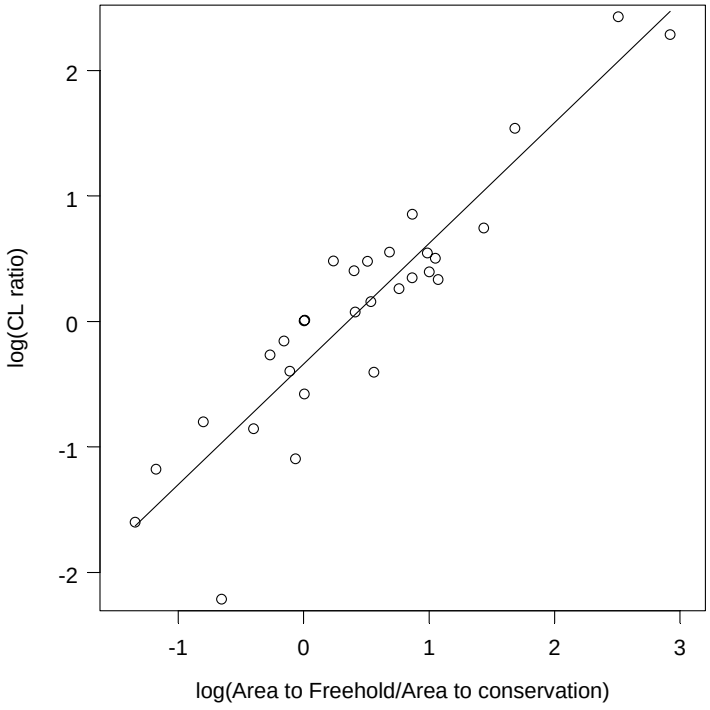

Figure 6

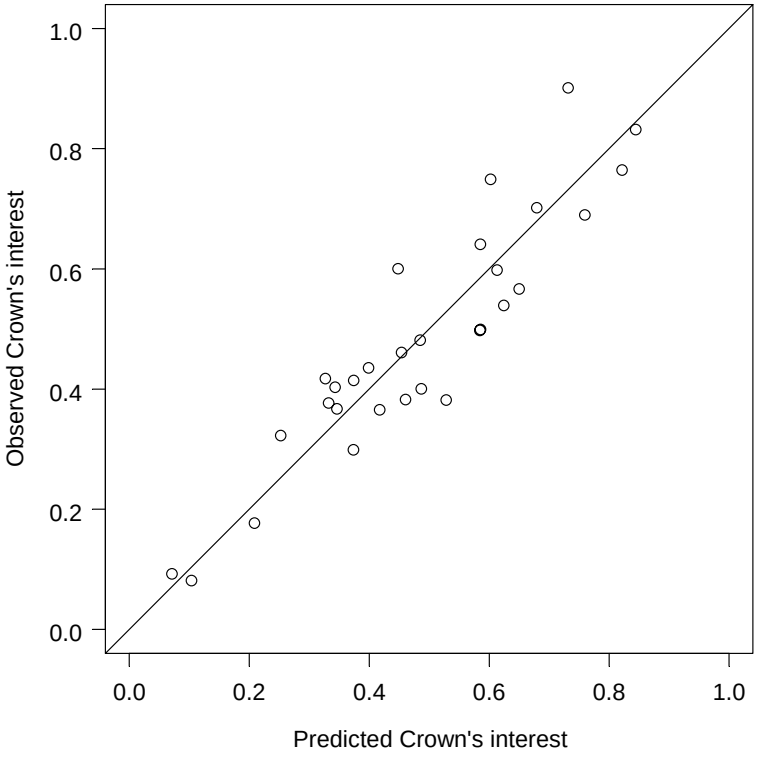

Figure 6. Observed vs predicted Crown's interest for the pre-CPLA data. Predicted Crown's interest was calculated by setting V_L=1 and V_C=0.704. The fixed cost ratio method results in a constant value of V_L/V_C.

Assuming again that *CI* is determined by the fixed cost ratio pricing method, CI can be expressed as the following function of A_C and A_L:

$$CI = \frac{P_L}{P_L + P_C} = \frac{V_L / A_L}{V_L / A_L + V_C / A_C} = \frac{(V_L / V_C) / A_L}{(V_L / V_C) / A_L + 1 / A_C} \quad \text{(A4)}$$

Substituting the data for A_C and A_L into (A4), and letting V_L=1 and V_C=0.704, explains 84.5% of the variance of *CI* over the pre-CPLA data (cf. 84.5% using the model (5)). The observed and predicted values are graphed in Figure 5.