Comparing Apples and Kūmara: Well-Being and Profitability Implications of Māori using Land for Cultural Purposes as well as Commercial

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Abstract

Household production techniques are used to model land use by utility-maximising Māori landowners. Such landowners are assumed to have preferences over cultural services provided by land, as well as over non-cultural goods and services (the purchase of which is funded by using land for conventional production). For a given resource endowment, Māori landowners achieve lower profits than those of profit-maximising non-Māori landowners due to allocating some of their endowment to "taonga land" to produce cultural services. However, their profits can be higher when cultural services production complements conventional production. Similarly, Māori landowners can achieve higher utility/well-being than similarly-endowed non-Māori if taonga land is more productive for cultural services than commercial land is for conventional production – even when cultural services production diminishes conventional production. Whether Māori landowners require higher endowments to achieve the same well-being as non-Māori landowners likewise depends on relative land productivities and any production externalities. Implications for well-being policies, performance measurement and incentives, and governance, are discussed, as are avenues for possible future research.

1   Introduction

Growing up in New Zealand, one is regularly reminded of the importance of land (*whenua*) to Māori. Indeed, Māori are also often referred to as *tangata whenua*, which is commonly translated as "people of the land".[1] More specifically, according to the online *Māori Dictionary*, *tangata whenua* means:[2]

> "[I]ndigenous people – people born of the *whenua*, i.e. of the placenta and of the land where the people's ancestors have lived and where their placenta are buried."

Importantly, under *Te Ao Māori* (the Māori world view), land is considered to offer far more than just productive potential. As stated on the Waikato Regional Council website:[3]

> "Māori consider that *Papatuanuku* [the Earth Mother] sustains all life, and that they are spiritually connected to her. This connection is shown when a baby is born and the whenua (after birth) is buried in a sacred site.
>
> Māori regard land, soil and water as *taonga* (treasures). Māori are the *kaitiaki* (guardians) of these *taonga*, which provide a source of unity and identity for *tangata whenua* (local people)."

Indeed, the very notion of owning land can be alien to Māori culture, being akin to owning one's own mother. Instead, land is regarded as *taonga tuku iho*, or a treasure over which Māori are *kaitiaki* (guardians), for the benefit of future generations.[4] Article II of the Treaty of Waitangi, entered into in 1840 by Māori chiefs and the British Crown, lists land along with other treasures

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[1]The author is a European New Zealander (*pākehā*), with no known Māori ancestry. He respectfully offers his lay understanding of the Māori world view (*Te Ao Māori*) as someone who has had the privilege of working for over 25 years with a variety of Māori and governmental organisations addressing issues of concern to Māori, acknowledging that there are others far more qualified than he to explain that view. He does so in the hope of helping economics, a world view with which he is more familiar, to better understand and accommodate *Te Ao Māori*, and to thereby facilitate deeper dialogue between the two.

[2]`www.maoridictionary.co.nz`, accessed 12 March 2019.

[3]From "Maori and the Land", `www.waikatoregion.govt.nz`, accessed 12 March 2019.

[4]This raises the issue of relative rates of time preference between Māori and non-Māori, which is not the subject of this paper.

as things over which Māori *rangatiratanga* (chieftanship) was to be protected by the Crown.

From an economic perspective, these attitudes towards land mean Māori could be said to have preferences over the services (i.e. values, or benefits) produced by land that differ substantively from the preferences of other cultures. In turn, this has important implications for how land use should be modelled.

Traditionally, in economics that is, land is conceived of as an input to some form of production function. It is deployed alongside other inputs, such as capital and labour – using available technologies – to produce "output". That output typically comprises quantities of goods or services that are either directly consumed by consumers (e.g. agricultural produce), with that consumption contributing to well-being (i.e. utility), or which themselves become inputs as "intermediate goods" in other production processes.

To narrowly apply this approach when land is used for purposes other than producing such conventionally-defined goods or services would be to ignore how land might contribute more *directly* to the well-being (i.e. utility) of its users – as suggested under *Te Ao Māori*. In other words, land can be thought of as producing "cultural services" to Māori (e.g. unity, identity, spiritual connection) which also contribute to well-being. This is in addition to simply enabling the production of conventionally-defined goods or services that also contribute to well-being, or as a means to generate the income (e.g. profits) required to purchase such goods or services. Accordingly, when making land use decisions, Māori organisations face additional trade-offs (or complementarities) not shared with non-Māori – specifically, between the production of cultural services and other land outputs.

Ignoring this dual role of land – as something more inherently valued in addition to producing other things that are valued – also has important implications for Māori organisational design and corporate governance. If such organisations are assessed just in terms of their use of land for conventional production, that would overlook their land use for producing cultural services. It also possibly complicates such organisations providing incentives to users of their land, with incentives based solely on commercial land use potentially compromising the delivery of cultural services (Holmström and Milgrom (1991)).

This paper takes tentative first steps towards incorporating aspects of *Te Ao Māori* regarding land use within a standard utility-maximisation framework integrated with standard firm production. Its point of departure is to assume that land is not just used in the production of conventional goods and services, but also for the production of cultural services. A utility-maximising Māori landowner therefore does not simply maximise profits from land use –

which profits, here, play the role of income in the landowner's budget constraint. Instead, the landowner allocates its resources between land used for both cultural services and conventional production, maximising the utility obtained from both cultural services, and the consumption of other goods and services enabled through conventional production.

Additionally, this paper allows for possible externalities – whether negative or positive – between the production of cultural services and conventional production. This is to recognise that using land for cultural services might affect the landowner's ability to use land for conventional production. Our analysis shows that the relative performance of Māori landowners, relative to non-Māori landowners with comparable resources – in terms of both profitability of land use and total utility (i.e. well-being) – arises as an inherent feature of different attitudes towards land use. It is further affected by these possible externalities.

More particularly, we show that a profit-maximising landowner (proxying a non-Māori landowner) would not commit any of its resources to land that produces cultural services. Conversely, a Māori landowner optimally allocates a share of its resources between land for cultural services and land for conventional production, even when there are negative externalities between both production types. As a consequence of utility being concave, for a given level of total resources, a Māori landowner's profits will fall below those of a non-Māori landowner, except when there are sufficiently positive externalities between cultural service and conventional production.

Likewise, total utility/well-being of a Māori landowner can fall short of that for a non-Māori landowner even for (small) positive complementarities between cultural service and conventional production. However, it can also be considerably higher, even with negative production externalities, provided land is more productively used (in utility terms) for cultural services than for conventional production.

We further show that this relative "productivity" of land for both types of output, plus any externalities between the two types of production, affects the level of resources needed by Māori and non-Māori landowners to achieve a given level of utility/well-being. When land is equally productive for both cultural services and conventional production, Māori landowners require a higher total level of resources than non-Māori landowners to achieve the same level of utility, except when complementarities between both production types are sufficiently positive. However, we also show that Māori landowners might require a lower level of total resources to achieve a given level of utility, even with negative production externalities, when land is more productively used for cultural services than it is for conventional production.

The rest of this paper is organised as follows. Section 2 sets out our

model and assumptions. Section 3 presents our results and analysis. Section 4 discusses our findings, particularly in relation to policies based on well-being, performance measurement and incentives, and Māori organisational design/governance. Section 5 concludes, including a discussion of avenues for further research.

2 Model

2.1 Context

To model Māori land use, a stylised context is that of a tribe (*iwi*) agreeing what assets to secure from the Crown when settling historical claims under the Treaty of Waitangi. Since the early 1990s it has been common for iwi with claims against the Crown to accept a bundle of cash and/or (mainly) land assets in settlement of its historical claims. Such land assets often include parcels of land of cultural importance, but with limited commercial potential (e.g. reserves containing important historical sites), as well as parcels of commercial land.

2.2 Constraints

Thinking of such a context, suppose an iwi has no existing land, and the Crown has offered it a total financial endowment, E, in settlement of its claims. The iwi is then able to nominate how much of this endowment to use to acquire "taonga land" L_T for cultural services production, and "commercial land" L_C for conventional production (e.g. forest land for forestry and/or agricultural production). For simplicity, we assume both types of land have the same unit transfer cost, so the following constraint applies:[5]

$$E = L_T + L_C \tag{1}$$

Taonga land L_T is assumed to produce cultural services (i.e. values, or benefits) X according to the following "cultural services production function":

$$X = f(L_T) = L_T^\alpha \tag{2}$$

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[5]In the Treaty settlements context, the iwi is typically offered a "financial and commercial redress amount", sometimes also referred to as settlement "quantum". This amount can then be used to acquire commercial redress such as commercial land, or taken as cash. In the present case, E refers to a broader constraint on what redress the iwi can take, since it also accounts for the value of non-commercial redress (e.g. land for cultural services).

where $0 < \alpha < 1$ is also assumed to ensure concavity. In principle $f(.)$ could take much more general forms, such as by including other productive inputs such as land or physical capital. We leave such extensions to further research.

Commercial land L_C, by contrast, is assumed to produce output q according to the following production function:

$$q(L_C, X) = A L_C^\beta (L_C X)^\gamma \tag{3}$$

A represents technology, and $0 < \beta < 1$ is assumed to ensure concavity in the case that $\gamma = 0$. From the form of utility assumed below it can be seen that A is effectively a nuisance parameter, affecting total profits and utility, but not optimal land choices. For the sake of tractability we normalise its value to $A \equiv 1$. As for cultural services production, much more general forms of (3) could be assumed, but we leave such extensions to future work.

The bracketed term in (3) introduces an interaction between L_C and X in the production of q. It may appear redundant to have L_C appear twice in this production function, but the Cobb-Douglas form of utility assumed below means that production depends not just on L_C, but also on the combination of L_C and X (i.e. allowing for interactions between each, not just an impact of X on q independent of L_C).

The sign of γ is unconstrained. When $\gamma = 0$, this interaction term vanishes. Importantly however, we allow $\gamma < 0$ to capture the possibility that producing cultural services might negatively affect the production of q.[6] Conversely, $\gamma > 0$ means that producing cultural services enhances the ability of L_C to produce q.[7] Either way, we further impose $0 < \beta + \gamma < 1$ to ensure concavity.

In addition to using L_T to produce cultural services X, the iwi is able to also consume a composite good Y which is assumed to not provide any cultural services. For example, Y could comprise food or other standard goods and services. However, in order to consume Y, which costs p_Y per unit, the iwi must satisfy the following constraint:

$$p_Y Y = \Pi(L_C, X) \tag{4}$$

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[6] Although we do not formally model this in our setup, one could imagine, for example, the landowner's labour or other non-land resources being diverted from conventional production to cultural services production.

[7] An example might be the production of tourist excursions to a mountain. The total number of excursions might be higher if they are associated by consumers with "authentic" or "indigenous" attributes such as those arising from cultural services production. Formal modelling of such preference complementarities is also left to future work.

Using (3), profits $\Pi(.)$ are assumed to be:

$$\Pi(L_C, X) = pq(L_C, X) = pAL_C^{\beta}(L_C X)^{\gamma} \tag{5}$$

In principle (5) should also allow for production costs when specifying profits, and could have provided for any interactions between L_C and X in costs. However, the assumed specification adequately provides for the concavity of production in L_C and captures such interactions.[8]

Equation (1) is the iwi's budget constraint for acquiring L_T and L_C, given its settlement endowment E. Conversely, equations (4) and (5) together constitute the iwi's post-settlement budget constraint for consuming composite good Y. Unless the iwi generates profits with which to consume Y, it will only be able to consume cultural services X. In principal the iwi might exercise some degree of market power in the production of q. In that case, we would write $p = p(q)$, and allow for the iwi to internalise the impact of its conventional output choice on output price p. However, for tractability we assume the iwi is a price-taker in its output market, and so treat p as exogenous.[9]

Since only relative prices affect the iwi's optimal choices of X and Y, we follow standard practice and normalise $p_Y \equiv 1$. Furthermore, as for A in (3), p affects total profits and utility, but not optimal land allocations, so for the sake of tractability we impose that $p \equiv 1$.

Using these simplifications, the iwi's budget constraint for Y writes as:

$$Y = L_C^{\beta}(L_C X)^{\gamma} \tag{6}$$

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[8]Also, with the Cobb-Douglas form of utility assumed later, it proves convenient not to have any additive terms in $\Pi(.)$.

[9]Another rationale for dispensing with both p_Y and p is that (5) could be interpreted as representing production of some good or service Y that is directly consumed by the iwi. In other words, instead of construing production as a means of generating profits which are then used to purchase the units of Y consumed by the iwi, the relevant budget constraint is that the iwi cannot consume more units of Y than it itself produces.

2.3 General Utility Maximisation

Assuming a general utility function $U(.)$ with the standard properties, using (1), (2) and (6) the iwi's utility maximisation problem writes as:

$$\begin{cases} \max_{\{X,Y\}} U(X,Y) \\ \text{subject to:} \\ \quad E = L_T + L_C \\ \quad X = L_T^{\alpha} \\ \quad Y = L_C^{\beta} (L_C X)^{\gamma} \end{cases} \tag{7}$$

We abstract from questions of whether a tribal utility function exists, how it aggregates the preferences of its individual members, and the impacts of any internal governance costs or incentive issues. We simply assume such an iwi-level utility function exists, and has the usual properties of individual- or household-level utility. Posing the iwi's problem in this way places it in the tradition of household production models pioneered by Becker (1965) and Lancaster (1966). Such models recognise that decision-makers – here, an iwi – do not simply earn (labour) income which they then apply to purchase the bundle of final goods and services they desire to maximise utility. Instead, while they apply income to purchase some final goods and services, they otherwise use their resources to acquire productive inputs or capitals which they then use to produce the other goods or services they wish to consume.[10]

Imposing the above constraints, the iwi's problem (7) reduces to an unconstrained choice of just L_T. Specifically, with parameters being $\{E, \alpha, \beta, \gamma\}$, the iwi's utility maximisation simplifies as:

$$\max_{L_T} U\left(L_T^{\alpha}, (E - L_T)^{\beta} ((E - L_T) L_T^{\alpha})^{\gamma}\right) \tag{8}$$

2.4 Special Case - Cobb-Douglas Utility

2.4.1 Utility-Maximising Iwi's Problem

In order to derive closed-form solutions for L_T, L_C and X, as well as for optimal profits $\Pi(.)$ and utility $U(.)$, we further impose that $U(.)$ takes the

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[10]For example, households purchase washing machines, soap powder and electricity which they combine with water, wastewater services and their own time in order to produce clean clothes (the thing that ultimately provides utility). See Davis (2008), or Meade (2018), for other applications.

following Cobb-Douglas form with $0 < \eta < 1$:

$$U(X,Y) = \eta ln(X) + (1-\eta) ln(Y) \tag{9}$$

Doing so means the iwi's problem (8) reduces to the following, tractable univariate utility maximisation:

$$\max_{L_T} \left\{ \eta ln(L_T^\alpha) + (1-\eta) ln\left((E-L_T)^\beta ((E-L_T) L_T^\alpha)^\gamma \right) \right\} \tag{10}$$

In principle, more general utility specifications would be desirable. However, in the interests of progress such more general specifications are left to future research.

2.4.2 Benchmark Case – Profit-Maximising Non-Iwi's Problem

Notice that imposing $\eta = \gamma = 0$ in (10) further reduces the problem to:

$$\max_{L_T} \left\{ ln\left((E-L_T)^\beta \right) \right\} \tag{11}$$

Due to the monotonicity of $ln(.)$, this is equivalent to maximising profits per the right-hand side of (6) in the case where there are no interactions between X and L_C in q (i.e. when $\gamma = 0$). Hence, imposing $\eta = \gamma = 0$ is equivalent to assuming profit-maximisation by a party that does not value cultural services.

We take this as our benchmark case for a profit-maximising non-iwi party with comparable total endowment E for acquiring land (in this case, only commercial land L_C).

2.4.3 Marginal Rate of Substitution between Taonga Land and Commercial Land

Utility in the maximand of (10) can be re-repressed in terms of both L_C and L_T using (1) as follows:

$$U(L_T, L_C) = \eta ln(L_T^\alpha) + (1-\eta) ln\left(L_C^\beta (L_C L_T^\alpha)^\gamma \right) \tag{12}$$

The marginal rate of substitution between taonga land and commercial land shows how the iwi trades off one land type against the other while holding utility constant. It can be calculated using (12) as:

$$MRS = -\frac{\partial U/\partial L_T}{\partial U/\partial L_C} = -\frac{L_C \alpha (\eta(\gamma-1) - \gamma)}{L_T (\beta + \gamma)(\eta - 1)} \tag{13}$$

Both land types contribute to the iwi's utility/well-being *indirectly* via productive technologies – for cultural services in the case of taonga land, and for conventional production in the case of commercial land. Because of this, the rate at which the iwi trades off one land type for the other while holding utility constant does not depend just on preference parameters (here, η) and the amount of each land type. Instead, it also depends on relative productivity rates of taonga land for cultural services (α) and commercial land for conventional production (β). Additionally, the MRS also depends on any production externalities between cultural services and conventional production (γ).

3 Results

3.1 Utility-Maximising Choice of Taonga Land and Resulting Cultural Services

3.1.1 General Case

Solving (10), the iwi's utility-maximising choice of taonga land, accounting for the constraints in (7), is:

$$L_T^* = \frac{E\alpha\left(\eta\left(\gamma-1\right)-\gamma\right)}{\alpha\eta\left(\gamma-1\right)+\gamma\left(\eta-\alpha\right)+\beta\left(\eta-1\right)-\gamma} \tag{14}$$

By (2), this leads to utility-maximising cultural services production:

$$X^* = \left(\frac{E\alpha\left(\eta\left(\gamma-1\right)-\gamma\right)}{\alpha\eta\left(\gamma-1\right)+\gamma\left(\eta-\alpha\right)+\beta\left(\eta-1\right)-\gamma}\right)^{\alpha} \tag{15}$$

Conversely, as would be expected, in the profit-maximising non-iwi benchmark case, the optimal choice of taonga land is $L_T^* = 0$, in which case $X^* = 0$ also.

3.1.2 Special Case – No Production Interactions

In the special case that cultural services production does not affect conventional production ($\gamma = 0$), (14) and (15) give the iwi's utility-maximising taonga land choice and corresponding cultural services production as:

$$L_T^*\left(\gamma = 0\right) = \frac{E\alpha\eta}{\beta + \eta\left(\alpha - \beta\right)} \tag{16}$$

$$X^*\left(\gamma = 0\right) = \left(\frac{E\alpha\eta}{\beta + \eta\left(\alpha - \beta\right)}\right)^{\alpha} \tag{17}$$

Since the benchmark case of a profit-maximising non-iwi already assumes $\gamma = 0$, the corresponding quantities remain $L_T^* = X^* = 0$.

3.2   Utility-Maximising Choice of Commercial Land

3.2.1   General Case

Using (14) in (1), the iwi's utility-maximising choice of commercial land can be shown to be:

$$L_C^* = \frac{E\left(\beta + \gamma\right)\left(\eta - 1\right)}{\alpha\eta\left(\gamma - 1\right) + \gamma\left(\eta - \alpha\right) + \beta\left(\eta - 1\right) - \gamma} \qquad (18)$$

Conversely, as also would be expected, in the profit-maximising non-iwi benchmark case, the optimal choice of commercial land is $L_C^* = E$. That is, a profit-maximising non-iwi with the same level of endowment E as the iwi would apply all of that endowment to secure L_C.

3.2.2   Special Case – No Production Interactions

In the special case where there are no interactions between X and L_C in the production of q, i.e. when $\gamma = 0$, (18) simplifies to:

$$L_C^*\left(\gamma = 0\right) = \frac{E\beta\left(1 - \eta\right)}{\beta + \eta\left(\alpha - \beta\right)} \qquad (19)$$

The profit-maximising non-iwi's commercial land choice remains $L_C^* = E$ as above.

3.3   Optimal Profits and Utility/Well-Being

Optimal profits are obtained by substituting L_C^* and X^* in the right-hand side of (6), namely:

$$\Pi^* = \left(L_C^*\right)^\beta \left(L_C^* X^*\right)^\gamma \qquad (20)$$

Likewise, optimal utility/well-being is obtained by substituting L_T^* in the maximand of (10), specifically:

$$U^* = \eta \ln\left(\left(L_T^*\right)^\alpha\right) + \left(1 - \eta\right)\ln\left(\left(E - L_T^*\right)^\beta\left(\left(E - L_T^*\right)\left(L_T^*\right)^\alpha\right)^\gamma\right) \qquad (21)$$

These expressions can be used to assess the relative profitability and well-being of the iwi relative to a profit-maximising non-iwi with comparable endowment E. Conversely, they can be used to assess the difference in endowment required by the iwi, relative to the profit-maximising non-iwi, to produce the same level of well-being. These are analysed further in the next sub-section.

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Figure 1: Iwi Profits as a Ratio of Non-Iwi Profits with Same Endowments

(a) Equal Productivity ($\alpha = \beta = \frac{1}{2}$)   (b) Different Productivity $\alpha = \frac{3}{5} > \frac{2}{5} = \beta$
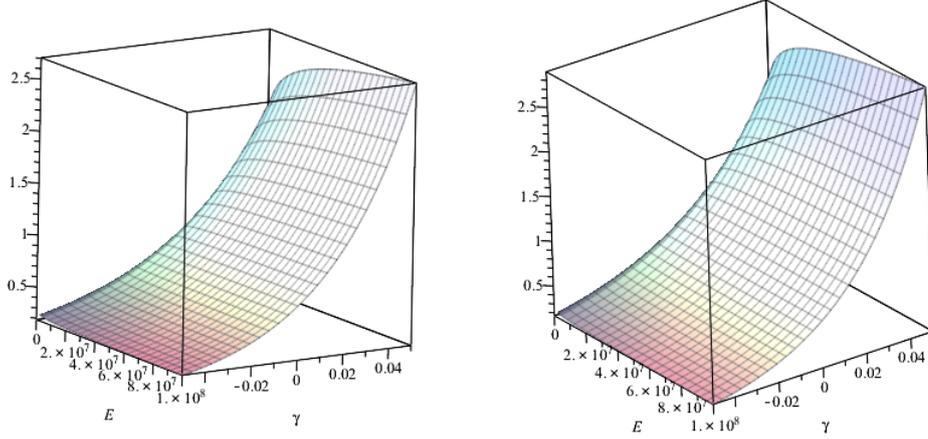
3.4 Relative Profitability and Well-Being of Iwi and Non-Iwi for Given Level of Endowment

3.4.1 Relative Optimal Profits

Supposing the utility-maximising iwi and profit-maximising non-iwi have the same endowment E, the iwi's optimal profits relative to the non-iwi's are as shown in Figure 1 for two illustrative cases, each assuming that $\eta = \frac{1}{2}$:
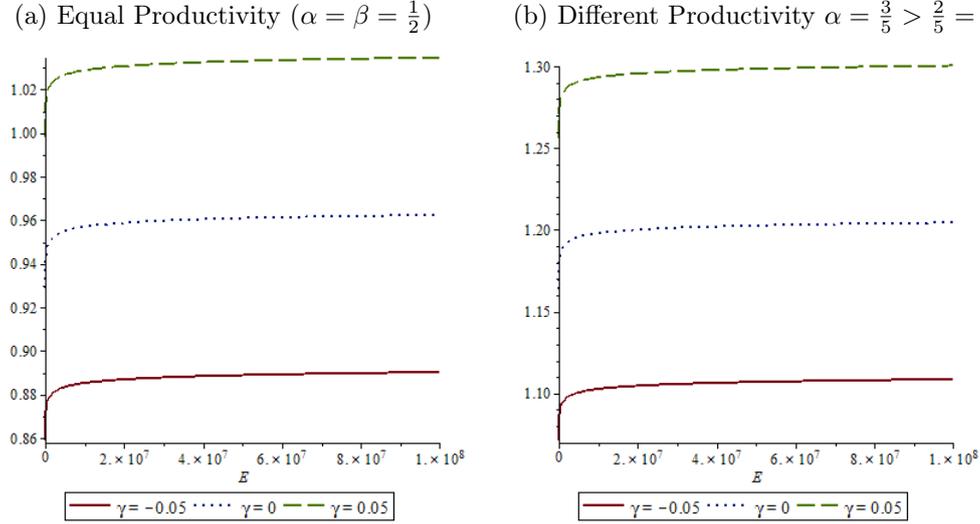
1. Cultural services and commercial land are "equally productive" – i.e. $\alpha = \beta$ with $\alpha = \beta = \frac{1}{2}$ for illustrative purposes; and

2. Cultural services are "more productive" than commercial land – i.e. $\alpha > \beta$ with $\alpha = \frac{3}{5}$ and $\beta = \frac{2}{5}$ for illustrative purposes.

As can be seen in both panels, the iwi's optimal profits are lower than a profit-maximising non-iwi's profits (ratio less than one), even when both have the same total endowment E. This is provided that γ is sufficiently small, and certainly if there are negative production externalities ($\gamma < 0$). However, when there are sufficiently strong complementarities between cultural services and conventional production (i.e. γ sufficiently positive) then the iwi's profits can be significantly higher than the non-iwi's (ratio greater than one).

3.4.2 Relative Optimal Utility/Well-Being

Turning to optimal utility (i.e. well-being), Figure 2 depicts the same two illustrative scenarios used for comparing relative profits (i.e. equal produc-

Figure 2: Iwi Well-Being as a Ratio of Non-Iwi Well-Being with Same Endowments

(a) Equal Productivity ($\alpha = \beta = \frac{1}{2}$)　　　(b) Different Productivity $\alpha = \frac{3}{5} > \frac{2}{5} = \beta$

tivity, and superior cultural services productivity) with $\eta = \frac{1}{2}$ when the iwi and non-iwi have the same endowment E. Each panel presents three scenarios for possible interactions between cultural services and commercial land in conventional production:

1. No interactions ($\gamma = 0$);

2. Production complementarities ($\gamma = 0.05 > 0$); and

3. Negative production externalities ($\gamma = -0.05 < 0$).

In Figure 2 it can be seen that differences in relative productivities play a greater role in relative utility/well-being than they do in relative profitability. In Panel (a) relative well-being is lower for the iwi, even in the case where there are no interactions between cultural services and conventional production ($\gamma = 0$) and both types of production are equally productive ($\alpha = \beta = \frac{1}{2}$). This flows from the assumed concavity of utility – if the iwi committed all its endowment to commercial land, that would produce higher utility than averaging the utility from splitting its endowment between taonga and commercial land.

Conversely, in Panel (b) of Figure 2 the iwi's optimal utility is relatively higher than the profit-maximising non-iwi's, even with (slightly) negative production externalities ($\gamma = -0.05$). In this case, with cultural services more productive than conventional production (α sufficiently greater than

β), the production disadvantages created by negative production externalities are less important for overall utility than the assumed greater productivity of cultural services.

These scenarios demonstrate that whether the iwi's well-being is greater or less than that of a profit-maximising non-iwi with the same endowment depends on the balancing of both the relative productivity of, and any production externalities between, cultural services and conventional production.

4 Discussion

4.1 Implications for Policies based on Well-Being

By definition, utility is a measure of well-being commonly used in economics.[11] This paper illustrates how a coherent economic framework can be applied to assess the utility/well-being trade-offs (or complementarities) confronting iwi that use land for both cultural services (directly consumed) and conventional production (to fund other consumption that is directly consumed). It shows how both preferences (the shape of utility), and the nature of available production technologies (for both cultural services and conventional production), play key roles in determining how iwi optimally make such trade-offs.

This implies that to properly assess the well-being impact of policies affecting land use by iwi (e.g. emissions trading scheme obligations, water or nutrient emission allocations) it is necessary to understand both iwi-level preferences and these dual production technologies. Understanding preferences – especially those for nonmarket goods like cultural services – requires resort to techniques such as those commonly employed in environmental economics (e.g. see Champ et al. (2017)) and transport studies (e.g. for the value of travel time savings, see Small and Verhoef (2007), Meade and Cheung (2016)).[12] Understanding the nature of production technologies requires use of techniques commonly employed in empirical industrial organisation (e.g. see Ackerberg et al. (2007)). Empirical applications of this paper's framework for informing well-being related policies is left to future work.

Importantly, this analysis circumstances under which iwi organisations may require greater – or lower – endowments than profit-maximising non-

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[11]A more general measure would attempt to measure the present value of present and future iwi-level well-being, using some appropriate framework for adjusting future utility, and inter-generational utility, into present utility terms.

[12]For example, candidate techniques include contingent valuation, and choice experiments.

iwi in order to achieve the same level of well-being. Key determinants of the required difference in endowments include not just possible interactions between cultural services production and conventional production. They also include differences in the productivity of taonga land for cultural services, and of commercial land for conventional production.

4.2 Implications for Performance Measurement and Incentives

4.2.1 Performance Measurement

As suggested in Section 1, conventional performance measurement approaches are unlikely to fully capture the range of benefits an iwi derives from its mix of taonga and commercial lands. Any measurement approach that simply measures profits ignores the fact that the iwi potentially values an extra dollar of profit, in terms of the utility it produces, differently to other parties (due to different preferences, as well as form of utility). Additionally, a pure profits focus would ignore altogether the utility derived by the iwi from the use of taonga land to produce cultural services. To focus on profits rather than utility is to prioritise just one an element of the iwi's budget constraint over the objective the iwi is actually pursuing (i.e. utility).

Multiple bottom line accounting techniques hint at more encompassing forms of performance measurement. While they account for profits, they also account for other measures of performance, such as environmental sustainability. In principle, they might be extended to account for other metrics such as cultural services production. However, such approaches suffer from not being able to indicate how the various performance measures should be traded-off against each other, or weighted to derive some composite index of performance. Additionally, they too must rely on nonmarket valuation techniques as discussed above when estimating the values of hard-to-measure outputs such as cultural services.

The results in Section 3.4 indicate that whether profits alone or total utility are compared for iwi and non-iwi, such comparisons will be confounded by possible interactions between cultural services and conventional production. Unless the nature of those interactions are identified, measured and understood, little can be said regarding the relative efficiency of iwi and non-iwi organisations with comparable (and certainly non-comparable) endowments. Differences in performance can arise due to differences in efficiency – i.e. how well existing resources are deployed. However, they can also arise due to differences in preferences and production technologies, even with resources deployed fully efficiently.

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4.2.2 Incentives

The analysis in this paper shows that performance of an iwi organisation comprises much more than just the profits produced by the use of its commercial land. Ironically, however, this analysis hints at circumstances in which it might be adequate for the iwi to provide its land users with incentives based just on profits in order to achieve both the profits required for consumption of non-cultural goods and services, as well as cultural services.[13] Specifically, if there are strong complementarities in the production of cultural services and conventional production, then providing strong incentives for one should induce greater production of the other. Indeed, if using taonga land to produce cultural services enhances conventional production and hence profits, then providing users of taonga land with profit-based incentives could induce them to produce more cultural services, since those services translate into higher profits. This means users of taonga land might be provided with incentives even if cultural services are inherently hard to measure and hence to incentivise directly.[14]

Conversely, if there are negative externalities between the production of cultural services and conventional production, then providing profit-based incentives to users of taonga land might induce under-provision of cultural services.[15] This is because it could force users of taonga land to internalise the reduction in profits from producing greater cultural services. In this case, providing utility-maximising incentives is considerably more complicated. This is because cultural services production leads to profit sacrifice – the incentives-relevant question is whether the realised profit sacrifice is more or less than it should be given available technologies, and given the iwi's preferred trade-offs? This then requires use of efficiency analysis techniques to determine the best feasible level of trade-off between cultural services production and conventional production (e.g. see O'Donnell (2018)), as well as nonmarket valuation techniques to ascertain the iwi's preferred level of trade-off.[16]

The nature of incentive issues within iwi organisations is a matter to be

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[13]Since our analysis does not formally model incentive issues, this discussion should be treated as tentative, pending such formal analysis.

[14]This supposes that users of taonga land are amenable to such "extrinsic" incentives, and that providing such incentives does not dilute any "intrinsic motivation" they might have to produce cultural services – e.g. see Bénabou and Tirole (2013).

[15]Once again, assuming users of taonga land respond to extrinsic incentives.

[16]In terms of conventional economic analysis, what is sought is identification of the "production possibility frontier" between cultural services and conventional production, and the point of tangency between that frontier and the highest possible "indifference curve".

more fully explored. This paper provides some initial insights into how best to proceed, but a more complete analysis is left to future work.

4.3 Implications for Organisational Design and Governance

4.3.1 Organisational Design

Related to the discussion of incentives above, this paper's analysis hints at issues relevant to iwi organisational design and governance. Specifically, where cultural services production is complementary to conventional production, there could be merit in bundling both sets of activities "under one roof".[17] Complementarities between the two types of production, and the inherent measurability of profits, simplify the oversight and inducement of both production types (i.e. through the provision of profit-based incentives).

Conversely, where cultural services production results in negative externalities for conventional production, combining both activities "under one roof" raises the risk of under-performance on both. This is because it will be hard to use profit-based incentives to induce better performance of both activities. Instead, there is a case in this instance to have each activity "under separate roofs". Profit-based incentives could be provided for conventional production (though perhaps also through selection of intrinsically-motivated commercial land users). However, with cultural services production being inherently harder to measure, it is possible that softer incentives and the selection of intrinsically-motivated users of taonga land will play a greater role in inducing desirable levels of cultural service production.[18]

4.3.2 Governance

As for the discussion of incentives when cultural service production results in negative externalities for conventional production, governance of iwi organisations in such situations is necessarily more complex than when both types of production are complementary. Different oversight and incentive arrangements are required for each activity, and an additional layer of governance is required to ensure appropriate trade-offs are induced between each

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[17]Once again, setting aside issues of intrinsic motivation, and any "cultural" clashes that might arise between users of cultural land on the one hand (who might be highly intrinsically motivated) for cultural services production, and users of commercial land for conventional production (who might be more extrinsically motivated) on the other.

[18]See Meade (2015) for a wider discussion of providing incentives in situations where performance is hard to measure.

production type (i.e. trade-offs that reflect the iwi's preferences, but which also are as efficient as possible).

Finally, the iwi's utility maximisation problem implies an optimal level of profits it wishes to achieve – what might be thought of as the iwi's "commercial investment policy". However, performance is better measured in terms of how well it achieves its optimal level of utility/well-being, with the latter better describing the iwi's "objective". Indeed, the iwi's utility maximisation problem also implies an optimal level of cultural services it wishes to achieve – what might be thought of as the iwi's optimal "cultural investment policy". The iwi needs to implement governance and incentive arrangements to induce the desired mix of cultural service and conventional production under their respective investment policies.

5   Extensions and Conclusions

This paper presents tentative first steps towards reflecting Māori preferences for land – particularly the cultural services produced by land – in standard economic frameworks for analysing utility/well-being. It provides for a stylised iwi allocating its resource endowment between taonga land and commercial land. The iwi does so to maximise the utility it enjoys from cultural service production using the taonga land, and its consumption of other goods and services which rely on the profits generated using commercial land. To complicate matters, cultural services production is allowed to directly affect conventional production.

These features, combined, demonstrate that the iwi's performance is not adequately represented by its relative profitability, and that the iwi faces trade-offs not shared with a profit-maximising non-iwi. These iwi-specific trade-offs reflect not just differences in objectives and preferences, but also possible interactions between cultural services production and conventional production. The implications of these findings have been explored for well-being related policies, performance measurement and incentives, and Māori organisational design and governance.

Not explored in this paper is the possibility that conventional production might result in externalities – positive or negative – for cultural services production. In the simplest sense, it might produce positive externalities (i.e. complementarities) where cultural service production requires financial resources and not just taonga land as assumed. However, it might also produce negative externalities, such as when certain types of commercial activity or practice conflict with iwi values and/or status (*mana*) that are being produced via cultural services. Exploration of these reverse externalities is left

to future work.

As discussed above, the framework presented in this paper does not formally incorporate incentive problems within organisations. The nature and extent of such incentive problems in Māori organisations – as well as any culturally-specific incentive solutions – are rich areas for future inquiry. Such inquiry could usefully include the interplay between organisational culture, ability to recruit and retain suitably-motivated land users, and balancing intrinsic and extrinsic incentives. How such incentive problems are resolved will go hand in hand with optimal organisational design and governance.[19]

Another likely useful extension of this study is to place the iwi's utility maximisation in a multi-period setting with uncertainty. That would allow differences between iwi and non-iwi in terms of inter-temporal trade-offs (i.e. rate of time preference) and risk aversion to be incorporated in the analysis. The current analysis produces the iwi's optimal commercial and commercial "investment policies" from its utility maximisation problem, in the sense that it indicates the optimal level of profits and cultural services to achieve (setting aside any incentive issues). A multi-period analysis, particularly one incorporating risk, would more comprehensively provide such investment policies. In particular, it would indicate the optimal time paths for both profits and cultural services production. The former might differ markedly from the optimal investment policy of a profit-maximising non-iwi with a comparable endowment, including due to differences in time preferences and risk aversion. The latter, multi-period cultural investment policy would likely not have a counterpart for a profit-maximising non-iwi.

A final important area of future work is the practical implementation of this paper's findings. In particular, aside from developing more sophisticated and general modelling approaches, estimating key characteristics of iwi preferences and production technologies would assist decision makers in applying this paper's insights. Such decision makers include iwi themselves – for example, in organisational design and governance – as well as policy makers (e.g. a government interested in well-being impacts of its policies). As discussed above, this could be achieved by applying techniques already widely used in economics for measuring preferences, nonmarket values, and productive efficiency.

In conclusion, this paper provides a highly stylised but coherent framework, based in conventional economic theory, for incorporating a particular aspect of Te Ao Māori (the Māori world view) – namely special Māori prefer-

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[19]It is possible that Māori organisational solutions may have as much in common with cooperatives as they will with purely profit-motivated firms. For a discussion of cooperative governance, see Hansmann (1996), Evans and Meade (2005), and Meade (2014).

ences regarding land. It hopefully assists decision makers by better identifying relevant considerations such as the respective roles of utility maximisation (an objective) – from both cultural services production and the consumption of other goods and services enabled by conventional production – and profits (a component of an iwi's budget constraint). It also highlights the importance – for iwi performance relative to non-iwi performance – of the relative productivities of taonga land and commercial land, and possible interactions between cultural services production and conventional production. As such, it hopefully provides a departure point for more general, comprehensive and applied analyses of the rich problems confronting iwi organisations and policy makers concerned with the well-being of their members.

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