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Have structural issues placed New Zealand's hospitality industry beyond price?

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Hospitality is a principal tourism characteristic group, yet its recent economic performance in New Zealand has not been exemplary. Increased hospitality prices have been advocated, unsuccessfully, for many years as a means of improving economic performance. This paper compares economic sustainability measures between divisions of New Zealand's hospitality industry and national tourism exemplars. Data envelopment analysis (DEA) is used to establish relative technical efficiencies and capacity utilization of hospitality divisions. The outcome correlates indicators of economic sustainability and the capacity utilization of hospitality division resources to suggest that improved performance requires strategies beyond those entailing price increases.

Keywords: hospitality industry; sustainability; capacity utilization; DEA; New Zealand

Over the past 100 years international tourism has grown steadily from insignificance to account for 5% of New Zealand's GDP and over 17% of its exports. Demand is seasonal, with approximately 53% of all visitor activity occurring between December through April. The country's principal visitor marketing agencies are Tourism New Zealand, a public sector agency, and Air New Zealand, a publicly listed corporation. Hospitality is indispensable to successful tourism, yet its share of total tourism demand is about 22% and comparisons between its divisional constituents (accommodation and the food and beverage serving division) are sharply contrasted. Accommodation income is overwhelmingly dependent on visitors (95%), but the food and beverage serving division sources the majority of its income from its local communities (59%) and the balance (41%) from visitors (SNZ, 2007). With such a tenuous dependency on visitor demand, economic performance is important so that NZ's visitors are just as satisfied as those investing in these essential products. Recent access to an extensive pool of tourism enterprise financial data has facilitated quantitative research into tourism business performance. This has helped to redress a historical bias towards qualitative research due to data access not being constrained by the ferocity with which enterprise financial data has been guarded.

Analysis reveals a sharp performance divide, not only between hospitality's two major divisions but also between other tourism contributors in retail, recreation and transport divisions. Financial yield (FY) or the cash returns on assets for the food and beverage serving divisions, none of which were exemplary performers, were generally twice those of accommodation divisions during the period 1999–2003 and little had changed as at 2005 (Moriarty, 2007b). The principal question arising from better knowledge of hospitality's financial performance is how might it be improved through better public and private policies? Although NZ's tourism satellite accounts (TSA) have provided high-level economic performance measurements since 1996, their appropriateness for policymaking has not extended to useful enterprise-orientated improvement tools as data are too highly aggregated in terms of both industry and expenditure classifications (Moriarty, 2006).

Hospitality product price increases have frequently been advocated as a panacea for improving their financial returns. Historically, such 'appealing' advice has proved ineffective since there are generally many other factors militating against it – including the risk of breaching competition legislation. However, the most recent advocacy for this approach was different – the Minister of Tourism and a senior public sector manager openly exhorted the hotel division to raise their prices collectively (Coventry, 2008; O'Connor, 2008). Apart from attracting the attention of the NZ Commerce Commission, it also raised the question as to whether such advice was even tenable in the first place and provided the basis for this paper.

Aside from this, there are numerous recent examples of research revealing constraints on the performance of New Zealand's hospitality enterprises that cannot be assuaged through price increases.

Distribution channel performance has been established as a significant contributor to tourism enterprise performance but is often undermanaged and thus fails to achieve its potential (Pearce, 2006). Proprietors generally do not perceive the true costs associated with product distribution; particularly the opportunity cost of one of their scarcest resources – time. Resources are also reflected in the scale of small and medium businesses. Scale of operation is an intrinsic constraint on small firms and increases the potential for imposed negative externalities on regional tourism's product quality (Ateljevic and Doorne, 2004). Analysis of entrepreneurial and risk characteristics of the New Zealand bed and breakfast sector identified proprietor preferences to be more aligned to social than commercial objectives (Hall and Rusher, 2004). An exploratory study of hospitality performance improvement concluded that a culture emphasizing innovation and efficiency would provide a better platform for overall enterprise performance (Gray *et al*, 2000). The dependence of the hospitality sector on energy, particularly non-renewable resources, is an ongoing issue and further constrains financial performance in a climate of rapidly rising energy costs and consumer frugality. Hospitality ranks 14th (out of 24) in terms of sectoral energy usage (SNZ, 2008), but hotels are its largest energy users and have been reported as accommodation's least efficient in terms of energy per visitor night (Becken *et al*, 2001).

A review of emerging 'new tourism' issues described 'sustainability' as an insufficient objective for tourism enterprises and suggested it be replaced with the more appropriate objective of 'sustained value addition' at environmental, community and customer levels (Ryan, 2001). This distinction is well supported as it has been shown that sustainable business programmes 'neither imply any sense of economic efficiency, optimality or uniqueness nor any guarantee that what currently might be deemed sustainable would be so in the future' (Arrow *et al*, 2004). Worse, future utility might not be as high or even attainable if resources essential to production are exhaustible. Sustainability is concluded to be an objective or aspiration, enhanced by behaviours that satisfy current resource providers yet anticipate unknown resource providers whose demands will require satisfaction at some future time.

Perhaps the most pertinent observation is the 'critical contribution' of hospitality to overall visitor satisfaction – raising significant managerial issues to ensure hospitality sector products are presented as 'intrinsic rather than ancillary' to a national tourism product culture (Ryan, 2005).

Addressing such a spectrum of managerial issues requires resources: access to which is predicated on the ability to satisfy their demands within a competitive economy. For example, research into future workplace skill requirements conducted jointly by New Zealand's Tourism Industry Association and the Ministry of Tourism (BERL, 2004) identified significantly higher human resource turnover for the hospitality sector and a historical propensity for low-skilled employees. Central to the circularity of the need for management to address such issues and having the appropriate resources to do so is economic performance. Deployment of disproportionately high levels of assets per dollar of revenue was cited as a significant contributor to poor FY within NZ's accommodation divisions (Moriarty, 2007a). Supporting this observation was accommodation's asset utilization – exemplified by an occupancy rate which averaged 35% during the period 1997–2007 (TMT, 2007). This contrasted with its closest neighbour, Australia, where the occupancy rate averaged in excess of 50% over the same period (AUSSTATS, 2009). These issues are disconcerting and suggest that prosperity is hampered by significant structural issues associated with oversupplied infrastructure and a dearth of quality human resources.

A recent examination of 64 NZ tourism small business enterprises combined qualitative and quantitative methods on two tourism business communities – Rotorua and Christchurch (Wason *et al*, 2007). It concluded that enterprises reporting higher quartile economic performance were associated with the characteristics of greater business motivation (entrepreneurship), employment creation and overall growth compared with their lower quartile counterparts. In contrast with Hall and Rusher (2004) and Getz and Petersen (2005), there was no suggestion that lower quartile respondents eschewed growth in favour of lifestyle objectives, but that they were more likely to pursue growth differently. Lower quartiles favoured lower risk (and skill) growth through improved operational efforts (for example, marketing, cost efficiencies), whereas higher quartiles favoured higher risk (and skill) options involving capital investment (resource expansion and innovation funded by debt or equity). In other respects, there was similarity between the NZ research and that of Getz and Petersen; only higher quartile performers demonstrated propensities to increase employment opportunities.

Although these examples of research offer valuable opportunities for improved business practice, industry's appetite for embracing them remains low

(Oram, 2008). A recent instance of enterprise cash contributions towards a joint public/private sector national tourism strategy objective to improve tourism yield (TRREC, 2007) is an exception. Moriarty (2004) noted that NZ's tourism industry was generally unwilling to fund either pure or applied research as it was a public good – however, it evinced greater willingness to respond to researchers' requests for qualitative data or logistical assistance. This situation persists despite tourism's increasing competitiveness and global stridency for operators to achieve higher levels of quality through 'sustainable' operating practices (UNWTO, 2005).

A conclusion is that applied research can only enhance the prospects of greater practitioner focus on to the underlying economic characteristics of the hospitality sector and provide management with a more informed basis for action than dependence on price increases.

A feasible route towards this objective might commence by identifying the implications of tourism's penchant for 'sustainability', use of which continues to grow despite its economic shortcomings.

Sustainability is a teleological phenomenon: congruent with any enterprise's overarching purpose, survival – an inescapable Aristotelian 'final cause' (Aristotle, 1984) of any organization since 'its pursuit is continuous and its attainment never automatic' (Pfeffer, 1997). Charles Peirce (1931) observed that processes behind this pursuit might not even be conscious of it and their trajectories might only 'involve physical possibilities rather than physical certainties'. Survival is a journey and organizations, unlike people, are not predestined to mortality: they could feasibly exist as long as society itself exists. Perhaps 'sustainability' is a better synonym for this journey – the 'teleological trajectory' of an organization towards its *final* purpose.

Pfeffer and Salancik (1978) equate organizational survival with environmental dependence coupled with the ability to acquire and maintain resources. An effective organization 'satisfies the demands of those in its environment from whom it requires support for its continued existence' (Handel, 2002). There are numerous viable organizational competencies contributing to the satisfaction of these demands: legitimacy (Dowling and Pfeffer, 1975; Singh *et al*, 1986), ability to learn (Levinthal, 1992) and innovation (Han *et al*, 1998; Baumol, 2002; Cefis and Marsili, 2005) being examples. But howsoever these competencies are prioritized or deployed, they reduce to a contribution towards continued organizational existence – that is, sustained (economic) value addition.

The effectiveness with which continued satisfaction is achieved is efficiency. Economic efficiency reflects the effectiveness of resources deployed to achieve continued satisfaction, but it is not intended to exclude phenomena that might have other than direct monetary or economic metrics. Whilst many organizational elements are measured in non-monetary terms (customer satisfaction, staff retention, workplace ambience, market-share, recognition, consents, legitimacy, etc), their impacts are ultimately economic. Establishing relationships between indicators of enterprise economic sustainability, efficiency and resource utilization provides mechanisms to gauge economic resilience and identify strategic options for the future.

Methodological framework

Three approaches are combined within the methodological framework: establishment of an enterprise-related economic sustainability measure using welfare theory; determination of relative technical efficiency using an output-orientated DEA model; and determination of the capacity efficiency of enterprise resources using a modified output-orientated DEA model. Mathematical derivations of these techniques are minimized in favour of their textual or graphical descriptions. The sources of all mathematical derivations are cited in each section.

Economic welfare

An expression of economic welfare has been derived by Stavins *et al* (2003) and Arrow *et al* (2004) based on the generalized organizational factors of time, t, and aggregate consumption or production over time, $C(t)$. The instantaneous utility or economic surplus arising from consumption is $S(t) = U(C(t))$, where $U(t)$ is a generalized utility function. If the time at which analysis commences is τ, any future economic surplus at time, t, must be discounted exponentially to this time by applying an appropriate discount factor, k,

$$U(C(t)).e^{-k(t-\tau)} \text{ or, } S(t).e^{-k(t-\tau)} \tag{1}$$

Thus, the total welfare, W, of the organization under consideration is the accumulated discounted utility, which should also be positive to be sustainable:

$$W(t) = \int_{\tau}^{\infty} S(t).e^{-k(t-\tau)}\, dt \geq 0, \text{ or in discrete form,}$$

$$W(t) = \sum_{j=\tau}^{\infty} S_j.(1 + k)^{-(j-\tau)} \geq 0 \tag{2}$$

For trading enterprises, economic surpluses are the actual (and forecast) contributions to capital and equity after all other consumption (for example, labour, materials, services and taxation expenditures) has been deducted from income. Enterprises consistently evincing negative economic surpluses eventually fail to satisfy the demands of their resource providers (for example, investors, staff, customers, suppliers and the community) and cease trading. The discount factor, k, in such cases is the prevailing risk-adjusted market rate for the opportunity cost of money.

Although resource efficiency is not theoretically necessary for sustainability, it is a pragmatic necessity in competitive environments where resource availability is undifferentiated. Enterprises consuming 'too much' without receiving commensurate value are not only inefficient and eventually abandoned but, in doing so, may create inequity for efficient providers. Thus, enterprise survival (sustainability) is enhanced if its resources are used efficiently and effectively (Lancaster, 1966). Associating sustainability and efficiency within a tourism hospitality enterprise context follows from Equation (2).

At time $j = \tau$, undiscounted economic surpluses can be estimated for an enterprise (satisfying customer's requirements) and its investors (satisfying returns on capital resources) from the following production functions that draw on readily available accounting data:

$$S_{Enterprise} = (operating\ surplus\ before\ tax - tax + cost\ of\ finance)$$

$$S_{Investor} = (investment.k - tax) \tag{3}$$

The respective ratios of enterprise and investor economic surpluses to the values of deployed resources represent FY and investor yield (IY).

$$\text{FY} = \frac{S_{Enterprise}}{Resources} \text{ and IY} = \frac{S_{Investor}}{Resources} \tag{4}$$

At any time, welfare or economic sustainability generated through enterprise trading is the difference between FY and investor's expected yield:

$$\text{Welfare} = (FY - IY).Resources \tag{5}$$

Correlation between FY and efficiency may depend on combinations of factors such as managerial excellence and market competitiveness. Inefficiency within competitive markets exacerbates trading risk, increases IY and isolates enterprises from essential resources. Managerial excellence can still deliver favourable FY, even in competitive markets. As the NZ tourism market is considered to be competitive, a high degree of correlation should reflect a high level of managerial proficiency.

Enterprise efficiency

Data envelopment analysis (DEA) was derived from the work of Farrell (1957) by Charnes *et al* (1978) and extended by Banker *et al* (1984) as a mathematical programming method of ranking a group of entities in terms of their (relative) efficiency where the elements contributing to efficiency are known but their production functions are known to be broadly similar. DEA is a non-parametric technique for evaluating the performance of entities characterized solely in terms of their inputs and outputs. This appealing feature has seen DEA used extensively to investigate the nature of production efficiency (Cooper *et al*, 2004) and used as a benchmark tool to identify exemplars and devise remedial strategies for non-exemplary performers (Cooper *et al*, 2000; Wöber, 2002). However, as DEA is directed to 'frontiers rather than central tendencies', data measurement errors or 'noise' are deemed to contribute towards efficiency and may influence results significantly (Cooper *et al*, 2004). DEA models determine relative technical and allocative efficiency as well as scale behaviour. Technical efficiency relates to an entity's production technology, whereas allocative efficiency refers to its cost. Overall efficiency is the product of these two (Farrell, 1957). Technical efficiency is a reliable proxy for overall efficiency where entities have access to the same resources at similar prices. Scale behaviour refers to the types of changes in the outputs of entity's production technology when inputs are increased. DEA determination of technical efficiency, scale behaviour and capacity efficiency are central to this analysis of NZ hospitality divisions. Readers may obtain the mathematical basis for DEA from the seminal works of Charnes *et al* (1978) and Banker *et al* (2004).

In accepted DEA terminology, data entities are referred to as DMUs

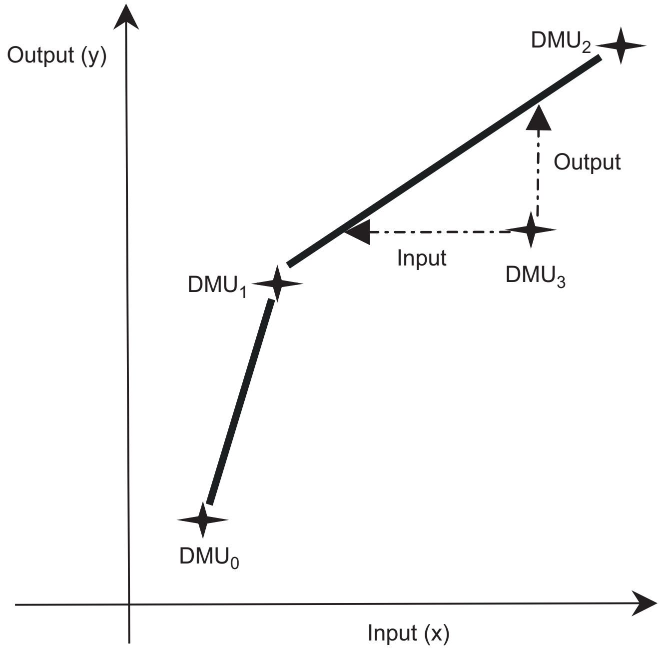

Figure 1. Efficient frontier and peer projection.

(decision-making units) – to encompass any situation where inputs are converted to outputs. An output-orientated DEA evaluates a selected DMU's relative standing within a set by calculating the degree to which better outputs can be achieved from its inputs. If this DMU's outputs cannot be improved, it is technically efficient within the set, otherwise it is inefficient. Since the best score that can be obtained is an exemplary 100%, lesser scores represent the level of inefficiency within the set.

A graphical representation of a single input/output system is shown in Figure 1.

If DMU_0, DMU_1 and DMU_2 are exemplary, segments connecting them establish a piecewise-linear efficiency frontier. DMU_3 uses excess input in proportion to its output. Projecting DMU_3 on to the frontier creates a fictitious exemplar whose performance is a linear combination of its peers, DMU_1 and DMU_2. The 'horizontal' distance from the frontier to DMU_3 is a measure of its input inefficiency and the 'vertical' distance a measure of its output inefficiency (Bell and Morey, 1995; Wöber, 2002).

Whether efficient or not, the nature of the relationship between input changes and corresponding output changes provides valuable insight into the nature of a DMU. Table 1 identifies various forms of 'returns to scale' behaviour and illustrates how DMU outputs respond to increased inputs ($\Delta+$).

In Figure 2, the piecewise efficient frontier is depicted by segments ABCD. Scale behaviour is reflected by the gradient of each segment. The 45° line, OZ, identifies the constant returns to scale (CRS) frontier. Note that DMU_J has different peers, depending on whether the DEA model is input or output orientated.

Table 1. Scale behaviour hierarchy. Returns to scale behaviour: corresponding output changes for changes in input Δ+.

<table>
<tr><th colspan="3">Variable returns to scale</th></tr>
<tr><th colspan="2">Non-increasing (NIRS)</th><th>Non-decreasing (NDRS)</th></tr>
<tr><td>Decreasing returns to scale (DRS)</td><td>Constant returns to scale (CRS)</td><td>Increasing returns to scale (IRS)</td></tr>
<tr><td>Δ– –</td><td>Δ+</td><td>Δ++</td></tr>
</table>

Increasing versus decreasing returns to scale suggest growth is more advantageous if directed towards expansion versus replication. Scale efficiency is a measure of growth exploitation. Irrespective of its overall efficiency, a scale efficient DMU demonstrates operating flexibility as it requires less radical changes in inputs to increase outputs. If an inefficient DMU is permitted to vary its returns to scale behaviour (VRS) in an attempt to reach the efficient frontier, the ratio of VRS efficiency to its CRS efficiency measures the degree to which its production technology exploits growth opportunities efficiently.

Frequently, some inputs must be restricted to particular levels for a variety of reasons. Most tourism hospitality enterprises would struggle to alter the nature of their assets (and depreciation) without altering the nature of their product (at least in the short term). The extent to which input restrictions affect outputs leads to the concept of capacity – defined by Johansen (1968) as the 'maximum amount that can be produced per unit of time with existing plant and equipment, provided the availability of variable factors of production is not restricted'. Färe *et al* (1989, 1994, 2000) and Grosskopf (1986) developed DEA capacity efficiency models by applying different constraints to variable versus non-variable inputs. Whereas DEA technical efficiency models reflect production technology efficiency, capacity efficiency models indicate whether too much resource is consumed in proportion to outputs and provide improvement factors that deliver optimal capacity usage.

Optimal capacity efficiency might suggest that enterprise operating practices are not only continuous but also continuously patronized. This is often infeasible: customer demand may only span part of the day and seasonality may reduce patronage during parts of the year. Just as the technical efficiency of any DMU is relative to other members within data sets having similar production objectives, capacity efficiency is relative to other members having the similar resource usage objectives. For example, the capacity efficiencies of hospitality divisions are best compared with each other rather than with, say, supermarkets.

Within tourism, DEA has been applied principally to the hospitality sector (Banker and Morey, 1986; Hruschka, 1986; Bell and Morey, 1995; Anderson *et al*, 2000; Chiang *et al*, 2004; Yang and Lu, 2006), notably in groups of hotel and restaurant enterprises to determine relative efficiencies and identify exemplars. Wöber (2006) cites 26 additional applications of DEA to hotel efficiency studies since 1996.

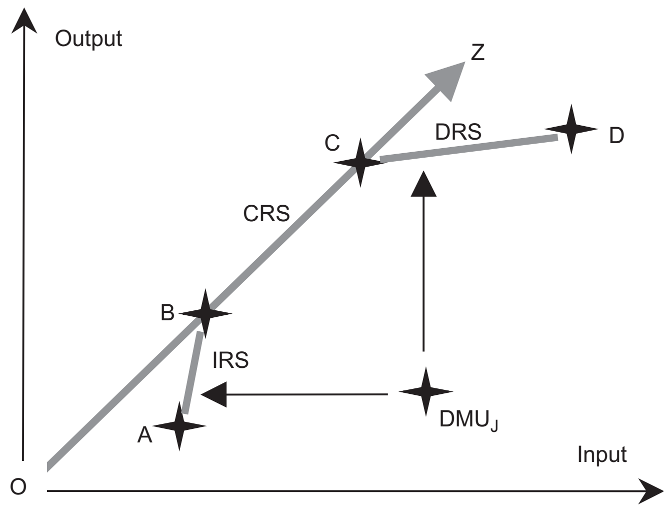

Figure 2. Returns to scale.
Source: After Banker *et al* (2004, p 46).

In recognition of the observation that practitioner support for DEA is enhanced if results are triangulated with other data (Belton and Vickers, 1993; Kirkley *et al*, 2001), independent tourism data were also included in this analysis. MathCAD's linear programming solver functions were used to calculate DEA models.

Data

Two data sets were used: aggregated tourism industry enterprise financial data (containing nine hospitality divisions) and IY benchmarks. Statistics New Zealand's data laboratory facility provided 'kind of activity' (KAU) data based on annual enterprise surveys from over 57,000 tourism characteristic and related enterprises during the analysis period 1999–2003, categorized into 65 Australia New Zealand Standard Industry Codes (ANZSIC) comprising 39 retail, 9 hospitality, 11 transport, 2 leasing and 4 recreation divisions. IY benchmarks were obtained from several public data sets.

FY was determined according to Equation (3) for all 65 tourism divisions, with the subset relating to 9 hospitality divisions shown in Table 2. Revenue, materials, interest, labour, depreciation and assets carry their usual commercial accounting meanings; OSBT is 'operating surplus before tax', SWWP is 'salaries and wages to working proprietors'; (I) DEA input; (FI) fixed DEA input; (O), DEA output and N is the number of enterprises contributing to the sample. SWWP was deemed a non-taxed dividend, hence excluded from operating surplus before tax (OSBT). The prevailing company tax rate of 33% was applied to all positive OSBT. Note that 'hotels' data refers to the accommodation component of their product. Their food and beverage serving divisions are reported under those divisions.

Table 2. Observed performance (all NZ$ bn), NZ hospitality divisions 1999–2003.

New Zealand hospitality divisions	Observed annual average divisional performance 1999–2003 (NZ$ bn)									
Consolidated division (KAU)	FY (%)	Revenue (I)	Materials (I)	Interest (I)	Labour (I)	Dep'n (FI)	Assets (FI)	OSBT (O)	SWWP (O)	N
H571010 Hotels (accommodation)	3.8	0.909	0.520	0.051	0.264	0.067	1.434	0.007	0.007	175
H571020 Motels and motor inns	5.3	0.457	0.279	0.024	0.071	0.039	1.001	0.043	0.013	833
H571030 Hosted accommodation	2.7	0.081	0.048	0.007	0.012	0.010	0.346	0.004	0.003	388
H571040 Backpacker and youth hostels	6.7	0.059	0.032	0.004	0.010	0.006	0.137	0.008	0.001	127
H571050 Caravan parks and camping grounds	3.7	0.082	0.048	0.004	0.013	0.006	0.296	0.011	0.001	234
H571090 Accommodation nec	3.6	0.146	0.079	0.005	0.041	0.010	0.352	0.012	0.001	137
H572000 Pubs, taverns and bars	11.7	1.024	0.722	0.014	0.187	0.031	0.522	0.071	0.025	363
H573000 Cafes and restaurants	10.0	2.382	1.529	0.039	0.599	0.080	1.292	0.135	0.062	2469
H574000 Clubs (hospitality)	3.0	0.213	0.117	0.006	0.060	0.019	0.450	0.011	0.000	116

Note: [a]Not elsewhere specified.
Source: Statistics NZ Datalab.

IY, after-tax, benchmarks during the analysis period used in Equation (5) were established from prevailing economic indicators:

- Home mortgage rate, average 5.0% (RBNZ, 2007a). Applicable to proprietor investors in small enterprises pledging personal equity (for example, their home) as security;
- Base lending rate, average 6.5% (RBNZ, 2007b). Applicable to trading bank investors where their small and medium business customers meet appropriate lending criteria; and finally
- Risk-adjusted weighted average cost of capital (WACC) for the tourism and leisure sector, 8.8% at data series midpoint, December 2001 (Price Waterhouse Coopers, 2001). Applicable to professional investors in large or public enterprises reliant on open market, unsecured equity funding.
- Risk-free rate (5-year NZ Treasury Bonds) was 4.3%.

Individual enterprise data had been obtained from annual taxation and enterprise returns mandated by NZ Income Taxation and Statistics statutes. Aggregation into ANZSIC divisions and a single period (1999–2003) preserved respondent confidentiality and averaged market-place disturbances. All enterprise data are assumed to accord with taxation rules. Nominal taxation (33%) has been applied to OSBT to calculate FY, but FY was not included as a DEA data element. The use of all 65 tourism divisions satisfies the recommendations of Cooper *et al* (2001) that the ratio of tourism divisions to the number of inputs plus outputs in DEA models should be at least 3:1. NZ's tourism demand over the analysis period generally grew at an average annual rate of 6.6%, with a relatively stable visitor profile. The combination of data aggregation and its presumed compliance with statutory requirements strengthens the requirement of DEA that all variations be deemed contributions towards efficiency.

Results

Economic sustainability. Relativities between hospitality divisions' FY and various IYs are shown in Figure 3.

Correlations between FY and technical and capacity efficiency. The rank and regression correlation coefficients between the FY of all 65 tourism divisions and the most favourable/flexible non-increasing returns to scale technical efficiency model (NIRS) and an input capacity efficiency model are shown in Table 3.

Technical and capacity efficiency; scale behaviour. The subset of hospitality division results from DEA technical and capacity efficiency models are shown in Table 4, with quartile boundaries for the entire tourism data set shown in Table 5. Note that in the capacity model, hospitality assets and depreciation were fixed at original levels but all other input resources were variable.

It was noted that those divisions exhibiting decreasing returns to scale (DRS) did so strongly – particularly the food and beverage serving divisions. Apart from hosted accommodation with a weaker tendency, those divisions exhibiting increasing returns to scale (IRS) did so strongly.

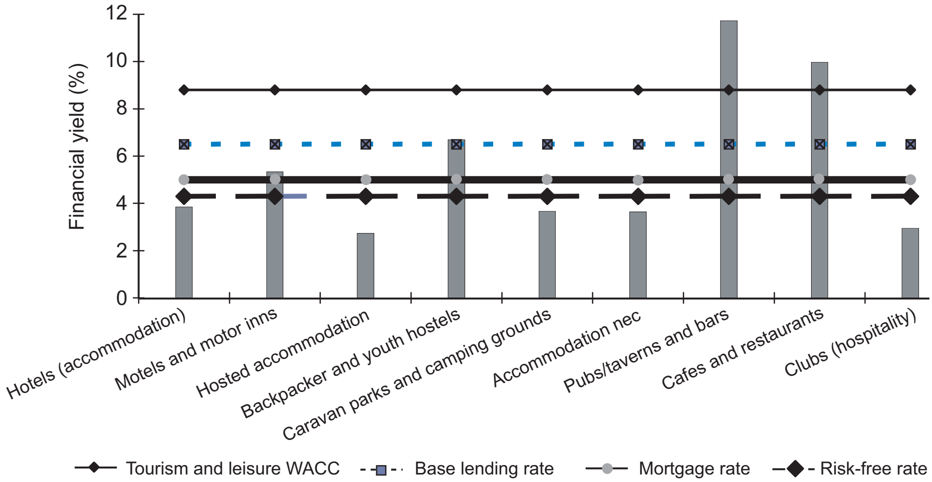

Figure 3. Financial yield versus investor yield: economic sustainability benchmarks for NZ hospitality divisions, 1999–2003.

Table 3. Correlation of NZ tourism divisional FY with relative technical and capacity efficiency.

P(FY) → Efficiency (63 degress of freedom)	Technical efficiency (NIRS)	Capacity efficiency
Spearman R^2	0.45	0.82
Pearson R^2	0.42	0.74

Improvement scenario. Optimal resource allocations, denoted (o), for capacity efficiency given fixed (f) depreciation and asset levels are shown in Table 6. Note that OSBT (o), FY (o) and assets per dollar of revenue (o) are calculated from both optimal scenario (opt) and fixed (f) parameter values.

Discussion

Economic sustainability factors and financial yield

Only two hospitality divisions exceeded the tourism and leisure independent investor ('WACC') benchmark and another exceeded the trading bank (base lending rate) benchmark. Only one of the remaining six divisions exceeded the risk-free benchmark. It might also be argued that unrealized gains arising from property or lease inflation would improve matters or that some enterprises (hotels, etc) derive income from non-hospitality sources (retail, etc). Neither of

Table 4. Technical efficiency, RTS and capacity efficiency of NZ hospitality divisions 1999–2003.

Consolidated division (KAU) 1999–2003	Financial yield (%)	Technical efficiency (CRS) (%)	Technical efficiency (VRS/NIRS) (%)	Returns to scale	Scale efficiency (%)	Capacity efficiency (%)
Hotels (accommodation)	3.8	12	14	Decr	85	3
Motels and motor inns	5.3	54	59	Decr	90	14
Hosted accommodation	2.7	73	74	Incr	99	7
Backpacker and youth hostels	6.7	57	63	Incr	90	17
Caravan parks and camping grounds	3.7	57	59	Incr	96	17
Accommodation nec	3.6	31	32	Incr	95	12
Pubs/taverns and bars	11.7	50	54	Decr	92	39
Cafes and restaurants	10.0	44	83	Decr	53	30
Clubs (hospitality)	3.0	19	20	Incr	97	8

Table 5. Quartile boundary ceilings for the NZ tourism data set 1999–2003.

Result element	Quartile boundary ceilings for the tourism data set, 1999–2003		
Financial yield (FY)	Q1 (8.5%)	Q2 (11.6%)	Q3 (16.6%)
VRS/NIRS efficiency	Q1 (55%)	Q2 (77%)	Q3 (100%)
Capacity efficiency	Q1 (28%)	Q2 (44%)	Q3 (72%)

these would have altered the tenor of these results as capital inflation averaged about 1% per annum during the analysis period and alternative incomes were accounted for by Statistics NZ. The linkage between FY and technical efficiency was tested over a range of DEA models operating on the entire tourism data set (all 65 divisions). The most favourable correlation between FY and relative technical efficiency occurred under a non-increasing return to scale model, as shown in Table 3. A correlation coefficient of about 0.43 reflects weak association and suggests tourism's overall managerial proficiency stands in need of improvement. This suggestion is further amplified by strong correlation between FY and capacity efficiency – implying that superior FY performance is associated with efficient technology and minimal waste of resources. Only two hospitality divisions exceeded quartile 1 but pubs/taverns/bars entered quartile 3.

Technical efficiencies

Three DEA models were applied to the tourism data set. The highest overall efficiencies for hospitality divisions were those from NIRS models, yet all but cafes/restaurants were in quartile 1. Cafes/restaurants operate in a fluid and

Table 6. Optimal resource improvement scenario for NZ hospitality divisions.

Consolidated division (KAU)	Capacity efficiency: optimal improvement scenario 1999–2003 Revenue opt (NZ$)	Materials opt (NZ$)	Interest opt (NZ$)	Labour opt (NZ$)	Dep'n (FI) (NZ$)	Assets (FI) (NZ$)	OSBT (o) (NZ$)	SWWP (o) (NZ%)	FY (o) (%)	A/NZ$Rev (o) (%)
Hotels (accommodation)	5.08	4.08	0.05	0.52	0.07	1.43	0.27	0.29	16	28
Motels and motor inns	3.13	2.48	0.03	0.27	0.04	1.00	0.31	0.09	24	32
Hosted accommodation	0.85	0.66	0.01	0.07	0.01	0.35	0.06	0.05	15	41
Backpacker and youth hostels	0.47	0.38	0.00	0.04	0.01	0.14	0.04	0.01	25	29
Caravan parks and camping grounds	0.53	0.41	0.01	0.04	0.01	0.30	0.06	0.01	16	56
Accommodation nec	0.83	0.64	0.01	0.07	0.01	0.35	0.10	0.00	21	43
Pubs/taverns and bars	2.37	1.92	0.02	0.22	0.03	0.52	0.18	0.06	27	22
Cafes and restaurants	6.12	4.96	0.06	0.56	0.08	1.29	0.45	0.21	28	21
Clubs (hospitality)	1.52	1.21	0.02	0.13	0.02	0.45	0.14	0.00	25	30

highly competitive market, yet produce uniformly good scores that contrast with other hospitality divisions. Technical efficiency of the hotels division is among the lowest of the entire tourism data set, suggesting the 'production technology' component of their visitor products stands in need of improvement.

Returns to scale and scale efficiencies

Hotel, motel, pub/tavern/bar and cafe/restaurant divisions were characterized as having strongly decreasing returns to scale, suggesting growth strategies involving replication rather than expansion of their scope of operation. However, five hospitality divisions exhibit IRS and high-scale efficiency, suggesting that even small operational improvements would be highly effective in improving FY. In contrast, the cafe/restaurant and hotel divisions exhibit low-scale efficiency, suggesting radical approaches to performance improvement are necessary to achieve growth. Even though cafes/restaurants exhibit high FY, their low-scale efficiency coupled with DRS suggest a fine balance between effective versus ineffective operation.

Capacity efficiency and optimal improvement

Although this tourism data set reflects a consistent approach to business (that is, profit orientated), divisional resources and production technologies are diverse. For example, hotel rooms seldom 'turn over' more than once per day, whereas numerous other tourism providers can reuse operational resources with much greater frequency; hence, the relative differences between similarly operated divisions offer more appropriate perspectives of capacity efficiency. Within accommodation divisions, the highest scores (backpackers/youth hostels and caravan parks/camping grounds) outperformed the lowest (hotels) by a factor of five. The same pattern applied within food and beverage serving divisions where the capacity efficiency of pubs/taverns/bars was also five times that of clubs and significantly better than cafes/restaurants. In terms of guest amenities, hotels and motels are frequently indistinguishable, yet there are significant disparities between the efficiencies of their production technologies and resources. These two divisions are also strategically significant as they account for over 79% of overall accommodation demand, together with 68% of its assets. As noted at the beginning of this paper, the NZ Commercial Accommodation Monitor reported the average occupancy rate to be approximately 35% during the analysis period. Within this average, hotel and motel division occupancies averaged 53%, whereas hosted accommodation and caravan park division occupancies averaged 28 and 13%, respectively. The difference between these results is one of perspective: DEA is a multifactored approach to efficiency, whereas occupancy, although important, partially reflects just one of the six factors in this model.

Table 6 provides an optimal scenario for tourism hospitality resource allocation. Inflating original resources by their optimum capacity improvement factors repositioned all divisions on to the efficient frontier, improved FY to levels exceeding all IY benchmarks and reduced the overall asset/revenue ratio from 217 to 33%. This scenario is contentious for accommodation divisions as it implies a sevenfold increase in prices (or current patronage), whilst maintaining current asset levels. Cafes/restaurants and pubs/taverns/bars would have a less daunting task as their price-increase factor was approximately 2.4.

An optimal VRS output orientated technical efficiency scenario was also examined and presented similar challenges. This scenario produced optimal targets for accommodation divisions' revenues and assets at 96 and 37% of their original respective levels. The corresponding targets for food and beverage serving divisions' revenues and assets were 76 and 71%, respectively. This scenario also highlights the degree to which excessive accommodation division asset levels restrain its efficiency, as well as the strongly DRS behaviour of the food and beverage serving divisions.

Conclusions

The contention that NZ's hospitality industry can improve its financial performance through price increases receives little support from these results.

The operational efforts of the hospitality's accommodation divisions (and clubs) generally failed to reward their proprietors with FY beyond that offered by a treasury bond investment. Yet their more ubiquitous food and beverage counterparts fared much better – leaving open the suggestion that a more diverse customer base really matters.

Although FY measures economic sustainability, its diagnostic potential improves when combined with other factors. For example, price-led strategies within hotel and motel divisions will be unsuccessful, except perhaps at peak times in some locations, because production technology capacity (infrastructure and mode of operation) significantly exceeds average demand in NZ's competitive market.

Strategies generating additional value generation from existing customers would improve economic performance, as would a more even spread of demand across the entire year or elimination of any variable costs of occupancy. For example, hotels and motels might operate as visitor hubs where additional revenues accrue from facilitating local activities for their guests – in the manner of a travel agent or a cruise vessel.

Although the hosted accommodation division has lower capacity efficiency and weaker IRS behaviour, its other attributes are similar to divisions catering for budget travellers (backpackers, youth hostels, caravan parks and camping grounds). Their significantly higher scale efficiency and IRS behaviour transforms modest operational improvements into more substantial economic gains, provided asset levels remain unchanged! For example, small improvements in marketing or distribution channel management policies, or even market-share shifts, would confer highly beneficial changes in their economic performance.

A singular conclusion from this modelling is that altogether different strategies are required to transform the FY of NZ hospitality's asset holders.

Given the significant levels of latent capacity within these divisions, it is pertinent to ask whether their current demand profiles are appropriate. The long-term result of dimensioning these divisions to meet five months of peak patronage has resulted in structural inefficiency and relatively poor economic performance so as to be irremediable by tenable price increases. The outcome of publicly funded marketing programmes has yet to address these seasonal imbalances. Continued stimulation of peak-season patronage clearly exacerbates resource inefficiency and erodes private good. In conclusion, contrary policies that successfully stimulate the off-peak use of latent capacity whilst constraining peak capacity at current levels would not only deliver public good but also profoundly improve the economic sustainability of the NZ hospitality industry.

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