An Economic Analysis of the Tourism Industry - Implications of the Online Travel Intermediary

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Abstract

Informational asymmetry and fragmentation of capacity suppliers in the tourist industry provide travel intermediaries with market power. Market structure is characterized by over-capacity in off-peak seasons, high fixed costs and low variable costs, leading to product under-pricing. Forward sales of capacity at low contract prices surrender profits from consumer surplus to intermediaries enjoying oligopsony benefits. The creation of formal futures contracts in rooms and seats would permit operators to hedge demand uncertainty and retain more of the profits. Online intermediaries can serve the interests of domestic hotel operators through exploitation of databases to provide analytical solutions to capacity utilization and to develop demand balancing.

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Although one of the most important industries in the world economy, tourism has not received serious attention from economists. The implications of tourism for developing economies are far more significant than for mature economies, yet virtually all nations recognize the importance of the industry. Development economics already includes tourism in addition to agricultural and industrial issues. Many of the features of the tourism industry resemble those in other long-studied areas of the economy, implying that similar analyses and solutions to problems should be applied. The direct influence of the airline industry on tourism provides a bridge between classical economic analysis and the less-studied aspects of tourism.

In determining a policy for industrial development, governments must focus on the domestic retention of value from engaging in an activity. Typically, the majority of tourism revenues do not remain on-shore due to the structure of the industry and its participants. We identify the significant features of the travel and tourism industry and provide an economic analysis that will indicate opportunities for value creating strategies. This demonstrates the importance that a large, publicly recognized online travel intermediary can have for further development and increased domestic profitability of the tourism industry. The case of the Thai industry is used as a focus.

This study provides direction for the strategy of such a travel intermediary by showing where the information available from online sources can be used to improve the design and pricing of services in the hospitality sector. It also gives a summary of how the information is to be used in analytical methods to optimize the sale of capacity in the sector under certain types of contracts.

The presentation includes introductory material indicating the significance of the industry, and a summary of the value retention by the various players in the industry, both domestic and international. There is also a brief strategic analysis of the industry by comparison to modern trends in corporate development through the characterization of the role played by travel intermediaries in the traditional sense in contrast to that of an online intermediary, using its larger database and sophisticated planning tools. An enhanced role involves the design of tourism services, marketing,

and financing initiatives. Next, there is an examination of the macroeconomic, microeconomic and financial issues involved in the industry and their implications for the creation of an effective online intermediary. Finally, a linear program is presented as an analytical tool to optimize the contracting policies of service providers.

1. Scope of the Tourism Industry

Statistical aspects

Current statistics on global tourism indicate that it is now the largest "export" industry, as it is for Thailand in particular. One measure of this gives $474.2 billion in annual global tourism revenues, as estimated by the World Tourism Organization, or over $600 billion when passenger transport is added. For Thailand, 323.5 billion Baht in tourism revenues constitute 6% of GDP as of 2002. Furthermore, the growth rate in revenues of 6% compared to the average GDP growth of 3.14% in the past five years implies that the potential share of GDP is even greater. (The share of GDP has risen from 4.66% in 1997 to 6% in 2002.)[1]

Of the latest sales volume of 323.5 billion Baht, however, it is estimated that only 30% is retained by Thailand, the remainder flowing to foreign hands. This figure contrasts with estimates as low as 20% for Caribbean nations (highly dependent on tourism but exposed to cruise liners) and as high as 60% in India. These retention rates result from "leakage" due to import of supplies and materials unavailable in the host country (international standards and tastes) and to export of financial flows (repatriation of profits earned by investors) plus overseas promotional expenditures.[2]

As well as leakage from the gross receipts of tourism, there are additional structural losses. Most of these are comprised of foreign carriers' fares and foreign travel agents' fees and profits. Increasing the share of domestic airlines and travel agents then can have a significant effect on increasing tourism revenues. Various studies have also questioned the net benefits of tourism at differing stages of development, which may be an issue of timing of investment and return cash flows. Costs of building infrastructure added to congestion may well make expansion of tourism a short-term negative proposition. Nevertheless, tourism is generally accepted as being beneficial on the whole and specifically to economic development. In

summary, the size of the actual and potential tourism market more than warrants efforts to increase both its gross and net revenues.

The value chain and value retention

The value chain in tourism can be summarized as formed by the end user or consumer, paying the total sales (above), linked by the carriers (largely airlines) to the hotels, resorts, restaurants, physical attractions and other members of the hospitality sector, with the linkage provided by the travel intermediaries, themselves either domestic or international. With 25% as a minimal target profit margin for a large intermediary, it is clear how significant is the share of the value chain captured by the intermediaries; of this the portion taken by domestic Thai agents is estimated to be minimal.

(Insert diagram about here)

The transfer of payments from consumers to the providers of goods and services in the tourism industry is filtered, at a cost, by the travel intermediaries. This filtration is viewed as a friction on the efficient transfer between the two parties, implying that a "tax" is imposed on users' ability to afford and enjoy the goods and services provided, and with the "tax" reducing the profits of the service providers; or else it is a reasonable price reasonable price for valuable and necessary services that enhance the enjoyment of the product by the end users. The justification for the intermediary services comes from the existence of informational barriers between users and providers, plus the possibility that experienced travel consultants have built up capital, to be rewarded by charges for enhancing the tourism experience of average consumers. One concludes immediately that more efficient intermediaries in a competitive market can reduce the "tax" by improving the information flow.

The technology of online services offers the benefits of lower overhead and centralized databases enabling the reduction of the "tax" and identification of opportunities for enhancement of tourist satisfaction through matching of needs and solutions. A further benefit is the opportunity for the intermediary to provide data-based analysis of travel patterns allowing service providers to refine their offerings and pricing strategies. The implementation of IT applications to tourism results in value creation analogously to the realization in the 90's of the benefits of the computer/internet revolution. The expected benefits of the computer for productivity enhancement were delayed until the potential was realized through the full deployment of communications networks; so too, the conventional use of computers

to achieve ticket bookings can be greatly extended by merging this technology with database exploitation, now seen through CRM (customer relationship management).

2. The Role of the Travel Intermediary

Increasingly in fully developed economies, corporations are recognizing that a fully vertically integrated production process results in lower return on capital. High labor costs make domestic production non-competitive. Consequently, successful corporations in Europe and North America are turning to out-sourcing of low-margin manufacturing operations. High-margin activity consists of the creative design of product and services, distributed using advertising and branding for the enlargement of market demand as well as sophisticated delivery channels. This process is further aided by arranging financing and structuring contracts to build markets and sales. This strategy has been implemented in established industries such as auto manufacturing (with parts production and assembly largely off-shore) and modern technologies such as computer software (code writing) and hardware (chip manufacturing); what were only recently viewed as high technology products are now seen as "commodities" to be produced in low-labor cost locations.

Progress in developing nations is then seen as a response to developed nation initiatives. Instead of emulating and competing with developed nations in basic industries, developing nations have now taken over those basic, and even advanced, industries. In fact, they are encouraged to develop those industries in accordance with the needs of the corporations in advanced societies for production under an out-sourcing program. In essence, developing nations are forced to follow the direction of more advanced nations, acting as branch plants. Challenging this process requires both financial and human capital in the developing nation. In the tourism industry, neither large financial capital nor unattainable creative resources are required to effect the challenge with the help of online travel agencies.

The traditional role

As a rule, the services provided by travel intermediaries have been centered on three areas – marketing, design and financing. A travel agency, by conventional advertising and increasingly by electronic publicity, attempted to attract customers for whom they would arrange travel by carrier and lodging at the destination. Advances led to attempts to channel the clients to appropriate destinations, aided by familiarity with

repeat customer habits and client preferences. In general, the response to new clients was reactive, offering specific hotels and carriers that would meet the stated requests, primarily cost-based with attention to the level and type of facility needed. Increased use of computers helped to establish data bases on past customers, but small operators were unlikely to have the capacity to employ a sophisticated data base analysis system. Business enhancement lay in combining packages of carrier and hotel, sometimes enhanced by theme-based add-ons such as golf vacations. This suggests the benefits of taking a creative role in designing attractive packages for different clienteles; hence building scale implies placing resources in the design area.

Initially, the role of the intermediary was to match the demand from clients to the inventory of passenger seats and hotel rooms accessible to the intermediary, identified by online connection to vendors. The intermediary then passed through the payment while extracting a fee from the supplier. This role has expanded for larger agencies acting as wholesalers or higher level intermediaries who will re-sell to travel agents or tour group operators in direct contact with clients; these wholesalers have booked allotments of rooms at reduced prices to them, which are then re-sold at a profit. The contractual allotment is a risk-reducing strategy for the supplier analogous to a commodity forward contract, but lacking the efficiency of forward and futures markets. An alternative arrangement is an allotment on a "best efforts" basis, which reserves capacity for agents with no firm commitment, effectively, granting an option to sell capacity to clients at a lower (exercise) price. "Free sale" arrangements with hotel operators sanction the travel agencies as agents to sell capacity within the available supply. Free sales to some degree and allotments to a greater degree limit the hotel operator's ability to manage capacity and extract a higher price for the units, but help to guarantee revenues by increasing the probability of rentals.

Online agency potential

The initial impact of creating an online capability for a travel intermediary is the creation of a low overhead operation with the potential to transact business on a world-wide basis. Efficient systems permit rapid low-cost response to inquiries and execution of bookings, plus book-keeping efficiencies. Electronic data entry leads to a reduction in handling costs and a dynamic inventory system for accurate information on future availability. Furthermore, the spatial limitations of a "bricks-and-mortar" operation are eliminated, leading to a vast expansion in potential market. Scalability is

relatively unrestricted, with only incremental hiring of personnel and the installation of larger servers needed to accommodate increased volume. Once the initial investment in software has been made, expansion is tied to the rate of market growth.

Online operations create a comprehensive database of potential clients that identifies sales opportunities for directed marketing. Statistical analysis can identify trends and generate descriptive measures to aid in planning. Development of database analysis tools enables an intermediary to offer a new kind of service to hotel operators. Building on statistical patterns, the intermediary can provide information to hotels on predictable demand and recommend pricing strategies to increase hotel profits. This can be provided by the development of analytical packages to be used by the hotel in planning its capacity sales at different times of the year. A further enhancement would be the coordination of marketing initiatives that would lead to demand smoothing, made possible by the size of the intermediary and its reach to end users as well as the integrated perspective on capacity utilization in defined areas and periods.

With a critical level of volume, the crucial element of diversification can be achieved allowing an intermediary to engage in risk-taking contracts with lower exposure than for individual hotel operators. At a certain level of operation, the intermediary can safely afford to accept allotments, to fill with a predictable demand. Hotel operators then create value by shifting demand risk to the intermediary. The experience gained between operators and the intermediary will lead to the development of more contracts for capacity sales. Effectively, the achievement of critical size by the intermediary implies greater ability to act as an agent for suppliers and results in enhancement of value for both suppliers and the intermediary.

Increased scale and experience also enable an intermediary to launch packaging initiatives to a larger client base. The opportunity to exploit specific local attractions or experiences, such as golf, spas or cultural and artistic events and themes, can be developed. The online capability allows the intermediary to promote new attractions rapidly and broadly in response to changing conditions, in contrast to a conventional approach of design, printing and distribution of brochures by physical agencies. Advanced methods of presenting visual images can provide prospective clients with greater detail, providing confidence in quality and aiding sales. Combined with current capacity information, this helps to achieve seasonal demand balancing.

The greater international reach and technical capabilities of online access would be particularly useful in promoting Thailand’s attractions to potential visitors

in order to stimulate a broader and higher-valued range of demand. Panoramic images of natural attractions, of spa treatment and surroundings, or of the details of Thai artistry and craftsmanship would effectively present the experience to be expected on a theme-based visit. Such attractions appeal to higher-end tourists, offer services requiring few off-shore inputs and hence reducing leakage, stimulate domestic production, and provide alternatives to the established tourist patterns.[3]

Experience reveals that a major problem before achieving critical size is supply related. Business development depends on obtaining capacity. To the extent that suppliers are constrained from over-selling, they favor larger intermediaries with greater perceived marketing potential. This creates a vicious circle of restricting growth due to supply, causing supply restrictions. To breach this circle, the agency must commit to purchases of capacity without the protection of critical size.

3. Economic Aspects

The characteristics of the tourism industry embrace a range of economic issues including monopoly/monopsony aspects, barriers to entry, fixed and variable cost structure, homogeneous/heterogeneous goods, product differentiation, dynamic pricing, asymmetric information and financial contracts.

Market structure

As suggested by the value chain, the tourism industry is affected by both oligopolistic and oligopsonistic behavior. On the one hand, there are atomistic clients, interacting with travel agents; the latter comprise both small, competitiveagents and large agencies with market power. At the other end, there are relatively competitive suppliers of services of varying sizes providing a limited but moderately expandable capacity. Large travel intermediaries act oligopolistically with respect to individual clients or smaller agents when functioning as wholesalers. Major hotel chains deal directly with clients using brand recognition or with intermediaries; when the latter have sufficient size, the structure, while not atomistic, is fairly competitive. Single site hotels may deal with smaller agents on a competitive basis, but face oligopsonistic behavior when interacting with large intermediaries that control large tourist volumes.

The market is composed of both homogeneous and heterogeneous goods. In the airline and hotel businesses, there is a gradation of product from basic to luxury. In practice, one can adopt a small discrete classification of levels of product and consider the services within a class as relatively interchangeable or substitutable; yet individual client preferences have some distinguishing effects, particularly at the higher class of product. Due to fixed capacity, inventories cannot be accumulated to satisfy later demand. Yet in a multi-period problem, some inter-period substitution is possible. Furthermore, across different seasons the demand and the perceived value of the product vary greatly. A degree of substitutability across regional or national boundaries also affects classification. In summary, there is sufficient size of supply and demand in most categories (across time, location and class of service) for the structure to be homogeneous within cells, but substitutable to a degree between "adjacent" cells. (For analogy consider the bond market, in which characteristics such as maturity, issuer, rating and currency distinguish cells; yet price consistency between cells must hold, given the purchaser's willingness and ability to substitute.)

Price determinants

The tourism industry is susceptible to the high fixed cost and low variable cost of providing additional capacity. Both hotel operators and airlines face similar issues, even if certain characteristics, in particular regulatory policies, are unique to each.

In the much-studied airline industry, the presumption of high barriers to entry due to the cost of planes and landing rights, is belied by the emergence of successful low-cost airlines. The ability to lease planes with an oversupply of moth-balled planes, and the existence of lower cost airport facilities have made entry relatively easy. Break-even volume for new entrants has been lowered to the point of attainability for a supposedly high-entry cost industry. Low-cost competition has led to the near or actual bankruptcy of major carriers with higher cost operations. Predatory pricing strategies by major carriers to eliminate smaller competitors have been circumscribed by the severe cash flow problems the major carriers have been suffering.

The key issue is fixed versus variable cost components. The variable cost of an additional passenger to a given flight is virtually zero. Varying unit sizes (large or small planes) and personnel costs (lower salaries for new entrants), combine to favor the smaller, new entrants. Structural elements include demand seasonality, passenger acceptance of lower service, negative reputation impacts of discriminatory prices,

positive reputation impacts of promotional prices (e.g. seat sales at the $5 level), and the ability to reach customers with offers. Finally, however, airlines can contribute marginally to overhead by selling at prices yielding marginal profits but overall losses.

In the hospitality industry, many of the same aspects apply. Additional guests cost only the servicing of the rooms, which for a fixed and low-cost staff component is virtually zero again. The elements of the airline industry affecting the cost structure are similar. Important differences between the industries include primarily the absence of international regulatory policies applying to flag carriers (under national economic strategies), the vastly increased number of suppliers, together with the scale issue (linked to entry cost). Hotels can be scaled at a relatively continuous level from small to large, affording even greater flexibility than the standard planes of varying capacities. The presence of more variety and greater numbers of suppliers implies that the ability of most suppliers to have direct access to potential customers is severely limited. Only large international chains have the marketing potential and brand recognition that parallels airlines; smaller hotels can only hope for referrals by travel intermediaries and repeat customers based on satisfactory experiences.

The hotel industry, unlike airlines, can offer true product differentiation. While airlines can advertise superior and distinctive service, to the average traveler, their product is virtually homogeneous and price, schedule and convenience become the only considerations in choosing between competitors. Besides varying the broad or specific location of hotels, décor and unique services offered will cause clients to differentiate and select by product characteristics. Hence, supply variables under direct control affect pricing and profitability. On the demand side for vacation destinations, the seasonal nature of travel patterns and climatic characteristics leave the operator with little control or the ability to find many load-balancing remedies.

Recognizing both similar and distinct aspects of the hotel industry, its fundamental characteristics resemble those of airlines. The pricing decision can be made in reaction to covering marginal costs, with the result again of short-term policies producing long-term losses. Yet the financial situation of the hospitality industry appears healthier than that of airline. Except when major economic catastrophes, due to incidents like SARS or terrorism, disrupt normal patterns, pricing policies tend to leave the majority of hotel operators with tolerable, if minimal, profits.

Asymmetric information

The role of the intermediary in the market for tourism goods is justified by the inability of participants to obtain adequate information on the supply and demand curves. The primary cause is the distance separating the parties at the time the contract needs to be made. The consumer's problem of determining the availability of supply is exacerbated in part by uncertainty as to the quality of the product. An informed intermediary can resolve both of these issues. Increasingly, the supply of airline seats is established by online reservations systems of carriers, although the prices can usually be bettered through an intermediary who has reserved capacity at a lower price. In this case, the quality is of no or minimal significance as an unknown.

For hotel units, however, both greater fragmentation of the suppliers and a lower level of standardization give cause to informed intermediaries. While hotel operators could conceivably establish websites, there is little prospect for individual consumers to reach these sites. A large online travel intermediary has the potential to aggregate the supply of numerous hotels and transmit this to end users at low cost, thereby increasing the efficiency of the market by enhancing information flows. Quality of the hotel facilities is important, but assurance of quality is difficult to convey at a distance;[4] the intermediary can use its reputation to help assure quality.

Dynamic pricing

Modern pricing practice attempts to extract the maximum consumer surplus from all classes of clients by discriminatory pricing. The posted price (rack rate or full fare economy) is a maximum price that only the desperate or uninformed client will pay; beyond that, there are deluxe suites and first/business class seating. Such rates will extract virtually all of consumer surplus. It is presumed that price sensitive informed clients (personal travelers or constrained business travelers) will seek to obtain lower prices from the same supplier or alternative suppliers in a competitive market; this again ensures that demand at below the highest price level can be filled.

Revenue management aims to ensure the maximum sale of limited capacity while obtaining the highest possible price from units of that capacity; units are sold independently to different customers with incomplete information as to the price. The technique is applicable when the capacity is not transferable to preceding or following periods and hence is wasted if not used; the possibility of mild substitution in time

amplifies the difficulties in optimizing the process, but does not invalidate the concept. Dynamic pricing is then the process of offering prices to different clientele based on analysis of remaining capacity and of demand patterns. Airlines have refined the dynamic pricing strategy through an almost continuous process of adjusting advertised prices to reflect remaining capacity and proximity to flight date. The hotel industry is beginning to practice a form of this, but with far less success and intensity.

A major variable in dynamic pricing is the amount of capacity allocated to other agents acting as intermediaries between the service provider and the clients. Airlines currently attempt to use their own individual or group online reservation systems to make direct contact. This is successful to the degree that customers recognize and remember the airlines' names to search for them, and if customers do not expect lower prices from alternative intermediaries. Pre-sale of capacity to intermediaries guarantees sales at profitable, even if low margin, prices, thereby helping to realize coverage of overhead and risk reduction. Conceivably, a supplier of capacity could pre-sell to intermediaries enough to cover fixed costs plus variable costs on the sold capacity, with remaining capacity retained for higher margin direct sales. The ability to sell remaining capacity, however, is curtailed by the existence of lower priced capacity in the hands of the intermediary.

Industrial parallels

The environment described for the tourism industry has direct parallels in other markets. Historically, railroads were examples of low variable cost, high entry and fixed costs, and a high degree of immovable assets, between track and rolling stock. This combination led to market failure, illustrated by illogical contract design and pricing, that ultimately led to strict regulation. Similarly, the airline industry became intensely regulated, before the deregulation that may well be responsible for the virtual or actual bankruptcy of so many carriers. Agriculture also had immovable assets plus high leverage through expensive equipment; the severe price elasticity of the output, despite atomistic end demand and very competitive supply, led to rigid regulation and government intervention.

In each of these cases, national policies with respect to essential industries, self-sufficiency, safety and standards, even national identity conveyed by a flag carrier, have affected decisions properly made on the basis of economic principles. The unifying theme to these industries, shared by the tourism industry, has been the

instability created by the price elasticity in the market structure. Competition between suppliers in the face of low variable costs has threatened the health of supply judged to be crucial to national security or welfare. The presence of intermediaries with information about both supply and demand only served to complicate the issue. Regulation has then been the natural response and is thus raised for the hospitality industry.[5]

Demand Patterns

Analysis of demand for capacity on airlines and in hotels is complicated by a number of factors. Clients are segregated into at least two categories, leisure and business, which will be subject to different influences affecting demand. For the leisure segment, or tourism, there are issues of economic prosperity in the client countries, seasonality and the associated weather in client and host countries, and unexpected world or local events (such as SARS and terrorism). The final demand in a host country is a combination of business and leisure segments and of the individual client country visitors. Intensive analysis to predict demand requires analysis of the patterns of each major client location and combining the results. A reasonable description of the end demand patterns for each season is then a normal distribution subject to "regime shifting" under major events that would alter the mean and standard deviation.

4. Financial Aspects and Instruments for Tourism Contracting

Forms of contracts

Three types of contracts enable capacity providers to allocate their current and future capacity. In financial markets, these correspond to pricing in spot markets, futures or forward markets, and options markets. The basic sale of a room or a seat by supplier to consumer is conducted in a spot market. Other than rare and temporary climatic or political events, supply is virtually fixed. The demand side is clearly uncertain, but the distribution is fairly stable, subject to influences that will modify the distribution. Pre-sale of capacity by suppliers is a risk-reducing strategy for the uncertain sale of the fixed supply. This can be accomplished by either forward contracts or options. A forward contract, as in commodity markets, reduces the risk for both supplier and purchaser. It is achieved by writing a contract for the allotment to an intermediary of a number of units during a fixed period. In practice, however, it appears that these

commitments may not be honored by the intermediary; enforcement is subject to the continuation of good relations between the two parties and depends on market conditions. Essentially, one can characterize the contract as either a number of options on a unit (maximum capacity sold), of which a large percentage is will be exercised, or as a forward contract with an attached put option to the intermediary, which may not be priced into the contract. Alternatively, the supplier might extend an option to the intermediary on a number of units for a fixed period; a looser commitment of capacity reserves for the intermediary the capacity in case he chooses to exercise when he can re-sell at a higher price. "Free sale" arrangements essentially constitute engaging an agent to sell for the supplier on a commission basis at the spot price.

From the intermediary's point of view, engaging in a forward contract through a fixed commitment fixes the price but engenders risk of sales in the spot market, at lower than the contract price. This removes the opposing risk of committing to supply capacity, but having to pay a premium for the necessary units in the spot market. To escape this exposure, most intermediaries would avoid committing to the sale; but the loss of potential profits from lack of supply is comparable. To avoid both risks, the agent can commit to a fixed price that is sufficiently below the expected spot price.

Intermediaries would be better served by actual options on the capacity at an exercise price yielding a probable profit. Yet the supplier has little incentive to grant these, even for a fee, unless the expected sales in the spot market are not effectively limited by the exercise of the options. In practice, this appears to occur when commitments that are in fact only options to the intermediary are given. This situation results from high market power for the intermediary, having a high probability of exercising that option, combined with low direct market potential for the supplier.[6]

Details of the contracts include the terms and timing of payments and depend on the market power of both hotels and intermediaries. A financially insecure hotel is anxious to assure both future sales and interim cash flow. It is likely to extend reservation allotment contracts to larger intermediaries, guaranteeing a number of rooms per night, with the flexibility to accumulate and exchange capacity across periods; in return, the intermediary will make a deposit or interim payments to the hotel. By contracting with a group of intermediaries on similar terms, the hotel assures a moderate cash flow in low season avoiding potential working capital problems.[7] The resulting demand is subject to a complex interplay of contracts with

option features. Different intermediaries each have a call option on capacity likely to be exercised at common times, thereby exceeding capacity; hence, the hotel retains an option to excuses delivery given unavailability of the supply. Intermediaries are subject to a first-come, first-served discipline in exercising their options. This contract, however, does not guarantee payment to the hotel. Larger hotels, with more visibility and sales potential, can by-pass intermediaries or limit the contract by restricting flexibility through a cap on simultaneous exercise of options, by charging a fee for reservations, or by bundling other services, which effectively increases the price paid.

Hotels and intermediaries with low market power are more likely to consider variations of the contract forms that will be mutually beneficial in dealing with each other. A lower price for rooms can be exchanged for a firmer guarantee of taking capacity and paying for it, as in a pre-paid contract. This will provide security to the hotel by reducing demand uncertainty and benefit the intermediary by securing capacity or reducing supply uncertainty. An alternative form is a time-sharing contract extending the committed period to thirty years.

Contract markets

A striking financial feature of the agriculture industry is the resolution of the uncertainty attached to supply, given a relatively predictable and stable demand. (By contrast, in travel and tourism supply is predictable and stable, with demand subject to unpredictable variation.) Suppliers' uncertainty as to price, and the impact on their welfare, gave rise to forward and later futures markets; the substitutability of crops traded in the markets, based on a (government) certified grade of product, is crucial.

A unit of a commodity such as wheat may not be as indistinguishable as a unit of copper, and climate conditions may affect the date of delivery, yet the futures contract design permits enough flexibility to satisfy the realities of the industry. The agreed substitution of lower grades under the stipulated adjustments is effective. The bond futures market amplifies the range seen in agricultural contracts (varying by delivery month and adjusted by grade) in order to cover the alternative instruments that can be used to satisfy the contract, leading to the concept of "cheapest to deliver" and to the impact of this on contract price. The markets in government bonds are also used to hedge interest rate uncertainty that affects all fixed income instruments, with correlated shifts accounted for in the hedging formulas.

Despite the heterogeneity of the underlying products, contract design can make a forward or futures market effective in reducing supplier uncertainty. This suggests the benefits of a forward market between suppliers and intermediaries of travel and tourism products in limiting risk. Hence, the existing commitments seen as forward contracts are justified. An intermediary agreeing to an allotment[8] of hotel or airline capacity relies on the relative substitutability of rooms and seats, across suppliers and proximate time periods, to justify taking the capacity and demand risk from the suppliers. Greater access to demand and ability to create a portfolio of assets (again in time and space) enable this risk sharing to be mutually beneficial.

Further implications concern the possibility of increasing the liquidity of the existing forward market. Commodity and financial markets evolved from individual forward contracts between grower and miller, or between financial institutions and counterparts, resulting in organized futures exchanges with greatly increased liquidity; analogously, one can envisage a formal liquid market with differing delivery months, grades of product, and routes for airline seats and locations for hotel rooms. It is neither possible nor necessary to cover all locations and routes, nor need all grades be covered. As is the case for the fixed income markets, representative standard locations (e.g. Hong Kong, Bangkok), routes (Los Angeles-Hong Kong, London-Bangkok) and periods would parallel bonds or money market instruments by different maturity and issuer. These would serve to cover the basic tourism demand uncertainty and allow hedging via swapping, with experience-based premiums and discounts for underlying products. (If this should appear unrealistic, it is worth considering the recent proposal for “terrorism futures.”) In addition, a reliable and enforced certification program would be needed to establish grades of service and avoid adverse selection problems.

Beyond the more immediate extension of existing, informal forward contracts to standardized futures, the alternatives of standardized options and swaps between larger intermediaries should also be considered. The fundamental issues involved in these derivative markets include uncertainty and desire to hedge the risk exposure, variability of supply, demand or both influenced by economic and political events, need for liquidity, the existence of speculators willing to provide that liquidity, default risks, and representative instruments on which contracts can be designed. All of these features apply to the travel and tourism industry.

5. Analytical Approaches to Contract Choice

The travel intermediary can exploit its relationships with suppliers to offer them advice on capacity allocation using the variety of contracts available for reserving space. The available types of contracts between intermediaries and hotel operators can be described as pre-sold allotments, free sale arrangements and walk-in sales. Under the pre-sold allotment label, an agent will guarantee to purchase a certain number of rooms for a period of time; in practice, this could be for an extended period such as two years or more, or for a portion of the year. Hoteliers typically would prefer to sell the lower demand periods and retain the high, and especially peak, periods for walk-in sales, but usually will sacrifice the profits on the latter to ensure cash flow during low season. The price is not in fact pre-paid, but is paid by an initial deposit with regular payments following; timing is not an issue except in periods of high interest rates, so the essential issue is the guarantee of supply to the agent and demand to the provider. The contract may be voided by force majeure. (Time-sharing contracts that would permit space to be taken at the reservation time of the intermediary are included here, although they have option aspects with respect to value and exercise.)

Free sale arrangements are classified as any case where the intermediary is authorized to sell capacity on the behalf of the hotelier, acting as an agent and receiving profits through mark-up. The term allotment is often used to denote the reservation of capacity for subsequent sale by the intermediary; if the capacity is not accepted by a cut-off date, it is released to the hotel for other sale. Since there is no guarantee and these allotments are usually granted to larger intermediaries at no cost, in the expectation of yielding sales, these are treated as free sales. Walk-in sales refer to any sale made directly between the hotel and the client, however the contact is made. The contracts used in the model assume enforcement of their terms; the exploitation of market power by large intermediaries to escape application of the precise terms cannot be accommodated in the model, except by reducing expected benefits by the option values of escape clauses or practices.

The hotelier's allocation

A formal model for allocating existing capacity in a hotel can be modeled initially by considering the classical approach to capacity utilization, specifically a linear programming formulation.[9] In a variation of a "knapsack" problem, this would be for each period a single capacity constraint with an objective function of maximizing the

expected revenues. The three types of activities are allotment sales, free sales and walk-in sales. The simplicity of this basic model leads to allocating all capacity to the activity offering the highest expected return per unit. Refinements would include that each activity has only a probability of payoff and a probable use of capacity, as well as constraints imposed by inter-period links. Calculating the expected revenue as the contract price times the probability of fulfilling the sale, the modification would be to weight each capacity unit by the probability, which still has a degenerate solution.

Consider the following linear program (LP):

Maximize: Total revenue = $AP_A + FP_F + WP_W$

subject to $A + F + W \le C$ where

A = no. of allotted units

P_A = revenue from an allotment unit

Y_A = probability of sale of an allotment unit

F = no. of free sale units

P_F = revenue from a free sale unit

Y_F = probability of sale of a free sale unit

W = no. of walk-in units

P_W = revenue from a walk-in unit

Y_W = probability of sale of a walk-in unit

C = total capacity in units

The expected solution with highest revenue would be W=C, having value C P_W.

With uncertain fulfillment of the contracted sales, the LP becomes:

Maximize: Total expected revenue = $AP_AY_A + FP_FY_F + WP_WY_W$

subject to $AY_A + FY_F + WY_W \le C$

having the degenerate solution with highest revenue (as the ratio of P_W Y_W to Y_W is again P_W, leading to C Y_W in value).

To capture more of the uncertainty effects, consider different contracts of each of the first two types, with higher or lower prices relative to the chance of fulfillment. (For example, an agent offering to take a lower priced allotment is likely to sell more units than one with a higher price, although not necessarily.) We could then enhance the allotment activities by four types representing alternative agents, as follows:

Type	contract revenue	probability of sale
A1	P_{A1}	Y_{A1}

A2	P_{A2}	Y_{A2}
A3	P_{A3}	Y_{A3}
A4	P_{A4}	Y_{A4}

For simplicity, assume that $P_{A1} = P_{A3} > P_{A2} = P_{A4}$ and $Y_{A1} = Y_{A4} < Y_{A2} = Y_{A3}$, making A1 and A2 potentially competitive, with A3 dominant and A4 dominated, and a parallel set of types and relationships for free sales (F1,…,F4), W remaining unique.

With varying contract features, the LP becomes

Maximize: Total expected revenue = $\sum_1^4 [A_j P_{Aj} Y_{Aj} + F_j P_{Fj} Y_{Fj}] + W P_W Y_W$

subject to $\sum_1^4 [A_j Y_{Aj} + F_j Y_{Fj}] + W Y_W \le KC$

where now a constant K has been added to C to represent the underselling of capacity to reflect the possible occurrence of sales above the expected level under contracts, or the alternative of over-selling capacity. Despite all these refinements, the LP still has a degenerate solution at the highest ratio of return to capacity use.

As presented, the problem is a single-period formulation. On a seasonal basis, the parameters P_{Aj} and Y_{Aj} and corresponding P_{Fj}, Y_{Aj}, P_{Wj} and Y_{Wj} would all vary, adding subscripts (e.g. Y_{Ajt}) to all. As well, the terms of allotment contracts would generally link the solution values A_{jt} for many consecutive periods t. This results in the addition of constraints ensuring $A_{j,t} = A_{j,t+1} = \ldots = A_{j,T}$, appearing as a series of constraints $A_{j,t} - A_{j,t+1} = 1$. The result is a structured linear program with diagonal sub-matrices or blocks and simple linking segments; these structured programs are amenable to efficient solution procedures.[10]

In order to make this approach useful and overcome the degeneracy problem, two more features must be added. The first would be to add bounds on any or all of the variables that might reflect experience as to the maximum possible sales under a contract type, maximum willingness to commit capacity to any single agent, or a requirement to have a minimum sold under one form or another (for instance, a minimum of pre-allotted units to provide assurance of covering overhead). This would immediately change the solution to a non-degenerate form. In addition, shadow pricing would provide valuable information on the consequences of imposing such constraints; it should be noted that shadow pricing is usually the most important product of a linear programming analysis, especially in an economic context.

A second feature adds a dimension that conveys the most important aspect of the capacity allocation decision with uncertain demand. In place of the linear objective function, the better replacement is a quadratic function capturing the risk aspect. As for investment portfolio optimization routines (mean-variance analysis), the quadratic objective function represents a risk-adjusted objective, expressed by E(R) – ½ k Var (R). The first effect of this modification is the inadequacy of expected value estimates, so that variance and covariance estimates must be obtained. The second result is that portfolio effects are obtained. Diversification reducing the portfolio variance without decreasing the expected return leads to superior allocation of capacity between alternative agents. This can lead to removal of some of the secondary constraints in the linear formulation, inserted to achieve diversification effects on an ad hoc basis. Again, shadow pricing information can be obtained from any constraints imposed, leading to evaluation of the importance of the constraints.

Due to the implications for data gathering and for complexity of solution methods with quadratic programming, alternatives exist in the same spirit. Loss avoidance objectives are often formulated in portfolio theory and allocation models. These lead to more subjective results based on parameter estimates. Another alternative is chance-constrained programming. Also, it is important to consider the replacement of expected revenues for each activity with certainty equivalents (CE). The impact of using the CE, however, is to return to a linear structure that would require additional constraints to avoid a degenerate solution based on the highest CE. One obvious constraint links relatively certain sales under allotment to overhead and variable costs; that is, the set of allotment sales should cover the total overhead (FC) and variable operating costs (VC) associated with those sales. This would appear as:

$$\sum_1^4 CE[A_j P_{Aj}] \geq FC + \sum_1^4 CE[A_j VC_{Aj}] \quad \text{or} \quad \sum_1^4 CE\,[A_j\,(P_{Aj} - VC_{Aj})] \geq FC$$

where the requirement to cover FC could be proportionately reduced as a policy choice. One should recall, however, that CEs are linked in theory to the principle of portfolio diversification in a liquid market; financial market conditions would not apply to a hotelier's decision.

Inputs required for the model include distributional estimates for demand quantities and price predictions, as well as cost information presumed to be easily determined. Assuming a normal demand curve for most periods, the quantities are then contingent on the prices set by the hotelier on the basis of own data and

information on competitors' actions, as well as data on aggregate demand, to yield a competitive but profitable rate[11]. Elasticity occurs around the market-clearing price, so that larger price increases or cuts probably cause informational problems in identifying the correct market segment.

One factor overlooked by this analysis is the secondary effect on free sales and walk-in sales of allotted capacity. Other issues that can be addressed by the hotel, given the seasonal nature of demand, are enhancement of the value of low season capacity by packaging, and whether to "mothball" capacity in low season. The first issue is basically a capital budgeting decision, in that the addition of other features to the standard room will involve an entry cost – whether high due to construction of additional facilities, or low due to effort of arrangements with other suppliers to combine services in a package. "Mothballing" also involves a fixed cost, which may be analyzed again by capital budgeting, but may involve a real options or decision tree approach. A further issue is the option to expand capacity in the face of rising demand or insufficient capacity. This also has been addressed by real options and decision tree analysis.

The intermediary's allocation

In contrast to the supplier, a travel intermediary faces two uncertainties – those of supply and those of demand. The intermediary is again concerned with maximizing revenues through a number of contracts with various suppliers permitting mark-up and sale to clients, these latter having a reasonably predictable demand distribution. The only capacity issue is the intermediary's ability to obtain capacity by allotment and free sale. The issues discussed above suggest that the intermediary enjoys greater access to clients than individual suppliers would. This implies that the intermediary has a higher capacity for the risk of unfilled demand. The hotel has a fixed supply, which then translates into a pre-determined break-even point, after having made an initial scale decision that risks loss of sales; the intermediary, on the other hand, has the added flexibility of contracting for a fixed supply through allotments but retaining the opportunity to sell additional capacity when required and available. Elements include the amount of committed capacity on an annual or even seasonal capacity (in contrast to the hotelier's infrequent decision to change scale and at higher fixed cost), the option of identifying free capacity and selling it on incremental demand (similar to

the hotel case), the risk of having no source of supply for identified demand (analogous to the capacity restriction of the hotel, but instead adjustable by contract terms over time), and access to a potentially vast market by website and internet advertising (at a cost that may be excessive for smaller hotels).

The intermediary's problem is to determine the amount of capacity to control by firm allotments, as a percentage of the total predicted volume of business. In principle, this decision hinges on an expected value trade-off between the profit margins anticipated from allotment versus free sales and the expected losses from unsold allotments. To illustrate an approach to determining this result, let:

A = no. of allotted units

C_A = cost of an allotment unit

R_A = sales revenue from an allotment unit

F = no. of free sale units

C_F = cost of a free sale unit

R_F = sales revenue from a free sale unit = R_A = R

D = demand for units

G(D) = probability distribution of demand D

$H(F \mid D)$ = conditional probability of available free sales given demand

The intermediary will receive (D R – A C_A) if demand is below the allotted units (D<A). If demand exceeds the allotted amount, the intermediary receives (A + F) R – (A C_A+ F C_F), where demand is lost if free sales fail to cover the difference (F < D – A). The intermediary's objective is to choose A (firm allotment contracts) to maximize: Total expected revenue =

$$\int_0^A (DR_A - AC_A)dG(D) + \int_A^\infty \int_0^{D-A} [A(R - C_A) + F(R - C_F)]dH(F|D)dG(D)$$

which can further be complicated by risk aspects as well as demand curve adjustments. This single objective is repeated for different market segments (class and location) and for different periods with varying demand curves, as well as requiring linkage between periods for allotments that span them. The key problem in addressing this is to obtain good estimates of the demand curves. Since the solution of this problem is relatively mechanical, we leave this to a separate study, but note that the solution involves various marketing and contractual issues, including price elasticity, reputation, marginal costs, embedded options and portfolio effects.

7. Summary

The problem faced by the operators of tourist facilities is primarily that of demand uncertainty based on random factors exacerbated by insufficient information. Thus the suppliers of capacity are held hostage by large intermediaries with greater access to this information and greater potential to process it. Large international hotel chains overcome this problem by virtue of their scale and ability to deal directly with clients and analyze their own data. Market structure creates powerful incentives to under-price the product. Forward sales of capacity through commitments are made at contract prices surrendering much of the potential profits from consumer surplus. Independent local hotel operators, even of moderate size, are forced by the absence of direct marketing channels and the risk associated with a lack of guaranteed sales to sacrifice profits to intermediaries. Over-capacity in off-peak seasons reinforces the market power of large intermediaries enjoying oligopsony benefits.

The creation of a more liquid market for contracts in future sales would permit operators to hedge demand uncertainty and retain more of the profits. Similar facilities in other industries serve to eliminate much of the informational frictions allowing intermediaries to offer services besides basic transactional functions. The creation of formal markets in standardized tourism units, analogous to commodity and financial futures markets, would be a major step; yet this is unlikely to be a short-term development, and would also require centralized support for an international project.

A low-cost and more immediate solution to the value transfer problem lies in online intermediaries who can serve the interests of domestic hotel operators. It also is a purely private sector initiative, resulting in a greater domestic retention of revenues generated by the industry. Besides offering a profitable line of business to the intermediaries, it is to be expected that some share of value would be captured by the actual capacity suppliers themselves. Some of the benefits would be obtained through exploitation of the databases that would be maintained by an online intermediary. Two avenues for improving tourism profits are analytical solutions to capacity utilization using statistical output, and development of demand balancing packages by analysis of unique capacity aspects and of demand characteristics.

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4. Tourist Authority of Thailand (TAT – 2003) Target Of Tourism In Thailand 1995-2004, see website: http://www.tat.or.th/stat/web/static_index.php

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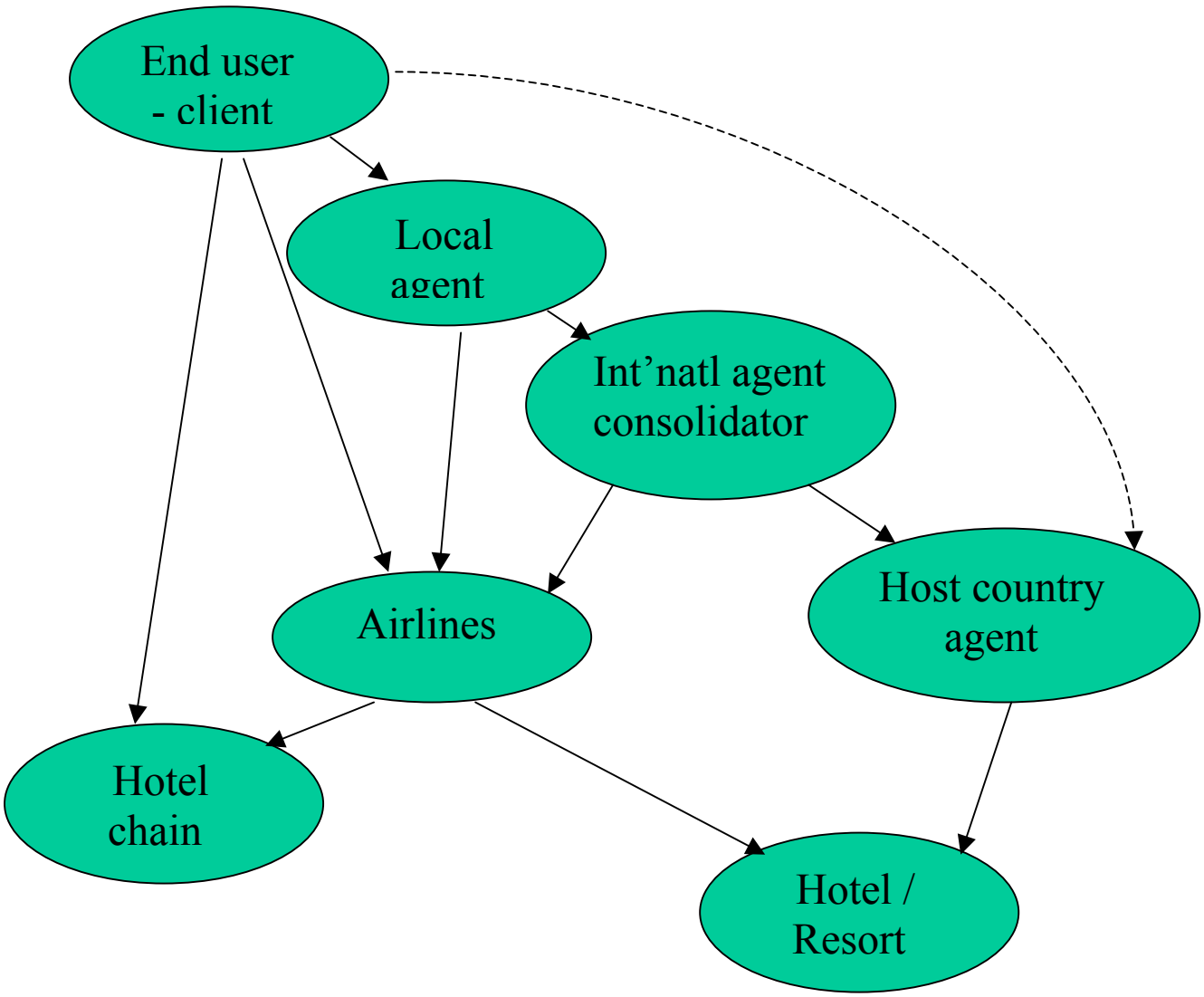
Diagram: Travel Industry Chain



[1] See the TAT website (4) for statistics and estimates for future growth.

[2] See UNEP report (5) for descriptions of economic effects and leakage.

[3] Since the production of such advertising is both costly and difficult to retain as proprietary on websites, this activity should probably be undertaken by the TAT as an alternative to standard promotional techniques.

[4] Informational asymmetry issues in the tourism industry are contained in Hoontrakul (2).

[5] Supply management is another issue. In order to protect the supplier and guarantee future capacity, governments limit either the number of suppliers or the capacity of individual suppliers. One mechanism for this is to grant licenses for levels of production, with the dubious result of making the license for a unit of output worth more than the actual production facility for that unit.

[6] An excellent academic study of the contractual and option aspects pertinent to the tourism and related industries is contained in Spinler (3).

[7] The credibility of the hotel in securing working capital loans from banks is also enhanced by the reputation of the intermediaries as dependable sources of later income. Issues of working capital and timing of payments are of secondary importance to the study of contractual terms.

[8] The term "allotment" is used in the travel industry to refer to the allocation of hotel capacity to an agent on a reservation basis. This report use the term more loosely for both option and forward terms.

[9] The solution presented here is illustrative of the approach; note that the formulation is described as being primarily degenerate until enough real characteristics of the problem are added.

[10] These constraints, however, do not capture the flexibility features of actual contracts, allowing inter-periodic transfers.

[11] Recent experience indicates that cutting prices to attempt to attract demand that has been curtailed by negative factors (SARS, terrorism, etc.) is counter-productive; lower prices may send signals of lower quality or a reduction in the expected enjoyment from the rental. Offers of complimentary services or added packed features lead to higher profits and maintenance of reputation, while retaining margins.