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Regulation and Taxation of Casinos under State-Monopoly, Private Monopoly and Casino Association Regimes

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Abstract

This paper considers alternative forms of regulation and taxation of the casino sector. The model considers the situation of a typical tourist destination country that is using casinos to attract and entertain foreign tourists. The objective is to invest in the sector efficiently while maximizing the amount of government revenue or profits accruing to the country. The regulator must determine how the price of gambling will be set, how many casinos will be allowed to enter the industry and the form and rates of taxation. Four alternative forms of regulation are considered: price regulation, state-owned monopoly, private monopoly and casino association regulation. Turnover taxes on the amount of funds gambled and also annual taxation of the fixed costs of the casinos are evaluated. Applications of the models are carried out for North Cyprus. The conclusion is that the economic efficiency costs and the revenue losses from the absence of effective regulation in these tourist destinations can be very substantial with welfare costs equal to the approximately 75 percent of the tax revenue generated by this sector.
Furthermore it shows that while a tax on turnover can be efficient in the case of a competitive industry or a cartel association form of regulation, it will be distortunary if a private monopoly is controlling the sector. In contrast a tax on fixed costs will lead to an efficient result in the case of a competitive or private monopoly cases, but it will lead to allocate inefficiencies if the sector is regulated by a casino association that can only control the number of casino entering the sector.

Keywords: Casino regulation, taxation, state-monopoly, welfare cost.

Jel Codes: H21, H32

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Introduction

The economic, fiscal and social impacts of lotteries have been widely studied (Clotfelter and Cook, 1987; Glickman and Painter, 2004; Paton, Siegel and Williams, 2004). However, to date very little economic analysis has been done on the structure and regulation of the casino sector. Most of the research that has been done has concentrated on issues such as their economic spillover effects on other sectors in the community (Eadington, 1999; Fink and Rock, 2003; Henrikson (1996); Gazel, 1998). The problems associated with casinos such as money laundering and the social cost of compulsive gambling have been given considerable attention (Roach, 2003; Nicaso, 1998). The determinants of the demand for casino gambling have been estimated with considerable care by (Thalheimer and Ali, 2003). Recently the legal tax structure of different jurisdictions in the USA has been studied (Anderson, 2005).

In this paper we wish to examine how the different regulatory and taxation regimes affect the benefits that casino tourism can give to a country and the economic costs it will incur to develop and operate this sector. We examine the situation of a tourist destination where casinos are built to attract and entertain tourists. In many such tourist destinations such as the Dominican Republic, Belize and North Cyprus there is virtually free entry into the sector provided the casino is willing to pay the license fees and other taxes. Often these countries have promoted the development of casinos as a way to attract foreign visitors. To simplify the analysis it is assumed that the local residents are prevented by law from gambling, hence there are no social costs associated with compulsive gambling that needs to be consider in the economic welfare

calculations[1]. Furthermore, there is also no economic welfare cost to the country from losses in consumer surplus because such losses are borne by foreign residents whose welfare is not included in that of the tourist destination country. In this situation the economic policy questions facing the government relate only to the economic resource costs incurred to develop and operate the sector, and the quantity of taxes paid to the government.

For the regulation of the casino sector under these circumstances there are three important economic issues that need to be settled. First, how many casinos should be allowed to operate in the sector? Second, what will be the share that the casino will take from the amount of money gambled?[2] Third, how would the government obtain revenues from the casino sector?

Due to either the rules of the games, or frequently through to price regulation by the government, there is a minimum placed on the share that the casino keeps from the amount gambled. Hence the "price" charged to the gamblers by casino industry, P, is not allowed to fall to its competitive level where for each casino the price would be equal to the casino's marginal cost (MC) at its point of minimum average cost (AC). Usually the price charged for gambling will be set well above the minimum average costs of the casino. If there is free entry into the sector new casinos will have an incentive to enter until P=AC for the last casino entering the industry, hence, the profits of the marginal casino will be equal to zero and each will be operating at a volume of business will below that level that would reflect the casinos' point of minimum average costs.[3]

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[1] Local residents are by law not allowed to gamble in casinos in North Cyprus. At one time this was also the law in the Dominican Republic.

[2] In this paper we refer to this variable as the "price" of gambling.

[3] This also explains why in both the Dominican Republic and North Cyprus one sees many applications being made to license new casinos, while at the same time some existing casinos are going bankrupt. This is similar to the situation discussed by Mankiw, N. G. and Whinston M. D. (1986) Free Entry and Social Inefficiency, *The Rand Journal of Economics*, **17**, 1, 48-58

In this paper we first construct a model of a casino sector with these characteristics, which are broadly descriptive of the situation in tourist destinations such as North Cyprus or Belize. For practical purposes free entry is allowed into the casino sector in these jurisdictions, but the price of gambling is set well above their competitive levels. To simplify the analysis, it is assumed that each casino's cost structure is identical.

The outcomes of this model are compared with those if the price of gambling is set competitively. Expressions are developed to measure the economic efficiency costs (WC) incurred by a country if it allows free entry of casinos into the industry, while simultaneously maintaining the price of gambling above its competitive level. It is clear that the economic efficiency losses of such a situation are very substantial.

A number of approaches to correct the situation are considered. The first approach is to use a turnover tax on the amount gambled. The turnover tax is set to maximize the tax revenues for the government. In this model if no other distortions exist in the country this would also be the optimal tax in terms of the overall welfare of the country.

Due to the practical difficulties of actually being able to administer such a tax, a series of other options for regulating the sector are examined. The first strategy is to institute a government monopoly over the sector that strictly controls the entry of casinos and sets the price charged for gambling at its profit maximizing level. We find the profit maximizing outcome of this model is identical to the results obtained by the previous case where an optimal turnover tax is levied on the activities of the casino where they are organized as a set of private operators along with free entry into the industry The profits of the state-owned monopoly, however, can be transferred much easier to the Treasury than can a turnover tax be administered. The main problem with a state-owned system of casinos is the risk that the state might not be able to run the casinos in an efficient manner and in a style that makes them internationally attractive to tourists.

To overcome this weakness, the situation is then examined if the casino industry were turned over to a private operator to run the individual casinos as a multiplant monopolist. The government then extracts revenue from the single operator by using either a turnover tax or a tax on annual fixed costs. If the government has to only deal with a single private operator, some of its tax administrative problems with taxation may be alleviated. The private operator determines the "price" charged by the casinos, the quantity of gambling allowed in each casino and the number of casinos in the industry. In this case an economic efficiency loss is created by the turnover tax, but not by the tax on fixed costs. The size of the efficiency less of the turnover tax will also be larger if it is a foreign investor operating the casino than if it is a private domestic operator.

A model is then developed for a situation where the government sets the "price" of gambling that would maximize gambling profits under a state monopoly, but turns over the regulation of the sector to an association of casino operators. It is assumed that the association can strictly control the number of casinos allowed to enter the sector in order to maximize the profits of their members, but the association can not control how much gambling is done within each casino.

In this case we find that each casino operator will try to expand to the point where the short-run marginal cost of the casino is equal to the regulated price. The result is that each casino will be operating at a greater volume than the quantity that would minimize its average costs. As a consequence there will be too few casinos operating in the industry and each one will operate at an inefficient level of capacity. When taxation is imposed on the operation of casino in this situation we find that the turnover tax reduces the level of economic inefficiency, while the tax on fixed costs results in a substantial economic loss if the tax is levied at its revenue maximizing level.

The theoretical models developed in the paper are evaluated using data from the casino tourism sector of the North Cyprus. The quantitative estimates of the economic losses suggest that they can be very substantial. For example with the present form of regulation in North Cyprus it is likely to result in an annual economic efficiency loss of up to 40 percent of the annual fixed costs of the sector.

I. Equilibrium in the Casino Sector with Free Entry and Price of Gambling Set by Regulation

In the first model we consider it is assumed that the price of gambling is set by the authorities at a rate of (s) percent of the amounts of money gambled. Owners and operators of casinos are free to enter the sector, provided they pay an annual tax on their fixed costs of T* and a turnover tax at a rate of t* on the amount of money gambled.

For the purposes of this analysis, the total cost function for our typical casino is assumed to take the following form,

(1) TC= $cq^2 + bq + t^* q + K(1 + T^*)$,

where q is the volume of gambling, K is the annual amount of fixed costs, t* is the rate of turnover tax and T* is the rate of tax on the annual fixed costs. From (1), average costs can be expressed as,

(2) AC= $cq + b + t^* + \frac{K}{q}(1 + T^*)$.

Suppose the price of gambling, P, or the share the casino is able to keep for itself from the total amount of money gambled, is set by regulation at a rate of s above the competitive price. In this situation the casinos will enter the sector until the average costs of the least profitable casino will be equal to s. In equilibrium with free entry and zero profits,

(3) AC= s.

In these circumstance the level of gambling carried out in each casino, q = q_0 will be determined by substituting s for AC in equation (2) and solving for the volume of gambling per casino q.

(4) $$q_0 = \frac{s-b-t^*}{2c} - \frac{\sqrt{(-b-t^*+s)^2 - 4cK(1+T^*)}}{2c}.$$

The volume of turnover of each casino, q_0, will be a function of the variables s, t* and T*. In order to determine the number of casinos that will enter and remain in the sector, the demand function facing the industry for gambling must be specified. Considering a tourist destination, it is assumed that the only variable that it can control is the price of gambling P. The total quantity of gambling demanded by tourists attracted to this destination is assumed to be a simple linear function of the price of gambling as given by equation (5).

(5) Q_d =a-fp.

The number of casinos that will enter the market, n = n_0, is found by dividing the total quantity demanded in the market, equation 5, by q_0,

(6) $$n_0 = \frac{2c(a - fs\ )}{(s-b-t^*) - \sqrt{(-b-t^*+s)^2 - 4cK(1+T^*)}}.$$

The total tax revenue paid by the casino sector, TTR, can be expressed as the sum of the turnover tax revenues, t* Q_d , plus revenue from the tax on the fixed costs of each casino, T*K, times the number of casinos, n_0.

(7) $TTR=TR_{t^*}+TR_{T^*}=t^* Q_d +T^*Kn_0$.

This is an inefficient outcome with excess capacity in the sector. With each casino sector operating at a level where s=AC the volume of business done by each casino, q_0, will be lower

than the amount it would be if each casino were operating at a competitive level of output so that average costs were minimized, or where AC=MC. To estimate the amount of economic welfare cost, the competitive output and price needs to be found. This is what we turn to next.

II. Equilibrium in casino market if price and quantity of gambling is determined competitively

Now instead of the price of gambling being set by regulation at s, or by the rules of the game at a level above the industry's competitive level, we now wish to derive q and n for a situation where the price of gambling P is assumed to be determined competitively by the casino industry at P_c. It will now be the case that for every casino P_c=AC=MC. Using the total cost function (1) we can derive the marginal cost function as:

(8) MC= $2cq + b + t^*$.

In a competitive market, each casino would be operating at a level where,

(9) P=MC= AC, hence, equating (2) and (8)

(10) $$2cq + b + t^* = cq + b + t^* + \frac{K}{q}(1 + T^*),$$

and solving for q we have,

(11) $$q_c = \sqrt{\frac{K(1+T^*)}{c}}.$$

If T*=0 then

(12) $$q_{c'} = \sqrt{\frac{K}{c}}.$$

Now to determine the competitive price for casino gambling, we substitute equation (11) for q in the marginal cost function (8) because the competitive casino will set P=MC, hence

(13) $P_c = b + t^* + 2c\left(\sqrt{\frac{K(1+T^*)}{c}}\right) = b + t^* + 2\sqrt{cK(1+T^*)}$.

By substituting equation (13) for the price into the demand function facing the industry, equation (5), we have,

(14) $Q_d^{'} = a - f(b + t^* + 2\sqrt{cK(1+T^*)})$.

With free entry and the zero profit condition for the marginal casino, the number of casinos, $n_c = Q_d^{'}/q_c$ can be found by substituting (14) for $Q_d^{'}$ and (11) for q_c to give us,

(15) $n_c = (a - f(b + t^* + 2\sqrt{cK(1+T^*)}))/\sqrt{\frac{K(1+T^*)}{c}}$.

At the price determined by equation (13) and the quantity of demand in the market (14) each of the n_c casinos will be operating at their most efficient point where the average cost is minimized. In the absence of taxation the number of casinos (15) can be expressed as,

(15') $n_{c'} = \left[a - f(b + 2\sqrt{cK})\right]/\sqrt{\frac{K}{c}}$.

Economic Efficiency Losses from Non-Competitive Pricing and Free Entry

To evaluate the economic loss created by allowing free entry into the casino sector, we need to compare the average costs of production with free entry (each casino producing at a level q_0) with the average costs of production that would arise if each casino were to operate without tax at its most efficient competitive level of $q_{c'}$. The difference between these two average costs must be multiplied by the total quantity of services demanded, Q_d, in the market at the regulated price. If no taxes are levied on the operation of the casinos, our analysis could stop there. However, if there are taxes levied on the sector, then to calculate the economic loss from allowing free entry we need to deduct the tax revenues of the asset tax, TR_{T^*}, and the tax revenue

from the turnover tax, TR_{t*}, from the differences between the total costs for the industry with taxes if new casinos can enter the market freely and the total costs of all the industry if each casino is operating without taxation at its most efficient level of output, $WC = (TC_c - TC_{c'}) - TR_{T*} - TR_{t*}$. With free entry, equilibrium will be reached where s=AC (3), and TC=AC($Q_d^{'}$). In this case total costs with free entry, identical casinos and a regulated price of (s) is equal to TC=s($Q_d^{'}$).

With competition where the price of gambling will be set so that each casino will be operating at a level of output so that P=MC=minimum AC, hence, TC_c=AC(Q_d)=MC(Q_d). From (8) we then have TC_c= (2cq+b+t*)Q_d. In a non-taxed situation to have MC=AC, we know from (12) that each casino must be operating at a level of output where $q = \sqrt{\frac{K}{c}}$. Substituting for q into the expression for total costs gives us $TC_{c'} = (b + 2\sqrt{cK})\,(Q_d)$. Substituting (14) for Q_d, the welfare cost of arising from setting a regulated price and allowing the free entry of casinos, can be expressed in the presence of taxes as,

(16) WC_c=[s-($b + 2\sqrt{cK}$)](a-fs)-TR_{T*}-TR_{t*}=[s-($b + 2\sqrt{cK}$)] (a-fs)- T*Kn_1-t*(a-fs).

Without taxes the WC is measured as,

(16') $WC_{c'}$=$\left[s - (b + 2\sqrt{cK})\right](a - fs)$.

Comparing the welfare cost with taxes (16) and without tax situation (16'), we find that the welfare cost of the without tax situation is larger. The difference is exactly equal to the tax revenue collected. Without taxation casinos will keep entering the sector until all the profits are spent on the costs of creating excess capacity in the industry.

Because of the assumption that only tourists gamble in the casinos, and taking a national perspective in the estimation of welfare costs we can disregard the consumer surplus losses inflicted on the foreign gamblers because they reduce the quantity of their gambling because $s>P_c$. In these circumstances, the economic welfare costs can be estimated by evaluating the loss in tax revenues to the government.

From either equation (16) or (16'), we can see that the combination of a regulated price of s, set above the competitive price of P, along with free entry into the sector will result in excess capacity in the sector and to a waste of economic resources.

An Evaluation of the Welfare Costs of Price Regulation with Free Entry into the Casino Sector of North Cyprus

With a total population of 200,000 souls, North Cyprus is home to 22 casinos. The market for the casino services is focused exclusively on the tourists visiting the state, primarily from Turkey, the UK and recently South Cyprus. The illustrative parameter values used in the following estimations of the revenue and welfare implications of current policies are based on a set of cost parameters for a typical casino operating in North Cyprus that were developed from the information obtained from public records and through interviews of casino owners and operators.

After estimating the values of the fixed cost in terms for a typical casino, K, is approximately US$ 572,000 per year.[4]

[4] It is estimated that the investment costs for the equipment in a typical casino with 4 roulette tables, 5 gaming tables and 85 slot machines is approximately US$ 520,000. Casino decorations, kitchen, equipment and vehicles bring the total investment costs (excluding the buildings) for such a casino to US$ 832,000. If an annual real user cost of capital of 15 percent of the value of these assets is assumed, the annual cost of these assets would be US$ 124,800. The rental cost of the building is estimated to be approximately US$ 52,000 per year. The annual cost of the utilities

The variable costs associated with the volume of gambling done in a North Cypriot casino are primarily associated with marketing efforts to attract gamblers, including the subsidization of the transportation costs from Turkey to North Cyprus, the cost of food, drinks and entertainment provided by the casino, and some variable labor costs needed to run the casino at a higher level of utilization. The pattern of marketing costs incurred to attract gambling to the casinos from Turkey also provides an empirical basis for the form of the total cost function that is assumed. Marginal costs eventually rise as the volume of gambling increases in a casino because of the declining marginal effectiveness of the promotional expenditures made to attract gamblers to the casino.[5] If approximately US$ 10 million is gambled each year in a typical casino, then the parameter values of 0.006 for b and 0.0004 for c results in a total variable cost of about US$ 100,000, an amount that is approximately what is observed.

The taxation system in North Cyprus consists of a set of asset taxes on the machines, and tables, plus an annual license fee of US$ 125,000 per year. For our hypothetical casino, this amounts to US$ 226,050 per year or a rate of T on fixed costs equal to 0.395.

In addition, there is a tax on the gross revenues of the casino that translates into a rate of t on turnover of 1.5 percent. In summary, the parameter values of the variables used in the model used to illustrate the situation for North Cyprus are:

K = US$ 572,000, c = 0.0004, b = 0.006, T = 0.395, t = 0.015.

Substituting these parameter values into equation (1), the total cost function becomes,

$TC = 0.0004q^2 + 0.021q + 0.798$.

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amounts to approximately US$ 31,200 per year, and the fixed labor cost associated with the operation of such a casino is approximately US$ 364,000 per year.

[5] Casino operators report that as they increase their promotions offering "free" airfares to potential tourists from Turkey to gamble in the casinos of North Cyprus, the proportion of people who accept their offer but spend large amounts of time on the beach increases.

If s = 0.10, and free entry occurs until zero profits are being earned, then using equation (4), the equilibrium quantity of turnover for each casino will now be:

q_0 =US$ 10.64 million.

At the present time there are 22 casinos in North Cyprus. From the estimations above of q_0 the turnover of each casino is US$ 10.64 million per year. Hence, the total quantity of the gambling services demanded from the 22 casinos in the market demand for gambling Q^d must be approximately US$ 234.08 million. With this volume of gambling the total annual tax revenue from the 1.5 percent tax on turnover, (TRt), (equation 7) is therefore TRt = US$ 3.51 million/year. The total annual tax revenue (equation 7) from the tax on fixed costs, TR_T= $T(K)n_0$= US$ 4.97 million/year. The total tax revenue estimated by this model is therefore approximately US$ 8.48 million per year. This estimate is close to the actual revenues collected from casino sector in North Cyprus in 2004 of US$ 8.13.

Welfare Cost of Casino Sector Operating with Regulated Price, Free Entry, Turnover Tax of t* and Assets Tax T*

For the competitive case, from (12), the total turnover of the amount gambled in a casino per year would have been $q_c = US\$37.82$ million. The minimum competitive AC_c or the competitive price without taxes would be equal to 0.036. Substituting the above values for s, AC_c, Q'_d, TR_T and TR_t into (16), the annual welfare cost of the existing taxation system for casinos in North Cyprus is estimated to be US$ 6.44 million per year. If there were no taxes levied on the casino sector then the welfare costs as expressed in (16') would be even greater, equal to US $14.98 per year. The economic cost of the present organization of the sector at US $6.44 million per year introduces a great deal of economic costs into a small economy, and is

equal to approximately 0.5 percent of GDP per year. In the remainder of this paper, we consider a series of possible options for regulation of the casino sector under such circumstances.

III. Turnover Tax is levied on all Casinos to Maximize Tax Revenue

Now suppose that the government decides to set the rate of tax t such that it maximizes the quantity of tax revenues that can be extracted from the sector. The casinos in this situation would set the price of gambling equal to the net of tax marginal cost, MC_n, plus the rate of turnover tax t. Because of competition and free entry into the sector each casino would need to be operating where the net of tax marginal cost, MC_n, is equal to the net of tax average costs, AC_n, in order for the sector to be supplying the services efficiently. This implies that, the gross of tax price of gambling charged to the casino customers will be equal to the minimum net of tax average cost plus the turnover tax. From (2) and (8), we have

(17) $P = MC_n + t = AC_n + t$.

The total quantity demanded will be determined by the demand function given in equation (5). Applying the turnover tax of t to the total quantity of gambling demanded Q_d, the total tax revenue TTR is expressed as,

(18) $TTR=tQ_d$.

Substituting equation (17) into equation (5), we have,

(19) $Q_d=a-f(MC_n+t)$.

Substituting equation (19) into equation (18) for Q_d we have,

(20) $TTR=t(a - fMC_n - ft)=ta - tfMC_n - ft^2$.

To find the tax rate that will give the maximum total tax revenue we set the marginal tax revenue from a change in the tax rate equal to zero,

(21) $$\frac{\partial TTR}{\partial t} = a - fMC_n - 2ft = 0 .$$

The revenue maximizing tax rate is found to be,

(22) $$t = \frac{a - f(2\sqrt{CK} + b)}{2f} = \frac{a}{2f} - \frac{b}{2} - \sqrt{cK} .$$

Given the rate of t from (22) and substituting it into equation (13), while setting T*=0, we find that the price charged when t is at its revenue maximizing level is,

(23) $$P = \frac{a}{2f} + \frac{b}{2} + \sqrt{cK} .$$

The total tax revenues can be calculated by substituting equation (22), (19) and (23) into equation (18),

(23') $$TTR = \frac{a^2}{4f} + \frac{b^2 f}{4} - \frac{ab}{2} - a\sqrt{cK} + fb\sqrt{cK} + fcK .$$

Estimation of Tax Revenue of Revenue Maximizing Turnover Tax using Parameter Value for North Cyprus

In order to estimate the revenue maximizing tax it is necessary to specify the parameters of the demand function (5) for casino gambling in North Cyprus. Following Thalheimer and Ali (2003) the values of (a) and (f) in equation (5) were selected to give a price elasticity of demand for casino gambling of -1.0 at the current price of 0.10 and a total quantity of gambling of US$ 234 million. To obtain this result a is set equal to 468 and f is set equal to 2340.

Substituting these values for a and f into equation (22) along with the values specified above for the other variables, we find the revenue maximizing rate of turnover tax would be 0.082. This would cause the price of gambling (23) rise to 0.118. The total tax revenue (23')

therefore becomes equal to 15.686 million per year. Hence, with these parameter values the maximum tax revenue is approximately 90 percent more than the 2004 tax revenue of US$ 8.13 million per year.

Setting the turnover tax t at its revenue maximizing level while letting the casino sector operate competitively with free entry, would seem to be a straight forward way to maximize the country's welfare. While being theoretically correct, the practical administration of such a tax is another matter.

Due to the nature of the casino sector, there are many ways for casino operators and clients to evade and avoid a turnover tax on the amount of funds gambled. Side betting is only one such avenue of evasion. As a result, a number of jurisdictions have had to resort to other forms of regulation in order to obtain revenues and to have an efficient operation of the industry. Some of these forms of regulation are considered below.

IV. Regulation by Public Ownership of Casinos

In some jurisdictions the casino sector is a state monopoly, such as in Monaco and the Province of Ontario, in Canada[6]. Alternatively a single gambling license is given to the private entrepreneur to operate the sector as a private monopoly such as in Malaysia and Macau. Having a state monopoly does not mean that there is just one casino. It is common to have a number of casinos that are geographically dispersed. Either the government or the monopolist will operate

[6] The Ontario Lottery and Gaming Corporation is a Government of Ontario Crown agency which is responsible for the province's lotteries, charities and Aboriginal casinos, commercial casinos, and slot machines at horse-racing tracks.

the industry like a multi-plant monopoly. In this case the monopolist, in order to maximize profits, will operate each casino at a level of output where its average costs are minimized, equation (12). If there are no taxes, t*=0, T*=0, the expression (8) for marginal costs becomes,

(24) MC=b+2cq.

Now substituting equation (12) for the value of q in (24) gives us the long-run marginal cost of the casino industry to be,

(25) MC= $b + 2\sqrt{cK}$.

Considering the demand for casino services equation (5) and expressing the state monopolist price P^m as a function of the quantity demanded gives

(26) $P^m = \frac{a}{f} - \frac{Q^d}{f}$.

The total revenue of the sector, TR, is equal to P^mQ^d or

(27) $TR = \frac{a}{f}Q^d - \frac{Q^{d^2}}{f}$,

and marginal revenue is,

(28) MR= $\frac{\partial TR}{\partial Q^d} = \frac{a}{f} - \frac{2Q^d}{f}$.

For the state monopolist to maximize its overall profits, it will produce output for sector up to the point where MR=MC for the industry.

Equating (28) and (25), we find the quantity of casino services that the state monopolist would supply Q_s^m, expressed as,

(29) $Q_s^m = \frac{f}{2}(\frac{a}{f} - b - 2\sqrt{cK}) = \frac{a}{2} - \frac{b}{2}f - f\sqrt{cK}$.

The profit maximizing price s=P^m charged by the state monopolist is found by equation $Q^d = Q_s^m$ and substituting the expression for the quantity supplied by the monopolist, Q_s^m, into the industry demand (26) gives,

(30) $$P^m = \frac{a}{2f} + \frac{b}{2} + \sqrt{cK}\,.$$

Here we find that the expression for the price charged by the monopolist (30) is the same as the expression for the price charged (23) to the customers when a revenue maximizing turnover tax is levied.

The number of casinos allowed to operate will be found by dividing Q_s^m by $q_{c'}$ of equation (12). The value of $q_{c'}$ is the output that minimizes the average cost of a casino operation.

(31) $$n^m = \frac{a/2 - b/2\, f - f\sqrt{cK}}{\sqrt{K/c}}\,.$$

The profits of the casino sector will then be equal to the difference between P^m and AC^m times the quantity of services demanded and supplied, Q_s^m .When taxes are set to zero the average costs from (2) for each casino operating at a quantity of $q_{c'}$ will be equal to

(32) $$AC^m = 2\sqrt{cK} + b\,.$$

Using P^m from equation (30) and AC^m from equation (32) along with Q_s^m from equation (29), the profits of the sector can be calculated as,

(33) $$\pi = (P^m - AC^m)Q_s^m = \frac{a^2}{4f} + \frac{b^2 f}{4} - \frac{ab}{2} - a\sqrt{cK} + fb\sqrt{cK} + fcK\,.$$

By comparing equations (33) and (23') we see they are identical. The maximum level of profits that can be generated by a state monopolist is identical to the maximum amount of

revenue the government could obtain by levying a turnover tax on the operations of a competitive casino industry. Hence the maximum profits of a government run casino monopoly in this case will be equal to US$ 15.686 million. Again the price of gambling will be 11.8 percent of the total gambling turnover of US$ 191.585. The number of casinos (31) that can supply the quantity demanded at least cost will now be reduced to 5.06.

V. Casino Industry Controlled by Private Monopoly

Suppose instead of the government operating a state monopoly it turned over the casinos to a single private operator, who operated the casinos as a monopoly in a manner so as to maximize its profits. It is also possible that the private casino company that will end up running the casinos, may be foreign owned. In a number of countries, the casinos are run by one or more foreign operators: For example, the casinos in Belize are run by Turkish companies as are also many of the casinos in North Cyprus. Many of the casinos in the Dominican Republic are also foreign owned. In the analysis that follows we want to consider the economic efficiency of the sector from the point of view of the host country if the private operator is a resident of the country or if it is a foreigner.

Turnover Tax Levied on Private Monopolist

Assume that the government now obtains its revenue from the private monopoly through a turnover tax on the volume of gambling. As a multi-casino monopolist it will equate its marginal revenue with the industry's long-run marginal cost, inclusive of the turnover tax. The industry's long-run marginal cost will be equal to the minimum average cost of the identical

casinos inclusive of the turnover tax. With the imposition of the tax, the MC (inclusive of the tax) will increase, output will be decreased and the gross of tax price charged to gamblers will be increased. As a consequence the quantity of gambling demanded would fall. If the government were to set the rate of turnover tax so as to maximize its revenue then it needs to take into consideration the fact that as the tax is raised the quantity of gambling would fall. Hence, there is a joint maximization where the maximum tax revenue is obtained given the constraint that the profit maximizing monopolist will be adjusting its industry output so that the long-run marginal costs of the casino industry inclusive of the tax is equal to the marginal revenue it receives. At this quantity supplied by the industry the price charged will be denoted as P_2^m.

With a tax on fixed assets of zero and a turnover tax of t the quantity of gambling supplied by a typical casino will be given by $q_{c'}$, (12) the output level that will minimize its average cost. Substituting equation (12) for the quantity of output per casino into the expression for marginal costs (8), we obtain the long-run marginal cost of the industry to be,

(34) MC= $b + t + 2\sqrt{cK}$.

Equating MR (28) with MC (35), we find the quantity of casino services that the private monopolist would supply Q_{2s}^m as,

(35) $Q_{2s}^m = \frac{f}{2}(\frac{a}{f} - b - t - 2\sqrt{cK})$.

Applying the turnover tax of t to the total quantity of gambling Q_{2s}^m, the total tax revenue TTR can be calculated as,

(36) TTR=t Q_{2s}^m.

Substituting equation (35) into (36) for Q_{2s}^m, it is found that,

(37) $\text{TTR}=\frac{ta}{2}-\frac{tbf}{2}-\frac{t^2 f}{2}-tf\sqrt{cK}$.

To calculate the tax rate that will maximize the total tax revenue, the marginal tax revenue is set equal to zero,

(38) $\frac{\partial TTR}{\partial t}=\frac{a}{2}-\frac{bf}{2}-tf-f\sqrt{cK}=0.$

The revenue maximizing rate of t is found to be,

(39) $\text{t}=\frac{a}{2f}-\frac{b}{2}-\sqrt{cK}$.

The profit maximizing price P= P_2^m that will be levied by the private monopolist is found by substituting the expression for the quantity supplied by the monopolist, Q_{2s}^m, into the industry demand (26), and setting $\text{Q}^{\text{d}}=Q_{2s}^m$ as follows:

(40) $P_2^m=\frac{a}{2f}+\frac{b}{2}+\frac{t}{2}+\sqrt{cK}$.

Given the rate of t from (39) and substituting it into equation (40), P_2^m can be expressed as,

(41) $P_2^m=\frac{3a}{4f}+\frac{b}{4}+\frac{\sqrt{cK}}{2}$.

As long as t is positive P_2^m will be greater than the price P^{m}, charged by the state-owned monopoly (30).By dividing Q_{2s}^m by $q_{c'}$ of equation (12), we can find the number of casinos in the sector. The value of $q_{c'}$ is the output that minimizes the average cost (inclusive of taxes) of a casino operation.

(42) $n_2^m==\frac{\frac{a}{2}-\frac{bf}{2}-\frac{tf}{2}-f\sqrt{cK}}{\sqrt{\frac{K}{c}}}$.

Comparing (42) and (31), we see that due to the $-\frac{tf}{2}$ term in (42) there will be fewer casinos operating in the sector if a private monopoly is controlling the sector in the presence of a turnover tax, then would be operated by a state-owned monopoly.

The profits of the casino sector will then be equal to the difference between P_2^m and AC_2^m times the quantity of services demanded and supplied, Q_{2s}^m. Average costs inclusive of tax for each casino operating at a quantity, $q_{c'}$, will from equation (2) be equal to

(43) $AC_2^m = b + t + 2\sqrt{cK}$.

Using P_2^m from equation (41) and AC_2^m from equation (43) along with Q_{2s}^m from equation (36), and t from (39), the profits of the sector can be calculated as,

(44) $\pi = (P_2^m - AC_2^m)Q_{2s}^m = (\frac{a}{4} - \frac{bf}{4} - \frac{\sqrt{cK}}{2} f)(\frac{a}{2f} - \frac{b}{4} - \frac{\sqrt{cK}}{2})$.

(45) Total tax revenues, TTR, will be equal to tQ_{2s}^m.

In this situation, WC can be calculated as follows,

(45') $\text{WC}=\left[\left(P^m - AC^m\right)(Q_{3s}^m - Q_{2s}^m)\right]/2$.

Estimations of Price of Gambling Sector Output, Number of Casinos, Revenues and Welfare Cost using Parameter Values for North Cyprus

Applying the parameter values specified above for north Cyprus, we find that the profit maximizing output, Q_{2s}^m, for the sector (35) would fall to US$ 95.94 million a year, with the government levying a turnover tax (39) of 8.2 percent and the casinos charging a gross of tax price (41) of 15.9 percent of the amounts gambled. This is close to the 15 percent that the private monopoly casino operator charges in Belize. The optimal number of casino now operating (42)

from the perspective of the multi-casino private monopolist would be about 2.5, with a total profits (44) of US$ 5.84 million. The tax revenues (45) amount to US$ 7.87 million. Overall this system creates a welfare cost (45') of US$ 3.92 million per year. It is interesting to note that as compared to the current situation, the tax revenues from a turnover tax with a profit maximizing private monopolist would be smaller, US$ 7.87 versus US$ 8.16 million, but the welfare cost is much smaller, US$ 3.92 million versus US$ 14.98 million per year. This result arises because the local monopolist is earning profits of US$ 5.84 million a year while in the current situation all profits are eliminated by free entry creating excess capacity and revenue costs.

This estimation of the welfare cost of a private monopoly operating in the sector holds for the case when the private monopolist is a local resident. The profits accrued by the local monopolist will therefore be included positively in the economic welfare of the country along with the tax revenues.

If instead the private monopolist running the casino was a foreign investor/operator then the calculation of the welfare costs changes. If the monopoly profits of the company are assumed to be repatriated abroad by the foreign owned company, then the profits are not an economic benefit accruing to the country. The government of the host country will then be able to count only the tax revenues as a positive benefit to economic welfare from the sector. If this is the case then the welfare cost of the private monopolist to the country is the welfare cost as measured in equation (45) plus the profits of the monopolist that are assumed to be repatriated as measured by equation (44). This results in a total welfare costs of US$ 9.76 million per year. This points out an important policy implications arising from allowing the participation of private foreign investors in the operation of the casino sector of a country.

Tax on Fixed Costs Imposed on Private Monopolist

Another alternative is to levy a tax T on the annual fixed costs of the private casino monopolist but with no turnover tax, t*=0. In this case the monopolist will not see a change in its marginal cost and hence will continue to operate at its most efficient level. This is given as,

(46) MR=MC (without tax).

The private monopolist will maximize its overall profits at the industry output where MR=MC. From equation (35), when t=0, Q_{3s}^{m} can be expressed as,

(47) $Q_{3s}^{m}=\frac{f}{2}(\frac{a}{f}-b-2\sqrt{cK})$.

The private monopolist would set the quantity supplied and the price charged P_{3s}^{m} in such a way as to maximize the profits of the whole sector.

(48) $P_{3s}^{m}=\frac{a}{2f}+\frac{b}{2}+\sqrt{cK}$.

In the situation with a turnover tax of t*=0 and an asset tax T the gross of tax average cost AC^{T} will be equal to the net of tax average cost of each casino AC plus the average tax per unit of output $\frac{TK}{q}$, expressed as,

(49) $AC^{T}=AC+\frac{TK}{q}$.

Profits of the private monopolist will therefore be equal to zero if the asset tax revenues are maximized i.e. $\pi=(P_{3s}^{m}-AC^{T})Q_{3s}^{m}=0$.

Because the tax on fixed cost does not affect the industry's MC, either the price or the quantity supplied, the maximum rate of asset must be such as to leave the monopolist with zero profits, i.e. substituting (48) for P_{3s}^{m}, (49) for AC^{T}, (32) for AC and (47) for Q_{3s}^{m} we find,

(50) $$\frac{a}{2f}+\frac{b}{2}+\sqrt{cK}=cq+b+\frac{K}{q}+\frac{KT}{q}.$$

By substituting $q_{c'}$ into equation (50), T can be found as,

(51) $$T=\frac{a}{2f\sqrt{cK}}-\frac{b}{2\sqrt{cK}}-1.$$

By dividing Q_{3s}^{m} by $q_{c'}$ of equation (12), we can find the number of casinos in the sector. The value of $q_{c'}$ is the output that minimizes the average cost (exclusive of taxes) of a casino operation.

(52) $$n_{3s}^{m}=\frac{\frac{a}{2}-\frac{bf}{2}-f\sqrt{cK}}{\sqrt{\frac{K}{c}}}.$$

We find that the number of casinos operating under a private monopolist subject to a revenue maximizing tax on fixed assets (52) is identical to the number of casinos that would be operated by the state-owned monopolist that was not subject to any taxation but simply maximizing its profits (31). This result comes from the fact that the tax on fixed costs does not alter the marginal costs of the monopolist.

Multiplying the tax on fixed costs (51) to fixed costs of each casino and number of casinos (52), the total tax revenue TTR=TK n_{3s}^{m} can be computed as,

(53) $$TTR=TK\,n_{3s}^{m}=\frac{f}{4}\left(\frac{a}{f}-b-2\sqrt{cK}\right)^{2}.$$

Simulation Results using Parameter Values from North Cyprus

We now find that the optimal quantity of gambling services supplied and demanded (47) doubles from the previous case with the turnover tax to US$ 191.59 per year, at a price of

gambling (48) of 11.8 percent. The price and quantity are the same now as in the case of a state-owned monopoly. The tax on fixed cost that maximizes tax revenue (51) and extract all the economic profits is equal to 5.41 times the annual fixed costs of the casinos. Under this tax regime the total revenues (53) are US$ 15.686 million per year, and the optimal number of casinos (52) are 5.07, the same as in the situation of state-owned monopoly of the casino sector.

In this situation the welfare cost of the private monopolist whether domestic or foreign, will be zero because the level of output produced by each casino is the same as in the competitive case and the numbers of casino operator in the sector are the same.

This case illustrates the dramatic effect that the form of taxation can have on both tax revenues as well as the welfare cost of excess burden of the tax. As we saw previously the turnover tax is potentially efficient tax both in terms of revenue generation as welfare cost when the industry is unorganized with the casinos competing with each other. In contrast, if applied to the turnover of a private monopoly it is highly inefficient in both aspects. In contrast a tax on fixed assets is an effective revenue generation as well as minimizes the efficiency losses created by the monopolized sector.

VI. Regulation by the Casino Association with Price of Gambling set by Government Regulation

Alternative type of regulation of this sector is for the government to turn over the decision making concerning the number of casinos allowed to operate in the market to an association of casino operators. The government would again obtain its revenues only through taxation. In tourist destinations this option may be given serious consideration by a government because it might believe that self regulation from the industry itself might be the best way to promote the tourist sector in the country and to maximize the return to the investments made by the private

sector in the industry. We assume that the price of gambling (s) is set by the government through by regulation at a rate equal to the price it would levy it the industry were being run by a state-owned monopolist, P_2^m. If the price were not set by regulation then the gambling price would be driven down by competition between the industrial casino operators to the familiar Cournot-Oligopoly result.[7]

It is assumed that such a casino association can control the number of casinos allowed to enter the industry. It is reasonable, however, to assume that the casino association would not be able to control the volume of gambling done within each casino. Because the marginal costs of each casino is less than the regulated price s there is an incentive for each of the cartel members to "cheat" and try to expand their level of output to the point where their MC= s. This is the most realistic outcome in the case of casinos where the quantity of gambling is difficult or impossible to monitor by a supervisory "association". In this situation if the casino association maximizes the profits of all its members in total, it would have to restrict further the number of casinos allowed to operate into the sector, because each casino would be operating at a level of output greater than the quantity that would have minimized its overall average total costs. In this case as in the previous one we consider a revenue maximizing turnover tax and later a revenue maximizing tax on fixed costs. First we will consider a revenue maximization turnover tax.

To model the behavior of the casinos under this type of regulation, we begin with the same total cost function as described in equation (1) along with the average cost function (2) and the marginal cost function (8) derived from it. In this case, however, each casino will choose a volume of output q_3 where its MC=s. From (8) we have:

[7] When there are several competing casinos the oligopoly result will be close to the competitive solution.
J. Friedman, "Oligopoly Theory," in K. J. Arrow and M.D. Intriligator, eds., *Handbook of Mathematical Economics*, vol. 2 (Amsterdam:North –Holland, 1982).

(54) MC= $2cq + b + t$ =s,

which gives us,

(55) $q_3 = \frac{s - b - t}{2c}$.

The number of casinos allowed under the casino association regulation is determined by taking the total demand for gambling services in the market as,

(56) $Q_d = a - fs$,

and dividing by q_3, we obtain the number of casinos n_4, that the casino association would allow to operate in the sector.

(57) $n_4 = \frac{2c(a - fs)}{s - b - t}$.

Now the question is what should the rate of tax be that would maximize revenue and lead to an efficient industry? Setting t*=0 and T*=0 we see from (13) that the competitive price in the absence of any taxes is expressed as,

(58) $P_c^{'} = b + 2\sqrt{Kc}$.

If the turnover tax is levied at a rate that is equal to the difference between the regulated price of s and the competitive price of $P_c^{'}$. The rate of turnover tax will capture all of the economic rents that are regulated price or,

(59) $t = s - b - 2\sqrt{Kc}$.

If (59) is substituted for t in (55), we find that the quantity of output of each casino becomes $\sqrt{\frac{K}{c}}$, which is the level of production if the casino sector was operating competitively. The revenue maximizing tax rate will force each casino in order to not make losses to operate at its most efficient level of output where its average costs are minimized.

The total tax revenues are equal to

(60) $TTR=tQ_d$,

or substituting (59) for t, we are able to find TTR as

(61) $TTR=(s-b-2\sqrt{Kc})(a-fs)$.

In this case if the government sets the price of gambling at the same rate it would have changed in the case of the profit-maximizing owned monopoly of 11.8 percent. The revenue maximizing tax (59) becomes 8.2 percent and total tax revenue is US$ 15.686 million per year.

Economic Welfare Cost of Turnover Tax

The welfare cost of the revenue maximizing tax can therefore be estimated as the difference between the total financial costs of the casinos' operations with the turnover tax, less the total costs incurred by the casinos in servicing the same quantity demanded if every casino operated at its perfectly competitive level of output. From this difference we need to subtract the amount of tax revenues that the government collects. Taxes are simply financial transfers, not economic costs of the casinos' operations.

This can be written $WC_t = (AC'-AC)(a-fs)-TR_t$. Substituting (43) for AC', (32) for AC and (61) for TR_t and setting $q_4 = \sqrt{\frac{K}{c}}$, we find that $WC_t = 0$. In this case the turnover tax set at a level (t) as in equation (59) will have a zero economic welfare cost.

In this case where each casino operator is setting the output of the casino so that his marginal cost inclusive of the tax is equal to the fixed price of s, then the government, in theory, can set a revenue maximizing turnover tax. The tax will also be an efficient tax, creating no welfare cost. The problem is a practical one of enforcing a turnover tax across a set of semi-

independent casino operators. The experience to date is that in such a circumstances there will be substantial evasion of the tax.

(i) Taxation of Annual Fixed Costs

To facilitate the administration of casino taxation, let us again consider the case where the government resorts to a tax, T, on the annual fixed costs of the casino[8].

With the turnover tax t=0, the AC and MC functions can be expressed as,

(62) AC"$= cq + b + \frac{K(1+T)}{q}$,

and

(63) MC"=b+2cq,

where TC" and AC" refer to total costs and average costs inclusive of the asset tax. Again setting the average cost function (62) equal to s, the rate of asset tax, T, can be expressed as a function of s, q, b, c and K, as,

(64) $T = \frac{sq - bq - cq^2}{K} - 1.$

If the asset tax T is set to extract all of the profits from the casinos when they are charging a price of s, the asset tax must be set so that the minimum average cost of the casinos, inclusive of tax is equal to s. At the same time in this model each casino operator in order to maximize its own profits will operate where its MC"=s. This implies from (63) that the quantity of turnover per period for each casino, $q=q_5$ in the presence of such a tax can be expressed as,

[8] In practice, this might involve an annual license fee plus annual taxes on the number of machines and the tables.

(65) $$q_5 = \frac{s-b}{2c}.$$

In order to maximize the revenue from such a tax its rate will need to be set so that each casino operators where gross of tax AC"=MC" are equal to each other and equal to s.

By substituting (65) into (64), the revenue maximizing rate of T is found to be equal to,

(66) $$T = \frac{(s-b)^2}{4cK} - 1,$$

In this case, with the asset tax T, and each casino producing q_3, the number of casinos that will enter the market, $n=n_5$ can be expressed as,

(67) $$n_5 = \frac{2c(a - fs)}{s-b}.$$

Comparing (67) with (57) we see that if there is a tax on fixed costs the number of casinos will be fewer than in the case of the turnover tax. Each casino operator will be "cheating" by expanding the size of its operations along his casinos marginal cost curve until MC is equal to the regulated price.

Substituting the values for North Cyprus for the various cost variables, we find that with a price of gambling set at 11.8 percent the revenue maximizing tax rate (66) is equal to 12.7 times the annual fixed costs. With this very high level of financial fixed costs then a casino has a strong incentive to only expand through increasing its variable inputs. The profit maximizing volume of the production of each casino (65) is now US$ 140 million a year, about four times the volume of business that would minimize its before tax average costs. Operating each casino at such a volume only requires 1.37 casinos (67) to meet the quantity demanded by the market.

Tax Revenues (TR_T) from Asset Tax (T)

The expression for the total tax revenues obtained from the asset tax in the casino sector, TR_T, will be equal to the rate of tax times the annual fixed costs of the casino times the number of casinos in the market, or $TR_T=T(K)n_5$. Substituting equations (66) and (67) for T and n_5 in this expression we have,

$$(68) \qquad TR_T = \left[\frac{s-b}{2} - \frac{2cK}{s-b}\right](a - fs).$$

Using North Cyprus parameter values, the total tax revenue generated by the tax or fixed costs (68) would amount to US$ 9.94 million per year. The total revenue TR_T from the revenue maximizing assets is substantially less than total revenues of US$ 15.686 million that could be obtained from the revenue maximizing turnover tax.

Economic Welfare costs of Taxing Annual Fixed Costs

The welfare cost of the asset tax (WC_T) will be equal to the total costs incurred by the casinos (TC") in the sector less total costs (TC) that would be incurred if the same quantity of services had been supplied by casinos operating at a competitive level of output. Again because tax revenues do not represent economic costs, we subtract the revenues collected via the asset tax. In market equilibrium, it must hold that TC"n_5=AC"q_5n_5=s$Q_d^{'}$. This value is compared to the total combined costs of all the casinos, AC($Q_d^{'}$), if each is operating at its most efficient level of $q_c^{'}$, and where $Q_d^{'}$ is the total quantity of casino services demanded at a market price of s. Given these relationships, the expression for the welfare cost of the optimal asset tax can be written as,

$$(69) \qquad WC_T=(s\text{-}AC)\ Q_d^{'} - TR_T.$$

Substituting (32), (12), (63) for AC, $q_c^{'}$, $Q_d^{'}$, and TR_T, respectively in equation (69) an expression is developed that measures the welfare cost of the asset tax as,

(70) $WC_T = \left[\frac{s-b}{2} + \frac{2cK}{s-b} - 2\sqrt{cK} \right](a - fs)$.

From (70) we find that the welfare cost of the asset tax will be greater, the greater is K, b and c. An economic efficiency arises because each casino is trying to maximize its profits by setting its MC equal to s. It will be operating at the point where its MC $\succ$ min AC. Substituting the parameter values for North Cyprus into equation for the welfare cost of this taxation fixed costs (70) gives an estimate of the welfare cost of US$ 5.80 million. Hence, this tax when levied on the annual fixed costs of casinos when they are being regulated by a casino association will result in a serious misallocation of productive resources. Each casino operator will not be allowed to expand the number of casinos, in fact they will be reduced, hence they will expand inefficiently through the excessive application of variable factors to the fixed factors regulated by the casino association.

Conclusions

In Table 1 the illustrative results of the eight models developed in this paper are presented:

Table 1: Estimate of Output, Tax Revenue and Welfare costs of the Casino Sector in North Cyprus with alternative Regulatory and Tax Regimes

	Output per casino (q)	Price of gambling (p)	Total market demand (Q)	Number of casinos (n)	Rate of turnover tax (t)	Rate of tax on fixed assets (T)	Economic Profits (Π)	Total tax revenue (TTR)	Welfare cost of taxes (WC)
a. Existing situation Equilibrium in the casino sector with free entry and price of gambling set by regulation	10.64	0.10	234.08	22	0.015	0.395	0.00	8.48	6.44
b. Turnover tax set to maximize tax revenue	37.82	0.118	191.59	5.07	0.082	0.00	0.00	15.686	0.00
c. Public ownership of casinos (without tax)	37.82	0.118	191.59	5.07	0.00	0.00	15.686	0.00	0.00
d. Private local monopolist with revenue maximizing turnover tax	37.82	0.159	95.94	2.54	0.082	0.00	5.84	7.87	3.92
e. Private foreign monopolist with a revenue maximizing turnover tax	37.82	0.159	95.94	2.54	0.082	0.00	5.84	7.87	9.76
f. Private monopolist with revenue maximizing assets tax T	37.82	0.118	191.59	5.07	0.00	5.41	0.00	15.686	0.00
g. Casino association, price of gambling regulated and turnover tax	37.82	0.118	191.59	5.07	0.082	0.00	0.00	15.686	0.00
h. Casino association, price of gambling regulated, and taxation of annual fixed costs.	140	0.118	191.8	1.37	0.00	12.71	0.00	9.94	5.80

The results of this analysis have far reaching implications for policies related to the regulation and taxation of this sector. The comparison of the first case where the price of gambling is regulated, but free entry is allowed into the sector, is clearly the worst of all options. The welfare cost can be reduced by the taxation of the casino by a revenue-maximizing turnover tax, case b. If one can administer a turnover tax, it can be designed to be with the option of running the casino sector as a profit maximizing state-owned monopoly (case c) turns out to be an attractive option. It should not be a surprise to find that several advanced jurisdictions such as the Province of Ontario, Canada have chosen this alternative.

Turning the sector over to a private monopoly to run (cases d, e and f) and taxing it, generates some surprising results. A turnover tax on gambling results in a substantial welfare cost, case e. If the private monopolist is a foreigner, case f then the welfare costs increases dramatically of it, also includes the amount of economic profits that accrues to the monopolist. In the case taxes, are levied on the casinos' fixed costs case f, the private monopolist, whether local or foreigner can be made to operate efficiently and generate maximum tax revenue for the country. The final type of regulation using a casino operators association or Mafia regulation, also yields some insights into the interaction of regulation and taxation. Because each casino operator tends to "cheat" through internal expansion a turnover tax, case g, serves to correct for this tendency towards inefficiency. If it can be administered, the turnover tax is the preferred tax instrument. On the other hand, a tax on fixed costs, case h, does not affect marginal costs so the full incentive is present for each casino operator to expand for beyond the point where the casino is operating at its minimum average costs. This again results in a misallocation of resources and a reduction in overall tax revenues.

This paper shows clearly that in this sector the regulatory and tax regime are very important instruments for extracting economic benefits from casino turnover. However, it is also very important to get the right combination of regulatory and tax systems to avoid both economic welfare losses as well as the loss in tax revenues.

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