MANAGERIAL AND DECISION ECONOMICS
Manage. Decis. Econ. **22:** 143–162 (2001)
DOI: 10.1002/mde.1004

Business Profitability versus Social Profitability: Evaluating Industries with Externalities, The Case of Casinos

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Casino gambling is a social issue, because in addition to the direct benefits to those who own and use casinos, positive and negative externalities are reaped and borne by those who do not gamble. To correctly assess the total economic impact of casinos, one must distinguish between business profitability and social profitability. This paper provides the most comprehensive framework for addressing the theoretical cost–benefit issues of casinos by grounding cost–benefit analysis on household utility. It also discusses the current state of knowledge about the estimates of both the positive and negative externalities generated by casinos. Lastly, it corrects many prevalent errors in the debate over the economics of casino gambling. Copyright © 2001 John Wiley & Sons, Ltd.

INTRODUCTION

Between 1990 and 1998, commercial casino revenues increased from $8.7 billion to over $22.2 billion, or 156%.[1] The number of counties with casinos rose from 26 to almost 200 in the same time. Including Class III American Indian casinos,[2] casino revenues totaled $29.5 billion in 1998, representing expenditures of $153 per adult aged 20 or over.

The rapid expansion of casinos to new parts of the country generated extensive debates about the impact of casinos on a range of social, economic, and political issues.[3] These concerns were sufficiently pronounced to cause Congress to establish the National Gambling Impact Study Commission (NGISC) in 1996 to conduct an exhaustive study of the impact of casinos.[4] At the conclusion of its investigation, the commission recommended a national moratorium on the expansion of gambling and more study of gambling's effects, costs and benefits, before making further decisions about it.

The literature on the costs and benefits of casino gambling is fraught with inadequacy and confusion. Even studies that purport to evaluate the economic impact of casinos commonly exhibit a great deal of misunderstanding about what should be included among benefits and costs, and provide little or no guidance about how the costs and benefits relate to one another or should be computed. Many studies pay a great deal of attention, for example, to estimating the number of direct and indirect jobs that casinos create and to tallying the taxes casinos pay, but do not explain the social value of an additional job or calculate the lost taxes of competing non-casino businesses.[5] In general, the costs and benefits discussed are casually listed, vary by study, and are commonly presented with little or no justification of how they were selected or why other potential costs and benefits were excluded.

A recent paper, Eadington (1999), is instructive. It identified three principal benefits of casinos: (1)

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gain in utility (for those gambling in moderation for entertainment), (2) ancillary economic benefits such as 'job creation, investment stimulation, tourism development, economic development or redevelopment, urban or waterfront revitalization, or the improvement of the economic status of deserving or underprivileged groups', and (3) additional revenues to the public sector. He lists two principal costs: (1) 'moral disapproval' and (2) 'fears of adverse social impacts', such as pathological gambling, crime, or political corruption. The net increase in profits to business, unless this is meant to be part of ancillary economic benefits, is absent from the list of benefits.[6] Although Eadington lists gain in utility (clearly internal to the individual or household) as a benefit, he writes that 'many of the costs identified are internal to the individual or the household, as opposed to external—borne by society—and are therefore difficult to place into a cost/benefit framework'. This view of costs (including the references to moral disapproval and fears of consequences instead of the actual consequences) suggests that the author believes costs are more subtle and possibly less tangible than benefits. However, because the process to determine how items are included is not explained, there is little theoretical guidance about how the identified cost–benefit components relate to one another in an overall assessment of the impact of casinos or how competing costs and benefits are reconciled. We will show how cost–benefit components based on utility can be placed into the evaluation framework.

To bring uniformity and more theory to bear on the cost–benefit treatment of casinos, this paper demonstrates the construction of an exhaustive and utility-grounded framework to identify costs and benefits. It outlines an explicit taxonomy for costs and benefits based on the principle of real resource use, and reviews the available studies that contain original research estimating one or more cost–benefit components. Although the primary purpose of this paper is to rectify theoretical cost–benefit reasoning as it applies to casinos, the methodology applies more generally to the evaluation of projects in other industries. We also review existing empirical estimates of the costs and benefits of casinos arranged according to the theoretically grounded principles. Unfortunately, there has been relatively little research on many of the most important social cost–benefit components, while much of research has examined less significant issues or issues that are not even part of a properly defined analysis of social costs and benefits. Some research that purports to evaluate costs or benefits actually examines local and not total social costs or benefits. Another concern is that much of the research has been conducted by organizations with a vested interest in the outcome of the research, institutes with industry ties, or state agencies. Relatively little research is in peer-reviewed journals. A review of the empirical literature that estimates correctly defined components of social costs and benefits indicates that the costs of casinos are at least 1.9 times greater than benefits.

The remainder of the paper is arranged as follows. The next section constructs a theoretical cost–benefit measure based on economic fundamentals. The third and fourth sections examine the social benefits and costs of casino gambling, respectively. The fifth section concludes by summarizing our contributions and outlining the implications of this work for future research.

THEORY

Linking Cost–Benefit to Utility

In this section, we lay out the foundations of cost–benefit analysis for casino gambling. To avoid the mistakes that have plagued cost–benefit analyses, especially confusion about what can be included on each side of the cost–benefit ledger and how each item should be computed, we start from the most fundamental cost–benefit concept possible—individual utility. The framework we employ can be as comprehensive and general as desired, although our objective is to provide just enough detail to include all of the major elements commonly considered relevant to the economic effects of gambling and enough explanation to indicate what would change in a more detailed application of the framework.

Our starting point is the change in the individual's utility, $u^1 - u^0$, where superscripts distinguish utility in two situations. In one, casinos are widespread geographically (alternative 1) and in the other, casinos are less widely spread (alternative 0). We assume that $u(x)$ is a continuous utility function representing locally non-satiable preferences defined on consumption $x \in R^n$. A positive element of x denotes consumption of a good or service, while a negative component stands for the

provision of a good or service.[7] For example, the provision of 10 hours of labor by the individual would appear as -10 in the labor component of x. We define the expenditure function $e(d, p, u)$ as the minimum expenditure needed to achieve utility u when the consumer buys and sells at prices p, and d is the distance to the nearest casino. It is strictly monotonic in u for any choice of fixed d and p. The sign of $e(d^1, p^1, u^1) - e(d^1, p^1, u^0)$ is, therefore, identical to the sign of $u^1 - u^0$. In other words, for fixed distance and prices d and p, $e(d, p, u(x))$ is a utility function whose natural money metric records utility in dollars.[8]

We compare the social welfare between the two situations. We presume for simplicity that gambling is a standardized good; casinos offer gambling on essentially the same terms as casinos in other locations.[9] The primary advantage to the consumer of more casinos, therefore, is closer proximity to the nearest one. Let d_i^1 be the distance to the nearest casino for consumer i in the post casino alternative 1. Our measure of social profitability is the change in welfare for all consumers

$$\Delta W = \sum_i w_i[e_i(d_i^1, p_i^1, u_i^1) - e_i(d_i^1, p_i^1, u_i^0)],$$

where $\Sigma_i w_i = m$, and m is the number of consumer households. Equation (1) allows for different weights for dollar gains to different households, a topic to which we will return below. However, in applying (1) to produce a working measure of social profitability, we explicitly address many issues left unspoken in some studies and that are a source of confusion in others. The initial model provides the simplest framework for analyzing the impact of casinos. We list our assumptions at the outset for clarity.

- We assume that a dollar of utility to one household is equal to a dollar of utility to another.[10] With respect to Equation (1) this implies that $w_i = 1$ for all households. It also means that firm profits do not need to be assigned artificial premia or discounts based on which individuals or households happen to own them.
- Firm profits are equally important to social welfare regardless of which firm generates them. For example, casino profits are valued the same as the profits of a non-casino firm.
- To allow for regional tax differences, consumers and firms may face different prices. In the limit, each firm and household could have a different, personalized set of prices. Household i faces price vector p_i, firm j faces price vector p_j, and endowments are traded at prices p_Ω.
- We allow for the possibility that consumers may be constrained in their labor supply decisions, resulting in unemployment. People have a reservation wage but cannot always find a job at that wage, and lowering their wage will not increase the chances of their getting a job.
- Firms and economy endowments are owned by households. Household i owns share θ_{ij} of firm j, $\Sigma_i \theta_{ij} = 1$ and endowment $\Omega_i \in R_+^n$, where $\Sigma_i \Omega_i = \Omega$, the economy endowment vector.
- The government spends tax revenues to purchase goods and services, and private households receive utility from these expenditures. To implement this assumption, we employ the artificial device of having the government return tax dollars to households in a lump-sum fashion. Households then spend the transfers as part of their income and experience utility gains based on their purchases.
- In addition to direct benefits and costs, casinos may generate positive or negative externalities. Positive externalities add value to the economy not reaped by the agent creating them, while negative externalities remove value not paid by the causing agent, following the usual definition. For example, if a casino's presence reduces crime in an area, leading to less need for police presence, this frees real resources to the rest of the community and represents a positive externality. If the reverse is true, and the casino increases the need for police, real resources are removed from final consumption x, and this is a negative externality. The third and fourth sections discuss the nature of benefits and costs in more detail. The net resources gained or lost to the system are denoted by g. If $g > 0$ negative externalities outweigh positive externalities, which decrease the resources available for consumption x, and thereby lower social welfare. Social cost accounting in real terms requires

$$x + g = y + \Omega + z,$$

where $x \equiv \Sigma_i x_i$ is aggregate consumption, and $y \equiv \Sigma_j y_j$ is aggregate production. For each

firm j, y_j is the associated production vector[11]; z is the economy trade vector.[12]

The above remarks provide the simplest framework that is sufficiently inclusive to discuss an economy's social costs and benefits of gambling.

Application

Consider now the following carefully chosen identity, a telescoping sum where each term cancels part of the preceding term.

$$\sum_i [e_i(d_i^1, p_i^1, u_i^1) - e_i(d_i^1, p_i^1, u_i^0)] =$$

$$\sum_i [e_i(d_i^1, p_i^1, u_i^1) - p_i^1 \cdot x_i^1] \quad (2.1)$$

(Consumption Constraints in Situation 1)

$$+ \sum_i [p_i^1 \cdot x_i^1 - p_i^0 \cdot x_i^0] \quad (2.2)$$

(Income Effects)

$$+ \sum_i [p_i^0 \cdot x_i^0 - e_i(d_i^0, p_i^0, u_i^0)] \quad (2.3)$$

(Consumption Constraints in Situation 0)

$$+ \sum_i [e_i(d_i^0, p_i^0, u_i^0) - e_i(d_i^1, p_i^0, u_i^0)] \quad (2.4)$$

(Distance Benefits)

$$+ \sum_i [e_i(d_i^1, p_i^0, u_i^0) - e_i(d_i^1, p_i^1, u_i^0)] \quad (2.5)$$

(Consumer Surplus)

Expression (2.1) measures the welfare impact of constraints on the consumer's choice that prevent him from being at his optimal bundle given the prices he faces. The primary example of this kind of constraint is unemployment. $e_i(d_i^1, p_i^1, u_i^1)$ by definition is the *least* costly way of achieving the utility achieved in situation 1. Consumption bundle x_i^1 satisfies $u^1 = u(x_i^1)$ and also achieves utility u^1. Because choice of x_i^1 was constrained (in the case of unemployment, by the consumer's ability to supply labor), it will lead to a greater expenditure than $e_i(d_i^1, p_i^1, u_i^1)$. Therefore, the difference in expression (2.1) is the amount of money the individual would be willing to pay to remove the constraint. The same argument applies to expression (2.3) in situation 0.

Expression (2.4) measures the value to the consumer of having the nearest casino distance d_i^1 away compared to distance d_i^0. For example, in the initial situation the consumer needed $e_i(d_i^0, p_i^0, u_i^0)$ to reach initial utility. When the nearest casino is closer, distance $d_i^1 < d_i^0$, the income needed to maintain original utility, $e_i(d_i^1, p_i^0, u_i^0)$, is smaller (presuming the individual gambles). The difference in expression (2.4), therefore, is the amount the consumer would be willing to pay to have the nearest casino closer.

Expression (2.5) is the conventional measure of consumer surplus. The only difference between the two terms in the expression is the price vector. If prices p_i^1 are better for the household than prices p_i^0 (lower for goods purchased and/or higher for goods sold, such as labor), then expression (2.5) is positive and measures the amount of money the consumer would be willing to give up to have the better set of prices.

Now examine expression (2.2). Use the household budget identity

$$p_i \cdot x_i = \sum_j \theta_{ij} \Pi_j + p_\Omega \cdot \Omega_i + T_i - E_i \quad (3)$$

to transform the income effects in (2.2) where Π_j is the profit of firm j, $p_\Omega \cdot \Omega_i$ is earning from the household's endowment, T_i is the household's share of taxes, and E_i is the household's share of the cost of gambling-induced externality expenditures. Summing (3) over households and differencing between the initial and final situations[13] yields

$$\sum_i [p_i^1 \cdot x_i^1 - p_i^0 \cdot x_i^0] = \sum_j \Delta\Pi_j \ (\Delta\text{Profits})$$

$$+ \Delta p_\Omega \cdot \Omega \ (\text{Endowment Capital Gains})$$

$$+ \Delta T \ (\Delta\text{Taxes}) - \Delta E \ (\Delta\text{Externality Costs}) \quad (4)$$

Substituting (4) into (2); writing the distance effects in differential form and rearranging gives the taxonomy of cost–benefit elements that we seek:

$$\sum_i [e_i(d_i^1, p_i^1, u_i^1) - e(d_i^1, p_i^1, u_i^0)] \equiv \Delta W =$$

$$\sum_j \Delta\Pi_j + \sum_i \int_{d_i^0}^{d_i^1} \frac{\partial e_i}{\partial d_i} dd_i + \Delta T - \Delta E$$

$$+ \text{Consumption Constraints} + \Delta p_\Omega \cdot \Omega$$

$$+ \sum_i [e_i(d_i^1, p_i^0, u_i^0) - e_i(d_i^1, p_i^1, u_i^0)], \quad (5)$$

where 'Consumption Constraints' is the sum (2.1) + (2.3).

The seven components in Equation (5) are an exhaustive, exact tabulation of the cost–benefit

elements for evaluating the economic effects of casinos. Moreover (5) shows precisely *how* each term should be computed theoretically. For example, the effect of casino gambling on firm profits should be summed over *all* firms, not just casinos. The increased profits of the casinos should be netted against lost profits of other firms that compete for consumer spending. Comparable statements apply to the computation of employment benefits and costs, taxes, and social costs.

There is one obvious simplification we can make to (5). Because gambling industry revenue (casinos, lotteries, racetracks and other forms of gambling) is relatively small,[14] it will have a negligible effect on creating capital gains or losses on endowments. It is unlikely that the cost of capital, for example, will differ because of the presence or absence of casinos in the economy. A similar statement applies to consumer surplus effects that depend on gambling to influence overall prices.[15] Therefore, for the remainder of the paper we assume that firm and household prices are invariant to the amount of gambling ($p_i^0 = p_i^1$, $p_j^0 = p_j^1$, $p_\Omega^0 = p_\Omega^1$), which means that the last two terms in Equation (5) related to capital gains on endowments and consumer surplus gains and losses drop out.

Conceptual Corrections

Equation (5) allows us to address some common errors and misconceptions of cost–benefit analysis applied to gambling.

The first error is the tendency to identify business profitability, $\Sigma_j \Pi_j$, and its improvement, $\Sigma_j \Delta\Pi_j$, with social profitability. The two are different. Business profitability is clearly important to social profitability and contributes to it, but the two are not synonymous. Failure to account for all of the components of social profitability is perhaps the most common mistake. Casino profits are visible and prominent. Other costs and benefits may be less so.

The second error is to evaluate the economic impact of gambling with respect to the taxes and profits of a subset of firms—typically the profits of firms in one state or region and sometimes the profits of local gambling firms only. Equation (5) sums profits over all firms, not just casinos or firms in one location. Ignoring firms that lose profits due to the expansion of gambling is equivalent to selecting weights for them in Equation (1) that are zero. Because households own these other firms, this violates the assumption that households are treated equally.

The third is to consider only the taxes of a subset of households or regions. It is not uncommon, for example, for studies to focus only on costs within the state, even though casinos that border another state have ramifications for citizens of the neighboring jurisdiction. Equation (5) sums taxes over *all* households and regions.

Evaluations that consider only the costs or benefits of a subset of households or regions are inaccurate and incomplete. For example, the cost–benefit measure in (5) does not treat a job in a given location as more valued than a job in another location. Many economic impact studies perform regional net export multiplier analyses of the effects of casinos. They erroneously report the number of jobs in a given location as a benefit. According to (5) the value of employment in one location (part of the determination of firm profits) must be netted against the value of employment in another location. There is no net gain to the economy from shifting a job from one location to another unless it increases profits to the economy.[16]

The last common error is that much empirical work purports to show casinos decrease unemployment, but fails to prove what employment *would have been* in the absence of casinos. Most casinos were introduced after 1991, when the country was recovering from the recession of 1990–1991. The period from 1991 to 2000 also coincided with the longest economic expansion in American history. As the country emerged from the recession, unemployment declined in areas with and without casinos. If casinos *temporarily* reduced unemployment faster than it would have fallen otherwise, this transitory effect could correctly be counted as a benefit of casinos. However, we know of no study that has made this case. On the contrary, the failure to account for the decline in unemployment that would have occurred anyway leads to a classic *post hoc*, *ergo propter hoc* fallacy of logic. For a more detailed example, see Appendix A, which discusses The Evans Group (1996). Although it argued that casinos reduced unemployment, it did not report that areas without casinos with comparable starting unemployment rates experienced comparable, and in many cases, larger reductions in the unemployment rate.

BOUNDING BENEFITS

This section reviews the studies that estimate the benefits from casinos based on the theoretically correct cost–benefit computation in Equation (5). We discuss in order the net increase in firms' profits plus taxes paid due to the presence of casinos, the consumer distance benefits of nearer casinos, employment benefits and total benefits from the expanded gambling opportunities.

Profits and Taxes

This benefit is calculated by determining the casino profits and taxes minus the reduction in profits and taxes of other businesses caused by casinos. Although casino profits and taxes are highly visible, they are invalid measures of *social* benefits because they do not adjust for the entire economy for the lost profits and taxes of competing businesses. This point is not special to casinos. Any business—be it Wal-Mart or a drugstore chain, that attracts consumer sales, employs labor and other inputs, and displaces competing businesses—should be evaluated on the same basis.

Because many casinos do not have to report their profits or pay taxes (for example, casinos owned by American Indian tribes), there are no data on industry profits. However, we can estimate revenues from annually published information. We provide a brief overview of casino gambling in the US before estimating the benefits.

Table 1 reports total and per capita gambling revenue.[17] For comparison, we provide data on the tobacco industry.[18] Many studies estimate potential casino revenues using the amount of gambling per person in areas where casino gambling is a prominent activity. For example, the City of Chicago Gaming Commission funded a study (Deloitte and Touche, 1992) that reported that adults within 35 miles of Atlantic City lost $198 per adult annually to casinos. Adjusted for eight years of price changes, this figure is approximately $230. In its study, the Mirage Hotel (1993) estimated that annual per capita gambling revenues for persons residing within a 50-mile radius of its proposed Chicago suburb gambling facility would be $200.[19] In Iowa, in 1995, a Christiansen and Cummings Associates study for the state Racing and Gaming Commission found that the average adult lost $172 to the casinos (this figure is lower than $230 because casinos are still not in close proximity to all parts of Iowa). These data are comparable to revenue for other areas.

In addition to averages we are interested in the concentration of gambling among users. Many studies examined gambling markets in different locations and at different times. Taken together, they provide a general estimate of how frequently residents gamble. In a market with readily available gambling opportunities including casinos, approximately 30% of the population does not gamble, meaning that they will not have gambled in the past year.[20] Another 50–60% could be termed light bettors, who gamble less than once per week. This group includes those who enjoy a night out at the casino once in a while, but do not frequent casinos. About 5–15% could be termed heavy bettors who gamble twice per week or more. The last 2–5% of the population consists of problem and pathological (P&P) gamblers, who suffer from compulsive gambling disorders, which are expressed when the opportunity to gamble is present and sufficient time has elapsed for the problem to become evident. This group might be in the casino daily, for long periods of time, and at unusual hours. Two-thirds to 80% of gambling revenues come from the 10% of the population that gambles most heavily.[21] Expressed in reverse, 90% of the population may provide as little as 20% of casino revenues. Consequently, the great majority of adults are indifferent, or nearly indifferent, to the availability of casino gambling. Although the average American adult loses

Table 1. The Casino Market

	Casino gambling revenues per adult ($)	All gambling revenues per adult ($)	Total revenues ($)	All gambling revenues ($)
US 1998	153	282	29.5 billion	54.4 billion
'Saturated market'	≈230	359	44.4 billion	69.3 billion
Tobacco industry			39 billion	

approximately \$153 per year and might lose closer to \$230 per year were gambling more widespread, these revenues come from a few who gamble a lot, instead of many who gamble a little.

We now return to our original question—what is the social value of this amount of casino gambling? According to Equation (5) we need the profits and taxes attributable to casinos, minus the reduction in profits and taxes of other business due to casinos. To these we must add the consumer distance benefits of casinos (which we address in the next section). Because profits are a function of market structure and the presence of free entry and exit, if casinos were deregulated, market contestability and free entry of casinos would drive economic profits to zero. In that event, from the perspective of profits, a larger casino sector and smaller remainder of the economy would represent a net wash because economic profits in the economy would be no greater with casinos than without. The sole contribution of casinos to social welfare in that case would be the direct consumer benefits.

However, in the current legal environment, casinos in many locations are effectively regional monopolies sustained by government licensing restrictions.[22] We, therefore, make the following adjustment to allow for the higher monopoly profits of some casinos. In 1998, profits before taxes[23] of all non-financial corporate business in the United States were 13.8% of sales.[24] Assuming that casinos average 30% profit rates before taxes (more than *double* the normal business rate of profit) implies that social benefits in the form of profits and taxes from shifting \$153 of revenue from other businesses to casinos is (0.30–0.138) 153 = \$25 rounded up to the nearest dollar. In the next section, we add to this consumer distance benefits of casinos to produce an upper bound on total casino social benefits.

Consumer Distance Benefits

Equation (5) also idenifies $\int_{d_i^0}^{d_i^1} (\partial e/\partial d) dd_i$ as a direct social benefit of casinos, where d_i is consumer i's distance to the nearest casino. Distance benefits have been little studied, even though they constitute a primary direct benefit of casinos. To our knowledge, only Grinols (1999) estimated these benefits and compared them with the other components of (5). Assuming that utility depends on goods x, the number of casino visits V, the amount gambled (spent) per visit g, and the distance traveled to the casino, $u = u(g, V, I(g, d))$ where $I(g, d)$ is an enjoyment factor or visit 'intensity' factor that rises with g and falls with d and g is consumption of other non-casino, goods. The envelope theorem and consumer optimization conditions show that $\int_{d_i^0}^{d_i^1} (\partial e/\partial d) dd_i \leq \int_{d_i^0}^{d_i^1} V dg$. This inequality allows inferences about welfare to be made from data that relate to the number of visits and amount gambled per visit to the distance from the casino. Grinols (1999) estimated that the upper bound for direct conumer benefits of casinos was \$50 per adult (again, rounding up to the nearest round figure to produce an upper bound on casino benefits) when no allowance is made for the significant portion of revenues from problem and pathological gamblers. If the revenues of non-P&P gamblers only are used to calculate consumer distance benefits, then the benefit figure falls to under \$34.[25] This number can be interpreted as the answer to the question, 'How much would you be willing to pay each year to have the opportunity to gamble in a casino nearby compared with the alternative where casinos are 1000 miles away?'

Employment Benefits

Although the topic of employment benefits is one of the most studied issues about casino gambling,[26] it also contains a widespread and central misunderstanding—that the benefits of new businesses are measured by the jobs they create in a given location. While it may be legitimate to ask what effect a new business will have on employment, what taxes it will pay, and from where its revenues will come, these answers do not assess the social benefits and costs of the business. Increasing jobs in one location at the expense of lost jobs in another is not a social benefit. Business profitability is not social profitability. Social cost benefit is grounded on consumer utility and results in a list of relevant factors different from tracking income and employment effects.[27]

Total Social Benefits

Based on the previous sections, if casinos were fully deregulated and allowed to spread freely nationwide, economic profits would be driven to zero. The net increase in profits and taxes from

expanding the casino sector at the expense of the rest of the economy, therefore, would be zero. The consumer distance benefits of casinos would be less than $50 per adult, or if the revenues of P&P gamblers are subtracted, $34 per adult.

If casinos are regulated and granted regional monopoly status in some jurisdictions, the economic profits of casinos will remain positive, but the distance benefits will drop. Assuming average pre-tax profits equal to 30% of sales (more than double the rate for non-financial corporate business in the US) implies that the net profit and tax benefits of casinos are less than $25 per adult. However, if there is not free entry, distance benefits will average less than $50 per adult (less than $34 adjusting for P&P gamblers) because some areas will not have casinos close to consumers. We are, therefore, left with three upper bounds. The preferred number, $34 per adult, is the most correct upper bound because it represents the full social value of casinos under circumstances in which all of the benefits would be captured by consumers if the industry were deregulated to allow free entry. Fifty-nine dollars combines the full estimate of consumer distance benefits adjusted for P&P gamblers with a generous profit figure. It is too high because the consumer benefit is overstated, and in addition, because it fails to recognize that distance benefits would decline with regional monopolies present that do not put casinos close to all consumers. Finally, $75 per adult adds consumer benefits to profits without making any adjustments. We emphasize that these numbers are upper bounds on the estimated benefits.

COUNTING COSTS

Researchers estimate the social costs of casinos using two methods. The first is through the study of problem and pathological gamblers. The second is through statistical analyses of cost-creating activities such as crime, suicide, and bankruptcy. The former approach ties the cost activities to gamblers, but overlooks social costs that do not derive from problem and pathological gamblers. The latter approach, determining the effect of casinos on social costs such as crime by examining aggregate statistics, is direct and more inclusive because it looks at more than just the crimes committed by P&P gamblers.

The remainder of this section consists of two parts. The first derives a detailed taxonomy of cost classifications tied to the theoretical analysis in the second section. When discussing these classifications, we cite cost studies of both types listed above. The second part of this section is a more detailed review of all the studies that focused specifically on problem and pathological gamblers. We calculate costs per pathological and problem gamblers, and estimate the costs for the entire nation. These sections constitute the most comprehensive compilation of the social costs of gambling available to date.

Cost Taxonomy

The underlying principle, based on Equation (5), is that each social cost uses physical resources g in ways that do not directly enter utility or that reduce economic efficiency. We arrange social costs into nine disjoint groups and discuss each one briefly.

1. **Crime:** Of all the social costs, the link between casinos and crime has received the most attention.[28] Crime costs are real resources used for the apprehension, adjudication, incarceration, and rehabilitation of criminals, or the police costs that result from the need for increased police presence in areas of greater gambling activity. One significant problem that has plagued the majority of the casino-crime literature is analogous to the problem present in calculating the profit and tax benefits of casinos: To estimate social costs, one should not count new crime around the casino only, but also consider whether casinos reduced crime in other locales (for example, this could happen if casinos move crime from other locations). Counting only local crime as a cost is similar to counting only local profits as a benefit.

   The most comprehensive analysis of the casino-crime link is Grinols *et al.* (2000), which evaluated county-level data for seven offenses in every US county over 20 years, and controlled for about 50 variables. It concluded that on average, 8–10% of crime in casino counties in 1996 could be attributed to the presence of casino gambling in the county, resulting in costs of $63 per adult annually in these counties. Furthermore, counties that border casinos also experience increased crime rates, which suggests that casinos truly

increase crime, not merely shift it from one location to another. Estimates of the cost of non-Index crimes would add to total crime costs. For example, insurance fraud is not an FBI Index I crime. Estimates of the fraud committed by gamblers is $1.3 billion per year,[29] or $6.61 per adult annually.[30]

Studies of problem and pathological gamblers have found similar effects. Maryland Department of Health and Mental Hygiene (1990) reported that 62% of gamblers in treatment committed illegal acts as a result of their gambling, 80% committed civil offenses and 23% were charged with criminal offenses. Lesieur (1998b) surveyed nearly 400 members of Gamblers Anonymous, 57% of whom admitted stealing to finance their gambling. On average these 400 people stole $135000, and their total theft was over $30 million. Lesieur (1992) reported on illegal activities and civil fraud engaged in by pathological gamblers to gamble or to pay gambling debts in five samples from hospital inpatients, Veterans Administration and Gamblers Anonymous groups, male prisoners, female prisoners, and a female Gamblers Anonymous sample that includes the white-collar crime and other crimes listed in item 1.[31]

2. **Business and Employment Costs:** These costs include lost productivity on the job, lost time and unemployment: sick days off for gambling, extended lunch hours, leaving early to gamble, and returning late after gambling. Problem and pathological gamblers often impose costs on their employers (in addition to theft or embezzlement discussed in the section on abused dollars below) in the form of an unreliable presence on the job and reduced productivity when present. Between 21 and 36% of problem gamblers in treatment reported losing a job because of their gambling (Lesieur, 1998b). Firing an employee imposes costs on the worker in terms of lost output during the period of unemployment and on the employer in terms of additional costs of hiring and training new employees. These costs are higher the greater the firm-specific human capital.
3. **Bankruptcy:** Lawsuits and legal costs, and bill collection costs, bill collector harassment are among the consequences of bankruptcy. Pathological gamblers often follow a predictable path of exhausting personal resources, selling insurance policies, selling possessions, and 'borrowing' from family and friends. Their search for funds may lead them to acquire multiple credit cards that they use to the limit. Debts will be paid off, of course, when the individual wins big in his next gambling episode. Bankruptcy entails costs to creditors attempting to collect and costs to the legal system in court time and resources. SMR Research Corporation (1997, p. 118) indicated that these costs may be quite large, 'We set out this year to interview many of the leading US experts on gambling, gambling addiction, and the financial impacts of gambling. Their studies have suggested, fairly consistently, that more than 20% of compulsive gamblers has filed for bankruptcy as a result of their gambling losses'.
4. **Suicide:** Lesieur (1992) concluded that problem and pathological gamblers have higher suicide rates than the general public.[32] Dozens of stories have been reported of gamblers killing themselves after losing at the casino, sometimes on the premises.[33] Consistent with this, Phillips *et al.* (1997) found that deaths in Las Vegas were 2.5 times more likely to be a result of suicide than deaths in other comparably sized metropolitan areas. Visitors to Atlantic City and Reno were 1.75 and 1.5 times more likely to die in suicides than tourists to other non-gambling areas, and in Atlantic City the suicide rates did not become elevated until after casinos were introduced in 1978. McCleary *et al.* (1998), funded by the American Gaming Association, contested Phillips' findings. While we recognize the impact of casino gambling on suicide, the literature has not provided sufficiently reliable social cost estimates, and, therefore, we do not account for such costs in the table below.
5. **Illness:** Among the forms of sickness associated with gambling or affected by it are depression, stress-related illness, chronic or severe headaches, anxiety, moodiness, irritability, intestinal disorders, asthma, cognitive distortions, and cardio-vascular disorders. Many sickness costs are borne by the gambler, but they also appear as resource costs when the gambler seeks treatment. Gambler-borne costs, even when not absorbing resources, however, are tangible costs to the extent that the gambler would be willing to pay to eliminate the problem.

6. **Social Service Costs:** This category of costs includes therapy/treatment costs, unemployment and other social service costs (includes welfare and food stamps).
7. **Government Direct Regulatory Costs:** Social service and government direct regulatory costs are paid primarily through the government. The gambling industry has been regulated because it has historically been subject to fraud and abuse. Social service costs transfer resources from one segment of society to another, consuming resources in the process. If social costs include the financial burden placed on the non-gambling society that would not be present in the absence of gambling, then these costs should be included for a complete assessment of the effects of gambling. Regulatory costs differ by state and depend on the type of casinos (i.e. riverboat, Indian reservation, etc.), and extent of the responsibilities of the regulatory agencies.
8. **Family Costs:** Families of problem and pathological gamblers bear gambling-related costs of divorce, separation, spousal abuse, and child neglect. Although these costs are non-pecuniary, they are, nevertheless, tangible and real. They can be quantified in terms of the amount of money an individual would be willing to pay to remove the problem. In practice, such costs are rarely measured. When social services become necessary, as when gambling leads to divorce proceedings, they represent resources lost to other uses in society and can be measured by the cost of the services provided.
9. **Abused Dollars:** The final category represents lost gambling money acquired from family, friends, or employers under false pretenses. Two examples are stealing that is never reported because the thief is a relative, and money 'loaned' under duress that is never repaid. Abused dollars represent costs to the non-gambling population. To the extent that abused dollars represent purchases of gambling services that are inefficiently sub-optimal from the gambler's perspective or create market inefficiencies, a significant portion represents social costs to society as a whole even allowing for gains by the gambler or gambling sector.[34]

Social Cost Estimates Tied Directly to P&P Gamblers

Table 2 reports the results of all eight studies that contain original research that ties social costs directly to pathological gamblers.[35] The first two rows show the location studied and the author(s), respectively. The first column shows the category of costs, as outlined in the previous section. The studies are listed in order of date of publication. With the exception of the pathbreaking paper by Politzer *et al.* (1981), the studies were published between 1994 and 1999. The column totals range from a low of $1,195 (Gerstein *et al.*, 1999) to a high of $30,235 (Politzer *et al.*, 1981). The Executive Office of the Governor (1994) is the highest post-1994 estimate. Because all studies omit some of the costs, these totals will understate the actual totals.

A large share of the differences in the totals is explained by differences in the number of cost components the studies estimated. The Executive Office of the Governor (1994) estimated only crime costs in Florida, while Thompson and Quinn (1999) estimated ten components. The study with the lowest total cost (Gerstein *et al.*, 1999) estimated only four categories. No study estimated all the components.[36] By far, crime and abused dollars are the largest cost estimates. Gerstein *et al.* (1999) is the only study that completely omits crime costs, and only the Executive Office of the Governor (1994) and Gerstein *et al.* (1999) omit estimates of abused dollars. One important common characteristic of all but one of these studies is that they are not published in peer-reviewed journals. The Executive Office of the Governor (1994), Ryan *et al.* (1999), Thompson and Quinn (1999) and South Dakota Legislative Research Council (1998) were either published by or prepared for state agencies. Thompson *et al.* (1996) was published by the Wisconsin Policy Research Institute. Politzer *et al.* (1981) was presented at the Fifth National Conference on Gambling and Risk Taking, Gerstein *et al.* (1999) was presented to the NGISC. The paper by Thompson *et al.* (1998) was presented at the Twelfth National Conference on Problem Gambling, and later published in *Gaming Research and Review Journal*.

We used many strategies to ensure that the final estimates of costs per pathological gambler were

Table 2. Annual Social Costs per Pathological Gambler

	MD Politzer *et al.* (1981) ($)	FL Exec. Office of Gov (1994) ($)	WI Thompson *et al.* (1996) ($)	CT Thompson *et al.* (1998) ($)	SD SD Leg. Research Council 1998–1999 ($)	LA Ryan *et al.* (1999) ($)	US Gerstein *et al.* (1999) ($)	SC Thompson and Quinn (1999) ($)	Row averages for studies 1994–1999 ($)
Crime									
Apprehension and increased police costs			44	71	1000	53		116	257
Adjudication (criminal and civil justice costs)	1788		1234	994	27	649		476	676
Incarceration and supervision costs	2828	15 221	758	889	382	690		451	3065
Business and employment costs	11 265								
Lost productivity on job								1082	1082
Lost time and unemployment			2717	3436		5936	320	2156	2913
Bankruptcy			515					118	316
Suicide									
Illness							700		700
Social service costs									
Therapy/treatment costs			437	114	75	396	30	83	189
Unemployment and other soc. svc. (incl. welfare and food stamps)			606	971	549	60	145	318	442
Government direct regulatory costs									
Family costs									
Divorce, separation								111	111
Abused dollars	14 354		3802	9519	240	3175		2436	3834
									13 586

lower bounds.[37] First, in calculating the average annual cost per pathological gambler by category (shown in the last column of Table 2 on the right) we omitted Politzer *et al.* (1981).[38] This study had the highest cost estimates, but was conducted at a different time and in a different gambling environment from the other studies. Second, costs for suicide and government regulation are omitted, because none of these studies estimated them. Third, we did not price adjust the estimates, but rather took the values as given by the authors. Last, many studies combined their estimates for pathological and problem gamblers. We treated the numbers as if the costs we report apply *only* to pathological gamblers. Because costs due to pathological gamblers are higher than costs due to problem gamblers, the estimates further underestimate the costs connected to pathological gamblers.

Table 2 shows that the total average social cost of eight studies is $13,586 per pathological gambler per year. If 1.5% of 196.65 million US adults were pathological gamblers, this would imply annual social costs of $40.1 billion or $204 per adult. If pathological gamblers are 1% of the population, the estimate reduces to $136 per adult.

Table 3 replicates Table 2 for problem gamblers. Only Gerstein *et al.* (1999) and South Dakota Legislative Research Council (1998) estimated any separate costs per problem gambler. These studies estimated only three of the many cost categories. The average annual cost per problem gambler by cost category is shown in the last column. For the same reasons discussed in analyzing the results for pathological gamblers, the Table 3 total cost estimate of $912 due to problem gamblers understates the actual cost.

Table 4 applies the information in Tables 2 and 3 to produce annual national social costs per adult. To test the robustness of these cost estimates, we use the 95% confidence bounds on the numbers of problem and pathological gamblers set by Shaffer *et al.* (1997).[39] This confidence interval sets the fraction of pathological gamblers between 0.9 and 1.38% of the adult population, and the fraction of problem gamblers between 1.95 and 3.65% of the adult population. Based on these lower and upper bounds, annual national social costs from problem and

Table 3. Annual Social Costs per Problem Gambler

	US Gerstein *et al.* (1999) ($)	SD S. Dakota, 1998–1999 ($)	Row averages: studies 1994–1999 ($)
Crime			
Apprehension and increased police costs			
Adjudication (criminal and civil justice costs)			
Incarceration and supervision costs			
Business and employment costs			
Lost productivity on job			
Lost time and unemployment	200		200
Bankruptcy			
Suicide			
Illness			
Social service costs			
Therapy/treatment costs	360		360
Unemployment and other soc. svc. (incl. welfare and food stamps)	155	549	352
Government direct regulatory costs			
Family costs			
Divorce, separation			
Abused dollars			
			912

Table 4. National and per Adult Social Costs

NATIONAL COST : BILLIONS of DOLLARS

Problem Rate	Pathological Rate: Low	Pathological Rate: High
High	$30.6	$43.4
Low	$27.5	$40.4

PER ADULT COST

Problem Rate	Pathological Rate: Low	Pathological Rate: High
High	$156	$221
Low	$140	$205

Pathological 95% Confidence Bound: LOWER	0.9000%
Pathological 95% Confidence Bound: UPPER	1.3800%
Problem 95% Confidence Bound: LOWER	1.9500%
Problem 95% Confidence Bound: UPPER	3.6500%

pathological gambling range from 27.5 billion to over $43 billion. On a per adult basis, the numbers range from a low of $140 to a high of $221. Because Shaffer *et al.* (1997) estimated these confidence bounds based on samples of the nation before the time of publication including areas with different degrees of casino gambling they clearly understate the fractions of the entire US population that would be identified as pathological or problem gamblers if casinos were expanded fully. The costs of Table 4, therefore, also understate the associated costs of full gambling expansion.

IMPLICATIONS FOR FUTURE RESEARCH

This paper makes many contributions to the discussion of social costs and benefits of casino gaming, and has numerous implications for future research in this area. First, we provide the first theoretical justification of what should be included as costs and benefits. This justification is based on individual utility and distinguishes business and social profitability for industries with externalities. The lack of a clear theoretical basis has impaired the entire research agenda on this issue. Much research has examined relatively minor issues or issues that are not even part of a properly defined cost–benefit analysis. Conversely, there are relatively few estimates of some of the key components of social costs and benefits. Consequently, a well-grounded theoretical framework of costs and benefits will make future research more productive.

Second, using this theoretically grounded cost–benefit analysis we corrected several common conceptual mistakes prevalent in the casino and gambling literature. One example of a common error is the focus on local rather than total social costs or benefits. On the benefits side, increases in local profits and taxes are often weighted heavily while losses in profits and taxes from geographically distant areas are weighted less or not at all. Similarly, on the cost side, local crime is often weighted heavily while there is little discussion about whether crime was simply moved from other areas. Another error is the frequent use of the net export-multiplier modeling of jobs, an inappropriate method to determine social costs and benefits. Clearly, identifying these errors will reduce them in future research.

Third, we used the theory to construct a clear taxonomy of benefits and costs as applied to the casino industry. To estimate these costs and benefits we reviewed the available studies that do original research on this topic. This literature shows that the extreme upper bound on annual total social benefits is $75 per adult. The lower bound for social costs, based on the estimates of costs associated with prevalence of problem and pathological gamblers, was between $140–$221 per adult. Consequently, the available research indicates that when using the highest estimates of benefits and the lowest estimates of costs, casino gambling fails a cost–benefit test by a ratio of 1.9 to one or greater.[40] Standard Pigouvian corrective theory for an industry with externalities is that it should be taxed by an amount equal to the costs that it imposes on society. Relative to the

revenues for a representative casino of about $230 per adult each year from nearby residents, Pigouvian corrective taxes would represent between 61 and 96% of casino revenues.

Fourth, we showed that the available research indicates there is a lack of quality research on both the benefit and cost sides of the debate, and that there is an important need for better research. There is a need for more uniformity in the manner in which costs and benefits are treated. Peer-review-quality studies not funded by the casino industry or by pro- or anti-gambling groups are especially needed to refine and improve the cost–benefit numbers that are currently available. To further refine the cost–benefit analysis of casino gaming the following questions must be addressed.

What is the Effect of Casinos on the Number and Gambling Patterns of Problem and Pathological Gamblers?

Because the social costs of the casino industry are generated primarily by problem and pathological gamblers, it is essential to know how casinos affect problem and pathological gamblers. There is abundant evidence that increased gambling opportunities increase problem and pathological gambling. For example, the NGISC reported that the presence of a casino within 50 miles roughly doubled the prevalence of problem and pathological gambling.[41] Other indicators include the tremendous increase in the numbers of gamblers seeking help when casinos enter a market, the increase in gamblers anonymous groups when gambling enters a state, and the evidence from survey data on the number of problem and pathological gamblers before and after casino expansion.

Casinos may also affect the amount of gambling by problem and pathological gamblers. An average adult is expected to lose $200–300 each year in casinos if they are nearby, while a typical pathological gambler often loses 10–20 times this amount. Therefore, a small number of pathological gamblers accounts for a significant portion of casino revenues. A related issue is to determine the share of casino revenues that derive from problem and pathological gamblers. Does this share differ by type of gambling? For example, lotteries receive a smaller portion of their revenues from P&P gamblers because lottery play attracts a larger portion of the population.

How much does an Additional Active Problem or an Additional Active Pathological Gambler Cost Society?

This question is best addressed by studying problem and pathological gamblers directly. However, estimates derived from this sample may be biased because only a small fraction of P&P gamblers seek formal treatment. If those who seek help impose the greatest costs on society, our cost estimates of P&P gamblers would be overstated.

What is the Life Cycle of a Problem and Pathological Gambler?

For example, when casino gambling becomes available for the first time, what is the behavioral time profile for individuals who enter and leave the states of problem and pathological gambling? Do individuals begin with a period of increasing gambling dependence, move through a period of problem gambling, progress to pathological gambling, seek treatment (or withdraw unilaterally from the problem), and abstain thereafter? Or are there relapses and continued problems if treatment is not sought. This information could be used to predict how many currently active problem and pathological gamblers to expect for given population as a function of the availability of casino gambling.

What Effect do Different Types of Treatment have on Problem and Pathological Gamblers?

Such information would help people to know how to efficiently allocate funding resources for treatment interventions.

How can Casino Gambling be Offered to Minimize its Social Costs?

Quinn (2001) discusses many possible ways of offering casino gaming to reduce social costs. To evaluate the effectiveness of these interventions and their impact on casino benefits one would need to estimate the elasticity of both P&P and non-P&P gamblers to such actions.

What are the Net Profit and Tax Benefits of Increasing Casino Gambling?

Rather than estimating a true social benefit, many studies estimate only the gross increases in profits or only weight the increased benefits to local firms while ignoring lost profits to other firms.

What are the Distance Benefits of Increasing Casino Gambling?

To date only one study examines this important question. Testing the robustness of this result will provide more insight into this understudied area.

Focusing future research questions and methodologies on a clearly formulated theoretical foundation will allow us to make our estimates of both the costs and benefits of casino gaming more precise.

APPENDIX A

A Study of the Economic Impact of the Gaming Industry Through 2005, by The Evans Group: A Partial Critique

International Game Technology (♠ IGT), a manufacturer of computerized casino gaming products and video gaming machines, and operator of proprietary gaming systems, commissioned The Evans Group, an econometric consulting firm, to produce a study of the impact of the gambling industry in 1996. The 9 September 1996 press release for the resulting report entitled *A Study of the Economic Impact of the Gaming Industry through 2005* issued by ♠ IGT reported,

> States and localities that permit casino gaming have improved their overall economic performance . . . The study . . . reports that *wherever casino gaming has been implemented*, *employment has risen*, *unemployment fallen*, and additional tax revenues have been generated. (Emphasis added.)

The Evans study describes impacts for individual states. We will briefly examine the findings related to Illinois, a state with which the authors are familiar. On page 4-3 the report states:

> Based on these data, *it would appear that the opening of a casino reduced the unemployment rate* in that county in both the year it was opened and in the following year. The average employment in these eight counties...implies a total of 37 000 extra jobs. These multiplier figures are much higher than ordinarily obtained, and employment in these counties might have risen for other reasons as well. Nonetheless, *the figures do indicate that casino gaming has been a boon to these counties*, especially those that are more rural. (Emphasis added.)

Most casinos opened after 1991. The period 1991–1996 covered by the study, therefore, coincided with the nationwide economic expansion coming out of the recession of 1990–1991. Employment was rising and unemployment was falling in many counties, with or without the introduction of casinos. The authors, therefore, were right to feel uneasy. Their caution that 'employment in these counties might have risen for other reasons' shows they knew that simple before-and-after comparisons finding declining unemployment and increasing employment proved

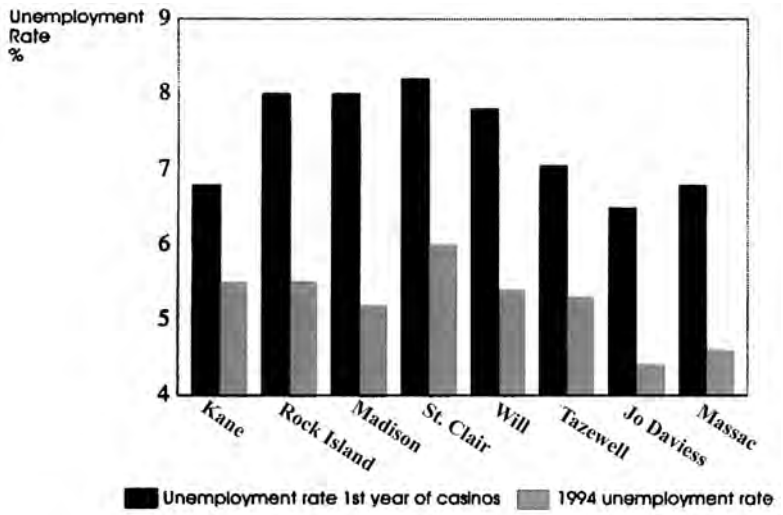

Figure 1. The Evans Group study, reproduced figure 4-1.

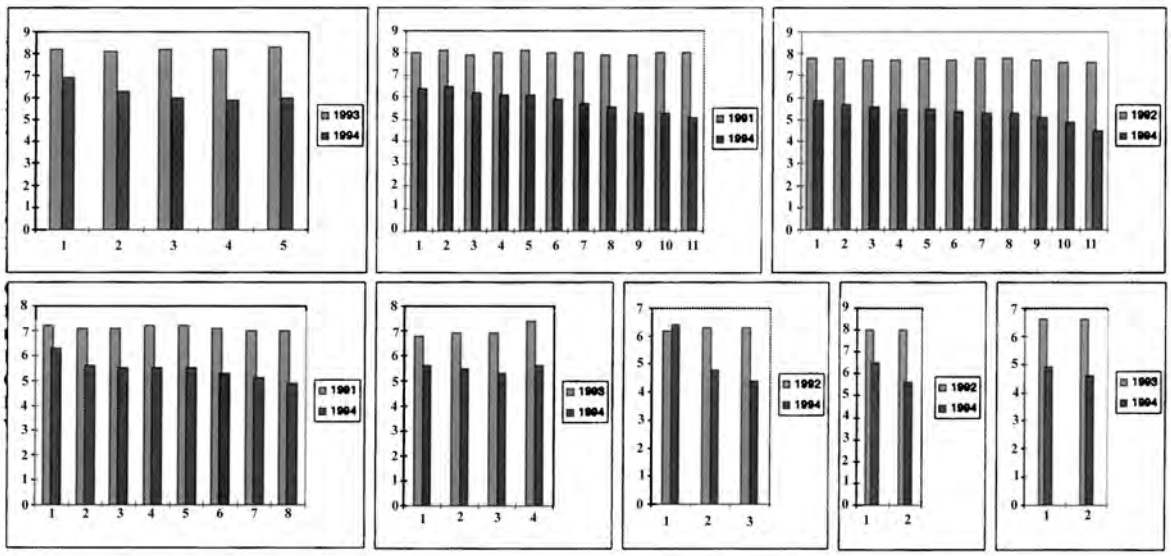

Figure 2. Casino counties are indistinguishable from non-casino counties.

nothing about the effects of casinos in a country recovering from recession. Figure 1 reproduces figure 4-1, provided in the original study. The authors explain that the observed drop in casino county unemployment rates exceeded the state average by 0.3 and 0.2 percentage points on average in the first and second year after introduction. The authors' conclusions are noted above. The rest of the story is provided below.

The study gives the impression that counties that opened casinos experienced better economic performance than those that did not. However, Illinois contains 102 counties. We can select other counties that had the same unemployment rate (within 0.1 percentage point) as the casino county in the inital period and compare their peformance directly. This is done in Figure 2. As shown there, the unemployment rate dropped in all counties with similar initial unemployment. Some counties did better than casino counties, some counties did worse. From left to right, bottom row first, the casino counties are numbers 6, 1, 3, 2, 2, 3, 7, 3. Nineteen counties performed better than their casino cousin, while 19 performed worse.

A statistical test confirms that the drop in unemployment of casino counties is statistically insignificantly different from the drop experienced by the comparable non-casino counties shown in Figure 2. Let ΔU denote the change in county unemployment rate minus the change in state unemployment rate for the same period, and let *Casino* identify counties that introduced casinos in the initial period (*Casino* = 1 if a county introduced a casino, 0 otherwise). Then running the following regression,

$$\Delta U = a + b\ Casino + \varepsilon$$

reveals that coefficient b is 2.75 (consistent with the 0.2 and 0.3 percentage point differences reported by The Evans Group), but with a standard error of 0.856 implying a p-value of 0.4. Coefficient b is, therefore, statistically indistinguishable from 0 at conventional levels.

NOTES

1. Gambling revenue is the net amount of money that the gambling operator extracts from patrons. It equals the 'handle' (gross amount wagered—which may reflect the same chips being bet many times before it is ultimately retained or lost) less payouts, prizes, or winnings returned to players. For example, if players wager \$1 000 000 on outcomes of a roulette wheel over the course of an evening, and \$880 000 is returned to them as winnings (some roulette slots are reserved for the house), then operator revenue is \$120 000.
2. According to the Indian Gaming Regulatory Act of 1988, Class I gambling consists of 'social games solely for prizes of minimal value'. Included in Class I gambling are traditional Indian games identified with tribal ceremonies and celebrations. Class II gambling includes bingo and 'games similar to bingo'. Class III gambling includes 'all forms of

gaming that are not Class I gaming or Class II gaming', such as blackjack, slot machines, roulette, and other casino-style games.

3. Kindt (1994), Grinols (1996), Grinols and Omorov (1996) and Henriksson (1996) discussed a number of these.
4. Public Law 104-169 of the 104th Congress established the NGISC. For more information about its mission, composition and findings see http://www.ngisc.gov/.
5. We show below that both concepts are necessary to a proper cost–benefit assessment of casinos.
6. We will show below that it should be present.
7. We follow throughout the paper standard general equilibrium accounting conventions for describing inputs and outputs in consumption and production.
8. That is, \$100 of utility is defined to be the utility that can be achieved by optimally spending \$100 at prices p, with nearest casino d miles away.
9. For example, the returns to playing roulette, slot machines, or a blackjack game are approximately the same regardless where offered. The framework could be modified to allow for different qualities of gambling. In this case the model would deal with multiple, imperfectly substitutable goods.
10. The transfer of wealth in gambling is generally from relatively poor to relatively wealthy. Therefore, if a dollar generates more utility for rich than poor, our assumption understates the social benefits. If a dollar generates more utility for the poor than the rich, our assumption understates the social costs of casinos.
11. A positive element of y_j denotes output of a good or service, and a negative component denotes the use of an input.
12. Although it is not central to our objective in this paper, we include z to be consistent with the general framework we develop. Excluding z does not affect the central arguments of this paper. Components of z are economy excess demands for traded goods. A zero denotes a non-traded good, while a positive entry denotes imports.
13. Use the fact that $\Sigma_i \theta_{ij} = 1$.
14. In 1998, gambling revenues were approximately 0.5% of GDP and casino revenues were approximately 0.25%.
15. It is conceivable, of course, in certain circumstances that the introduction of casinos could change prices enough to matter to local residents. For example, if casinos increased employment and the local population, the demand for local housing would increase, thus raising housing prices and creating capital gains for residents. In such cases, however, the *reduction* in demand for residential property and capital *losses* in the areas from which the new residents came would have to be taken into account. Over time, if new housing responded to the increased demand, the prices of the existing stock of housing would decrease. Because gambling doesn't *create* new people, but only moves them from one place to another, a reasonable first approximation is that the net effect of gambling on capital gains and consumer surplus considerations would be small.
16. We presume that the jobs being compared in two locations are comparable. Blair *et al.* (1998) argued that 'employees in gaming industry occupations are less satisfied with their jobs than those in other industries'. If jobs are *different* in two locations, then the jobs would appear in the formula as different because workers would demand compensating wage differentials, and this would affect profitability. If compensating wage differentials do not arise, but workers face non-market constraints that cause them to work hours that are not optimal given the wages paid, these costs would appear in the unemployment terms of Equation (5).
17. For industry revenue data, see *International Gaming and Wagering Business* (1999, p. 24).
18. The value of tobacco grown each year is \$39 billion. *Encarta Encyclopedia*, http://encarta.msn.com/find/Concise.asp?ti = 02A43000 # s12.
19. The proposal was for West Dundee, Illinois. The study reported, 'Both Christiansen/Cummings and Mirage Resorts estimate local gaming demand by applying gaming win *per capita* factors to the population residing within concentric circles of a gaming venue. The factors decline as distance increases. The \$200 win *per capita* applicable to the 0–50 mile segment was developed jointly by representatives of Mirage Resorts and Dr Cummings to apply to the local population in the New Orleans environs in a 1992 evaluation of the New Orleans gaming market.'
20. See, for example, GLS Research (1994) Clark County (Las Vegas, Nevada) Residents Study 1993–1994. Even in Las Vegas, one-third of the population does not gamble.
21. For example, a study of wagers in Minnesota (Smith and Craig, 1992; Tice, 1995) found that 1% of gamblers accounted for 50% of wagers, and that 10% accounted for 80%. An Illinois study (Gazel R, Thompson WN. 1996. Casino gamblers in Illinois: who are they? Manuscript, 1–25 (plus data supplied by the authors)) found that 10% of bettors accounted for 66% of wagers. Heavy gambling is not the same as problem and pathological gambling even though the revenues of P&P gamblers figure disproportionately among the revenues of the highest-gambling segment of the population. When compared with the population at large, the amount gambled by P&P gamblers implies that the share of casino revenues from problem and pathological gamblers can be as much as 1/4 to 1/2 of casino revenues (see Grinols and Omorov, 1996). Lesieur (1998b) reported that 48.7% of casino revenues in Nova Scotia came from problem gamblers, and that 55% of revenues for casino cards and dice games came from problem gamblers in Washington. In other locations he found that percentages ranged between 26.7 and 41.4%. In Montana, 37% of the revenues of video gambling machines was estimated to come from problem and pathological gamblers (Polzin *et al.*, 1998). The Productivity

Commission (1999) reported that problem gamblers account for 2.1% of the adult population but one-third of all gambling revenues in Australia. Volberg *et al*. (2001) also examined the distribution of revenue from different types of gamblers.

22. This description applies in Illinois and many other midwestern states. In Minnesota, for example, only American Indians operate casinos. In locations such as Atlantic City or the Gulf Coast of Mississippi, regulations allow entry to all as long as certain operating requirements are met. In these locations competitition drives economic profits to zero.
23. Non-Indian casinos paid over $2 billion in taxes to the various states on gaming revenues in 1997. CT's two Indian casinos paid $236 million to the state that year. In comparison, states generated revenues of approximately $10 billion from net proceeds of lotteries in 1997, or $51.15 per adult.
24. See Economic Report of the President, 1999, Table B-15, column 8.
25. How should we treat demand derived from addiction? If addiction is not rational then its derived demand should be treated differently. We, therefore, report both figures above. In the lower figure, we assumed that 32% of casino revenues are from P&P gambling.
26. A survey of this literature and list of references can be found in Adam Rose and Associates (1998) and the NGISC (1999), appendix 5 on Economic Development.
27. Leven *et al*. (1998) provide an example of how the focus on job creation may mislead the unwary or untrained. They wrote,

> 'This study seeks to take an objective look at the economic impact of the gaming industry on the Missouri economy. Where do the gaming revenues come from? How are they redistributed in the economy? By how much do state and local governments benefit? What is the net bottom-line economic impact? . . . [Gaming] does add spending, income, and jobs to the Missouri economy. It should be addressed in this context.'

While the authors do not claim that the answers to their questions constitute a cost–benefit evaluation, their plea that gambling adds 'spending, income, and jobs to the Missouri economy' and that 'it should be addressed in this context' could easily be misinterpreted to mean that a calculation of income, jobs, and employment is synonymous with a cost–benefit evaluation. In their summary (p. 75) they wrote:

> 'The focus of this study has been the determination of whether net new output (and jobs and employment) have been created state-wide in Missouri as a consequence of casino gaming operations, and if so how much . . . The 'bottom line' is that significant additions to the Missouri economy have been achieved. As of 1997, almost 18 000 net new jobs, $500 million in added personal income, and over $750 million of added output have benefited the state's economy.'

Who would argue with such figures? Or be aware that regardless of their accuracy, casinos in Missouri might fail to pass a cost–benefit test and thus be harmful to state welfare?

28. See Grinols *et al*. (2000) for a complete review of this literature. Each of the following crimes has been alleged in the literature to be associated with gambling. Index I Violent Crime (Aggravated Assault, Robbery, Rape, Murder), Property Crime (Larceny, Burglary, Auto Theft), and non-Index I crime such as Embezzlement and Employee Theft, Loan Fraud, Insurance Fraud, Forgery (including check forgery), Tax Evasion, Tax Fraud, Con Games (Swindles, Hustling Cards, Dice or Other Games), Bookmaking, Working in an Illegal Game, Pimping, Prostitution, Selling Drugs, and Fencing Stolen Goods.
29. Lesieur (1992, p. 45) and Executive Office of the Governor (1994, p. 67).
30. National population data by age cohort are on the US Census Bureau website http://www.census.gov/population/estimates/nation/intfile2-1.txt. As of 25 August 2000, the US had a population of 275 130 000. Moreover, 196 649 000 were aged 20 or older.
31. See Table 2.
32. See also Frank *et al*. (1991).
33. Representative of such cases is the following account, 'A Florida man who lost about $50 000 while gambling here (Atlantic City) during the past two days died Tuesday after he jumped seven floors from a Trump Plaza Hotel and Casino roof onto Columbia Place, officials said'. Brian Hickey, Staff Writer, 18 August 1999, South Jersey Publishing Co.
34. The minimum social costs of this category are the value of the resources spent by those trying to steal and cover up their offenses and the value of the resources spent by potential victims to decrease their likelihood of being victimized. There may be another component of cost in addition, however. Social costs can be higher if the original owners of the property value it more than the offenders do. For example, if the owners valued their property at $1000 and the offenders who stole it sold it to someone who valued it at $300, there would be an additional social loss of $700. Furthermore, if the thief is a pathological gambler and spends the wrongly acquired $300 gambling, his expenditures may reflect addiction rather than rational choice. In that case there would be social cost equal to some or all of the $300 because of his sub-optimal allocation of resources to the gambling sector. Last, although there is some debate about whether to count stolen dollars as costs to all of society (which includes the thief) because 'the thief gets the money', it is clear that the non-gambling portion of society will be made worse off by such actions, and losses to the rest of society are important in the

policy debate because they suggest that all of the abused dollars represent social costs to the non-gambling sector.

35. Westphal *et al*. (1999) is not used in Table 2, but supplements Ryan *et al*. (1999). The South Dakota Research Council study was completed in 1998, but addenda were added in 1999. See also Finance and Administrative Cabinet, Commonwealth of Kentucky (1999), Florida Department of Law Enforcement (1994), Florida Sheriffs Association (1994), Iowa Racing and Gaming Commission (1995), Lesieur (1998a).
36. As an alternative way of showing that the differences in the totals are driven largely by the number of cost categories estimated, we compared the totals after 'filling the gaps' in each study using the average cost for a given category from those studies that did estimate those particular costs. When doing so, the variance in the totals decreased substantially. The lowest totals were for South Dakota Legislative Research Council (1998–1999) and Thompson and Quinn (1999), $7396 and $8047, respectively. The largest were $25 742 by the Executive Office of the Governor (1994) and $18 203 by Thompson *et al*. (1998).
37. In addition to our use of the numbers, some studies, such as Thompson *et al*. (1998) intentionally formed their original estimates conservatively to understate costs.
38. Including the nominal value of this study would increase the cost estimate for three of the four costs it estimates. Using the values adjusted for 19 years of price level changes would have significantly increased the estimates of all four costs.
39. See Table 5, p. 34.
40. Our highest estimate of benefits was $75; our lowest estimate of costs $140. Applying the per adult costs of $221 from Table 4 to the estimate of benefits adjusted for P&P gamblers of $34 implies that casino gambling fails a cost–benefit test by a ratio of 6.5:1.
41. NGISC (1999, p. 4-4).

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