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Do economies of scale exist in the Atlantic City casino industry?

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Abstract

Purpose – The purpose of this paper is to examine evidence indicating the presence of economies of scale among Atlantic City casinos at the property-level and between multi unit and single unit operators.

Design/methodology/approach – The study extended two previous studies by performing a vertical analysis of financial performance data and by using multiple regression analysis to study costs and revenues over time. The study collected 320 annual property observations for the main analysis for the period of 1980 to 2009 and used detailed financial performance data for the 2007-2009 period.

Findings – Findings from both forms of analysis support the existence of scale economies in Atlantic City at both the property level and for multi unit operators.

Originality/value – Results of this study suggest that there are economies of scale for casinos in Atlantic City. Additionally, larger size was associated with better performance even during the current economic downturn. Managers or owners of casinos in Atlantic City may consider developing large physical size of their casinos when it is feasible. Additionally, the success of multi unit operators compared to single unit operators has implications for acquisitions while property values are depressed. Replication as a tool to aid generalization of results across time and situation contexts is illustrated and a number of future research lines are suggested.

Keywords United States of America, Casinos, Financial analysis, Casino management, Economies of scale, Replication research

Paper type Research paper

Introduction

Current conditions present numerous challenges to the casino industry, both in the USA and internationally. The worldwide financial crisis has impacted gaming jurisdictions across the USA. Commercial casino gambling revenue in the USA peaked at $34.13 billion in 2007. However, this total declined to $32.54 billion in 2008 and then to $30.74 billion in 2009 (American Gaming Association, 2010). Demand is soft, year-to-year performance figures have declined in many casino jurisdictions, and employees have been laid off. The availability of credit, or more precisely, the lack of available credit has put many expansion plans on hiatus. Complicating these tough economic times is the arrival of new gaming jurisdictions. The expansion of gambling jurisdictions during economic downturns has been a prominent feature of the last 40 years as states have repeatedly turned to legalized gambling as a revenue source when other revenue streams have been stressed (*State Legislatures*, 2009).

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These challenging economic conditions have perhaps eliminated the claim that gaming is a recession proof economic engine. Furthermore, a recent (2009) American Gaming Association sponsored survey of gaming professionals suggests that the industry's worldview may have been altered by the events of the last few years. Over three-quarters of the survey's respondents believed that recent economic downturn will forever alter the gaming industry (Lehman, 2009). This newly emerging view point about the casino industry forces casino researchers and practitioners to closely re-consider many issues including responsible gaming, customer retention, employees' job satisfaction, and loyalty programs (for example, McCain *et al.* (2010)).

Among the consequences from this changing gaming landscape may be a renewed emphasis on using the gaming firm's resources efficiently. For example, one of the suggested strategies for gaming firms to survive this economic downturn involves the evaluation of performance measures and the reallocation of underperforming assets. Taking this perspective forces the firm to critically evaluate many of the basic aspects of how it does business (Kalé, 2009).

In light of these concerns, the purpose of this paper is to evaluate efficiencies related to the allocation of casino size (when measured by floor space) in one of the gaming jurisdictions badly hit by the current economic downturn, Atlantic City, New Jersey, USA. This study will replicate and extend past work (Gu, 2001; Marfels, 1995) regarding economies of scale issues in the Atlantic City casino industry. Specifically, this study extends Marfels' study by introducing an important control variable (macro-economic conditions) to the regression model and includes more recent years of data observations. This study also replicates Gu's study by performing a vertical analysis and compares findings to his study results.

Background

The regulatory environment in Atlantic City

Because of its regulatory environment casino floor space is both a key, and in many ways a limited, resource for Atlantic City casinos. From the outset of legalized gaming in Atlantic City in the late 1970s, the State of New Jersey had planned the industry as an oligopoly, meaning that there would be few casino operators in the market (Eadington, 1999). In order to gain licensure and build a casino in Atlantic City, the property had to meet certain benchmarks for size and scope.

For instance, new Atlantic City casino construction had to include at least 500 hotel rooms and casino floor space of 60,000 square feet or less. If casinos built more than 500 hotel guest rooms and suites, they could increase the casino floor size by 10,000 square feet for each additional 100 rooms above the prerequisite 500 rooms. While no cap was placed on the total size of Atlantic City casino hotels, the maximum casino floor size was set at 200,000 square feet (NJ CCC, 1976). These regulations limited the types of investors who could afford to do business in Atlantic City and therefore set up the oligopolistic nature of the industry still present in Atlantic City today. They also made choices regarding casino floor size a key strategic decision faced by management.

Twenty-first century challenges facing Atlantic City

Atlantic City, New Jersey is among the casino jurisdictions struggling during the current economic conditions. Casino revenue peaked at $5.1 billion in 2006 and has since declined to $3.9 billion in 2009. In many ways this reflects Atlantic City's long history as a resort;

its performance over the last 150 or more years has been characterized as a rollercoaster of alternating periods of popularity and economic decline (Stansfield, 1978). Since New Jersey legalized casinos in 1976 and the opening of the first casino hotel in 1978, Atlantic City has become the second largest casino gaming destination in the USA. There are currently 11 casino hotels operating in the coastal community. Following the long term pattern of its boom and bust history in the early 2000s Atlantic City began yet another resurgence. In fact, until 2007, Atlantic City casino revenues had grown every year of the decade (Rutherford, 2008). Borgata Hotel Casino and Spa opened in the summer of 2003; it was the first new casino property since the opening of the Trump Taj Mahal 13 years prior. Borgata, a more upscale, Las Vegas-style mega casino was the first of its kind to open in Atlantic City. Borgata was an immediate success and it showed that Atlantic City had capacity for growth. On the heels of a successful half-decade of operations for Borgata, plans were on the table to bring several additional Las Vegas-style properties to Atlantic City. Prior to the current economic downturn, developers in Atlantic City were in the process of adding or renovating at least four new casino hotel properties (MGM Grand, Margaritaville, Pinnacle, and Revel) (*New York Times*, 2008; Pinnacle Entertainment Atlantic City, 2008; Revel Entertainment, 2007; Spain, 2007). It was widely believed that these projects would provide both a competitive edge against aggressive new jurisdictions and that they would help change the image of Atlantic City in such a way to guarantee the destination's success in the next generation. However as of midyear 2010 only one of these projects is moving forward. These economic impacts reach well beyond the direct stakeholders in the Atlantic City casinos; the 9.25 percent tax on total casino revenue is a major funding source for the State of New Jersey (Parmley, 2006; Rutherford, 2008).

Economies of scale

Quoting Cullen (1997, p. 140) "economies of scale exist when the long-run average cost falls as the rate of output increases." Furthermore, these economies of scale can exist at various levels of aggregation: there can be economies of scale at play for an industry as a whole, for a firm, and/or for a production unit. Thus, economies of scale can be external to the firm but internal to the industry – as the industry grows all units in the area benefit from reduced costs. Or economies of scale can be internal to the firm or the production unit. In that case, the benefits of decreased cost per unit of output are only enjoyed by the firm or production unit that has some advantage from, typically, size or scope of operations. Cullen goes on to argue that long-term trends away from small independent economic units in the hospitality industry and towards multi-unit operations reflects the achievement of, and benefits from, economies of scale.

Cullen's argument is consistent with many others found in the business literature. For example, Goldberg *et al.* (1991) identified economies of scale for securities companies while others (e.g. Berger *et al.*, 1987; McAllister and McManus, 1993; Shaffer and David, 1991) demonstrated its presence in the banking industry. Also, the existence of economies of scale has been suggested for manufacturing companies by Dunning (1989) and Riordan and Williamson (1985) in various perspectives, including the transaction costs aspect. Bourgeois (1980) and Keats and Hitt (1988) also argued that by achieving economies of scale firms can improve their performance.

In contrast, according to the agency cost argument (e.g. Jensen, 1986, 2000), monitoring expenditures increase as a firm size increases and consequently, damage the

firm's performance, supporting diseconomies of scale. Also, several scholars argued that an increase of transaction costs tends to exceed benefits from a firm's growth in size because of, for example, reduced operational efficiency and increased information loss in communications (Arrow, 1974; Child, 1973; Pugh *et al.*, 1969). These authors also argued that large firms tend to be highly bureaucratized which may limit their operational efficiency. Vogel (2001) was also agnostic regarding the presence of economies of scale in travel and hospitality industries. He argued that in these industries, including casinos, constant return to scale are dominant. He noted that while economies of scale can be achieved, for example, in administrative functions or purchasing, (Bogel, 2001, p. 183) "the people-service nature of these businesses suggests that most returns on investment do not improve as the scale of the operation increases."

Empirical evidence for casino economies of scale

Eadington (1976) conducted an initial study on casino economies of scale. He used a Cobb-Douglas production function to model casino output as a function of capital, labor, and raw material inputs. Specifically, he modeled gross casino revenue as a function of the number of various denomination slot machines, the number of table games of different types, and the number of employees. His units of analysis were seven Nevada gaming regions (Las Vegas Strip, Downtown Las Vegas, Reno, South Shore of Lake Tahoe, Sparks, North Shore of Lake Tahoe, and Elko) across the three years 1971 to 1973. He then summed the estimated output elasticities from the regression results. If these had summed to substantially more than 1.0 that would have provided evidence for scale economies. Elasticities in his empirical results summed to 1.106 which was not significantly greater than 1.0. Eadington considered this evidence regarding scale economies inconclusive but suggested that other evidence supported the presence of scale economies in the casino industry. He argued that if diseconomies of scale were present one would not expect larger areas to grow at faster rates than smaller areas. Since the larger gaming regions were growing faster than the smaller regions during the period under consideration he took this as evidence of a spillover effect of aggregation; that is he interpreted it as evidence for an industry level economy of scale.

A different approach to the study of economies of scale in the casino industry was taken by Marfels (1995). He used casino floor space in square feet as his measure of size and looked for relationships between size and several measures of casino efficiency among Atlantic City casinos. The four measures of efficiency used were total cost of casino/hotel operations per square foot of casino floor space, casino department revenue per square foot of casino floor space, casino department expenses per square foot of casino floor space, and casino department income per square foot of casino floor space. He claimed that these were, respectively, measures of average total costs, average revenues, average expenses, and average income. The analysis used full-year performance data covering the years 1980 to 1993. Results for all four regression equations were statistically significant. In each case, there was a negative relationship between casino floor size and each measure of efficiency. Larger casinos had lower total costs per square foot of casino floor space and lower casino department costs per square foot of casino floor space than did smaller casinos. At the same time larger properties had lower casino department revenue per square foot of casino floor space and lower casino department income per square foot of casino floor space than did smaller properties. Marfels (1995, p. 10) concluded: "overall evaluation of the evidence

from the regression analysis leads to the conclusion that the Atlantic City industry does not lend support to the notion that bigness is better in casino gaming when casino floor space is used as the benchmark for bigness."

Firm level economies of scale have also been investigated. Upneja *et al.* (2000) examined a number of financial performance measures for 50 publicly traded casino firms listed on the New York Stock Exchange, the American Stock Exchange, and NASDAQ. Data were retrieved from COMPUSTAT for the fiscal year 1995. A total of 11 performance ratios measuring liquidity, solvency, efficiency, and profitability were used. Size was operationalized using the firms' asset value. A median split was used to divide the 50 firms into two groups – large firms and small firms. Differences in the 11 financial ratios between large and small firms were evaluated with the Wilcox Rank Sum Test. Three of these tests indicated statistically significant differences between large and small firms. All the observed relationships involved the solvency ratios. Upneja *et al.* (2000, p. 33) found that smaller firms had a higher short-term debt ratio and lower long-term debt than did larger firms. Larger firms had a greater proportion of total debt than did smaller firms. These statistically significant relationships were all in the directions hypothesized from the literature. The lack of any statistically significant differences in efficiency ratios (asset turnover and fixed asset turnover) led the authors to note that "large casino firms do not appear to enjoy economies of scale."

A fourth approach to economies of scale in the casino industry was provided by Gu (2001, 1999). He used vertical analysis of casino income statements to compare the performance of larger and smaller casinos. In this approach, line items on an income statement are divided by total revenue. This approach is based on the logic that if costs and expenses are proportional between different firms or across different size classes, then they will show similar percentage values. On the other hand, economies of scale would be suggested if larger firms have lower percentages for cost items and/or higher percentages for income items when compared to smaller firms. Diseconomies of scale would be suggested if larger firms have higher cost percentages and/or lower income percentages than smaller firms.

Gu had access to aggregate data for small and large casinos on the Las Vegas Strip, where $72 million in revenue was the cut point between small and large casinos while he collected financial data of individual casino properties in Atlantic City. Given the regulatory requirements regarding size of casinos in Atlantic City, he used an ad hoc cut point of $400 million in revenues to identify larger from smaller properties. Results from the vertical analysis of aggregated Las Vegas Strip casino income data illustrated a number of cost advantages enjoyed by large casinos over small casinos. Given the availability of property-level data for Atlantic City, he was able to do both a vertical analysis of large versus small properties as well as a correlation analysis of the relationship between total revenue and each of the cost and income ratios from the casino income statements. These results also suggested that the benefits of economies of scale were present for larger properties compared to smaller properties in Atlantic City. For example, properties with higher total revenues tended to have lower cost-of-goods-and-services ratios, lower cost-of-selling, general, and administrative ratios, higher gross operating income ratios, and higher income from operations ratios than did smaller properties. Gu concluded that casinos in these two jurisdictions did experience economies of scale. Specifically larger casinos, as measured by total

revenue, achieved savings in costs areas such as sales, payroll, administration, and marketing when compared to smaller casinos.

These empirical results reflect the divergent theoretical positions regarding economies of scale in the casino industry advanced by Cullen (1997) and Vogel (2001). Some evidence was found in some situations for economies of scale; however other studies that operationalized size differently, or used different methods, or focused on different jurisdictions, or used data at a different level of aggregation (i.e. property versus geographical aggregation) reached different conclusions. Thus, it may be too early to generalize from this literature. Given the nature of these results, this study will attempt to replicate and extend the two studies that focused on Atlantic City (Gu, 2001; Marfels, 1995) in order to try to answer whether or not economies of scale have been present in the Atlantic City casino industry.

Replication research

Replication research was defined by Hubbard and Armstrong (1994) as "a duplication of a previously published empirical study that is concerned with assessing whether similar findings can be obtained upon repeating the study." A careful understanding of this definition hints at one of the limitations of replication research.

In hospitality research, it is difficult to fully "duplicate" a study; more often researchers are approximating the original work (Madden *et al.*, 1995). For example, this study can replicate the research and either support or contest the findings of Marfels' study on the Atlantic City data from 1980 to 1993 that appeared in his original study. However, when looking at the casino data generated after 1993, the last year Marfels studied, this study can only approximate Marfels' research methods because of the introduction of unknown factors that could include changing economic cycles, regulatory changes (including the cessation of reporting casino department expenses and income to the NJ CCC), and changes in local, regional and national competition, customer demographics and many more.

Replication research has long been a respected form of research in the natural sciences due to its ability to support or contest, and therefore validate or invalidate, previous work (Madden *et al.*, 1995). However, replication research in the hospitality literature has been less common. This is an unfortunate fact since replication is integral to establishing reliability, validity and generalizability of research findings.

Data and methodology

The data were collected from New Jersey Casino Control Commission annual reports spanning 1978 through 2009. From the annual reports, data for total revenues, costs, operating income, and casino floor size were recorded for each of the Atlantic City casinos each year they were in operation, which provides for a sample size of 320 observations. Because 1980 was the first year to have full data available for more than one property, that year serves as the first year for which observations were analyzed in this study, paralleling the logic of Marfels (1995). This study collected an additional data series of gross domestic product from the US Bureau of Labor Statistics' web site.

All performance observations within the data table were adjusted in two ways. First, all revenue, expense, and income have been assigned a ratio to the casino floor size in square feet for the corresponding property and year. Dividing all of the financial values by the casino floor size in square feet provides variables such as Total Revenue

per Square Foot. These values allow comparisons across properties of differing sizes. Also, all financial values have been adjusted for inflation by bringing each into 2009 dollars using the Consumer Price Index.

Following Marfels' method, this study performed a regression analysis to accomplish the study goal. However, this study introduced an additional control variable of economic conditions to the regression model because casino performance may vary by different economic conditions. With this control variable, the proposed regression model is:

$$OI_{it}(REV_{it} \text{ or } COST_{it}) = \alpha_0 + \alpha_1 SIZE_{it} + \alpha_2 EC_{it} + \varepsilon_{it},$$

where OI represents operating income per square foot, adjusted for inflation; REV represents total revenues per square foot, adjusted for inflation; COST represents total costs per square foot, adjusted for inflation; SIZE represents a firm's size, measured by log of total square foot; EC represents economic conditions, measured by gross domestic product; ε is the residual term, and subscripts, i and t, represent each casino operator and time period, respectively.

As a further extension to Marfels (1995), this study analyzed a second set of data. This second data set aggregated observations that qualified as multiple unit operators, such as Trump, Harrah's, Caesars and Bally's in years when the companies operated at least two casinos in the Atlantic City market. This data manipulation was done based on the notion that operators of multiple units existing in the same jurisdiction may strategically share their customers or centralize purchasing, possibly to maximize benefits of the company as a whole, not the individual property. This data set was analyzed with the same methods previously described to measure the impacts of size on total revenue, cost and operating income.

In addition to replicating Marfels' study, this study also replicated and extended Gu's (2001) analysis of economies of scale in Atlantic City. As discussed in a previous section, this study manipulated data to replicate two analyses (appearing in Tables 4-6 of Gu's study):

(1) vertical analysis on income statements to examine percentages of income and cost items; and

(2) correlation analysis between revenues and percentages of income statement items.

Results

Descriptive summary

Prior to carrying out the regression analysis to measure the impacts of casino floor size on costs, revenues and income, this study generated general descriptive statistics for the data. Some key observations about the Atlantic City casino industry from 1980 through 2009 gleaned from the data follow (all dollar figures are in constant 2009 dollars). The mean value of revenues was about $375 million, ranging from $6 million to $1,044 million while total costs ranged from $8 million to $859 million with a mean value of $258 million. Operating income of the Atlantic City casino industry had a mean value of $46 million with a minimum (maximum) value of − $33 ($199) million. Total casino floor square feet, representing a casino operator's size in this study, shows a mean value of 79,316 feet, ranging from 28,982 (Claridge in 1981) to 179,108 (Bally's

Park Place in 2004). Gross domestic product (GDP) during the period, on average, was $9,384 billion with the lowest of $5,839 billion (in 1980) and the highest of $13,229 billion (in 2007) (see Table I).

The study also performed a Pearson's correlation analysis to examine the bivariate relationship among examined variables and Table II present results. Except one case (i.e. a relationship of operating income with SIZE variable ($r = -0.023$), all bivariate relationships appear to be statistically significant at the 0.001 level. Especially, SIZE negatively correlates not only with COST which provides a hint of existence of economies of scale, but also with REV (total revenues) which does not fully support the economies of scale argument. However, SIZE significantly correlates with OI (operating income), which is consistent with the economies of scale proposal. A correlation analysis can be also used to examine a possibility of multicollinearity problem in a multiple regression analysis and only the correlation between REV and COST seems high enough to be considered alarming. Thus, the main multiple variable analysis will provide variance inflation factors (VIFs) to investigate whether or not the multicollinearity problem exists.

Main findings from replications of Marfels' study

To examine the main proposal, this study performed a separate multiple regression analysis for each of three dependent variables (i.e. total costs, total revenues, and operating income). Understanding the value of these three dependent variables is important when seeking to identify whether economies of scale exist in Atlantic City casino hotels. The linear regression method used in this section is a loose replication of Marfels' method. While Marfels measured data on casino department-specific revenues, expenses and income, this study looks at total property revenues, costs and operating income. Changes in NJ CCC reporting eliminated the existence of department-specific expense and income data, which existed for several years of Marfels' study.

Variable	*n*	Mean	Median	SD	Minimum	Maximum
Revenue (in million USD)	320	375	328	174	6	1,044
Total costs (in million USD)	320	258	235	112	8	859
Operating income (in million USD)	320	46	41	38	−33	199
Total square foot	320	79,316	63,538	33,696	28,982	179,108
Gross domestic product (in billion USD)[a]	30	9,384	8,982	2,469	5,839	13,229

Note: [a]The data are adjusted for inflation

Table I.
Summary of descriptive statistics

Variable	COST	OI	SIZE	EC
REV	0.892*	0.640*	−0.531*	−0.666*
COST		0.339*	−0.620*	−0.718*
OI			−0.023	−0.232*
SIZE				0.742*

Note: *Represents significance level of less than 0.001; REV represents total revenues per square foot, adjusted for inflation; COST represents total costs per square foot, adjusted for inflation; OI represents operating income per square foot, adjusted for inflation; SIZE represents a firm's size, measured by log of total square foot; EC represents economic conditions, measured by adjusted gross domestic product

Table II.
Summary of Pearson Correlation Coefficients

To allow for comparability amongst casinos of different sizes, new variables were created in which total cost, total revenue and total operating income observations were divided by the square footage of a given casino's gaming floor. To determine whether economies of scale exist within Atlantic City casino hotels, this study looks at the impacts of casino floor size on total costs per square foot, total revenue per square foot and total operating income per square foot. Additionally, all data measurements were adjusted for inflation using the consumer pricing index (CPI) multiplier. Having inflation-adjusted for 2009 dollars provides for comparable measurements over the 29 years of the study. After these treatments, the final three dependent variables are denoted as COST (total costs per square foot adjusted for inflations), REV (total revenues per square foot adjusted for inflations) and OI (total operating income per square foot adjusted for inflations).

Next, for each of the three regression analyses, the study checked the 320 total sample observations for outliers, based on the cut-off of standardized residuals at the 0.01 significance level (Anderson *et al.*, 2005). After the outlier elimination, the final sample sizes for the regression analysis with COST, REV, and OI are 295, 300 and 310, respectively. Table III shows main findings of the regression analysis. First, casino size (SIZE, measured by log of total square feet) appears to have a negative effect on COST (t-value $= -8.29$; p-value < 0.0001) which supports the argument for economies of scale. The second regression analysis demonstrates a negative relationship between SIZE and REV with t-value of -3.33 at the 0.001 significance level which may not be

DV Variable	Coefficients	t-value	p-value	VIF
COST				
SIZE	−1,337	−8.29**	<0.0001	2.02
EC	−0.53	−19.55**	<0.0001	2.02
n	295			
Adj R^2	0.82			
F-value	686.96**			
REV				
SIZE	−860.09	−3.33*	0.001	2.05
EC	−0.73	−16.81**	<0.0001	2.05
n	300			
Adj R^2	0.72			
F-value	383.32**			
OI				
SIZE	454.39	5.44**	<0.0001	2.16
EC	−0.10	−7.02**	<0.0001	2.16
n	310			
Adj R^2	0.13			
F-value	24.74**			

Notes: *Represents significance level of 0.001; **represents significance level of less than 0.001; REV represents total revenues per square foot, adjusted for inflation; COST represents total costs per square foot, adjusted for inflation; OI represents operating income per square foot, adjusted for inflation; SIZE represents a firm's size, measured by log of total square foot; EC represents economic conditions, measured by adjusted gross domestic product

Table III.
Summary of pooled regression analysis

consistent with the argument of economies of scale. However, the last regression analysis shows a significant effect of SIZE on OI and this last finding becomes critical in supporting the economies of scale proposal of this study. The highest VIF value is 2.16, which is far less than the cut-off value of 10 that would indicate the existence of a multicollinearity problem (Hair *et al.*, 1998).

As previously discussed, this study performed an additional analysis by aggregating data for multiple unit operators, for example, Trump, Harrah's, Caesars and Bally's. This analysis has been performed because of a possibility that those multiple unit operators may strategically work as a group to maximize the company's performance, not necessarily the performance of a specific individual property, and thus possibly could distort findings about the proposed relationship between casino floor size and performance. The additional analysis suggests basically the same results as was found in the analysis of individual properties; a negative effect of SIZE on COST and REV while a positive effect on OI[1].

The study also performed sensitivity analyses with the main models by introducing year dummy variables to control for any particular trends in time that the models may miss[2]. The analyses provide similar results to the main findings that SIZE positively influences OI while SIZE negatively influences COST. However, the negative effect of SIZE on REV that was found from the main analysis disappeared in the sensitivity analysis; the coefficient of SIZE on REV is −379.36, statistically insignificant with *t*-value of −0.982. These findings, however, still support the main findings that the positive impact of a casino' size seems derived from a significant reduction in costs, rather than an increase of revenues.

Main findings from replications of Gu's study

Extending Gu's (2001) work, this study analyzed the most recent year-end casino income statements using vertical analysis of cost and income ratios where all line items on an income statement are divided by total revenue and are reported in the percentage figure. Table IV shows Gu's (2001) results as a benchmark and makes two comparisons with the available data – a comparison of small versus large casinos using the same size criteria as used by Gu and a comparison of single unit casinos versus multi-unit casinos (where single and multi-unit refer only to activities in the Atlantic City market). Small casinos include AC Hilton, Claridge, Resorts, Sands, Showboat, Trump Marina and Trump Plaza while large casinos include Bally's, Caesars, Harrah's, Tropicana, and Trump Taj Mahal.

To evaluate the validity of this approach to operationalizing size, this study provides mean values of square feet for each casino company in Table V. Showboat and Trump Plaza show large enough mean values of square footage to be included in the large category. However, to be consistent with Gu's criteria for large and small properties which was based on revenue, not casino floor area, for a comparison reason as a replication analysis, this study keeps the same criteria and report results accordingly. Nevertheless, we performed an independent *t*-test between the large and small categories with Claridge and without Claridge, and both findings suggest that those casinos in "Large" category are larger than the casinos in "Small" category in a statistically significant fashion.

Comparing the 2000 results reported by Gu with the performance in 2009 shows potentially increased competition in Atlantic City, but generally provides similar results in terms of economies of scale. Ratios of income before taxes and extraordinary items

	2000[a]		2009[b]		2009	
	Small casinos[c]	Large casinos	Small casinos[d]	Large casinos	Single unit operators[e]	Multiple unit operators
Total revenue (%)	100	100	100	100	100	100
Promotional allowances	10.9	10.9	28.0*	23.7*	24.7	24.9
Net revenue	89.1	89.1	72.0*	76.3*	75.3	75.1
Costs of goods and services	49.3	44.1	55.8*	48.0*	52.4	48.6
Selling, general, and administrative	23.8	18.8	12.0*	9.1*	11.3	9.0
Provision for doubtful accounts	0.7	0.6	1.0	1.0	0.9	1.0
Gross operating income	15.3	25.6	3.2*	18.2*	10.7	16.4
Depreciation and amortization	4.8	5.4	4.6*	8.4*	8.9	6.6
Management fees	0.9	2.4	0.2	0.0	0.2	0.0
Other operating costs	2.0	1.3	2.3	2.8	0.1*	4.1*
Income from operations	7.6	16.4	−3.9*	7.0*	1.5*	5.7*
Interest expense	9.1	9.5	2.9	6.8	3.5	7.1
Other non-operating expenses	1.0	0	53.8*	1.5*	9.0	18.5
Income before taxes and extraordinary items	−2.5	7.0	−63.2*	−1.3*	−12.9	−19.8

Notes: *Represents significance level of 5 percent based on an independent *t*-test analysis; [b]all analyses for 2009 by authors using data from the New Jersey Casino Control Commission unaudited income statements; [c]Gu (2001) identified Hilton, Claridge, Resorts, Sands, Showboat, Trump Marina, and Trump Plaza as small properties and Bally's, Caesars, Harrah's, Tropicana, and Trump Taj Mahal as large properties; [d]following Gu and adjusting for changes in the industry Hilton, Resorts, Showboat, Trump Marina, and Trump Plaza were categorized as small properties and Ballys, Borgata, Caesars, Harrah's, Tropicana, and Trump Taj Mahal as large properties; [e]single unit operators in Atlantic City included Hilton, Borgata, Resorts, and Tropicana. Operators with multiple units in Atlantic City included Bally's, Caesars, Harrah's, Showboat, Trump Marina, Trump Plaza, and Trump Taj Mahal
Source: [a]Gu (2001)

Table IV.
Vertical analysis of Atlantic City casinos' aggregated income statements, 2000 and 2009

(IBTEI) to total revenue declined for both small and large casinos between 2000 and 2009. None-the-less, larger properties appeared to outperform their smaller counterparts in that key cost ratios were lower (e.g. costs of goods and services, and selling, general, and administrative) and income ratios were higher (e.g. gross operating income and income from operation). Perhaps most noteworthy is that the ratio of IBTEI to total revenue was extremely low for small casinos (−63.2 percent) compared to their larger counterparts (−1.3 percent). A further investigation on individual property's financial data reveals that this extreme value was mainly derived from Trump Marina and Trump Plaza. Similarly, the data generally suggest some advantages for multi-unit operators over single unit operators in Atlantic City. This happened even though what is arguably Atlantic City's most successful property, the Borgata, appears as part of the single unit operator data. More discussions are provided in the conclusions section.

Parallel with the logic used in the regression analysis, this study performed the vertical analysis with additional years of data sets, that is, years of 2007 and 2008. These additional analyses were performed because the specific financial picture based on the economic conditions of year 2009 could potentially misrepresent the general picture. Table VI presents the results of additional vertical analysis of the years 2007 and 2008, which basically support the findings of years 2000 and 2009.

	Mean value of square foot	*t*-tests *t*-value	*p*-value
Small casinos			
Hilton	64,434		
Claridge	41,006		
Resorts	67,403		
Sands	50,588		
Showboat	86,556		
Trump Marina	67,145		
Trump Plaza	82,589		
Large casinos			
Bally's	102,157		
Borgata	127,917		
Caesars	81,243		
Harrah's	85,880		
Tropicana	99,300		
Trump Taj Mahal	122,487		
Comparison			
Small vs large (with Claridge)		8.96	<0.001
Small vs large (without Claridge)		7.93	<0.001

Table V.
Summary of Atlantic City casinos' size information and comparisons between small and large casinos

There are a number of consistent patterns across both Tables IV and VI. For example, the ratio of costs of goods and services accounts to total revenue is larger in smaller casinos compared to larger ones and in single unit operations compared to multiple unit operations in all years investigated. A similar pattern is shown by the ratio of selling, general, and administrative costs to total revenue. On the other hand, gross operating income as a percentage of total revenue, income from operations as a percentage of total revenue, and income before taxes and extraordinary items as a percentage of total revenue are larger for large casinos compared to small casinos and for multiple unit operations compared to single unit operations for all years both pre- and post- the current economic crisis. These results suggest that even during recessionary conditions firms better able to achieve economies of scale either by volume of business or by being part of a multi-unit operation out perform their competitors. These results parallel those reported by Gu (2001) for Atlantic City casinos in 2000.

Recognizing that the vertical analysis data in Tables IV and VI are aggregated across properties, this study conducted a correlation analysis using data at the level of the individual property (Table VII). Again this replicates and extends Gu's (2001) presentation and the current study replicates the analysis for years of 2007, 2008 and 2009. Following Gu's method, this study adopted Kendall's tau-b correlation analysis. Generally, the results parallel his findings. Size, as measured by total revenue is negatively related the ratio of selling, general, and administrative costs in both Gu's work and the current analysis for years 2007 and 2008. Similarly, there are positive relationships between size and gross operating income and income from operations ratios in Gu's study and the current analysis for years 2007, 2008 and 2009. The current work finds a positive relationship between size and IBTEI ratio in 2007 and 2009. These relationships seem consistent with the presence of economies of scale in the Atlantic City casino industry, reinforcing the findings from this study's regression analysis.

Table VI.
Vertical analysis of Atlantic City casinos' aggregated income statements, 2007 and 2008

	2007				2008			
	Small casinos	Large casinos	Single unit operators	Multiple unit operators	Small casinos	Large casinos	Single unit operators	Multiple unit operators
Total revenue (%)	100	100	100	100	100	100	100	100
Promotional allowances	26.0*	21.6*	22.2	23.4	26.0*	22.3*	23.3	23.3
Net revenue	74.0*	78.4*	77.8	76.6	74.0*	77.7*	76.7	76.7
Costs of goods and services	47.6	45.2	47.7	44.9	51.9*	48.0*	51.4	47.8
Selling, general, and administrative	12.3	10.0	11.3	10.3	13.1*	9.8*	12.3	9.8
Provision for doubtful accounts	0.5	0.4	0.5	0.4	0.7	0.8	0.6	0.8
Gross operating income	13.5*	22.7*	18.2	21.0	8.3*	19.1*	12.4	18.2
Depreciation and amortization	6.0	7.4	7.4	6.7	5.1*	7.7*	8.1	6.3
Management fees	0.2	0	0.2	0	0.2	0.0	0.1	0.0
Other operating costs	2.6	1.8	0.3*	3.0*	2.3	2.1	0.1*	3.3*
Income from operations	4.7*	13.5*	10.3	11.2	0.8*	9.4*	4.1*	8.6*
Interest expense	9.1	7.3	8.0	7.7	6.8	8.2	7.5	8.0
Other non-operating expenses	7.1	0.8	−0.5	4.6	12.6	18.3	5.0	23.4
Income before taxes and extraordinary items	−16.8	5.4	−5.8	1.4	−18.6	−17.1	−8.4	−22.8

Note: *Represents significance level of 5 percent based on an independent t-test analysis

	2000[a]	2007[b]	2008	2009
Promotional allowances	0.147	−0.455	*−0.491**	−0.309
Costs of goods and services	*−0.846****	−0.345	*−0.564**	*−0.527**
Selling, general, and administrative	*−0.783***	*−0.527**	*−0.636***	−0.418
Provision for doubtful accounts	−0.021	−0.055	−0.236	−0.200
Gross operating income	*0.818***	*0.564**	*0.673***	*0.745***
Depreciation and amortization	0.378	0.200	*0.491**	*0.491**
Management fees	0.284	−0.341	−0.341	−0.341
Other operating costs	−0.036	0.110	0.150	0.187
Income from operations	*0.671***	*0.782***	*0.673***	*0.709***
Interest income	0.434	−0.382	0.091	−0.018
Other non-operating expenses	−0.427	0.091	−0.055	*0.564**
Income before taxes and extraordinary items	0.387	*0.600**	0.164	*0.600**

Notes: *, **, and ***represent significance level of 5 percent, 1 percent, and less than 0.01 percent, respectively; [b]all analyses for 2007, 2008, and 2009 by authors using data from the New Jersey Casino Control Commission unaudited income statements
Source: [a]Gu (2001)

Table VII.
Kendall's tau-b correlation coefficients and significance levels between total revenue and cost/income percentages from vertical analysis

Conclusions

This study examines whether economies of scale exist in Atlantic City casinos at the property level and whether multi-unit operators in the market achieve benefits compared to single unit operators. To achieve the study's goals, analyses from two previous studies were replicated and extended: a regression analysis by Marfels (1995), and vertical and correlation analysis Gu (2001). In general, regression analysis findings suggest that economies of scale exist in Atlantic City casinos for the period of 1980 to 2009. Replication of Gu's work indicates the presence of economies of scale both before and during the current recessionary period.

The findings generally suggest that an increased floor size tends to decrease total costs more than it decreases total revenues, thus in the end, increases operating income which becomes an important evidence of economies of scale. These findings are inconsistent with Marfels' findings that argued against economies of scale for Atlantic City casinos. Findings from the analyses that replicated Gu's (2001) study also support the existence of economies of scale which is consistent with Gu's findings. This part of the analysis showed superior performance by larger casinos compared to smaller ones and by multi-unit operations compared to single unit operations for years of 2007, 2008, and 2009 in terms of income from operations. Interestingly, when considering income before taxes and extraordinary items in 2008, single unit operators appeared to perform as well as multiple unit operators since the difference between the two groups mean performance was not statistically significant. This phenomenon seems to be driven by a huge increase in other non-operating expenses from multiple unit operators (i.e. 23.4 percent in 2008 compared to 4.6 percent in 2007 and 18.5 percent in 2009). While recognizing the importance of operating numbers (e.g. operating income), this particular finding in a major relation to non-operating numbers may have a somewhat limited implication. However, further studies may reveal more interesting findings on the matter.

New Jersey gaming regulations have shaped the industry in Atlantic City to include a relatively small number of large casino properties. Yet even within this restricted

range of business models, there is some evidence that size matters and our findings support such economies of scale. However, findings should be cautiously interpreted and applied. Considering other success factors impacting financial performances of Atlantic City casinos that are not examined in the current study, our findings should be counted as only one empirical support for advantages of casino size. Designing a property to optimize casino floor space is one thing; designing operational processes that reduce costs and generate high levels of profit may well be a more daunting, but important task. Certainly, an examination of such issues is strongly encouraged for future research.

This study's results also emphasize some of the benefits from replication research. Updating and extending studies helps to distinguish between situation and time-period specific results and more robust results that can be generalized across settings and eras. For example, in comparing this study to Marfels' earlier work, a control variable (economic conditions) was added to the regression analysis and the analysis was extended to include the case of multiple unit versus single unit operations and the time frame over which relationships were considered was substantially increased. Consequently, our findings are not consistent with Marfels' findings. Implications of these inconsistent results have to be conditioned on at least two points. First, changes in NJ CCC reporting practices meant that departmental level data available for the time period of the earlier study was not available for the full 1980-2009 time period. Second, the time series of data investigated in this study was considerably longer than that available to Marfels. A longer time series represents both more data and more statistical power as well as more opportunity for changes in the context in which the operations of Atlantic City casinos are framed. For example, during most of the time period covered by Marfels Atlantic City faced little direct competition from casinos east of the Mississippi River. The competitive environment had changed substantially by the late 1990s and 2000s. These differences are a reminder that, as noted by Madden *et al.* (1995) replication typically involves approximation rather than duplication. Researchers are strongly encouraged to continue the examination of this topic with more rigorous and sound approaches to better understand the generalizability of Marfels' and our findings.

Findings of this study may provide some practical implications. The regression analysis suggests that large casinos in Atlantic City enjoy significant cost (per square feet) reduction while revenues (per square feet) either decrease less than cost reduction (based on the main regression analysis with economic conditions variable) or statistically do not change (based on the sensitivity regression analysis with 29 year dummy variables). Casino managers and executives may consider these findings when they develop strategies regarding new properties or expanding existing ones. When casino operators plan growth projects, our findings may provide positive tips in evaluating the operational nuances of those projects so that they can reduce costs to drive economies of scale. Casino executives may choose an expansion project over other riskier or unpredictable projects during recessions; our findings suggest that economies of scale tend to exist even during recessionary periods. Also, casino managers may develop concrete and constructive plans on how to bring in revenues when considering an expansion project because it seems that revenues decrease as a casino in Atlantic City grows in size.

More likely than new construction or even expansion projects in the current economic climate are mergers and/or acquisitions of existing properties. The failure of some casinos to generate net gains during turbulent economic times has devalued them and has made them ripe for acquisition. This study provides information to operators regarding what they can expect in terms of performance when they add properties to their existing portfolios. Top-line revenues continue to suffer in Atlantic City as they do in Las Vegas. However, operators that have cash or can secure financing in order to purchase existing properties, especially if they can do so at a bargain, may realize a high rate of return on that investment. This study has shown that multi-unit operators, like large casinos, are able to drive operating income increases by exploiting economies of scale. While many variables exist, not the least of which are management and marketing, multiple unit operation can position the operator to generate greater operating income through the decrease of costs even if the acquired casino's revenues stay about the same.

Another interesting finding from our study is about effects of economic conditions on casinos in Atlantic City. Our findings show that economic conditions – measured as adjusted GDP – have a negative relationship with costs and revenues. However, this negative effect tends to be greater on revenues than costs, thus it has a negative effect on casinos' operating income. It is not difficult to understand that costs decrease during good economic periods, but it is somewhat puzzling to see why revenues decrease during periods of economic growth. A possibility that should be investigated as to why Atlantic City's revenues may fall during periods of economic boom and perform better during hard times is that Atlantic City, as a destination, is an inferior good and people may choose to go to Atlantic City and gamble in Atlantic City casinos when other (superior good) options are not available or are too expensive. As the economy improves and consumers are more confident and have greater disposable income and a bigger gaming wallet, they may likely choose to go elsewhere (i.e. Las Vegas). And when times are more difficult and consumers cannot afford a vacation in Las Vegas, they may do their gaming closer to home perhaps in Connecticut, Pennsylvania or in Atlantic City. To date little work has been done on the status of casino destinations as inferior or superior goods. These results suggest that this may be a fruitful line of future inquiry.

Furthermore, opportunities for future research include testing hypotheses related to casinos' revenue and income in environments not as strictly regulated as Atlantic City. In addition, there are opportunities to research impacts of the 2008 and 2009 economic decline in the USA on casino markets across the country. Comparing the vertical analysis results for 2000 to those for operations in 2008 and 2009 illustrated some of the areas hardest hit by economic conditions (e.g. other operating expenses at some small operators) and indicated some ways that casinos may be attempting to cope with these more challenging conditions. Replicating this study across other jurisdictions may help to identify best practice and may help to quantify the role that the different regulatory regimes play in shaping casino performance.

Notes

1. Regression analysis results of multiple unit operators are available on request.
2. Sensitivity analysis results are available on request.

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