

# *Journal of Business Valuation and Economic Loss Analysis*

---

*Volume 4, Issue 2*

2009

*Article 9*

HURRICANE KATRINA AND ECONOMIC LOSS

---

## Katrina and the Gulf States Casino Industry

Douglas M. Walker\*

John D. Jackson†

\*College of Charleston, WalkerD@cofc.edu

†Auburn University, jjackson@business.auburn.edu

# Katrina and the Gulf States Casino Industry

Douglas M. Walker and John D. Jackson

## **Abstract**

Hurricane Katrina devastated the Louisiana and Mississippi Gulf Coast. The casino industry, especially in Mississippi, suffered staggering losses. We describe the industry's losses and provide data on the industry before and after Katrina. Following previous research which has indicated that casino development may be a stimulus to a state's economy, we use a simple OLS model to examine whether rebuilding the Gulf Coast casinos has had an impact on personal income in Louisiana and Mississippi. After accounting for other factors, our results indicate that the casino industry has had a positive impact on post-Katrina personal incomes in Louisiana and Mississippi.

**KEYWORDS:** casinos, natural disasters, economic development

## I. INTRODUCTION

Hurricane Katrina was one of the most devastating natural disasters affecting the U.S. in recent history. Television footage of the hurricane saturated the airwaves immediately after the storm and in the wake of the political controversies surrounding the roles of local, state, and federal government relief agencies. Long after the hurricane, Louisiana and Mississippi still exhibit the devastation. A drive along I-10 from New Orleans to the Mississippi Gulf Coast is surreal. The vast damage one sees actually being there cannot be effectively described. Still-photos and video images somehow do not capture the devastation. Many areas along that route remain as they were immediately after Katrina: lifeless and mangled. Even within the New Orleans metro area, hardly recognizable houses, department stores and gas stations remain stagnant, debris widespread. After being there and seeing it in person, one must wonder whether the area will ever fully recover.

Hurricane Katrina made landfall near the Louisiana-Mississippi border. The media coverage of Katrina focused on the devastation and humanitarian trauma of New Orleans. Although the Mississippi Gulf Coast was almost completely destroyed, it did not receive much attention. Of course, the overall impact of Katrina outweighs the effect on any particular segment of the economy. But among the industries most seriously impacted, the casino industry suffered staggering losses from Katrina. Then in September 2005, Rita made landfall near the Louisiana-Texas border, wreaking additional damage to Louisiana and further crippling the casino industry there.<sup>1</sup>

The casino industry is an interesting case, in part because of the extent of agglomeration of casinos on the gulf coast and in other markets. The industry represents a special case for the study of economic loss because a natural disaster such as Katrina can literally destroy the entire industry because of its agglomeration. This characteristic of casino markets is due, in part, to legal restrictions on casinos, but also to consumer demands for choice in casino venues, which would support the agglomeration of casinos.

The Gulf Coast casinos immediately began rebuilding in the wake of Katrina (and Rita). Aside from its focus on capital reinvestment, the industry has also publicized its efforts to help its employees in the wake of the hurricanes.<sup>2</sup> By October 2007, casino revenues on the Mississippi Gulf Coast and New Orleans' land-based casino had surpassed pre-Katrina levels, and Louisiana riverboat

---

<sup>1</sup> For maps of Louisiana and Mississippi casino locations, and other information, see American Gaming Association (2007, pp. 13-14).

<sup>2</sup> For example, see the press release by the American Gaming Association (2006), documenting the charity funds that had been established to help the affected Gulf Coast casino employees.

casino revenues were nearly up to pre-Katrina/Rita levels,<sup>3</sup> even though some properties had not been rebuilt. In perhaps no other industry was the recovery effort so immediate, intense, and noticeable.

In this paper we describe how the Gulf Coast casino industry was affected and how it has reacted to Hurricane Katrina.<sup>4</sup> Using the available data we also perform a simple empirical analysis of the casino industry's impact on the economic recovery of Louisiana and Mississippi after Katrina. Our paper highlights how this industry, concentrated as it is, has had a significant impact on the recovery from Hurricanes Katrina and Rita. This impact may be due, in part, to the industry's large size and agglomeration.

The paper continues in section II with a description of the Gulf Coast casino industry and how Katrina (and Rita) affected it. Section III is a brief literature review of the "economics of casinos" literature. In Section IV we describe the data and a very simple model to test whether the industry has affected the recovery efforts in those states. The results are also presented in Section IV. Section V concludes the paper.

## II. THE CASINO INDUSTRY IN LOUISIANA AND MISSISSIPPI

Since casinos were legalized in the early 1990s the casino industry in Louisiana and Mississippi has expanded significantly. At the end of 2006 there were fourteen large casinos in Louisiana and 28 in Mississippi, many of which are located near or on the Gulf coast and along the Mississippi River. Some of the casinos are land-based and some are riverboats.<sup>5</sup>

The casinos in these two states enjoy some measure of isolation. Commercial casinos are not legal in any surrounding states (Alabama, Arkansas, Tennessee, Texas), suggesting that casinos in these states are able to attract tourists from around the Southeast U.S. and beyond.

During the past decade at least eighteen hurricanes have landed in or near the Louisiana or Mississippi coast. But none of the storms has affected so much damage as Katrina did. Certainly, no other storm has damaged the casino industry as significantly. Nine casinos in Louisiana and thirteen in Mississippi were seriously damaged and shut down, or destroyed, by Hurricanes Katrina and Rita

---

<sup>3</sup> August 2005 Mississippi Gulf Coast revenues were \$105 million; in September 2007 they were over \$111 million. The New Orleans land based casino revenue was \$29 million in July 2005, and \$32 million in October 2007. Riverboat casino revenues in Louisiana were \$157 million in July 2005 and \$137 million in October 2007.

<sup>4</sup> We include information on Hurricane Rita, too, to the extent it impacted the casino industry.

<sup>5</sup> The sizes of these casinos range from 14,000-180,000 square feet. In addition to these there are a variety of smaller casinos. Information on specific casinos can be found at <http://www.casinocity.com>.

in late summer 2005 (Table 1). Six of the casinos – three in Louisiana and three in Mississippi – never reopened.

**Table 1.** Casinos damaged by Hurricanes Katrina and Rita

Damaged by Katrina (August 2005)		Damaged by Rita (September 2005)	
<i>New Orleans area</i>	<i>Mississippi Gulf Coast</i>		<i>Lake Charles, LA</i>
Bally's Boomtown Harrah's Treasure Chest	Beau Rivage Boomtown Casino Magic (Bay St. Louis) Casino Magic (Biloxi) Copa Casino Grand Casino (Biloxi)	Grand Casino (Gulfport) Hard Rock Imperial Palace Isle of Capri Silver Slipper The New Palace Treasure Bay	Grand Palais Isle Lake Charles Harrah's Pride Harrah's Star L'Auberge du Lac

Specific data on damages are not available by casino property. However, pictures of some of the damaged properties illustrate just how devastating Katrina was, particularly in Biloxi and Gulfport, MS.<sup>6</sup> Of course, New Orleans received most of the media attention after Katrina because of the large number of people affected by the storm and the subsequent flood, but the casino industry in Mississippi was damaged more seriously than that in Louisiana. This is mainly because of the high concentration of casinos along the Mississippi Gulf Coast.

According to Fahrenkopf (2005), the State of Mississippi loses \$500,000 each day the Gulf Coast casinos are not operating. Casino taxes and fees constitute 10% of the Mississippi's state tax revenues (Mississippi *ad hoc* Gaming Committee 2004).<sup>7</sup> The industry's tax impact on Louisiana is not as significant, but is still sizable.

To get a more objective picture of the casino damage caused by the hurricanes, we can piece together data provided by each state's casino regulatory agency.<sup>8</sup> Unfortunately, the states do not publish the same type of data on their casinos. Louisiana publishes monthly revenue data by property, but Mississippi does not. Mississippi publishes the number of slot machines operating at each property each

<sup>6</sup> For example, see <http://www.gulf-coast.com/Katrina-Information/katrinapics1.html>.

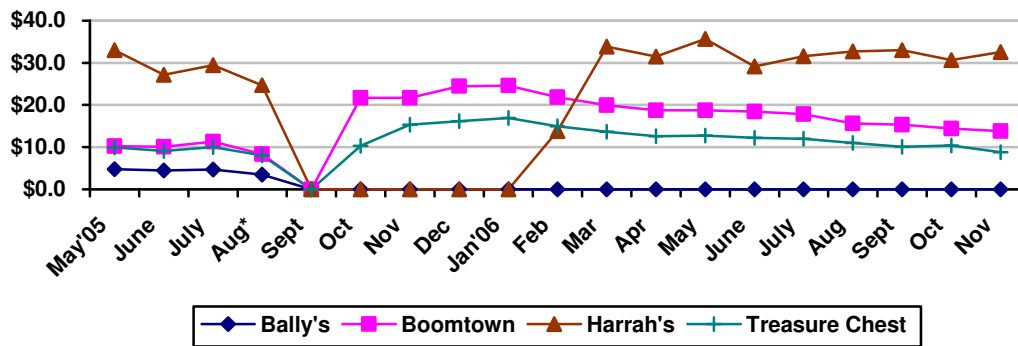
<sup>7</sup> Walker and Jackson (2008) estimate that casino taxes represent about 3.3% of Mississippi's tax revenues.

<sup>8</sup> The agencies are the Louisiana Gaming Control Board, <http://www.dps.state.la.us/lgcb/>; and the Mississippi Gaming Commission, <http://www.mgc.state.ms.us/>.

month; Louisiana does not. Revenue by property is the ideal measure of gambling volume, but the number of slot machines is an adequate substitute, since the industry relies on a basic formula in allocating slot machines to floor space, and this is directly related to total revenue. By examining the revenue data (LA) and slot count (MS) we can get a picture of the impact of Katrina on the industry's revenues.<sup>9</sup>

Figure 1 illustrates the monthly (nominal) revenue from New Orleans area casinos. Katrina forced the closing of all of the casinos through the end of September 2005. Boomtown and Treasure Chest reopened in October 2005, and Harrah's reopened in February 2006. Bally's never reopened.

**Figure 1.** Nominal casino revenue, New Orleans area casinos affected by Katrina (millions of \$)



Source: Louisiana Gaming Control Board

Table 2 lists the slot count at Mississippi Gulf Coast casinos the month before Katrina (July 2005), several months after (December 2005), and in October 2006, over one year after Katrina. After Katrina many casinos rebuilt and, in some cases, expanded. By looking at the total number of slots operating on the Gulf

<sup>9</sup> The state agencies do track aggregate state monthly casino revenue, but these data do not reveal the extent to which Katrina affected Gulf Coast casinos since not all casinos in the state are on the coast.

Coast during each month (last row, Table 2) we get an idea of the extent to which the casino industry in Mississippi has recovered from Katrina.<sup>10</sup>

**Table 2.** Mississippi Gulf Coast casino slot machine positions, casinos affected by Katrina

Casino \ Slot Positions	July 2005	Dec. 2005	Oct. 2006
Beau Rivage (Biloxi)	2217	-	2017
Boomtown (Biloxi)	1052	-	1388
Casino Magic (Biloxi)	1177	-	-
Copa Casino (Gulfport)	1354	-	-
Grand Casino (Biloxi)	2610	-	838
Hard Rock Casino <sup>a</sup> (Biloxi)	1500	-	-
Hollywood <sup>b</sup> (Bay St. Louis)	1206	-	915
Imperial Palace (Biloxi)	1484	1885	1999
Island View Casino <sup>c</sup> (Gulfport)	2060	-	1032
Isle of Capri (Biloxi)	1184	728	1333
New Palace (Biloxi)	1189	827	849
Silver Slipper (Biloxi)	860	-	-
Treasure Bay (Biloxi)	973	-	228
<b>Total Slot Positions</b>	<b>17366</b>	<b>3440</b>	<b>10599</b>

Source: Mississippi Gaming Commission. Notes: <sup>a</sup> The Hard Rock Casino was set to open the week Katrina hit. The rebuilt hotel/casino opened in July 2007, with 1445 slot machines. <sup>b</sup> Prior to Katrina the Hollywood was named Casino Magic. <sup>c</sup> Prior to Katrina the Island View was named Grand Casino.

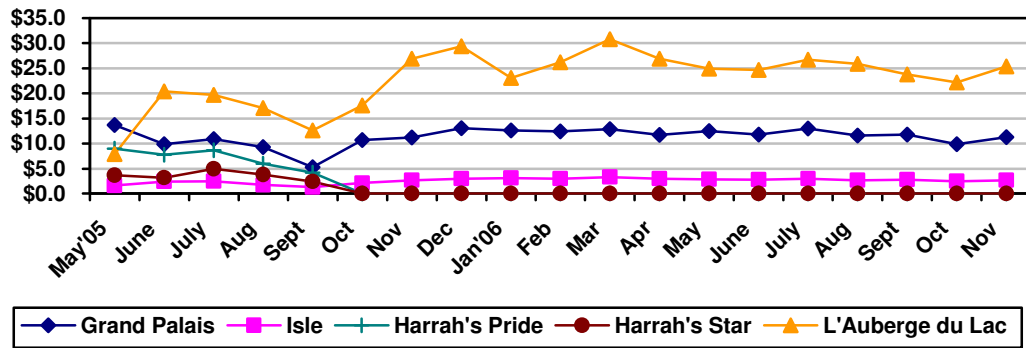
Hurricane Rita affected the casino industry in Lake Charles, LA, less than a month after Katrina. Figure 2 illustrates revenues at the affected casino properties. The area's largest casino, L'Auberge du Lac, opened in May 2005, the first month for which data are shown. This casino's opening probably accounts for the decline in revenues at the other casinos leading up to Hurricane Rita. After Rita this market appears to have stabilized.

The repair and rebuilding of the casinos on the Mississippi Gulf Coast and, to a lesser extent, in New Orleans and Lake Charles, LA, raise the question of whether the casino industry has an impact on the overall recovery of the region. The question is more relevant for Mississippi, as the casino industry is the dominant

<sup>10</sup> Occasional snap-shots of slot positions provide a better picture than a monthly listing would. This is because casino expansion and remodeling may affect slot count and revenue in different ways.

industry in Biloxi and Gulfport, and is significant relative to the state economy. However, the industry is also a noteworthy component of the New Orleans, Lake Charles, and Louisiana economies.

**Figure 2.** Nominal casino revenue, Lake Charles area casinos affected by Rita (millions of \$)



Source: Louisiana Gaming Control Board

### III. BRIEF LITERATURE REVIEW

Currently in the U.S., eleven states offer legalized commercial casino gambling. The primary motivation for casino legalization has been the potential tax revenues, as well as the capital development and employment growth promised by the casino industry. Now the casino industry is one of the largest entertainment industries in the country, with gross revenues exceeding \$30 billion per year.<sup>11</sup> Given the size of the U.S. casino industry there are surprisingly few empirical studies of it. No studies have been published that analyze the impact of Katrina on the casino industry or how this relationship affects the states' economies.

The theoretical link between economic development and the introduction of a new, large industry in a region is fairly straightforward. Schumpeter (1934) suggests that one source of economic development is the introduction of a new good to an economy. Casino gambling qualified as a new good in Louisiana and Mississippi in the early 1990s because casino gambling was illegal prior to that time. Building a new industry requires an inflow of capital and labor. To the

<sup>11</sup> Source: <http://www.americangaming.org>.



extent inputs are already fully employed in the region, the new industry puts upward pressure on the prices of labor and capital. The result is the growth in the local economy, accompanied by lower unemployment, higher incomes, and so on.

The director of the Chamber of Commerce of Tunica County, Mississippi, offered anecdotal evidence in 1994 that the casinos did, in fact, have a positive impact, at least on his community:

In January 1992, per capita income in the county was \$11,865; ...53% of residents received food stamps... Because of increased government revenues, property taxes have been lowered by 32% in recent years. Unemployment has dropped to 4.9%... The number of welfare recipients has decreased 42%; the number of food stamp recipients has decreased by 13%... In 1994 [Tunica] county recorded the highest percent increase in retail sales of all Mississippi counties: 299%. (Franklin 1994)<sup>12</sup>

Most economic research on gambling has been focused on lotteries. However, there is a small body of work that has focused on casino gambling and its impact on the local economy. Some of the more comprehensive resources include the Australian Productivity Commission report (1999), Eadington (1999), National Gambling Impact Study Commission (1999), National Research Council (1999), and Walker (2007a). Two studies (Walker and Jackson 1998, 2007) offer empirical analyses of the relationship between the casino industry and state level economic growth.

In the literature there are basically two opposing views on the economic effects of casinos.<sup>13</sup> On one side, there are researchers who have argued that the casino industry essentially cannibalizes other industries, resulting in no net economic effect. Goodman (1995) provides anecdotal evidence in support of this view. However, even staunch casino opponents like Goodman (1995, p. 25) have admitted that under some conditions the casino industry can be a catalyst for growth:

In those rare instances where a casino was located in an area with a negligible economic base and few jobs to begin with – an impoverished rural area...or a severely depressed area...there could be a significant

---

<sup>12</sup> It is unclear whether Franklin's data account for people who have migrated to/from Tunica county.

<sup>13</sup> For our discussion we will take for granted the potential for social costs resulting from the behavior of "pathological gamblers." Approximately 1% of gamblers are diagnosed as pathological. The behavior of these individuals is responsible for a significant amount of social costs. However, whether casino legalization affects the prevalence rate is not clear. In addition, how to measure these costs is still under debate in the literature. For a discussion, see Walker (2003, 2007b). The social cost issue is beyond the scope of this paper.

positive economic transformation...since there are almost no preexisting local businesses to be negatively affected.

This perhaps describes the Mississippi Gulf Coast both prior to casino legalization in 1991 and after Katrina in 2005.

On the other side of the debate, we have argued that casinos in the U.S. have stimulated state-level economic growth (Walker and Jackson 1998). We analyzed quarterly data from U.S. commercial casino states from 1991-96 and found that casino revenues Granger cause state per capita income. There was no causality in the other direction. We argue that this evidence supports Schumpeter's (1934, p. 66) theory that the introduction of a new good is a source of economic development. However, our study was early enough that it included few years of data after the introduction of casinos in the early 1990s. Arguably, these results might have been picking up only some initial stimulus effect.

Since 1993 the casino industry in Mississippi has matured significantly. Prior to Katrina it was the third largest casino market in the U.S., after Nevada and Atlantic City. The Gulf Coast, in particular, had been transformed by the casino industry, as a tour or photos prior to Katrina would have shown. It is difficult to argue that the casino industry has not helped in the economic development of the Mississippi Gulf Coast. The stimulus effect, if it exists, is less obvious in Louisiana; New Orleans was a vibrant tourist destination prior to the introduction of casinos.

Recently we repeated our 1998 study using updated annual data, from 1991-2005. Our goal was to determine whether the earlier results were robust in the longer term. The newer study did not indicate any Granger causal relationship between casino gambling and per capita income (Walker and Jackson 2007). The explanation for this result contradicting the earlier one was that (1) the earlier study used quarterly data, while the later study used annual data; and/or (2) perhaps there is a short-run growth effect from casinos but as time passes the effect diminishes, indicating no long-term effect.

Other than our previous studies, there are no other published studies of which we are aware that examine the relationship between casino gambling and economic growth. Other work has speculated on the relationship, but none has offered empirical analyses of it. With this limited evidence in mind, we view the evidence on the long-term relationship between casino gambling and economic growth as inconclusive. In any case, our concern in this paper is primarily with the more short-term issues surrounding recovery from a natural disaster.

In terms of the risk, insurance, and loss valuation literature, we believe the casino market provides an interesting example of study, in terms of the industry

agglomeration, the potential for significant losses from natural disasters<sup>14</sup> and, most importantly, the extent to which such industries may lead economic growth during the recovery from a natural disaster.

#### IV. THE DATA, MODEL, AND RESULTS

We wish to test whether there has been any positive impact of rebuilding the casino industry on the post-Katrina economies of Louisiana and Mississippi. As indicated above, what empirical evidence exists on the relationship between gambling and economic growth is mixed. However, our hypothesis is that the immediate, large scale rebuilding efforts after Katrina might have an effect similar to that found in our 1998 study. So soon after Katrina a large data set is not available. We use what data are available and test a very straightforward (and simple) model of income determination in the affected states.

We collected quarterly data on Louisiana and Mississippi personal income and casino revenues.<sup>15</sup> The personal income data are from the Bureau of Economic Analysis. The states' casino regulatory agencies provided the casino revenue data. The data were adjusted for inflation using the southern urban CPI from the Bureau of Labor Statistics.

To be consistent with earlier studies we initially considered using per capita income as our measure of economic growth. Instead, we use state-level personal income. There are two reasons for this. First, before and after Katrina there was a significant amount of migration from New Orleans, the Biloxi/Gulfport area, and other affected cities. We are uncertain of the extent to which this migration would be accurately accounted for in the states' per capita income data. In other words, sufficient out-migration from the affected area could ameliorate or negate the expected fall in per capita income even though the economy of that area was devastated. Second, personal income data are available on a quarterly basis, while per capita state level GDP data are not. For these reasons we believe our personal income data are the best available to proxy for economic growth.

Our analysis uses data beginning in the first quarter of 1997 (1997.1). We chose this starting period for two reasons. First, we wanted to avoid revisiting the same time period analyzed in our earlier paper (1998). By starting in 1997 we hope not to pick up the same initial stimulus effects we found in that paper.

---

<sup>14</sup> For a more general discussion, see Jaffee and Russell (1997), Kunreuther (1996), and Zeckhauser (1995). Guimares, Hefner, and Woodward (1993) and West and Lenze (1994) discuss the impacts of specific hurricanes.

<sup>15</sup> We use quarterly, rather than annual, data because we wanted to maximize the number of observations in our sample. Aside from this, there are no post-Katrina annual data as of this writing. Our casino revenue data exclude non-casino video poker and slot machines. We also exclude Indian casinos, as their data are not publicly available.

Second, the Louisiana Gaming Control Board was created in 1996 and began subsequently publishing the casino industry data. Previously, the State Police were responsible for data collection and reporting. Rather than dealing with the potential for changes in data collection and reporting among the two agencies, we opt to use data from the new regulatory agency only. Aside from these reasons, data from 1997.1 provide adequate pre-Katrina data given the available post-Katrina data.

Our sample of data runs through the third quarter of 2006 (2006.3), the last period for which personal income data were available as of this writing. Thus, we have 39 quarters of data for each variable and each state, for a total of 78 observations. Hurricanes Katrina and Rita struck in August and September, 2005 – both were in 2005.3. This means that 34 observations for each state are pre-hurricane (1997.1-2005.2), and five are post-hurricane (2005.3-2006.3).

We posit the following panel model to explain state personal income:  $Personal\ income(t_0) = \beta_1 Constant + \beta_2 Personal\ income(t_{-4}) + \beta_3 Casino\ revenue(t_0) + \beta_4 Casino\ revenue(t_{-4}) + \beta_5 Katrina\ dummy + \beta_6 Katrina \times (Casino\ revenue) + \beta_7 State\ dummy + \varepsilon(t_0)$ . We regress personal income on income lagged one year ( $t_{-4}$ ), contemporaneous casino revenue ( $t_0$ ), and casino revenue lagged one year ( $t_{-4}$ ). We employ the value of personal income lagged four quarters due to the well known result that aggregate annual personal income is a random walk. We chose the four period lag for casino revenues after an analysis of its correlogram. Current values of casino revenue appear not to be affected by immediately past quarters'. However, the fourth lagged period of casino revenue significantly affects the current period's. This is probably due to an annual cycle. For example, each January casino revenues are larger than the other winter months. When we did include other lag periods in the model, these did not have a marked impact on the results.

Since this is a panel model, we include a state dummy. This takes a value of 1 for Mississippi observations, 0 for Louisiana.

The remaining variables are designed to pick-up the effect the states' casino industries may have in explaining state personal income. The *Katrina dummy* takes a value of 1 from periods 2005.3 through 2006.3. Note that, since Rita hit Louisiana in September 2005, the Katrina dummy would also pick-up the effect of Rita. Finally, *Katrina x (Casino revenue)* is an interaction term between the Katrina dummy and contemporaneous casino revenues. This variable should pick up any relationship between casino gambling and personal income *above and beyond* what is explained by *Casino revenue (t<sub>0</sub>)* and *Casino revenue (t<sub>-4</sub>)*. In particular, it should tell us whether the effect of casino revenues on income enhances ( $\beta_6 > 0$ ) or detracts ( $\beta_6 < 0$ ) from economic recovery.

There are several variables that have been omitted from the model. Initially we included quarterly (seasonal) dummies. However, these were insignificant and did

not affect other coefficients appreciably. We suspect that our four-period lag adequately accounts for any seasonal effects. In the same vein, a linear time trend was found to be insignificant, and its omission did not affect other coefficients, so it was also dropped.

We did not explicitly account for financial relief provided by FEMA, other federal or state agencies, or insurance settlements. However, the BEA does indicate that these factors are accounted for in the 2005.3 personal income data (Bureau of Economic Analysis 2005). These expenditures, as well as the rebuilding efforts in other industries, are likely to be correlated with our *Casino revenue* ( $t_0$ ) variable. The casino revenue term interacted with the *Katrina dummy* should therefore pick-up any post-Katrina effect on personal income specific to the casino industry.

The regression results are presented in Table 3. The coefficient estimate on the four period lagged value of personal income is negative but statistically insignificant.<sup>16</sup> This is not totally unexpected since a correlogram of the pooled personal income variable suggested a white noise series. However, we included that variable because we viewed it as important to allow for some sort of time series process in personal income. The contemporaneous value of casino revenues is also statistically insignificant.<sup>17</sup> This result, as well, was not unanticipated. It should be expected to take time for any extant expansionary effects of the casino industry, such as employment, construction, or tax revenue effects, to impact area incomes. This expectation is borne out by the positive and significant (5% level, one-tailed test) fourth period lag in casino revenues. It is also worth noting that the coefficient on the state dummy variable is negative and statistically significant, confirming that, *ceteris paribus*, personal income is lower in Mississippi than Louisiana.<sup>18</sup>

We are concerned with the economic impact of Katrina and Rita and, more particularly, with whether the rebuilding of the casino industry has aided in recovery. Therefore, our particular interest is on the *Katrina dummy* and the term interacting it with casino revenues, i.e., *Katrina* x (*Casino revenue*). Recall that the coefficient on the *Katrina dummy* measures the *ceteris paribus* impact of the hurricanes on personal income and the interaction variable measures the post-Katrina impact of casino gambling on personal income above and beyond the standard (pre-Katrina) effect measured by the *Casino revenue* variables.

---

<sup>16</sup> The personal income data are in real terms, in millions of dollars.

<sup>17</sup> Casino revenues are in real dollars.

<sup>18</sup> Through a Phillips-Perron test on the residuals of the model we can reject the hypothesis of non-stationarity ( $P$ - $P$  statistic = -10.18; critical value at the 1% level is -3.53).

**Table 3.** Regression results.  
Dependent variable: Personal income (in millions \$)

Variable	Coefficient (t-statistic)
Constant	60134*** (7.19)
Personal income (t <sub>4</sub> )	-0.006 (-0.42)
Casino revenue (t <sub>0</sub> )	-1.30e-5 (-0.62)
Casino revenue (t <sub>4</sub> )	4.25e-5* (1.83)
Katrina dummy	-32093*** (-3.29)
Katrina x (casino revenue)	0.0001*** (3.30)
State dummy	-32489*** (-6.89)
$R^2=0.924$ , $Adj. R^2=0.918$	

Note: \*\*\* Signifies statistically different from zero at the 1% level or better, \*\* at the 5% level or better, and \* at the 10% level or better.

Regarding these results, Table 3 clearly indicates that Katrina and Rita had a devastating effect on personal income in Louisiana and Mississippi. The coefficient on the *Katrina dummy* is negative, sizeable in magnitude, and statistically significant at the 1% level. Equally important to this study is the result that the coefficient on the interaction term is positive and statistically significant at the 1% level. Increases in casino revenues thus have a significantly greater expansionary effect on personal income after the hurricanes than they had prior to them. This result in turn suggests that the casino industry, through rebuilding and its current conduct, has provided an impetus to the economic recovery of the area.

## V. CONCLUSION

We find that the post-Katrina casino industry expansion in Louisiana and Mississippi has had a positive impact on personal income in the states, even after accounting for the regular casino gambling activity in the two states. These results are consistent with our earlier paper (1998), which found a positive relationship between casino revenues and state per capita income. In one sense this is not very surprising. The rebuilding/new investment implicit in the rise in post-Katrina

casino revenues from essentially zero to their current levels would be expected to have a stimulative effect on any local economy, especially one that has been recently devastated.

This analysis brings to light an interesting case for research in economic loss, insurance, and valuation. If the casino industry serves as an economic engine, at least in certain jurisdictions, then perhaps traditional actuarial methods may understate the true social value of the industry, and others, that have a similar effect in the wake of a natural disaster.

There are several caveats that must be kept in mind when interpreting these results. First, we have a limited data series. With only five post-Katrina/Rita observations, it is uncertain whether this positive effect will continue. Second, it is not clear the path through which casino revenue translates into personal income. Rather than having a direct impact on personal income, perhaps the pattern of increase in casino revenues is a proxy for other rebuilding and revitalization activities.

Everything considered, we believe our analysis suggests that the casino industry is helping to make the recovery from Katrina more robust than it would otherwise be. This lends support to our earlier results of an initial stimulus from casino gambling development. But it does not necessarily mean this effect will continue in the longer-term.

## REFERENCES

American Gaming Association. 2006. Summary of gaming industry Katrina relief efforts. Washington, DC: American Gaming Association.

\_\_\_\_\_. 2007. *State of the States, 2007*. Washington, DC: American Gaming Association. Available online at <http://www.americangaming.org>. Accessed November 26, 2007.

Australian Productivity Commission. 1999. *Australia's Gambling Industries*, Report no. 10, Canberra, Australia: AusInfo. Available online at <http://www.pc.gov.au/inquiry/gambling/finalreport/index.html>. Accessed January 12, 2007.

Bureau of Economic Analysis. 2005. Estimated damage and insurance settlement effects from Hurricanes Katrina, Rita, and Wilma on quarterly and annual estimates of personal income. Available online at <http://www.bea.gov/katrina/index2.htm#Katrina2>. Accessed January 2, 2007.

Eadington, W. 1999. The economics of casino gambling. *Journal of Economic Perspectives* 13: 173-192.

Fahrenkopf, F. 2005. New challenges on the road to recovery. Washington, DC: American Gaming Association. (Nov.)

Franklin, W. 1994. Testimony and prepared statement. In U.S. House of Representatives (1995), Committee on Small Business. *The National Impact of Casino Gambling Proliferation*. 103<sup>rd</sup> Cong., 2<sup>nd</sup> sess., pp. 18-32 and 50-55. 21 Sept. 1994.

Goodman, R. 1995. *The Luck Business*. New York, NY: The Free Press.

Guimares, P., F. Hefner, and D. Woodward. 1993. Wealth and income effects of natural disasters: An econometric analysis of Hurricane Hugo. *Review of Regional Studies* 23: 97-114.

Jaffee, D., and T. Russell. 1997. Catastrophe insurance, capital markets, and uninsurable risks. *The Journal of Risk and Insurance* 64: 205-230.

Kunreuther, H. 1996. Mitigating disaster losses through insurance. *Journal of Risk and Uncertainty* 12: 171-187.

Mississippi *ad hoc* Gaming Committee. 2004. *Final Report*. December 10.

National Gambling Impact Study Commission. 1999. *Final Report*. Washington, DC: U.S. Government. Available online at <http://govinfo.library.unt.edu/ngisc/>. Accessed January 12, 2007.

National Research Council. 1999. *Pathological Gambling*. Washington, DC: National Academy Press. Available online at <http://www.nap.edu/catalog/6329.html>. Accessed January 12, 2007.

Schumpeter, J. 1934 [1993]. *The Theory of Economic Development*. New Brunswick, NJ: Transaction Publishers.

Walker, D. 2003. Methodological issues in the social cost of gambling studies. *Journal of Gambling Studies* 19(2): 149-184.

\_\_\_\_\_. 2007a. *The Economics of Casino Gambling*. New York: Springer.

\_\_\_\_\_. 2007b. Problems with quantifying the social costs and benefits of gambling. *American Journal of Economics and Sociology* 66(3): 609-645.



Walker, D., and J. Jackson. 1998. New goods and economic growth: Evidence from legalized gambling. *Review of Regional Studies* 28(2): 47-69.

\_\_\_\_\_ and \_\_\_\_\_. 2007. Do casinos cause economic growth? *American Journal of Economics and Sociology* 66(3): 593-607.

\_\_\_\_\_ and \_\_\_\_\_. 2008. The effect of legalized gambling on state tax revenues. College of Charleston working paper. Available at <http://www.cofc.edu/~walker.d>.

West, C., and D. Lenze. 1994. Modeling the regional impact of natural disaster and recovery: A general framework and an application to Hurricane Andrew. *International Regional Science Review* 17: 121-150.

Zeckhauser, R. 1995. Insurance and catastrophes. *The Geneva Papers on Risk and Insurance—Theory* 20: 157-175.