Beyond Gaming: Unpacking the Spillover Effects of Macau's Casino Gaming Industry

on Accommodation, Restaurant, and Retail Sectors with Mediating Role of MICE and

Cultural Industries

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Abstract

This study examines the spillover effects of the gaming industry's growth on other industries in Macau, such as wholesale and retail trade, restaurants, and hotels. The study finds that the MICE and cultural industries partially mediate this relationship. The results suggest that policymakers and industry stakeholders should formulate urban economic steering plans to accelerate positive externalities in the gaming industry for sustainable development. Future research could include field experiments, sufficient time data to investigate threshold effects, and the incorporation of urban development variables.

Keywords: Gaming industry, spillover effects, Macau, MICE industry, cultural industry, sustainable development, field experiments, threshold effects, urban development.

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Macau, one of China's two Special Administrative Regions, is rapidly emerging as a global

leisure and tourism center. Its nominal gross domestic product (GDP) has grown from US$6.55 billion in

1999 to US$30.12 billion in 2021[1], with the gaming industry being the largest contributor. Macau holds a

legal monopoly on casino gaming in China, and its gaming industry has been the driving force behind its

economic growth for the past two decades, with the gaming and gaming intermediary industry structure

reaching a peak value of 58% in 2014[2]. Despite entering a period of decline, the industry still accounted

for 51.02% of the structure in 2019, before suffering the effects of COVID-19, with its gaming revenue

being six times that of Las Vegas[3]. This dependence on the gaming industry has left Macau's economy

vulnerable, as evidenced by the impact of mainland China's anti-corruption action (a 34.3% plunge in total

gaming revenue) and the COVID-19 pandemic (a MOP 232.014 billion drop in total gaming revenue).

In response, Macau has been emphasizing moderate economic diversification since 2014, in line

with the goals set out in China's 12th Five-Year Plan. The current Chief Executive, Ho Iat Seng, has

emphasized a "1+4" strategy to optimize the industrial structure in his Policy Address[4] for the 2023 fiscal

year. This involves optimizing the comprehensive tourism and leisure industry and promoting the

development of four key industries: health, modern finance, high technology, and MICE (meetings,

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[1] The World Bank Group. (2023). GDP (current US$) - Macao SAR, China.
https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=MO
[2] DSEC (Direcção dos Serviços de Estatística e Censos, Statistics and Census Service of Macau). (2023). Statistics
Databases. https://www.dsec.gov.mo/en-US/Statistic/Database
[3] Zhao, S. (2022, July 20). Macau Casino Crash Shifts World's Gambling Crown to Las Vegas. Bloomberg Businessweek.
https://www.bloomberg.com/news/articles/2022-07-20/china-s-covid-zero-rules-dampen-macau-s-gambling-
revenue#xj4y7vzkg
[4] Government of the Macao Special Administrative Region. (2022, November). Policy Address for the Fiscal Year 2023:
Making progress while ensuring stability.

incentives, conferencing, exhibitions) and culture while keeping the gaming industry as the primary source

of tax revenue. The objective is to achieve industrial growth in the four sectors, led by the gaming industry,

to account for 60% of GDP in the future. The policy suggests promoting cross-border integration of

tourism to extend the length of stay of visitors, increase business cooperation and visitor spending, and

encourage visitors to explore the community and support small and medium-sized enterprises.

Therefore, this study aims to estimate the spillover effect of the gaming industry's growth on the

restaurant, accommodation, and retail sectors, as well as the mediating role of the MICE and cultural

industries in this effect in Macau. The significance of the study is its potential to improve the

understanding of the interdependence of various industries in Macau's economy, particularly in the gaming

industry's context. The results could serve as a reference for policymakers, industry stakeholders, and

researchers in formulating urban economic steering plans to accelerate positive externalities in the gaming

industry for sustainable development.

Literature Review

Spillover effect

Spillover effects, which stem from research on retail space optimization, refer to how one store's

sales can impact another's. For instance, when shoppers visit multiple stores in a mall to save time,

spillover effects are believed to occur (Brueckner, 1993[5]). Low rental rates for anchor stores can also

benefit non-anchor stores through spillover sales, as explained by Eppli and Shilling (1995)[6], enabling

developers to charge higher lease rates. The spillover effect is comparable to the indirect impact of gaming

volumes on entertainment consumption in various industries, such as wholesale, retail, restaurants, and

hotels. The Macau government signed contracts with six gaming companies for new 10-year gambling

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[5] Brueckner, J. K. (1993). Inter-store externalities and space allocation in shopping centers. The Journal of Real Estate Finance and Economics, 7, 5-16.
[6] Eppli, M. J., & Shilling, J. D. (1995). Large-scale shopping center development opportunities. Land Economics, 35-41.

licenses on December 16, 2022. The companies announced[7] a total investment of MOP 118.8 billion over

the next ten years, of which MOP 10.87 billion will be spent on non-gaming projects.

Development of the casino gaming industry

As Eadington concluded in 1984[8] and 1999[9], Nevada has authorized casinos and other forms of

gaming practices since 1931, and after a series of explorations of the benefits and harms associated with the

gaming economy, the industry has developed in the United States since the 1970s. In the 1990s, when the

industry became more competitive and bottlenecks emerged, academics further explored aspects of market

cannibalization and sustainability, and operators in practice tried to build resorts to drive non-gaming

businesses to generate indirect or direct revenue. According to Li and Gu et al. (2010)[10], while over-

expansion of commercial gambling may have negative effects like worsening terms of trade and increasing

impoverishment, it can also help casino gaming operators diversify risks by investing in non-gaming

industries that benefit from spillover effects and has a positive impact on related industries and the local

economy. Scholars and practitioners have also conducted various explorations of the interactions between

the development of the gaming industry and the development of related entertainment industries such as the

MICE industry, retail, restaurants, and hotels. Caesar's Palace executives, for example, expect show patrons

to spend between $30 and $50 per trip on gaming, food, and shopping (Benston, 2003[11], Tyrangiel, 2003[12]).

Development of Macau's Casino Gaming Industry

Macau's casino industry has gone through three stages of development, as outlined by Sheng and

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[7] Zhang, W. (2022, December 17). 6 major gaming companies will invest a total of MOP 118.8 billion in non-gaming projects over the next 10 years. HK01.
https://www.hk01.com/article/848068?utm_source=01articlecopy&utm_medium=referral

[8] Eadington, W. R. (1984). The casino gaming industry: A study of political economy. The Annals of the American Academy of Political and Social Science, 474(1), 23-35.

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[10] Li, G., Gu, X., & Siu, R. C. S. (2010). The impacts of gaming expansion on economic growth: A theoretical reconsideration. Journal of Gambling Studies, 26, 269-285.

[11] Benston, L. (2003 March 21). Park Place betting on Dion success. https://lasvegassun.com/news/2003/mar/21/park-place-betting-on-dion-success/

[12] Tyrangiel, J. (2003 March 21). Park Place betting on Dion success.
https://content.time.com/time/subscriber/article/0,33009,1004416,00.html

Gu (2018)[13], which include ending the monopoly and starting to develop, moving towards prosperity under suitable constraints, and experiencing a decline due to external shocks. These stages have led to sustainability issues, such as social and environmental consequences and an increasing need for labor. Liu and Lin (2022)[14] analyze the sustainability of Macau's socio-economic development from the perspectives of economy, society, and environment, while Luo, Lam, and Ye (2019)[15] identify the obstacles that Macau may face in exploring diversified entertainment and achieving sustainable development. Liu, Chang, Loi, and Chan (2015)[16] point out that macroeconomic and political factors in China were the primary cause of the decline in Macau's gambling revenue in 2014. However, they suggest that the long-term prospects for the gambling industry are still optimistic, with the potential for positive catalysts to boost demand. Entertainment tourism is one of the ways to achieve diversification with barriers to its development, including economic, infrastructural, and human resources issues, as well as policies and regulations (Chen and Luo, 2021[17], Qiu, Li, So, and Lehto, 2015[18]). In general, papers that empirically study the spillover effects of Macau's gaming industry on different parts of other entertainment industries (e.g., MICE industry, cultural industry, retail and wholesale industry, restaurant industry, and hotel industry) and the interrelationships are relatively rare.

Research Hypothesis

Relationship between Gross Profit Growth of the Casino Gaming Industry and Industry Value Added of the Wholesale and Retail, Restaurant, and Hotel Industries

The current economic objective of Macau is to achieve industrial growth in the four sectors, led

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[13] Sheng, M., & Gu, C. (2018). Economic growth and development in Macau (1999–2016): The role of the booming gaming industry. Cities, 75, 72-80.

[14] Liu, C., & Lin, Y. (2022). Macau's sustainability and diversification. Business economics (Cleveland, Ohio), 1–5. Advance online publication. https://doi.org/10.1057/s11369-022-00260-9

[15] Luo JM, Lam CF, Ye BH. Barriers for the Sustainable Development of Entertainment Tourism in Macau. Sustainability. 2019; 11(7):2145. https://doi.org/10.3390/su11072145

[16] Liu, M. T., Chang, T. T. G., Loi, E. H., & Chan, A. C. H. (2015). Macau gambling industry: current challenges and opportunities next decade. Asia Pacific Journal of Marketing and Logistics, 27(3), 499-512.

[17] Chen S, Luo J M. Assessing barriers to the development of convention tourism in Macau[J]. Cogent Social Sciences, 2021, 7(1): 1928978. https://doi.org/10.1080/23311886.2021.1928978

[18] Qiu, S., Li, M., So, S. I., & Lehto, X. (2015). Competitiveness of Macau in developing the exhibition sector: Can gaming industry contribute?. Journal of China Tourism Research, 11(3), 278-296.

by the gaming industry, to account for 60% of GDP in the future. In this regard, Lin Jiang[19], deputy director of the Hong Kong and Macau Pearl River Delta Research Center, believes that instead of suppressing the gaming industry, the share of non-gaming industries should be increased through the development of other industries. In this paper, accordingly, it is assumed that the government does not deliberately suppress the development of the gaming industry to study the increase in the output value of the gaming industry.

In their study, Li and Gu et al. (2010) noted that major casino resorts around the world follow a diversification strategy, developing sub-projects that include wholesale and retail, restaurants, and hotels to support their economic sustainability. This type of resort operation, in addition to achieving differentiation from the brand style of competitors, also creates a situation where the segmentation of gambling and non-gambling entertainment products, so that the utility of different individuals in business tourism and family tourism is satisfied, thus cutting down the negative externalities of the gaming industry and allowing the spillover effect of the resort to take effect. The "spillover effect" in this case refers to the positive impact of the increase in output of the gaming industry on the increase in output of the wholesale and retail, restaurant, and hotel industries, i.e., the positive externalities. Therefore, hypothesis 1 is proposed in this paper as:

H_1: The gross profit growth of Macau's gaming industry has a spillover effect on the value added of its total industries of wholesale and retail trade, restaurants, and hotels.

Value Added of MICE and Cultural Industries as Mediating Variables

Combining practice and theory, the evidence of reverse causality of the reverse spillover effect from the growth of other entertainment industries in Macau to the gaming industry is scarce and of low strength, so this paper does not address it. Therefore, the simple model in this paper treats correlation as causal inference and does a mediating effect exploration on the interrelationship between industries.

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[19] Zhang, X. (2022, November 16). Macao releases its policy report for the 2023 fiscal year: What else can Macao do besides gambling? Jiemian News. https://www.jiemian.com/article/8399083.html

In addition to the reasons for the spillover effect, some casino gaming operators, and researchers (Benston, 2003, Palmeri, 2004a[20], Samuels, 1999[21], Tyrangiel, 2003) have noted that because gaming executives believe that traffic at these venues will increase gaming volume, they are willing to invest consistently in showroom entertainment. In practice, many shows are allowed to lose money, relying solely on their indirect gaming contribution to calculate their value (Atlas, 1995[22], Benston, 2003, Lucas and Kilby, 2008[23], Yoshihashi, 1993[24]), Suh and Lucas (2011)[25] point out that such shows can be considered a form of loss-making promotion.

On the other hand, the Macau government has proposed in the 2023 fiscal year policy address to promote business and leisure tourism by adding more leisure tourism experience activities during MICE events to extend the stay of business visitors in Macau and drive more business cooperation and visitor spending.

Accordingly, this paper proposes the hypothesis that the growth of the gaming industry can boost the output value of the MICE and cultural industries; an increase in the output value of the MICE and cultural industries can lead to an increase in the output value of the wholesale and retail, restaurant, and hotel industries, i.e., the increase in the output value of the MICE and cultural industries plays a mediating role.

H_2: The gross profit growth of the gaming industry in Macau contributes to the increase in the output of the wholesale and retail, restaurant, and hotel industries through the MICE and cultural industries

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[20] Palmeri, C. (2004). Rebuilding the Roman Empire: can a massive makeover return Caesars to its Old Vegas glory. Business Week, 3888(June), 25-126.

[21] Samuels, J. B. (1999). A qualitative investigation into the characteristics and synergistic relationships of non-gaming recreation/entertainment facilities in casino environments. The business of gaming: economic and management issues, 303-315.

[22] Atlas, R. (1995). May 8. Sex sells. Forbes, 155(10), 49-50.

[23] Lucas, A. F., & Kilby, J. (2008). Principles of casino marketing. Okie International.

[24] Yoshihashi, P. (1993). Entertainment: Stars fade as Las Vegas bets on families. Wall Street Journal, (February), B1.

[25] Suh, E., & Lucas, A. F. (2011). Estimating the impact of showroom entertainment on the gaming volumes of Las Vegas hotel–casinos. International Journal of Hospitality Management, 30(1), 103-111.

as mediating variables.

Hypothesis Test

Variable Description

Since 2015, DSEC of Macau has started to compile an analytical report on the system of statistical indicators for the moderate and diversified development of the Macau economy and to publish the value added of emerging small industries such as the MICE industry and the cultural industry in the report, which is released to the public in the fourth quarter of each year. Accordingly, the sample for this paper is Macau industry annual data from 2015 to 2021, and the sample source is DSEC.

The study used the value added of the wholesale & retail, restaurant, and hotel industries as the dependent variable, the gross profit growth of the gaming and gaming intermediary industry as the independent variable, and the value added of the cultural and MICE industries as the mediating variable. Control variables included the value of change in cross-border traffic and employment-population growth rate for cultural and gaming and other service industries to limit the effects of consumer numbers and labor force. Considering that the management adjustment process has a lag, the one-period lagged values of control variables are taken. In robustness tests, the value added of the gaming and gaming intermediary industry was used as the dependent variable instead of the value added of the gaming industry to improve the analysis's reliability and academic rigor. For all of the above industry-level variables, standardization was applied to eliminate the effect of large unit differences on the magnitude of the coefficients.

The correlation test indicates a strong correlation between the dependent and independent or mediating variables, while the correlation between the independent and mediating variables is weak. As the focus of mediation analysis is on the indirect effect of the independent variable on the dependent variable through the mediating variable, the significance of the relationship between the mediating and dependent variables is less important.

Regression and Results

According to hypothesis 1 and hypothesis 2, there are two sets of ordinary least squares time series models established for empirical testing, and the following are the test results.

$$H_1: ASRHI = -207.495 + 1.956^{***}lnGGP - 0.435lagAVeh + 16.041laglnEply + \varepsilon$$

$$H_2: \begin{aligned} ACMI &= -119.187 + 1.491^{*}lnGGP - 0.169lagAVeh + 8.841laglnEply + \varepsilon \\ ASRHI &= -141.976^{**} + 0.55^{***}ACMI + 1.136^{***}lnGGP - 0.342^{**}lagAVeh + 11.181^{**}laglnEply + \varepsilon \end{aligned}$$

The results of the multiple regression analysis suggest that the logarithmic growth rate of the gaming industry gross profit (lnGGP) has a statistically significant positive effect on the value added of wholesale and retail, restaurant, and hotel industries (ASRHI) at a 99% confidence level ($p < 0.01$). The coefficient of lnGGP (1.956) indicates that a one-unit increase in the logarithmic growth rate of the gaming industry gross profit in Macau is associated with an increase in the standardized value of ASRHI, suggesting that the growth of the gaming industry in Macau has a positive spillover effect on other industries such as wholesale and retail trade, restaurants, and hotels, i.e., H_1 holds.

The three-stage test (Baron & Kenny, 1986[26], Judd & Kenny, 1981[27]) for mediating effects examines the indirect effect of the independent variable (lnGGP) on the dependent variable (ASRHI) through the mediating variable (ACMI). In the first stage (H_{2a}), the coefficient for lnGGP is positive and marginally significant ($p = 0.083$), indicating that the growth rate of the gaming industry is positively related to the value added of the cultural and MICE industries. In the second stage (H_{2b}), the coefficient for ACMI is positive and highly significant ($p = 0.009$), indicating that the value added of the cultural and MICE industries is positively related to the value added of the wholesale and retail, restaurant, and hotel industries, even when controlling for the other variables. The bootstrap results show that the indirect effect

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[26] Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of personality and social psychology, 51(6), 1173.
[27] Judd, C. M., & Kenny, D. A. (1981). Process analysis: Estimating mediation in treatment evaluations. Evaluation review, 5(5), 602-619.

of lnGGP on ASRHI through ACMI is statistically significant (0.819669, BC interval: -0.00718 to

0.994902). The direct effect of lnGGP on ASRHI is also significant (1.13617, BC interval: 1.07255 to

1.19097). Combining the results with the regression results in H1, we can say that with the indirect effect

of lnGGP on ASRHI through ACMI is 0.819669, the direct effect of lnGGP on ASRHI is 1.13617, and a

total effect of 1.95584 (BC interval: 1.1838 to 2.13921), ACMI partially mediates the relationship between

lnGGP and ASRHI, i.e., H_2 holds.

Table 1

Results of Mediation Effect Test

Bootstrap	Coef	Bias	Std Err	[95% Conf Interval]
ind eff	.819669	-.163036	.392154	-0.00718, .994902 (P)
				-0.00718, .994902 (BC)
dir eff	1.13617	-.014001	.048259	1.07255, 1.19097 (P)
				1.07255, 1.19097 (BC)
tot eff	1.95584	-.177037	.360283	1.1838, 2.13921 (P)
				1.1838, 2.13921 (BC)
(P): percentile confidence interval, (BC): bias-corrected confidence interval				

Robustness Tests

The variance inflation factor test reveals that the dependent and independent variables and

mediating variables (i.e., the value added of the three major categories of industries) are relatively highly

linearly correlated, which may lead to inflated regression results. This finding is consistent with economic

logic and has important practical implications. Future statistical results related to the MICE and cultural

industries published by DSEC could serve as a proxy to illustrate the extent of their development.

Furthermore, the Dickey-Fuller unit root test suggests that the value added of all three major

industries is nonstationary, possibly due to the limited data set from 2015 to 2021 and the inclusion of large

exogenous shock effects such as COVID-19. The Breusch-Godfrey LM test shows that the regression

model has no serial autocorrelation. Considering the practical implications in Macau, this paper does not

address reverse causality.

This paper also uses the value added of gaming and gaming intermediary industry as an alternative dependent variable for robustness testing and again tests hypothesis 1 and hypothesis 2. The regression results are similar to the previous empirical results and again prove that the hypothesis holds.

Conclusion and Future Research

Conclusion

In conclusion, this study provides evidence that the gaming industry's growth in Macau has a positive spillover effect on other industries such as wholesale and retail trade, restaurants, and hotels. Moreover, the study finds that the MICE and cultural industries partially mediate the relationship between gaming industry growth and the value added of these industries. The results of this study have implications for policymakers and industry stakeholders in formulating urban economic steering plans to accelerate positive externalities in the gaming industry for sustainable development.

Future Research

The study presented in this paper did not include field experiments but relied on secondary public data due to practical feasibility and workload intensity. As a result, only seven periods of nonstationary annual data for a few relevant industry variables could be used for analysis. Future studies could consider conducting field experiments in casino resorts such as designing various complimentary coupons and tracking their flows, which would provide a more refined understanding of the interactions between the leisure and entertainment industries in Macau. Moreover, studies with sufficient time data could investigate whether the size of the industrial structure of the gaming industry has a threshold effect on the spillover effect, which would inform the development of industry-led incentive policies. Additionally, subsequent studies should aim to incorporate urban development variables such as Macau's traffic situation and area size, which may play a complex role in the interrelationships under consideration.

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sector: Can gaming industry contribute?. *Journal of China Tourism Research*, 11(3), 278-296.

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Evaluation review, 5(5), 602-619.

Appendix

Table 2

Description of Model Variables

Types	Variables and Labels	Descriptions
Dependent Var.	ASRHI - Value added of wholesale & retail, restaurant, and hotel industries	(Total) value added of corresponding industries (MOP million), which is calculated in terms of producer prices, including product taxes such as franchise taxes because they are generated through economic activities and should be included. In terms of moderately diversified development, GDP
Mediating Var.	ACMI - Value added of cultural and MICE industries[28]	

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[28] The MICE industry is a comprehensive service sector integrating project planning, hotels, business activities, information exchange, sightseeing, and cultural entertainment. The cultural industry encompasses creative design, art collection, cultural exhibitions, and digital media.

		calculated by production method at producer prices is more relevant for input-output analysis than GDP at basic prices in Macau. Standardization is applied to eliminate the impact of large unit differences on the coefficient size.
Independent Var.	lnGGP - Logarithmic growth rate of gaming industry gross profit	The gaming industry's gross profit refers to revenue from Lucky Strike Casino and other gaming venues before tax deductions.
Independent Var. for Robust Test	AGI - Value added of gaming and gaming intermediary industry	Value added of corresponding industries (MOP million), which is calculated in terms of producer prices. Standardization is applied to eliminate the impact of large unit differences on the coefficient size.
Control Vars.	lagAVeh - Value of change in cross-border traffic	One-period lag of the cross-border traffic flow changes in millions.
	laglnEply - Employment population growth rate for cultural and gaming and other service industries	One-period lag of the logarithmic growth rate of employment in millions in the cultural, entertainment, gaming, and other service industries.

Table 3

Descriptive Statistics Table

variable	N	mean	p50	Sd	min	max
ASRHI	8	32199	32386	6207	20978	39917
lnGGP	8	12.19	12.42	0.64	11.01	12.77
ACMI	7	4087	3817	1519	2460	6027
AGI	8	167066	183025	76479	41809	254051
lagAVeh	7	-0.310	0.110	1.140	-2.840	0.430
laglnEply	7	11.45	11.45	0.0200	11.42	11.48

Table 4

Pairwise Correlation Statistics Table

Variables	(1)	(2)	(3)	(4)	(5)
(1) ASRHI	1.000				
(2) ACMI	0.868***	1.000			
(3) lnGGP	0.874***	0.583	1.000		
(4) lagAVeh	0.197	0.301	0.369	1.000	
(5) laglnEply	-0.186	-0.105	-0.177	0.681*	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5

Model Regression Results Table

Variables	(H$_1$) ASRHI			(H$_{2a}$) ACMI			(H$_{2b}$) ASRHI		
	Coefficient	t value	p-value	Coefficient	t value	p-value	Coefficient	t value	p-value

constant C	-207.495	-1.51	0.228	-119.187	0.48	0.664	-141.976**	-6.2	0.025
lnGGP	1.956***	6.06	0.009	1.491*	2.56	0.083	1.136***	12.28	0.007
ACMI							0.55***	10.69	0.009
lagAVeh	-0.435	-1.77	0.174	-0.169	0.38	0.727	-0.342**	-8.48	0.014
laglnEply	16.041	1.36	0.267	8.841	0.42	0.705	11.181**	5.74	0.029
N	7			7			7		
R²	0.9418			0.7709			0.9990		
Adj-R²	0.8837			0.5418			0.9970		

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6

Results of Mediation Effect Test

		Bootstrap		
	Coef	Bias	Std Err	[95% Conf Interval]
ind eff	.819669	-.163036	.392154	-0.00718, .994902 (P)
				-0.00718, .994902 (BC)
dir eff	1.13617	-.014001	.048259	1.07255, 1.19097 (P)
				1.07255, 1.19097 (BC)
tot eff	1.95584	-.177037	.360283	1.1838, 2.13921 (P)
				1.1838, 2.13921 (BC)

(P): percentile confidence interval, (BC): bias-corrected confidence interval

Table 7

Table of VIF Values for Multicollinearity Test

Dependent Var.	ASRHI		ACMI			ASRHI		
Variable	VIF	1/VIF	Variable	VIF	1/VIF	Variable	VIF	1/VIF
lnGGP	1.91	0.523907	lnGGP	1.91	0.523907	lnGGP	6.09	0.164324
					0.290345	ACMI	4.36	0.229115
lagAVeh	3.44	0.290345	lagAVeh	3.44	0.325516	lagAVeh	3.61	0.276782
laglnEply	3.07	0.325516	laglnEply	3.07		laglnEply	3.25	0.307762
Mean VIF	2.81		Mean VIF	2.81		Mean VIF	4.33	

Table 8

Robustness Test Model Regression Results Table

Variables	(H₁) ASRHI			(H₂ₐ) ACMI			(H₂ᵦ) ASRHI		
	Coefficient	t value	p-value	Coefficient	t value	p-value	Coefficient	t value	p-value
constant C	-115.165	-1.78	0.173	-67.225	-0.38	0.732	-91.905*	-3.91	0.059
AGI	1.296***	12.27	0.001	1.042**	3.57	0.038	0.936***	10.89	0.008
ACMI							0.346**	4.67	0.043
lagAVeh	-0.395**	-3.27	0.047	-0.179	-0.53	0.630	-0.333**	-7.41	0.018
laglnEply	10.065	1.79	0.172	5.894	0.38	0.731	8.026*	3.91	0.059
N	7			7			7		
R²	0.9850			0.8606			0.9987		
Adj-R²	0.9699			0.7212			0.9962		

*** p<0.01, ** p<0.05, * p<0.1

Table 9

Results of Mediation Effect Test of Robustness Test

	Coef	Bias	Std Err	[95% Conf Interval]
		Bootstrap		
ind eff	.360468	-.047459	.089394	0.213108, .396115 (P)
				0.213108, .396115 (BC)
dir eff	.93564	-.015872	.025594	0.87419, .934748 (P)
				0.87419, .934748 (BC)
tot eff	1.29611	-.063331	.080301	1.14218, 1.32535 (P)
				1.14218, 1.32535 (BC)

(P): percentile confidence interval, (BC): bias-corrected confidence interval