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Does Mandated Carded Play at a Casino Increase Gambling at Neighboring Uncarded Venues?

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Research Article

Keywords:

Posted Date: November 23rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11707560/v1

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Additional Declarations: Competing interest reported. Melissa Salmon: MS is employed by Focal Research Consultants as Senior Research Lead. During the past 5 years, Focal Research Consultants has received funding from various gaming companies, regulatory bodies, government funding agencies, and research institutions for consultancy work in the area of player data analytics, social responsibility, and safer gambling products, services, and compliance solutions. MS has also received reviewer honorarium from Greo Evidence Insights. None of these entities played a role in the design, analysis, or interpretation of this study, and imposed no constraints on publishing. Kasra Ghaharian at IGI: During the last five years, International Gaming Institute (IGI) at University of Nevada, Las Vegas, has received funding for its research and programs from Action Gaming, American Gaming Association, Aristocrat Leisure Limited, Association of Gaming Equipment Manufacturers, Axes.ai, Bet Blocker, Clarion Gaming, DraftKings, Entain Foundation, ESPN, Evoke plc, Focal Research Consultants, Gaming Analytics, Global Payments, IGT, Kindbridge Behavioral Health, Las Vegas Sands Corporation, Massachusetts Gaming Commission, MGM Resorts International, Playtech plc, Responsible Online Gaming Association, Yuhaaviatam of San Manuel Nation, Sightline Payments, Sports Betting Alliance, State of Nevada Department of Health and

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Does Mandated Carded Play at a Casino Increase Gambling at Neighboring Uncarded Venues?

Evidence from Australia

Gambling regulations that restrict some gambling mediums but not others can unintentionally shift expenditure to available options outside the regulation's scope. We tested for such displacement in Victoria, Australia, where the state's only casino was directed to implement mandatory carded play, requiring patrons to play using a card linked to their identity rather than with cash. However, hotels and clubs with electronic gambling machines (EGMs) were not subject to the legislation and continued to offer uncarded play following implementation. Using monthly EGM expenditure data at hotels and clubs in 57 local government areas (LGAs) from January 2023 to December 2024, we compared changes in player loss at the four LGAs nearest the casino with the remaining 53 LGAs in a difference-in-differences design. After the requirement took effect, player loss in the nearby LGAs were 2.1 to 3.0 percent higher on average relative to other LGAs ($p = .001$ to $.021$ across log specifications)—a total of AUD $434,000 to $616,000 per month across the four nearby LGAs. The results suggest that the effect of a carded play requirement confined to one venue type can be partly offset by expenditure moving to venues where anonymous play remains available.

Introduction

Gambling regulation seeks to protect players from harm and to hold operators accountable for offering safe and fair products. Mandatory identification of players belongs to a class of structural protection measures, which change the gambling environment for everyone rather than relying on individual gamblers to protect themselves (Heirene, 2026). When play is identifiable, every wager made with a card is linked to the cardholder, so venues and regulators can monitor account activity for indicators of risk, enforce limits on time and expenditure, and evaluate interventions (Newall & Swanton, 2024; Wohl, 2018). Card-based systems can also give players access to voluntary limits, records of the time and money they have spent, and periodic activity statements.

Identified play through player cards and accounts has long been available on a voluntary basis in many jurisdictions, usually through venue loyalty schemes. Mandatory identification is more recent and has been introduced mainly in monopoly markets (e.g., Finland, Norway; Newall & Swanton, 2024). For example, Finland requires players to identify themselves and register as customers of the state operator, Veikkaus, for all its gambling products, including slot machines and casino games (Ministry of the Interior, n.d.). Selin et al. (2025) reported that approximately 43 percent of those who gambled at casinos and on arcade machines after identification became mandatory in Finland had not held an account while identification was voluntary. Findings also showed that measured monthly spending per player increased after the change, including among those who already held a voluntary player account. The second result is consistent with some account holders having gambled anonymously while that option remained available. A voluntary identification scheme therefore leaves part of the market unobserved, and an identification requirement that covers only some venues may do the same.

Gamblers substitute across products and venues when relative prices, convenience, or regulatory conditions change. Studies of casino markets find that gambling expenditure is reallocated in response to travel costs, venue availability, and market entry (Cotti, 2008; Walker, 2007). For example, recent studies estimated how the legalization of sports betting in the United States reduced lottery sales (Larsen et al., 2025; Sy & Ishihara, 2025). A requirement that raises the cost of play in one channel may therefore move expenditure to channels without that same requirement.

How much expenditure moves depends on how players weigh the costs and benefits of the new requirement. In interviews with regular electronic gambling machine (EGM) players, Swanton et al. (2023) found that the perceived benefits of cashless, identity-linked payment systems included tracking and managing spending and not needing cash, while the perceived costs included the security and privacy of personal information and play history and the risk of spending more if bank accounts were linked to the card. In a discrete choice experiment, Swanton et al. (2025) found that preferences for cashless systems depended on the consumer protections offered, flexibility, and the perceived burden of use. Consistency across venues and integration with existing loyalty schemes were among the attributes gamblers valued most. However, roughly two in five respondents would opt out of a voluntary system. Some players may therefore avoid carded venues while others value the added safeguards.

Little empirical evidence exists on how gamblers respond when carded play is required at some venues but not at competing ones. If gamblers value the protections that accompany carded play, expenditure at uncarded venues may fall as play moves to the carded venue. If the identification requirement and its associated frictions are costly to gamblers, expenditure may instead move

from the carded venue to nearby venues where anonymous play remains available. Victoria, Australia provides a natural setting in which the net direction of this response can be measured from expenditure data, because carded play became mandatory at the state's only casino while hotels and clubs in the same metropolitan area continued to offer uncarded EGM play.

The Present Study

On 4 May 2023, the Victorian Gambling and Casino Control Commission (VGCCC) directed Crown Melbourne (hereafter Crown) to introduce mandatory carded play and mandatory pre-commitment through the YourPlay system on all of its EGMs which went into effect in December 2023 as part of measures to prevent money laundering and reduce gambling harm (VGCCC, 2023). Under the direction, all EGM play at the casino is linked to a patron's identity: patrons load funds onto a registered card, which is inserted into the machine in order to play (i.e., cash can no longer be used on the machines). The same direction removed the continuous play function, capped the credit that can be loaded onto a machine at AUD $1,000, and confined unrestricted machines to premium gaming areas (VGCCC, 2023). Hotels and clubs in Victoria also operate EGMs but were not subject to the direction.[1] Crown operates alongside a dense network of hotel and club gaming venues across metropolitan Melbourne, and EGM losses in Victoria vary across areas with venue density (Livingstone, 2001; Rintoul et al., 2013). Because the requirement changed the terms of play at Crown alone, venues a short distance from the casino, which are the closest uncarded substitutes for its gaming floor, were left unchanged. This asymmetry is the source of variation we use: it allows a comparison of EGM expenditure at hotels and clubs near Crown with expenditure at hotels and clubs elsewhere in Victoria, before and after implementation.

We test whether EGM expenditure at hotels and clubs near Crown changed after carded play became mandatory at the casino, using publicly available monthly data from the VGCCC on EGM player losses at hotels and clubs aggregated to the local government area (LGA) (VGCCC, n.d.). A difference-in-difference design fits this setting because the policy changed at a known date for a well-defined group of nearby LGAs, and because the same outcome is observed for all other LGAs before and after that date. The change in expenditure in the nearby LGAs over the period contains the effect of the policy together with statewide influences on EGM expenditure in the same months, such as seasonality, economic conditions, or regulation affecting all hotels and clubs; the change in the other LGAs contains the statewide influences only. Subtracting the second change from the first removes the influences common to both groups, and fixed differences in expenditure levels between LGAs do not affect the estimate. The result has a causal interpretation under the assumption that, absent the policy, expenditure in the nearby LGAs would have followed the same trend as expenditure in the other LGAs, an assumption we assess below. We use 24 months of data, 12 before and 12 after implementation.

[1] In Australia, gambling in physical venues is regulated by the states and territories (Abramova, 2025). In Victoria, hotels and clubs that operate EGMs are regulated by the VGCCC under the *Gambling Regulation Act 2003* (Vic), while Crown is also subject to the licensing and regulatory requirements of the *Casino Control Act 1991* (Vic). Rules governing EGMs can therefore differ between the casino and other venues, which is why the direction could apply to Crown alone.

The direction of both hypotheses follows from the evidence above. Some players, particularly those who value anonymity, privacy, or freedom from preset limits, may perceive a cost when identification becomes mandatory (Swanton et al., 2023) and opt to gamble anonymously where the option remains available (Selin et al., 2025). Hotels and clubs near the casino offer the closest uncarded alternative to the casino's carded gaming floor. We therefore expected expenditure at those venues to rise relative to venues farther away. Because the requirement is permanent and applies at every session, through the need to present an identified card and to play within preset limits, we expected the shift to appear as soon as the requirement took effect and to persist rather than decay over time.

We hypothesized the following, as done in our pre-registration (https://osf.io/uhg6c/overview).

H1: EGM expenditure at hotels and clubs in LGAs near the casino will increase following the introduction of mandatory carded play, relative to EGM expenditure in other LGAs.

H2: The increase in EGM expenditure in the nearby LGAs will appear immediately, in the first month after implementation, and will persist throughout the twelve months of the post-period.

Methods

Data

The VGCCC publishes monthly EGM expenditure for all hotels and clubs in Victoria, excluding Crown, by LGA. The data can be accessed through the VGCCC website (https://www.vgccc.vic.gov.au/for-community/gambling-victoria/gambling-data). Our sample contained the 57 LGAs that appear in the data for each month from January 2023 to December 2024, giving 1,368 LGA by month observations. For each LGA and month, the data included Player Loss (i.e., the net amount lost by players on EGMs (amounts wagered less winnings paid) in Australian dollars); the number of EGMs; and the number of venues.

Player Loss was our outcome variable. It measures EGM expenditure, not the number of players, visits, or sessions, so our estimates concerned where gamblers spend rather than how many people gamble or how often. The number of EGMs and venues served as control variables.

We defined the treated group by proximity to Crown, which is located in Southbank within the City of Melbourne LGA. We set $C_i = 1$ for Melbourne and for Port Phillip, Stonnington, and Yarra, which adjoin the City of Melbourne close to the casino (Figure 1), and $C_i = 0$ for the other 53 LGAs. These four districts make up the immediate inner urban core of the Greater Melbourne metropolitan area and in total amount of an area of roughly 40 square miles. We refer to the first group as the nearby LGAs (the treated group) and to the second as the other LGAs (the control group). We set $Post_t = 0$ for each month from January to December 2023 (the pre-period) and $Post_t = 1$ for each month from January to December 2024 (the post-period). We used the natural log of Player Loss as the outcome in our main specifications so that coefficients can be read as approximate percent changes.



Figure 1. Location of Crown Melbourne (red dot) and surrounding LGAs in metropolitan Melbourne. The nearby (treated) LGAs are Melbourne, Port Phillip, Stonnington, and Yarra.

Table 1 reports means and standard deviations of the three variables for the nearby and other LGAs in the pre-period and the post-period, computed over all LGA by month observations in each period. In the pre-period, average monthly Player Loss was AUD $3.46 million in the nearby LGAs and AUD $4.44 million in the other LGAs, and the nearby LGAs had fewer venues and EGMs on average, with less dispersion across LGAs. The difference-in-difference design does not require equal levels across groups, since LGA fixed effects absorb differences in levels that do not change over time.

Between the two periods, average monthly Player Loss rose by 8.4 percent in the nearby LGAs (from AUD $3.46 million to $3.75 million) and by 3.1 percent in the other LGAs (from AUD $4.44 million to $4.57 million). This unadjusted comparison does not account for the numbers of EGMs and venues, which also changed: the average number of EGMs rose from 394 to 403 in the nearby LGAs and fell from 466 to 464 in the other LGAs. We therefore included both as controls.

Table 1

Means and Standard Deviations for Nearby and Other LGAs in the Pre- and Post-Periods

	Nearby LGAs (Treated)		Other LGAs (Control)	
	Pre-Period	Post-Period	Pre-Period	Post-Period
Player Loss	$3,463,731	$3,754,384	$4,437,013	$4,573,729
	($2,357,818)	($2,647,986)	($3,765,115)	($3,857,769)
# of Venues	7.69	7.75	8.56	8.50
	(2.19)	(2.51)	(4.63)	(4.61)
# of EGMs	394.44	403.00	465.48	463.54
	(189.13)	(211.28)	(304.12)	(303.04)

Note. Means with standard deviations in parentheses, computed over LGA by month observations. Nearby LGAs are Melbourne, Port Phillip, Stonnington, and Yarra (4 LGAs); other LGAs are the remaining 53. The pre-period is January to December 2023 and the post-period is January to December 2024. Player Loss is in Australian dollars.

Estimation Strategy

We estimated the effect of the policy on EGM expenditure in the nearby LGAs with a difference-in-difference regression (Baker et al., 2026; Card & Krueger, 1994; Wooldridge, 2010). The four nearby LGAs formed the treated group, the other 53 LGAs formed the control group, and treatment began when carded play took effect at Crown. The regression is

$$y_{it} = \alpha_i + \rho_t + \beta_0 X_{it} + \beta_1 C_i + \beta_2 Post_t + \beta_3 C_i Post_t + \varepsilon_{it},$$

where y_{it} is Player Loss (in logs or levels) in LGA i in month t, α_i is an LGA fixed effect, ρ_t is a time fixed effect, X_{it} contains the numbers of EGMs and venues, C_i indicates the nearby LGAs, $Post_t$ indicates the months after implementation, and ε_{it} is the error term. We report two sets of time fixed effects: month of year fixed effects, which absorb seasonality common to all LGAs, and month by year fixed effects, which absorb all statewide shocks in each calendar month. The LGA fixed effects absorb C_i, and month by year fixed effects absorb $Post_t$, so β_1 is not separately identified in any specification and β_2 is not identified when month by year fixed effects are included. The coefficient of interest is β_3, the change in Player Loss in the nearby LGAs after implementation relative to the change in the other LGAs.

A causal interpretation of β_3 rests on three assumptions. The first is parallel trends: absent the policy, Player Loss in the nearby LGAs would have evolved in the same way as in the other LGAs. This would fail if, for example, inner Melbourne recovered from the COVID-19 pandemic more slowly than the rest of Victoria, in which case β_3 would capture the difference in recovery paths rather than the effect of carded play. The assumption cannot be tested directly, but we examined whether the two groups followed similar paths before implementation using the event study described below.

The second assumption is that no other event specific to the nearby LGAs or to Crown coincided with implementation and changed hotel and club expenditure in the nearby LGAs (e.g., a promotion confined to venues in those LGAs or a reduction in Crown's gaming capacity in December 2023). We are not aware of such an event, but the assumption cannot be verified with our data. Two features of the setting bear on it. The VGCCC direction changed several features of Crown's EGMs at once, including mandatory pre-commitment, removal of continuous play, and restrictions on unrestricted machines, so β_3 measures the response to this package rather than to carded play alone. Statewide measures that applied to all hotels and clubs, such as the mandatory closure of gaming areas between 4 a.m. and 10 a.m. from 30 August 2024 (Premier of Victoria, 2024), are absorbed by the time fixed effects to the extent that they affected nearby and other LGAs equally. If late night trade accounts for a larger share of expenditure in inner Melbourne, the closures would reduce Player Loss in the nearby LGAs relative to the others from September 2024 and move β_3 toward zero which we do not see (we also see limited changes at the end of the event study time frame).

The third assumption is that the policy did not affect the control group. If some Crown patrons moved to venues in control LGAs, expenditure in the control group would also rise and β_3 would understate the effect on the nearby LGAs. We cannot test this assumption, but a violation would bias our estimates toward zero rather than away from it.

To examine the first assumption and to trace the timing of the effect, we estimated the event study regression

$$y_{it} = \alpha_i + \rho_t + \beta_0 X_{it} + \sum_{\tau \neq -1} \beta_\tau C_i \cdot 1(t = \tau) + \varepsilon_{it},$$

where τ indexes months relative to implementation, from $\tau = -12$ (January 2023) to $\tau = 11$ (December 2024), with $\tau = 0$ for January 2024, the first month in which carded play was enforced for the entire month at the Crown, so each β_τ measures the difference between nearby and other LGAs in month τ relative to that difference in December 2023. Coefficients for months before implementation indicate whether the two groups followed different trends before the policy, and coefficients for later months trace the effect over the post-period.

Results

Table 2 reports estimates for β_3. Columns (1) to (3) use the natural log of Player Loss as the outcome and Columns (4) to (6) use its level. Columns (1) and (4) include LGA and month of year fixed effects only; Columns (2) and (5) add the numbers of EGMs and venues; Columns (3) and (6) replace month of year with month by year fixed effects.

Over the 12-month post-period, Player Loss in the nearby LGAs rose by approximately 3.0 percent (p = .001) relative to the other LGAs each month after implementation. This translates to an average increase of $153,937 ($p$ = .008) in Player Loss per nearby LGA. When controlling for number of EGMs and venues, Player Loss in nearby LGAs increased by 2.1 percent (p = .020 and p = .021) relative to other LGAs per month post-implementation. This translates to an average relative increase of $108,589 to $108,900 ($p$ = .033 and p = .032) in Player Loss per nearby LGA. Across all four of the nearby LGAs, Player Loss increased by AUD $434,000 and $616,000 per month. Relative to average pre-period Player Loss of AUD $3.46 million per nearby LGA per month, the level estimates correspond to increases of 3.1 to 4.4 percent, somewhat larger than the log estimates. These estimates support H1.

Table 2

Estimated Effects of Mandatory Carded Play at Crown on EGM Expenditure in Nearby LGAs

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(PL)	Ln(PL)	Ln(PL)	PL	PL	PL
Crown × Post	0.030***	0.021**	0.021**	$153,937***	$108,900**	$108,589**
	(.001)	(.021)	(.020)	(.008)	(.032)	(.033)
# of EGMs		0.00059**	0.00059**		$3,995***	$4,043***
		(.039)	(.034)		(.009)	(.010)
# of Venues		0.024**	0.024**		$27,086	$25,389
		(.047)	(.048)		(.672)	(.694)
Observations	1,368	1,368	1,368	1,368	1,368	1,368
Month of Year FE	x	x		x	x	
Month-Year FE			x			x
LGA FE	x	x	x	x	x	x

Note. Difference-in-difference estimates of β_3. The sample is 57 LGAs observed monthly from January 2023 (12 months pre-implementation) to December 2024 (12 months post-implementation). The dependent variable (PL, Player Loss) is in natural logs in Columns (1) to (3) and in Australian dollars in Columns (4) to (6). Crown × Post is the interaction $C_i Post_t$. Columns (1), (2), (4), and (5) include month of year and LGA fixed effects; Columns (3) and (6) include month by year and LGA fixed effects. p-values are reported in parentheses below each estimate. ***p < .01, **p < .05, *p < .10.

The difference-in-difference estimates average the effect over the 12 post-implementation months. The event study estimates in Figure 2 show how the difference between nearby and other LGAs evolved month by month. Before implementation, the coefficients for $\tau = -12$ to $\tau = -1$ lie between −0.03 and 0.04, with many close to 0, and each 95 percent confidence interval includes zero. After the Crown policy, the point estimates are positive in all twelve months of 2024, ranging from a high of 0.12 in February 2024 ($\tau = 1$) to a low of 0.02 in October 2024. The monthly estimates are imprecise: the 95 percent confidence interval for $\tau = 0$ has a lower bound close to zero, and the intervals for some of the other post-period months include zero. This is common in an event study design with a limited sample size like this one and does not jeopardize our main results from Table 2 (Wooldridge; 2010). The pattern is consistent with a shift in expenditure, as H2 predicts, but the monthly estimates are too imprecise to establish that the effect began in the first month or remained constant, so H2 is partly supported. A temporary response, in which gamblers initially avoided carded play and later accepted it, would appear as positive coefficients in the first months that then returned to zero; the estimates do not show this pattern.

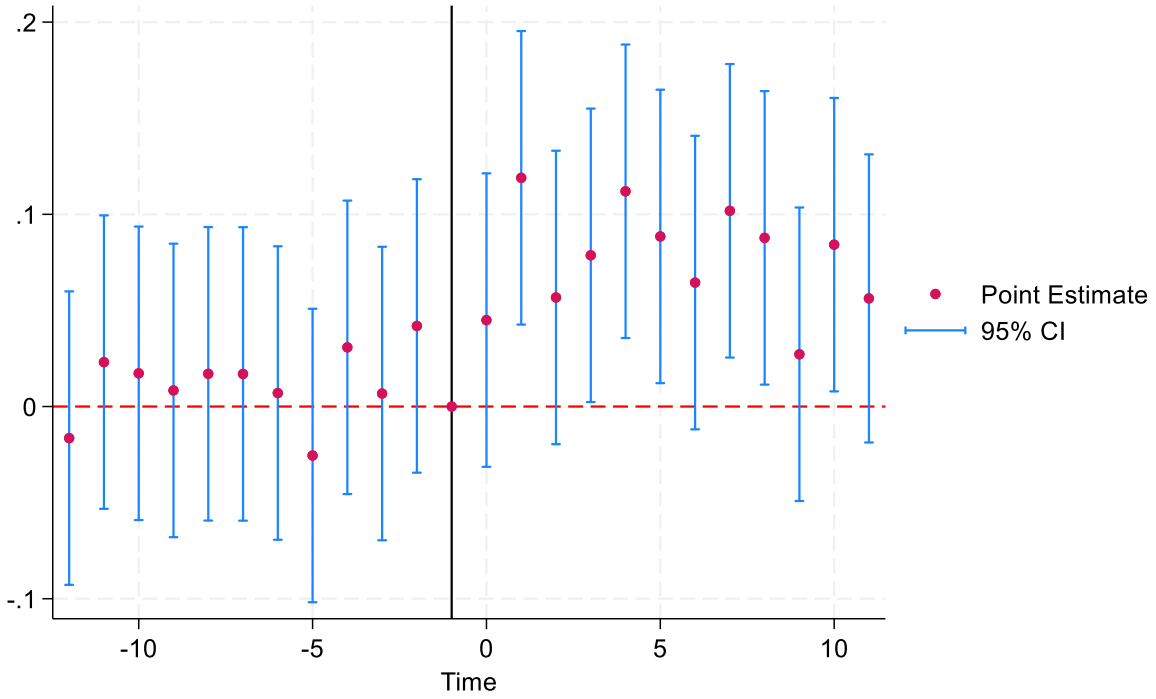


Figure 2. Event study estimates of the difference in log Player Loss between nearby and other LGAs by month are relative to the implementation of mandatory carded play at the Crown which occurred in December 2023 ($\tau = -1$), which corresponds to the omitted month in the event study. Dots are point estimates and bars are 95 percent confidence intervals.

Discussion

The current study examined the displacement in EGM revenue following the introduction of mandatory carded play in a casino where nearby gaming venues where carded play remained

voluntary. This asymmetry allowed us to measure the response of EGM gamblers to changes in regulations using expenditure data from EGMs in hotels and clubs across the state of Victoria, Australia. We estimated that after carded play became mandatory at the casino, Player Loss at nearby hotels and clubs rose by 2.1 to 3.0 percent relative to other hotels and clubs throughout the state, or AUD $434,000 to $616,000 per month. These findings support H1. The event study demonstrated that the increase in expenditure at nearby hotels and clubs appeared within the first months after implementation and did not return to zero over the following year, which partly supports H2.

EGMs account for a large share of gambling expenditure in Australia. The Productivity Commission (2010) concluded that their continuous play, rapid event frequency, and accessibility make them disproportionately associated with harmful gambling. Subsequent Australian studies have found that EGM losses are concentrated among a relatively small group of regular gamblers, including those experiencing gambling problems (Browne et al., 2017; Livingstone & Woolley, 2007). In our data, hotel and club EGM Player Loss across the 57 LGAs was approximately AUD $3.0 billion in 2023. The estimated displacement, about 0.2 percent of this total, is small relative to the state market but equals 2 to 3 percent of hotel and club expenditure in the LGAs surrounding the casino.

Swanton et al. (2023, 2025) document stated preferences that may underly the displacement of EGM expenditure: regular EGM players report both benefits and costs of identity-linked payment systems, where their willingness to use such systems depends on privacy protections and burden. When carded play became mandatory at one venue and uncarded play remained available a short distance away, enough expenditure moved to the uncarded venues to raise their Player Loss by 2 to 3 percent. This is consistent with the perceived costs of carded play (Swanton et al., 2023), whether through loss of privacy, the effort of registration, or the limits that accompany the card, exceeding its benefits for at least some gamblers. Our finding also parallels the Finnish evidence that some account holders continued to gamble anonymously while that option remained (Selin et al., 2025). It does not imply that gamblers value carded play negatively on average, since our data do not show how many patrons remained at the casino and used the card.

The results also bear on the design of partial regulation. Where gambling expenditure moves between close substitutes as their relative cost changes (Larsen et al., 2025; Sy & Ishihara, 2025; Walker, 2007), a requirement imposed on one venue raises the cost of play there and leaves nearby substitutes unchanged, so part of the expenditure it targets can move rather than fall. Expenditure that moves to uncarded venues from the carded system risks leaving players exposed and without the protections these regulations offer (e.g., risk monitoring; Newall & Swanton, 2024; Wohl, 2018). In response to these risks, the Victorian Government is expanding requirements for carded play and pre-commitment limits to all EGMs in the state (Premier of Victoria, 2023), beginning with a trial in hotels and clubs in September 2025 (after our sample period; Blaschke, 2025). As consistency across venues is among the attributes gamblers valued most in a card-based gambling system (Swanton et al., 2025), a uniform requirement may also improve perceived benefits and uptake of the system. As our estimates measured the size of the displacement that a requirement confined to the casino generated, future research is encouraged to measure the wider implications of extending coverage to all licensed gambling venues.

The study has several limitations. We did not observe EGM revenue at Crown, so we were unable to measure how much expenditure left the casino, whether total EGM expenditure in the Melbourne area rose or fell, or what share of post-implementation expenditure at Crown was carded. The data were aggregated to each LGA by month, so we could not follow individual gamblers or distinguish expenditure by former Crown patrons from other changes in play at nearby venues. With four treated LGAs, inference relied on few treated units, and conventional cluster robust standard errors can understate uncertainty in this case (Conley & Taber, 2011). The estimates measured the response to the full set of measures in the VGCCC direction, not to carded play alone. Player Loss also measures net expenditure and does not show whether the number of gamblers, sessions, or time on device changed. Account level data from venues would allow movement of individual players between the casino and hotels and clubs to be traced, and survey or qualitative studies could establish why players moved.

Conclusion

We examined whether mandatory carded play at one casino affected EGM expenditure at nearby hotels and clubs. Using publicly available monthly LGA data from Victoria and a difference-in-difference design, we found that Player Loss at hotels and clubs in the four LGAs nearest Crown increased by approximately 2.1 to 3.0 percent relative to other LGAs following the December 2023 implementation of carded play (p = .001 to .021), or roughly AUD $434,000 to $616,000 per month across the four nearby LGAs. Event study estimates indicate that the increase appeared within two months of implementation and did not return to zero during 2024. These findings are consistent with some gamblers responding to mandatory carded play by moving expenditure to nearby venues where uncarded EGM play remained available. A requirement applied to one venue can therefore be partly offset when close substitutes are exempt.

The results imply that the effect of carded play on the EGM market as a whole depends on whether the requirement applies consistently across the gambling ecosystem. Evaluations of gambling regulations that target a single venue or channel should account for substitution toward the venues and channels the regulation does not cover. More broadly, our results illustrate a risk that is inherent in regulation that covers only some gambling venues or modalities: a measure that raises the cost of gambling in one setting can move demand toward settings with fewer protections. The same mechanism underlies current debates over whether stricter controls on licensed operators divert gamblers to unlicensed offshore markets.

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