review

Market Cannibalization Within and Between Gambling Industries: A Systematic Review

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Abstract

In economics, cannibalization refers to a process in which a new product or service partly or completely substitutes for those in existing markets. This systematic review analyses the existing evidence on cannibalization within gambling markets to determine whether such substitution takes place between different types of gambling. The analysis shows that new gambling products substitute to a certain extent for existing gambling products. The sector in which the evidence is most convincing is the casino industry, which cannibalizes lotteries and pari-mutuel racing. There is also evidence that casinos substitute for other casinos and for non-casino electronic gaming machines. Lotteries substitute for casinos, other lotteries, sports betting, and pari-mutuel or racing industries. In other cases, the evidence is less conclusive and sometimes non-existent, or industry relationships are more complicated. This review also found that even in cases where substitution does occur, it is incomplete, and thus the introduction of new products tends to expand the overall gambling market. We discuss these market dynamics and identify gaps in the available research.

Keywords: gambling, cannibalization, substitutionary effects, economic impacts, review

Résumé

En économie, on entend par cannibalisation un processus par lequel un nouveau produit ou service se substitue partiellement ou complètement à des produits ou services existants. Cet examen systématique analyse les données dont on dispose sur la cannibalisation dans les marchés du jeu pour déterminer si une telle substitution a lieu entre différents types de jeux de hasard. L'analyse montre que les nouveaux produits de jeux de hasard remplacent, dans une certaine mesure, certains produits de jeu existants. La preuve la plus convaincante est celle portant sur le secteur du casino qui cannibalise les loteries et les courses de pari mutuel. Il est également

prouvé que les casinos accaparent légèrement le marché d'autres casinos et d'appareils de jeu hors casino. Les loteries s'approprient une part de marché des casinos, d'autres loteries, de paris sportifs et mutuels ou des secteurs de la course. Dans d'autres cas, les preuves sont moins concluantes, voire inexistantes, ou les relations entre les divers secteurs sont plus compliquées. Cet examen a également révélé que, même dans les cas où il y a un accaparement du marché, il n'est pas total et, par conséquent, le lancement de nouveaux produits tend plutôt à élargir le marché global du jeu. Nous abordons ces dynamiques de marché et cernons les lacunes dans la recherche disponible.

Introduction

Several research papers have considered whether the introduction of new games or the expansion of existing games have a "substitutionary" or "complementary" relationship with other gambling markets. Although in economics these terms refer to cross-price elasticities (Farrell & Forrest, 2008), in the literature on market substitution, they are used to describe the level of replacement or reduction in sales or market share that occurs when a new commodity enters the market. Market substitution is also called displacement or cannibalization. This systematic review analyses the available evidence on whether substitution takes place in gambling markets. Cannibalization can occur between gambling products or between gambling and other industries. The focus of this paper is on the former, also known as intra-industry substitution.

Substitution in gambling markets can occur either between different gambling sectors or within the product range of the same gambling provider. Srinivasan, Ramakrishnan, and Grasman (2005) distinguished between intra-product cannibalization and inter-product cannibalization. In the case of intra-product cannibalization, two different products with similar functionalities compete for the same market share, as would be the case with two state lotteries competing for the same business. Inter-product cannibalization can occur when two products within the same product group compete for market share. This is the case when, for example, casino gambling competes with lotteries or pari-mutuel gambling.

There is currently no unanimity on whether cannibalization occurs in the gambling sector. The discussion is also coloured by ideological positions related to the potential economic benefits of gambling. Gambling can have benefits to societies as well as to individuals (e.g., American Gaming Association, 2014; Basham & Luik, 2011; Collins, 2003), but the economic benefits of all forms of gambling are not the same. Casinos and racing are labour intense, although the value for the economy of the often low-paid, part-time jobs that are associated with these industries has been questioned (Grinols, 2004; Kendall, 2011). Automated forms of gambling, such as electronic gaming

machines (EGMs) or online gambling, require less personnel and do not have a positive impact on employment (Williams, Rehm, & Stevens, 2011). Lotteries are not major job providers, but increase government budgets and benefit charitable causes. In comparison, casinos, particularly Native American casinos, pay less or no tax to state governments, although they may reduce the need for state subsidies (Gordon, 2010).

Two previous reviews that have considered market substitution between and within gambling industries have also come to contradictory conclusions. The Swiss Institute of Comparative Law (2006) conducted a comprehensive review of the relationships between different gambling industries from existing empirical evidence at the time and found that most gambling sectors cannibalize each other. A more recent but less comprehensive review by Philander and Bernhard (2012) concluded that the available evidence does not support claims of cannibalization in the casino sector. The most comprehensive empirical study on the substitution effects between gambling products was conducted by Walker and Jackson (2008). The authors modelled gambling market relationships in all 50 U.S. states from 1985 to 2000. Results indicated that some industries do indeed cannibalize each other, whereas other industries have no impact on one another.

This finding suggests that gambling industry relationships are complicated and depend on several factors, which is why a systematic review of all intra-industry relationships is even more important. This is the research task of the current review. First, we introduce the methodology and inclusion criteria of studies considered for the systematic review. Second, we present detailed results of all forms of cannibalization within the gambling industries that have been addressed in previous research. Third and finally, we discuss these industry relationships and the issue of market expansion.

Method

The review was conducted by systematically searching scientific article databases. The keywords used were the following, as well as corresponding search words in French: gambling/gaming/lottery/casino/betting/poker/wager/pari-mutuel/online gambling AND substitution/cannibalisation/displacement/complementary.

We searched the following databases:

- EBSCOhost
- ProQuest
- Scopus
- Web of Science
- Google Scholar
- Cairn.info (for French-language references)

In addition, we searched Google for possible grey literature and reports, and we used a snowballing method by browsing the lists of references of all articles that we had found for possible additional papers.

Only articles that were consistent with our inclusion criteria were selected in this review. These criteria were as follows: (1) The article presented original empirical evidence on the topic of substitution between gambling industries. Previous reviews and articles that were hypothetical or theoretical were excluded from this review. (2) The article had to focus on inter-industry cannibalization between gambling types, not on substitution between gambling and other industries. This form of cannibalization will be analysed separately in another (forthcoming) paper. (3) The article had to be published between 1978 and 2017. Other researchers have noted that the bulk of research on the economic and social impacts of gambling dates back only to the 1990s (Walker & Sobel, 2016), but we hypothesized that the introduction of casinos in Atlantic City in 1978 may have drawn interest to the subject matter, at least in the United States. (4) The article had to be in English or French because of our linguistic limitations. Most references found were in English, and only two original empirical articles were found in French. (5) We had to be able to find the original text of the article for proper analysis. In particular, some studies from the 1980s and early 1990s were not available through our institutional channels or were out of print.

The final sample consisted of 61 articles, of which we were unable to locate the original research text of three, bringing the final sample to 58 articles. Of these, 20 studies considered two or more types of substitution between different types of gambling. The results of some studies were therefore included under several types of cannibalization analysed for this review, bringing the total number of observations to 102.

Table 1 details the frequencies of observations on different types of intra-industry substitution considered in this review.

We noted the following information about each paper: reference, gambling type analysed (the impact of gambling X on gambling Y), research context, research data, results, and quality of the study. The quality of each study was assessed from four metrics: First, we considered the quality of the statistical analysis, including whether the study considered other variables, conducted statistically robust checking,

Table 1

Frequencies of Study Observations Describing Types of Intra-Industry Cannibalization

Type of gambling	Casinos	Lotteries	Pari-mutuel/ racing	EGMs	Sports betting	Online gambling	Bingo
Casinos	11	2	1	2	0	3	0
Lotteries	8	19	4	1	0	2	1
Pari-mutuel/racing	6	10	7	5	0	1	0
EGMs	5	0	3	1	0	1	0
Sports betting	1	4	0	0	0	0	0
Online gambling	1	1	0	0	0	0	0
Bingo	0	2	0	0	0	1	0

Note. EGM = electronic gaming machine.

or controlled for bias. Second, we checked whether the study was longitudinal as opposed to cross-sectional, preference being given to longitudinal studies. Third, we looked at whether the study included comparative observations from locations with no change as opposed to a simple before/after analysis in one research context. Preference was given to comparative studies, rather than before/after models that cannot account for the counterfactual. Fourth, we considered generalizability, meaning whether the study included many states or countries, or focused on one location only. Preference here was given to studies with more locations that allowed wider generalizability of the results. The quality of the studies reviewed was given a score out of 4 points in the analysis.

In the following sections, the results of this review are presented, with more weight given to studies that were ranked as the best quality. We did not conduct a meta-analysis on the actual levels at which cannibalization takes place. Rather, we focused on the issue of whether studies found a substitution or not. This is because studies have used widely varying statistical methods that are not possible to compare within the scope of this review, although such a task would be of importance in future studies on the topic.

Results

The bulk of studies that considered intra-gambling industry cannibalization were conducted in the United States, but some evidence was also available from other contexts. Results were inconclusive and diverse, suggesting that the substitutionary effects between gambling products depend on the type of gambling and the socio-cultural and economic environment in which they are introduced (see Paton & Vaughan Williams, 2013).

Table 2 summarizes the available evidence on intra-gambling industry cannibalization. In most cases, gambling industries seemed to cannibalize each other and even themselves, but this does not mean that money simply transferred from one gambling sector to another. The gambling sector also has the potential to grow, and even though different types of gambling may cannibalize each other, the aggregate revenue of the industry and the aggregate tax revenue to governments can still grow.

Casinos

Market relationships between casinos and other types of gambling are relatively well researched, and there is plenty of evidence for possible intra-product and inter-product substitution. However, all existing evidence found for this review comes from the United States or Canada, and more studies are needed in other contexts. Table 3 summarizes the findings related to the impacts of casinos on other gambling services that were considered for this review.

Impact of casinos on casinos. The impact of new casinos on existing casino gambling is one of the best researched types of intra-industry cannibalization in

Table 2

Summary of Relationships Between Gambling Sectors Based on Previous Research

Gambling game	Casinos	Lottery	Pari-mutuel/racing	EGMs	Sports betting	Online gambling	Bingo
Casinos	-	-	+ *	+	Unknown	+	Unknown
Lottery	--	-	+/-	-*	Unknown	+/-	+ *
Pari-mutuel/racing	--	-	+/-	--	Unknown	+/-*	Unknown
EGMs	-	Unknown	+	--*	Unknown	+ *	Unknown
Sports betting	--*	---	Unknown	Unknown	Unknown	Unknown	Unknown
Online gambling	+ *	+/-*	Unknown	Unknown	Unknown	Unknown	Unknown
Bingo	Unknown	+ *	Unknown	Unknown	Unknown	+ *	Unknown

Note. EGM = electronic gaming machine;
 - cannibalization;
 -- significant cannibalization;
 --- very significant cannibalization;
 + complementary relationship;
 +/- evidence inconclusive or both cannibalization and complementary;
 * limited evidence.

gambling markets, although evidence comes only from the United States and might therefore not apply to other country contexts.

Seven of these 10 studies found that casinos substitute for other casinos, measured notably as decreases in gross gambling revenue (GGR), patronage, and admissions (Eadington, Wells, & Gossi, 2010; Gallagher, 2014; McGowan, 2009; Nichols, 1998; Shonkwiler, 1993; Thalheimer & Ali, 2003; Walker & Jackson, 2008; Walker & Nesbit, 2014). Three studies found either a complementary relationship or no impact (Geisler & Nichols, 2016; Hunsaker, 2001; Walker & Jackson, 2008). These contradictory results can be partly explained by the study method used. The two studies that found a complementary effect examined the impacts of casino development from a nationwide perspective, whereas the studies that reported market substitution focused on local-level markets. The results indicate that cannibalization occurs at the local level but substitution is only partial. Thus, as aggregate casino markets grow, there may be a complementary relationship at the nationwide level.

This analysis is in line with the results of a study conducted by Gallagher (2014), who showed that two processes of cannibalization in fact take place in situations where two casinos compete against one another: First, a patronage effect occurs when a competing casino influences the patronage levels of another casino, and second, a spending effect occurs when a competing casino influences the levels of spending at another casino. Gallagher (2014) found that new casinos tend to cannibalize existing casinos primarily through the patronage effect, but within a 25-mile (40-kilometre) radius. The spending effect was less significant. This finding indicates that although cannibalization takes place, overall spending on casino gambling rises following the introduction of new opportunities. Evidence would therefore suggest that market

Table 3
Substitution Impacts of Casinos on Other Gambling Products

Product impact	Study	Context and data years	Result	Quality
Casinos on casinos	Eadington, Wells, & Gossi (2010)	USA (California and Nevada), 1994–2009	Cannibalization: 10% increase at a California casino decreases GGR in Reno area by 2.3%	2/4
Casinos on casinos	Gallagher (2014)	USA (Illinois), 1994–2006	Cannibalization: No loss of revenue but loss of patronage in 25-mile area	3/4
Casinos on casinos	Geisler & Nichols (2016)	USA (Riverboat states), 1984–2009	No impact found from casino from a neighbouring county	3/4
Casinos on casinos	Hunsaker (2001)	USA (Riverboat states, Atlantic City, and Las Vegas), 1978–1998	Complementary: 1 million USD increase in riverboat GGR corresponds to 0.61 million USD increase in Las Vegas GGR. No impact on Atlantic City GGR	3/4
Casinos on casinos	McGowan (2009)	USA (Pennsylvania and New Jersey), 2000–2007	Cannibalization: Decrease of 5.7% in New Jersey GGR after the introduction of a casino in Pennsylvania	2/4
Casinos on casinos	Nichols (1998)	USA (Iowa and Illinois), 1991–1996	Cannibalization: Introduction of riverboat gambling in Iowa decreased GGR and admissions in Illinois. An estimated 30% of GGR and 41% of admissions in Iowa substitution for Illinois	2/4
Casinos on casinos	Shonkwiler (1993)	USA (Las Vegas and Atlantic City), 1969–1991	Cannibalization: Atlantic City had reduced Las Vegas GGR by 10–12% by 1985	2/4
Casinos on casinos	Thalheimer & Ali (2003)	USA (Illinois, Iowa, and Missouri), 1991–1998	Cannibalization: EGM gambling at a subject casino decreases with competition from other casinos in the area	4
Casinos on casinos	Walker & Jackson (2008)	USA, 1985–2000	Complementary: Indian casinos increase GGR of other casinos	3/4
Casinos on casinos	Walker & Jackson (2008)	USA, 1985–2000	Cannibalization: Cross-state casinos decrease casino GGR	3/4
Casinos on casinos	Walker & Nesbit (2014)	USA (Missouri), 1997–2010	Cannibalization: 10% increase in EGMs in other casinos decreases casino GGR by 5.7%. 10% increase in table games in other casinos increases casino GGR by 1.7%	2/4

Table 3 Continued.

Product impact	Study	Context and data years	Result	Quality
Casinos on lotteries	Cummings, Walker, & Cotti (2017)	USA (Maryland), 1990–2014	Cannibalization: Estimated impact of casinos on all lottery GGR of -103 million dollars. Aggregate lottery sales decline more near casinos	3/4
Casinos on lotteries	Economopoulos & Stolle (2012)	USA (Pennsylvania), 2004–2010	Cannibalization: State lottery GGR reduced by 5–10 cents for each dollar gained in casino GGR	4
Casinos on lotteries	Elliott & Navin (2002)	USA, 1989–1995	Cannibalization: 1 USD spent on casinos declines lottery spending by 1.38 USD. Corresponds to a loss of 0.83 USD in state revenue	2/4
Casinos on lotteries	Fink & Rork (2003)	USA, 1988–2000	Cannibalization: 1 USD increase in state casino tax revenue reduces net lottery proceeds by $0.56	3/4
Casinos on lotteries	Room, Turner, & Ialomiteanu (1999)	Canada (Ontario), 1995/1996, 1997	Cannibalization: Spending on lotteries and instant lotteries decreased after the opening of Niagara Falls casinos	2/4
Casinos on lotteries	Siegel & Anders (2001)	USA (Arizona), 1993–1998	Cannibalization: 10% increase in number of EGMs at Indian casinos is associated with declines of 2.8% for lottery games and 3.7% for lotto	2/4
Casinos on lotteries	Steinnes (1998)	USA (Minnesota), 1988–1993	Cannibalization: Introduction of Indian casinos reduced lottery revenue by less than 2%	3/4
Casinos on lotteries	Walker & Jackson (2008)	USA, 1985–2000	Cannibalization: Decreases in casino revenue increase lottery revenue	3/4
Casinos on pari-mutuel/racing	Ali & Thalheimer (1997)	USA (New Jersey), 1960–1988	Cannibalization: Introduction of casinos decreased pari-mutuel wagering by 32%	2/4
Casinos on pari-mutuel/racing	Prybylski, Felsenstein, Freeman, & Littlepage (1998)	USA (Indiana) and Israel, 1997	No impact found in Indiana; analysis on Israel was not based on empirical data and was not considered in this review	1/4
Casinos on pari-mutuel/racing	Siegel & Anders (2001)	USA (Arizona), 1993–1998	No impact found	2/4
Casinos on pari-mutuel/racing	Ray (2001)	USA (Greyhound racing states), 1991–1998	Cannibalization: Presence of casino significantly reduces greyhound handle	3/4
Casinos on pari-mutuel/racing	Thalheimer (2012)	USA (Iowa), 1993–2006	Cannibalization: Pari-mutuel wagering fell by 16% after the introduction of table games at the racino	2/4

8

Table 3 Continued.

Product impact	Study	Context and data years	Result	Quality
Casinos on pari-mutuel/racing	Walker & Jackson (2008)	USA, 1985–2000	Complementary: Increases in casino GGR connected to increases in horse racing GGR	3/4
Casinos on pari-mutuel/racing	Walker & Jackson (2008)	USA, 1985–2000	Cannibalization: Decrease in casino GGR increases dog racing GGR	3/4
Casinos on EGMs	Marfels (1997)	USA and Canada (South Dakota, Manitoba, and Nova Scotia), 1990–1996	No impact: Introduction of casinos did not cause long-term drop in VLT revenue in any context	3/4
Casinos on EGMs	Room, Turner, & Ialomiteanu (1999)	Canada (Ontario), 1995/1996, 1997	Cannibalization: No impact on GGR, but frequency of gambling on VLTs decreased when visits to casino increased	2/4
Casinos on EGMs	Thalheimer (2012)	USA (Iowa), 1993–2006	Cannibalization: EGM wagering fell 8% after the introduction of table games	2/4
Casinos on EGMs	Thalheimer & Ali (2003)	USA (Illinois, Iowa, and Missouri), 1991–1998	Cannibalization: EGM revenue was 13% lower at casinos that had table games than at racinos with no table Fgames	4
Casinos on EGMs	Thalheimer & Ali (2008)	USA (Illinois, Iowa, and Missouri), 1991–1998	Cannibalization: EGM wagering fell by 11.5% in the presence of 40 table games (average in the sample)	2/4
Casinos on sports betting	Room, Turner, & Ialomiteanu (1999)	Canada (Ontario), 1995/1996, 1997	Cannibalization: Decreases in GGR and frequency of sports betting after the opening of Niagara Falls casino	2/4
Casinos on online gambling	Philander & Fiedler (2012)	USA and Canada, 2010	Complementary: 1 million USD in casino GGR corresponds to an increase of 2,700 USD in online GGR	3/4

Note. EGM = electronic gaming machine; GGR = gross gambling revenue; VLT = video lottery terminal.

cannibalization between casinos occurs, but that it is only partial and mainly focused on the local level.

Impact of casinos on lotteries.   The impact of casinos on lotteries can be of interest to national and state governments from a revenue perspective. A substitution for state lotteries has the potential to impact on state tax revenue if the declining and increasing forms of gambling are taxed at different levels. The evidence is conclusive, as studies on this topic have found that the introduction of casinos cannibalizes lottery revenue.

All eight studies found cannibalization of lottery products from casinos (Cummings, Walker, & Cotti, 2017; Economopoulos & Stolle, 2012; Elliott & Navin, 2002; Fink & Rork, 2003; Room, Turner & Ialomiteanu, 1999; Siegel & Anders, 2001; Steinnes, 1998; Walker & Jackson, 2008), but the estimated degree of this substitution varied. The highest figure was obtained by Elliott and Navin (2002), who found that the introduction of a casino corresponded to an 83-cent decline in state lottery revenues for each dollar played. The results of this study were later questioned by Fink and Rork (2003), whose calculations, based on a revised methodology, showed only a 56-cent decline in lottery revenue for each dollar increase in casino tax. More conservative estimations have landed at around a 5–10% decline (Economopoulos & Stolle, 2012; Walker & Jackson, 2008). Economopoulos and Stolle (2012) found that cannibalization of lottery revenues is mainly local, as half of this substitution takes place in counties in which a casino is located. A recent study by Cummings et al. (2017) noted that aggregate lottery sales decline when they occur closer to casinos. In this study, the impact was strongest on lotteries played on monitors, which resemble EGM play. It appears that the cannibalization of lotteries by casinos has an impact, particularly on state finances, because of the lower taxation of casinos, but the situation may be attenuated by the fact that the substitution is only partial, and aggregate gambling markets grow with new gambling opportunities.

Impact of casinos on pari-mutuel or race betting.   Pari-mutuel betting has been declining in many Western contexts for a long time. Some authors have attributed this decline to the cannibalizing effects of the expansion of casino gambling and state lotteries since the 1980s (e.g., Thalheimer, 1998), and the available evidence seems to support this view.

We found seven studies that dealt directly with the issue of casinos cannibalizing horse racing and one study that dealt with the impacts of introducing casino games at the race tracks to create racinos (race tracks with casino games), four of which found substitution (Ali & Thalheimer, 1997; Ray, 2001; Thalheimer, 2012; Walker & Jackson, 2008). Evidence from New Jersey (Ali & Thalheimer, 1997) estimated that the level of cannibalization is about 32%, and a study on racinos (Thalheimer, 2012) estimated that pari-mutuel wagering fell by 16% after the introduction of casino table games at the venue. Two studies found no impact (Prybylski, Felsenstein, Freeman, & Littlepage, 1998; Siegel & Anders, 2001), but the study by Prybylski et al. (1998) concluded that there was no impact because the pari-mutuel industry financially benefits from riverboat casinos, not because casinos would not substitute for

parimutuel markets. One study (Walker & Jackson, 2008) found a complementary relationship between casinos and horse racing but a negative relationship between casinos and greyhound racing.

It is likely that the decline of the racing industry cannot solely be attributed to cannibalization from casinos, but there appears to be an impact. From the available evidence, casinos seem to cannibalize the racing industries to some extent.

Impact of casinos on EGMs.   Five studies considered the impacts of casinos on EGMs. We have included both non-casino EGMs and EGMs at the same venue as table games in this category.

Two of these studies focused on the impacts of casinos on video lottery terminals (VLTs, a type of non-casino EGM that resembles lotteries; Marfels, 1997; Room et al., 1999). The results appear contradictory: The study by Marfels (1997) found no impact, whereas Room et al. (1999) reported a relationship of substitution. However, according to Gallagher (2014), it is possible that cannibalization takes place through the patronage effect rather than through the spending effect. The study by Marfels (1997) considered only the spending effect, whereas that by Room et al. (1999) considered both effects and found that although there was no impact on GGR, the frequency of gambling on VLTs decreased. This result indicates that casinos cannibalize non-casino EGM gambling, but not revenue.

The three remaining studies considered the impact of EGMs on table games at the same venue (Thalheimer, 2012; Thalheimer & Ali, 2003, 2008). These studies found substitution in EGM revenue and wagering of about 10% following the introduction of or in the presence of table games. This evidence shows that other casino games partly cannibalize EGM gambling.

Impact of casinos on sports betting.   Only one study considered the impact of casinos on sports betting. The results of the study by Room et al. (1999) indicated that casinos cannibalize both the GGR and the frequency of sports betting. Although this is a high-quality study, the finding was linked to only one location, and more studies are needed to confirm the result.

Impact of casinos on online gambling.   The rise of online gambling is a relatively recent development in gambling markets, and there have not been many studies on its impact on the established gambling market, let alone the impact of land-based gambling on online forms of gambling. One study nevertheless considered the impact of land-based casinos on online gambling. The findings of this study by Philander and Fiedler (2012) suggest a small complementary relationship based on GGRs. More research is, however, needed to confirm the result.

Lotteries

Lotteries have received the most research attention of all the categories of gambling considered in this review. Most studies again come from the United States,

but evidence is also available from other country contexts, particularly the United Kingdom. This is probably not a coincidence, because the expansion of state lotteries in the United States in the 1980s (first introduced in the state of New Hampshire in 1964) and in the United Kingdom in 1994 sparked interest in how they would impact on other gambling industries. The studies focusing on the impact of lotteries on other forms of gambling are detailed in Table 4.

Impact of lotteries on casinos.   Surprisingly little evidence is available on the impact of lotteries on casinos, with only two studies dealing directly with the question. Both studies were also conducted in the United States, leaving room for more analysis, particularly in other contexts. Results were nevertheless convincing. We have already noted that casinos appear to cannibalize lotteries, but the relationship seems to go both ways. Both studies (Shonkwiler, 1993; Walker & Jackson, 2008) found that state lotteries have a negative impact on casino revenues, although substitution is relatively small. This result suggests that although state lotteries may slightly cannibalize casino revenue, their introduction also significantly increases total GGR.

Impact of lotteries on lotteries.   The impact of new lottery products, either cross-border or in the same jurisdiction, on existing lotteries has been the most widely researched type of cannibalization reported in the literature.

Of the 19 study observations analysed, 13 indicated substitution (Brown & Rork, 2005; Farrell & Forrest, 2008; Fink & Rork, 2003; Forrest, Gulley, & Simmons, 2004; Garrett & Marsh, 2002; Grote & Matheson, 2006; Mikesell & Zorn, 1987; Roger & Chabi, 2009; Stover, 1990; Tosun & Skidmore, 2004; Walker & Jackson, 2008), two found a complementary relationship (Forrest & McHale, 2007; Purfield & Waldron, 1999), and four found no impact (Farrell & Forrest, 2008; Forrest et al., 2004; Gulley & Scott, 1993; Lin & Lai, 2006). This result indicates that intra-product cannibalization (Srinivasan et al., 2005) is common in the lottery markets. However, the deconstruction of these results shows that certain types of lotteries may be more prone to cannibalization than others.

Three different types of substitution processes can take place between lottery products. First, cross-state lotteries can potentially cannibalize contiguous state lotteries. Six of the studies considered in this review had studied this type of substitution, and all of them found that cross-state lotteries substitute for state lotteries. Reasons for cross-border lottery purchases included lower prices of tickets, better jackpots, and convenience (Garrett & Marsh, 2002), but the introduction of new cross-state lotteries can also have a negative impact if a state or country loses its tourist players (Fink & Rork, 2003). There appears to be less substitution when the same products are available on both sides of the border.

Second, multistate or multinational lotteries may impact on national or state lotteries. Here the evidence is more contradictory, with some studies showing substitution and others claiming a complementary relationship. For example, the European

Table 4
Substitution Impacts of Lotteries on Other Gambling Products

Product impact	Study	Context and data years	Result	Quality
Lotteries on casinos	Shonkwiler (1993)	USA (Atlantic City, Nevada, and California), 1969–1991	The introduction of California state lottery impacted Nevada casino proceeds by -3%	2/4
Lotteries on casinos	Walker & Jackson (2008)	USA, 1985–2000	Cannibalization: Decreases in lottery revenue increase casino revenue	3/4
Lotteries on lotteries	Brown & Rork (2005)	USA, 1967–2000	Cannibalization: A 10% increase in payout rates in neighbouring states forces states to increase payout rates by 4%	3/4
Lotteries on lotteries	Farrell & Forrest (2008)	Australia, 1982–2002	Cannibalization: Other lotteries significantly reduce lottery GGR	3/4
Lotteries on lotteries	Farrell & Forrest (2008)	Australia, 1982–2002	No impact	4
Lotteries on lotteries	Farrell & Forrest (2008)	Australia, 1982–2002	Cannibalization: Keno sales impact lottery sale turnover negatively	4
Lotteries on lotteries	Fink & Rork (2003)	USA, 1988–2000	Cannibalization: Cross-state lotteries have a negative impact on state lotteries	3/4
Lotteries on lotteries	Forrest, Gulley, & Simmons (2004)	UK, 1997–2000	Cannibalization: A 10% increase in Thunderball lottery sales is associated with 0.025% decrease in lotto sales. No impact the other way around	3/4
Lotteries on lotteries	Forrest, Gulley, & Simmons (2004)	UK, 1997–2000	No impact: Increases in sales of Thunderball lottery game showed no impact on scratch-card sales	2/4
Lotteries on lotteries	Forrest, Gulley, & Simmons (2004)	UK, 1997–2000	Cannibalization: 10% increase in scratch-card sales is associated with a 1.07% decrease in National Lottery sales. No impact on Thunderball lottery sales	2/4
Lotteries on lotteries	Forrest & McHale (2007)	UK, 1999–2007	Complementary: Multistate Euromillions lottery is associated with 5.45% increase in National Lottery sales	2/4
Lotteries on lotteries	Garrett & Marsh (2002)	USA (Kansas area), 1998	Cannibalization: Cross-state lotteries have a -10 million USD negative impact on Kansas lottery sales	3/4
Lotteries on lotteries	Grote & Matheson (2006)	USA (Colorado, New Jersey, and Ohio), 1990–2004	Cannibalization: State lottery sales fell by 50% after a multistate lottery was introduced	3/4

Table 4 Continued.

Product impact	Study	Context and data years	Result	Quality
Lotteries on lotteries	Gulley & Scott (1993)	USA (Kentucky, Ohio, and Massachusetts), 1990–1991; 1987–1990 and 1984–1990; 1989–1990	No impact found	2/4
Lotteries on lotteries	Lin & Lai (2006)	Taiwan, 2004	No impact found	2/4
Lotteries on lotteries	Mikesell & Zorn (1987)	USA, 1983–1985	Cannibalization: New games come at the expense of existing ones	3/4
Lotteries on lotteries	Purfield &Waldron (1999)	Ireland, 1993–1994	Complementary: Larger lotto sales associated with larger sales in Lucky Numbers game	2/4
Lotteries on lotteries	Roger & Chabi (2009)	France, 2002–2008	Cannibalization: Multistate Euromillions game substituted for sales in the National Lottery	2/4
Lotteries on lotteries	Stover (1990)	USA, 1984–1985	Cannibalization: Contiguous state lotteries are substitutes	2/4
Lotteries on lotteries	Tosun & Skidmore (2004)	USA (West Virginia), 1987–2000	Cannibalization: Cross-state lotteries and new games in state substitute for existing lottery sales	2/4
Lotteries on lotteries	Walker & Jackson (2008)	USA, 1985–2000	Cannibalization: Cross-state lotteries substitute for state lotteries	3/4
Lotteries on pari-mutuel/racing	Forrest, Gulley, & Simmons (2010)	UK, 1996–2001	No impact	2/4
Lotteries on pari-mutuel/racing	Gulley & Scott (1989)	USA, 1976–1980	Cannibalization: An additional 1 USD spent on the lottery decreases pari-mutuel spending by 0.18 USD	2/4
Lotteries on pari-mutuel/racing	Kaplan (1990)	USA and Canada, previous research	No impact: Decline of pari-mutuel industry is not associated with the lottery but with other factors	0/4
Lotteries on pari-mutuel/racing	Mobilia (1992)	USA, 1950–1987	Cannibalization: Lotteries negatively impact attendance at tracks but no significant impact on real handle per attendee	3/4
Lotteries on pari-mutuel/racing	Miers (1996)	UK, 1995	Cannibalization: Horse racing companies report losses since the introduction of the National Lottery	0/4
Lotteries on pari-mutuel/racing	Simmons & Sharp (1987)	USA, 1982	Cannibalization: Lotteries decrease horse racing handle by 10%	3/4

Table 4 Continued.

Product impact	Study	Context and data years	Result	Quality
Lotteries on pari-mutuel/racing	Thalheimer & Ali (1995c)	USA (Kentucky), 1986–1990	Cannibalization: The introduction of a state lottery negatively impacted the handle of race tracks	2/4
Lotteries on pari-mutuel/racing	Thalheimer & Ali (1995a)	USA (A multistate market area), 1960–1987	Cannibalization: The introduction of state lotteries is associated with significant losses in attendance and handle at race tracks	2/4
Lotteries on pari-mutuel/racing	Vasche (1990)	USA (California), 1970–1989	Cannibalization: Additional 1 USD spent on lottery is associated with a decline of 0.26 USD in pari-mutuel wagering	3/4
Lotteries on pari-mutuel/racing	Walker & Jackson (2008)	USA, 1985–2000	Complementary: Increases in lottery revenue increase horse racing revenue	3/4
Lotteries on pari-mutuel/racing	Walker & Jackson (2008)	USA, 1985–2000	Complementary: Increases in lottery revenue increase dog racing revenue	3/4
Lotteries on sports betting	Forrest (1999)	UK, 1993–1997	Cannibalization: Three years after the introduction of the National Lottery, football pool sales had declined by 60%	1/4
Lotteries on sports betting	Forrest & Perez (2011)	Spain, 1970–2007	Cannibalization: Cumulative impact of the introduction of two lottery draws on football pool sales was 86.6%	2/4
Lotteries on sports betting	Miers (1996)	UK, 1995	Cannibalization: Initial impact but ensuing relaxations on football pool regulations made it very small	0/4
Lotteries on sports betting	Forrest, Gulley, & Simmons (2010)	UK, 1996–2001	Cannibalization: National Lottery associated with significant substitution for soccer betting when there is a good draw	2/4
Lotteries on online gambling	Philander & Fiedler (2012)	USA and Canada, 2010	No impact	3/4
Lotteries on bingo	Miers (1996)	UK, 1995	Complementary: Introduction of lottery had a positive impact on bingo	0/4

Note. GGR = gross gambling revenue.

multinational Euromillions lottery was found to be complementary to the National Lottery in the United Kingdom (Forrest & McHale, 2007), but substitutionary for the National Lottery in France (Roger & Chabi, 2009). Grote and Matheson (2006) suggested that multistate lotteries cannibalize some of the sales from state lotteries, but that the overall benefit for lottery companies is positive.

Third, a lottery provider's own product range may include several types of lotteries, including instant lotteries, that may substitute sales for each other. Evidence regarding this type of substitution is inconclusive. It is likely that some level of cannibalization of older games by new games takes place, but only to a degree that is acceptable to the organization. This type of substitution is even necessary to keep up consumer interest in the product range (Mikesell & Zorn, 1987). It is possible that only certain types of lottery games substitute for others. For example, the comprehensive Australian study by Farrell and Forrest (2008) found that although other lotteries and a Keno game substituted for national lotteries, scratch cards did not. Similarly, Forrest et al. (2004) found that although scratch cards substituted for the National Lottery, they did not cannibalize the Thunderball lottery game. Hence, lottery providers design their product range carefully to maintain acceptable levels of substitution, while increasing overall sales and maximizing related tax revenue (see also Grote & Matheson, 2013; Gulley & Scott, 1993).

Impact of lotteries on pari-mutuel or race betting. The impact of lotteries on pari-mutuel or race betting is another well-documented type of substitution in previous research, with evidence available from the United States, the United Kingdom, and Canada.

As was the case with studies on the substitutionary impacts of casinos on pari-mutuel and race betting, lotteries have also been argued to be partially responsible for the decline of racing industries (Thalheimer, 1998). The available evidence seems to support this suggestion, as most studies have found that lotteries cannibalize pari-mutuel and racing wagers both by a patronage effect and by a spending effect (Gulley & Scott, 1989; Miers, 1996; Mobilla, 1992; Simmons & Sharp, 1987; Thalheimer & Ali, 1995a, 1995b; Vasche, 1990). Studies have reported losses in pari-mutuel GGR of around 10–20% following the introduction of lotteries (Gulley & Scott, 1989; Simmons & Sharp, 1987; Vasche, 1990), but despite this substitution, net state revenue is positive (Vasche, 1990).

Other studies have nevertheless found a complementary relationship or no impact (Forrest, Gulley, & Simmons, 2010; Kaplan, 1990; Walker & Jackson, 2008). It is therefore possible that there are direct local-level cannibalization effects between lotteries and the racing industry, but that at a national level, the rise of lotteries may not have more than a coincidental impact on the racing industry. The studies that have found no impact have tended to be those that analysed larger nationwide data sets. Kaplan (1990) suggested that the difficulties of the pari-mutuel industry are not a result of cannibalization, but of difficulties inherent in pari-mutuel betting itself and its governmental regulation. However, more research is needed to establish whether this is the case.

Impact of lotteries on sports betting.   The impact of lotteries on sports betting has been studied in Europe, where attention has been paid to the substitution of a traditional form of gambling known as football pools. Football pools are a type of sports betting that flourished in Europe from around the 1940s to the 1980s, with little competition from other forms of gambling (Forrest, 1999). Higher quality studies (Forrest, 1999; Forrest & Perez, 2011) indicate that lotteries almost completely cannibalized football pools, whereas one lower quality study (Miers, 1996) found a smaller level of cannibalization. One study (Forrest et al., 2010) also considered the impact of lotteries on other sports betting and found a significant substitution. We therefore conclude that lotteries appear to cannibalize sports betting.

Impact of lotteries on online gambling.   One study considered the impact of lotteries on online gambling, more specifically on online poker. The study, by Philander and Fiedler (2012), found no relationship between these two types of gambling. This is probably not surprising, as population surveys have shown that players of lottery and online poker tend to have different socio-demographic characteristics and therefore represent different population segments (e.g., Costes, Eroukmanoff, Richard, & Tovar, 2015; Wardle, Moody, Griffiths, Orford, & Volberg, 2011). However, more research is needed to establish this link.

Impact of lotteries on bingo.   Finally, one study considered whether lotteries have a substitutionary impact on bingo (Miers, 1996). It found a complementary relationship, but the quality of the evidence was not ranked as high, and therefore these results should be interpreted with caution. There is a need for more research to verify the validity of this outcome.

Pari-Mutuel or Race Betting

The impact of pari-mutuel or race betting on other gambling industries has been less studied than have the impacts of other types of gambling on this form of wagering. This is not surprising, as pari-mutuel and race betting have been a declining form of gambling for some time, whereas new gambling opportunities, such as casinos, lotteries, and online games have been increasing. The decline of the racing industry appears to be a particular worry in the United States, where all the research evidence for this review originated. The studies on the impacts of the racing and pari-mutuel industries on other types of gambling are detailed in Table 5.

Impact of pari-mutuel or race betting on casinos.   Although the impact of casinos on pari-mutuel betting has been extensively studied, we found only one study that investigated the relationship in the opposite direction. Walker and Jackson (2008) found a complementary relationship, with horse racing increasing casino revenues, indicating an opposite relationship to the case of the negative impact of casinos on the horse racing industry, as discussed earlier. The result may also be due to the growth of racino markets in the United States at the time of the study. Although this is a high-quality study, more research is needed to confirm the result.

Table 5
Substitution Impacts of Pari-Mutuel/Race Betting on Other Gambling Products

Product impact	Study	Context and data years	Result	Quality
Pari-mutuel/racing on casinos	Walker & Jackson (2008)	USA, 1985–2000	Complementary: Horse racing increases casino GGR	3/4
Pari-mutuel/racing on lotteries	Elliott & Navin (2002)	USA, 1989–1995	Cannibalization: Pari-mutuel completely substitutes for lotteries and causes losses for states. 1 USD of state revenue from pari-mutuel betting decreases lottery revenue by 2.55 USD	2/4
Pari-mutuel/racing on lotteries	Garrett & Marsh (2002)	USA (Kansas area), 1988	No impact	3/4
Pari-mutuel/racing on lotteries	Davis, Filer, & Moak (1992)	USA, 1982–1991	Cannibalization: Expected per capita lottery revenues are 29% lower in states with pari-mutuel	4
Pari-mutuel/racing on lotteries	Siegel & Anders (2001)	USA (Arizona), 1993–1998	No impact	2/4
Pari-mutuel/racing on lotteries	Walker & Jackson (2008)	USA, 1985–2000	Complementary: Increases in dog or horse racing increase lottery revenue	3/4
Pari-mutuel/racing on pari-mutuel/racing	Ray (2001)	USA, 1991–1998	Cannibalization: Availability of horse racing significantly reduces greyhound racing handle	3/4
Pari-mutuel/racing on pari-mutuel/racing	Thalheimer & Ali (1992)	USA (Kentucky), 1970–1988	Cannibalization: Introduction of telephone betting reduced betting at tracks by 22%	2/4
Pari-mutuel/racing on pari-mutuel/racing	Thalheimer & Ali (1992)	USA (Kentucky), 1970–1988	Cannibalization: Competition from other tracks resulted in a 16% decrease in race track handle	2/4
Pari-mutuel/racing on pari-mutuel/racing	Thalheimer & Ali (1995b)	USA (New Jersey and Kentucky), 1971–1987	Inconclusive: Exotic (multi-horse) wagers decline straight (one-horse) wagers, but increase overall GGR if exotic wagers are on two horses. Overall GGR declines with three- or four-horse exotic wagers	2/4
Pari-mutuel/racing on pari-mutuel/racing	Thalheimer & Ali (1995c)	USA (Kentucky), 1986–1990	Complementary: Inter-track betting increased total handle of race tracks, but betting at tracks did not decline significantly	2/4
Pari-mutuel/racing on pari-mutuel/racing	Walker & Jackson (2008)	USA, 1985–2000	Cannibalization: Decreases in horse racing revenue increase greyhound racing revenue	3/4

Table 5 Continued.

Product impact	Study	Context and data years	Result	Quality
Pari-mutuel/racing on pari-mutuel/racing	Walker & Jackson (2008)	USA, 1985–2000	Cannibalization: Decreases in greyhound racing revenue increase horse racing revenue	3/4
Pari-mutuel/racing on EGMs	Thalheimer (1998)	USA (West Virginia), 1989–1991	Complementary: Presence of pari-mutuel racing increases EGM gambling	2/4
Pari-mutuel/racing on EGMs	Thalheimer (2008)	USA (West Virginia), 1994–2002	Complementary: Presence of pari-mutuel racing increases EGM gambling	2/4
Pari-mutuel/racing on EGMs	Thalheimer (2012)	USA (Iowa), 1993–2006	Complementary: EGM gambling increased by 13% in the presence of live horse racing and 14% in the presence of simulcast horse racing	2/4
Pari-mutuel/racing on EGMs	Thalheimer & Ali (2003)	USA (Illinois, Iowa, and Missouri), 1991–1998	Cannibalization: Access to pari-mutuel betting has a statistically insignificant negative impact on EGM revenue	4

Note. EGM = electronic gaming machine; GGR = gross gambling revenue.

Impact of pari-mutuel or race betting on casinos. We found five studies that focused on whether pari-mutuel or race betting substitutes for lottery revenue. Results were contradictory, with some research studies reporting that the relationship is insignificant (Garrett & Marsh, 2002; Siegel & Anders, 2001) or complementary (Walker & Jackson, 2008) and others finding that the presence of pari-mutuel betting in a state diminishes the profitability of the lottery (Davis, Filer, & Moak, 1992; Elliott & Navin, 2002). The work by Elliott and Navin (2002) used cross-sectional time series dating from 1989 to 1995 to study the impacts that casinos and pari-mutuel betting have on state lottery revenue. Results suggested that pari-mutuel betting cannibalizes state lotteries so strongly that states may even suffer net revenue losses. As there is not much difference in the quality of these studies, we cannot reliably determine the impact of pari-mutuel or racing on lotteries from this evidence. In any case, states that have both lotteries and racetracks have been found to have a higher overall tax revenue (Gulley & Scott, 1989), suggesting that if there is substitution, it is only partial.

Impact of pari-mutuel or race betting on pari-mutuel or race betting. The pari-mutuel industry may also cannibalize itself. Inter-product (Srinivasan et al., 2005) cannibalization within the pari-mutuel or racing industries can take place through two different processes. First, different types of racing products or competition from other tracks may have an impact each other. Studies have found that horse racing and greyhound racing cannibalize each other (Ray, 2001; Walker & Jackson, 2008) and that competition from other tracks cannibalizes racing revenue (Thalheimer & Ali, 1992). The second process is related to new betting options. In the United States, the decline of pari-mutuel betting following competition from state lotteries and casinos has led legislators to allow the introduction of new wagering interfaces to draw in players. Evidence suggests that these new betting options, such as telephone betting and inter-track betting, can cannibalize older forms of betting, but tend to increase overall GGR (Thalheimer & Ali, 1992; 1995b, 1995c). We therefore conclude that inter-product relationships in the pari-mutuel industry can be both substitutionary and complementary depending on the type.

Impact of pari-mutuel or race betting on EGMs. The final type of impact that previous studies on pari-mutuel or race betting have researched is on EGMs. The four studies that we identified have notably focused on how the presence of pari-mutuel betting at racinos impacts on EGM gambling.

Like the new betting options described earlier, the introduction of EGMs at race tracks has been a way for tracks to boost visitation and revenue. Studies have been conclusive and evidence suggests that the presence of pari-mutuel racing, live or simulcast, increases EGM gambling (Thalheimer, 1998, 2008, 2012). One study (Thalheimer & Ali, 2003) found a negative impact on EGM revenue, but the relationship was statistically insignificant. We can therefore conclude that the impact of pari-mutuel or race betting on EGM gambling is complementary.

EGMs

This category includes the impacts of various types of non-casino EGMs or in-venue EGMs on other games in the same venue. Non-casino EGMs have been of particular interest outside the United States, more specifically in Australia and the United Kingdom, where EGM venues and convenience EGM gambling are common. In the United States, most research has examined the relationships between EGMs and other games at the same venues. Table 6 details the studies that were included in this section.

Impact of EGMs on casinos. We found only two studies that considered whether non-casino EGM gambling has an impact on casino GGR or whether in-casino EGMs have an impact on other casino games. Although results are preliminary, as both studies have a limited scope, there does not appear to be significant cannibalization.

In-casino EGMs substitute for other casino games (Levitzky, Assane, & Robinson, 2000), and this finding is in line with previous research showing that the importance of EGMs to casino revenue has steadily increased (see, e.g., Schüll, 2012; Young, Tyler, Lamb, & Stevens, 2008). Nevertheless, total casino GGR has risen despite this development, as casino corporations are careful to maintain their profits.

Marfels (1997) examined the relationship between casinos and VLTs in Canada and the United States and found no case in which casino revenue would have declined because of the introduction of VLTs. It would therefore appear that EGMs and casino gambling are complementary products.

Impact of EGMs on lotteries. Only one Australian study has considered the impacts of EGMs on lotteries. It found that EGMs are associated with a small negative impact on lottery GGR (Farrell & Forrest, 2008). The result seems reliable because although we were able to find only one study observation of this type of substitution, the result is in line with that reported by Siegel and Anders (2001), who found that the number of EGMs in casinos had a negative impact on lottery revenues.

Impact of EGMs on pari-mutuel or race betting. As racing tracks across the United States have become racinos, the impact of these new casino-type gambling opportunities on traditional race wagering has received some research attention.

All three studies on this topic found cannibalization (Thalheimer, 1998, 2008, 2012). According to this evidence, EGMs at race tracks reduced pari-mutuel betting by over 20% (Thalheimer, 1998, 2012), while the combined effects of various relaxations on EGM regulations at race tracks reduced the pari-mutuel handle by 49% (Thalheimer, 2008). However, despite these significant levels of substitution, the overall profits of race tracks increased, as the revenue from EGMs more than made up for any losses in race betting (Thalheimer, 1998, 2008).

Table 6
Substitution Impacts of EGMs on Other Gambling Products

Product impact	Study	Context and data years	Result	Quality
EGMs on casinos	Levitzky, Assane, & Robinson (2000)	USA (Nevada), 1988–1995	Cannibalization: EGMs are generating increasing amounts of casino GGR. The importance of table games is decreasing	2/4
EGMs on casinos	Marfels (1997)	USA and Canada (South Dakota, Nova Scotia, and Manitoba), 1990–1996	No impact in any context. Non-casino EGMs did not negatively impact on casino GGR	2/4
EGMs on lottery	Farrell & Forrest (2008)	Australia, 1982–2002	Cannibalization: EGMs associated with a small negative impact on lottery GGR	4
EGMs on pari-mutuel/racing	Thalheimer (1998)	USA (West Virginia), 1989–1991	Cannibalization: EGMs at race tracks reduced pari-mutuel betting	2/4
EGMs on pari-mutuel/racing	Thalheimer (2008)	USA (West Virginia), 1994–2002	Cannibalization: The combined effect of deregulations on the number, location, and maximum bet on EGMs at race tracks reduced pari-mutuel handle by 49%	2/4
EGMs on pari-mutuel/racing	Thalheimer (2012)	USA (Iowa), 1993–2006	Cannibalization: Pari-mutuel horse race wagering fell 21% after EGMs were introduced	2/4
EGMs on EGMs	Paton & Vaughan Williams (2013)	UK, 2001–2006	Cannibalization: FOBT machines directly substituted for older EGMs at betting shops, but no statistically significant substitution in other locations	4

Note. EGM = electronic gaming machies; GGR = gross gambling revenue; FOBT = fixed-odds betting terminal.

Impact of EGMs on EGMs.   One study investigated the possible substitution of older types of EGMs with new EGM models. In this UK study, Paton and Vaughan Williams (2013) investigated whether the introduction of fixed-odds betting terminals (FOBTs), a type of EGM found more often in betting shops than in casinos, affected the number of traditional non-casino gambling machines. They found that overall FOBT-type gambling increased the available gambling offer and spending, but in the case of licensed betting offices, FOBTs directly substituted for older machines.

Sports Betting

No studies have investigated the impacts of sports betting on other forms of gambling, and this is an area in need of future research attention.

Online Gambling

Online environments have created new threats to existing land-based businesses. Online gambling is particular in comparison to the more traditional gambling markets, as online environments often merely offer a new medium in which to gamble by using existing games. Research evidence is limited for the time being, and all relationships between offline and online gambling are not yet known. Some land-based gambling providers, such as the Las Vegas Sands Corporation and its founder and chairman, have been opposed to all online gambling and have feared that it would directly compete with established offline venues. However, empirical evidence has been less conclusive, and other gambling operators have been more open towards the online gambling market. Table 7 details the available research evidence on the impacts of online gambling on other forms of gambling.

Impact of online gambling on casinos.   Three studies have focused on whether online gambling cannibalizes land-based casino gambling.

In one study, Philander (2011) used data on online gambling volumes in the United States before the Unlawful Internet Gambling Enforcement Act of 2006 (UIGEA) was enforced. Results showed that online gambling was a gross substitute for offline casino gambling. The author further estimated that one dollar spent on online gambling cannibalizes around 27 to 30 cents of casino revenue. However, the author brings up concerns about the quality of the study in his paper, particularly the fact that it took place before the UIGEA. Two more recent studies (Philander, Abarbanel, & Repetti, 2015; Philander & Fiedler, 2012) instead found that participation in online and land-based casino gambling were complementary. The results of the study by Philander et al. (2015) were based on self-reported data from the British Gambling Prevalence Survey, which may not be completely reliable, but the Philander and Fiedler (2012) study is of high quality. We can therefore cautiously conclude that the relationship between online gambling and land-based casino gambling may be complementary, although more research is still needed.

Table 7
Substitution Impacts of Online Gambling on Other Gambling Products

Product impact	Study	Context and data years	Result	Quality
Online gambling on casinos	Philander (2011)	USA, 1999–2006	Cannibalization: Before UIGEA, 1 USD bet on online gambling reduced land-based casino GGR by 27 to 30 cents.	2/4
Online gambling on casinos	Philander, Abarbanel, & Repetti (2015)	UK, 2010	Complementary: Positive correlation of 0.088 between online gambling and land-based casino participation rates	1/4
Online gambling on casinos	Philander & Fiedler (2012)	USA and Canada, 2010	Complementary: 1 million USD in casino GGR corresponds to an increase of 2,700 USD in online GGR	3/4
Online gambling on lotteries	Philander & Fiedler (2012)	USA and Canada, 2010	No impact	3/4
Online gambling on lotteries	Trucy (2011)	France, 2010	No impact: National lottery revenue did not decline after the introduction of licensed online gambling markets	0/4
Online gambling on pari-mutuel/racing	Trucy (2011)	France, 2010	No impact: Pari-mutuel revenue did not decline after the introduction of licensed online gambling markets	0/4
Online gambling on EGMs	Philander, Abarbanel, & Repetti (2015)	UK, 2010	Complementary: 1-unit increase in gambling frequency on online EGMs was related to a 2.5-unit increase in land-based EGM gambling frequency	1/4
Online gambling on bingo	Philander, Abarbanel, & Repetti (2015)	UK, 2010	Complementary: Positive correlation of 0.191 between online bingo and land-based bingo participation rates	1/4

Note. EGM = electronic gaming machine; GGR = gross gambling revenue; UIGEA = Unlawful Internet Gambling Enforcement Act of 2006.

Impact of online gambling on lotteries.   Two studies evaluated the impact of online gambling on lotteries, neither of which found an interaction between these two forms of gambling (Philander & Fiedler, 2012; Trucy, 2011). Philander and Fiedler (2012) suggested that this is because the population groups participating in these two games are different, which appears to be true based on population surveys (e.g., Costes et al., 2015; Wardle et al., 2011). Studies have furthermore not found cannibalization of online gambling by lotteries, as discussed earlier.

Impact of online gambling on pari-mutuel or race betting.   One French study considered the impact of online gambling on the French pari-mutuel industry (Trucy, 2011). It found no impact on pari-mutuel revenue after the introduction of online gambling markets. However, this result is based on only one country context, and the study did not present any statistical analysis of the relationship. Furthermore, it did not consider the fact that the opening of licensed online gambling markets also allowed the national pari-mutuel company to expand its operations online to new games, which may have had an impact on this result. It is therefore necessary to conduct more studies to confirm the result.

Impact of online gambling on EGMs.   One study focused on whether online EGM play has an impact on land-based EGM gambling (Philander et al., 2015). It found a complementary relationship. However, this finding is again based on self-reported data obtained from the British Gambling Prevalence Survey, leaving room for more studies that use actual gambling data.

Impact of online gambling on bingo.   Finally, one study focused on whether online bingo substitutes for land-based bingo. The study by Philander et al. (2015) found a complementary relationship from a positive correlation in participation rates. However, this study is again based on self-reported data, and the same caution applies to this finding as described earlier.

Bingo

Bingo is a form of gambling that has been largely ignored in previous gambling studies, perhaps because of its small-scale nature and history as a form of charity gambling (Bedford, Alvarez-Macotela, Casey, Kurban Jobin, & Williams, 2016). There is also a real paucity of research evidence on whether bingo gambling substitutes for other forms of gambling, and the only observation that we found for this review concerned the impacts of bingo on lotteries (see Table 8).

Impact of bingo on lotteries.   One Australian study considered the relationship between bingo sales and lottery. The study (Farrell & Forrest, 2008) found a complementary relationship, with bingo sales correlating positively with lotto sales. However, although this is a high-quality study, little research has been done on the topic, which is understandable, given the nature of bingo as a charity game.

Table 8

Substitution Impacts of Bingo on Other Gambling Products

Product impact	Study	Context and data years	Result	Quality
Bingo on lotteries	Farrell & Forrest (2008)	Australia, 1982–2002	Complementary: Bingo sales correlate positively with lotto sales	4

Discussion and Conclusion

In this study, we reviewed the available evidence on whether gambling games cannibalize other games. We can draw five conclusions from this analysis.

First, few examples of complete or near-complete substitution between gambling games exist. The only one that we could identify is the European football pool industry. This type of gambling was highly popular around Europe until the early 1990s (Forrest, 1999; Forrest & Perez, 2011), but by 2010, pools had become almost non-existent, with less than 3% of UK gamblers participating. The launch of FOBTs in the early 2000s and the UK National Lottery in 1994 are the likely cause (Forrest & Perez, 2011). This type of near-complete cannibalization, also called positive displacement (Farrell & Forrest, 2008), may be a sign of a normal market environment, in which less interesting products are replaced by new and more attractive gambling services. However, it may also be problematic in that new economic activity is created by substituting services from other sectors. This does not produce net economic benefits, particularly when less labour-intensive gambling sectors such as online gambling or EGMs substitute for sectors that provide more jobs or government revenue, such as casinos, racing tracks, or lotteries. Such a development can be seen in the case of EGMs substituting for traditional table games in casinos (Levitzky et al., 2000; Schüll, 2012, 2013). This type of substitution does not reduce the total win of casinos, but it may reduce employment opportunities in the industry.

Second, in most cases, there appears to be partial cannibalization, also known as negative displacement (Farrell & Forrest, 2008). In these situations, gambling industries substitute for each other and themselves, but not completely. Instead, the overall markets tend to grow. This appears to particularly true in wider national markets, whereas on the local level, impacts of cannibalization can be stronger. A so-called agglomeration effect (Philander & Bernhard, 2012) has taken place, which refers to a situation in which the presence of more gambling may cause some substitution, but leads to overall increases in activity in the entire sector. It is possible that there is a point of saturation for gambling markets, as was recently proposed by Barrow, Borges, and Meister (2016). However, the authors considered only inter-product cannibalization in casino markets, and it is possible that even if one type of gambling market is saturated, there is still room for other types of gambling products. The studies analysed in this review indicate that most gambling industries

cannibalize themselves, but they can still be complementary to other forms of gambling.

Third, and as further evidence of the agglomeration effect, some industry relationships appear to be complementary. This is particularly the case with online gambling, which according to available evidence seems to be mainly complementary to existing gambling products. This leads to more overall growth for the gambling market. Increased gambling opportunities can offer advantages to consumers, governments, and businesses (Basham & Luik, 2011; Williams et al., 2011; Zheng & Wang, 2014), but they can also have negative social and individual consequences, including harm to families (Dowling, Rodda, Lubman, & Jackson, 2014), gambling-related crime (Williams et al., 2011), and socio-economic inequality (Bol, Lancee, & Steijn, 2014); they can also contribute to health inequalities (Barnes, 2013). According to total consumption theory, these problems increase with increased gambling participation (Fong, Fong, & Li, 2011; Govoni, 2000; Grun & McKeigue, 2000; Hansen & Rossow, 2008, 2012; Lund, 2008), and they affect not only problem gamblers, but also moderate and low-risk gamblers (Browne et al., 2016). Other authors have suggested that populations will adapt to an increased gambling offer (LaPlante & Shaffer, 2007; Shaffer, 2005), but there is currently no conclusive evidence that adaptation occurs (Abbott et al., 2015; Orford, 2012). Although these social consequences of gambling were not the main interest of this review, they are important to bear in mind when considering the overall impacts of the growth of the gambling market described herein.

The fourth conclusion that we draw is that the relationships between gambling sectors are not always straightforward and may be different even between two games, depending on which way around we consider them. For example, EGMs have a negative impact on pari-mutuel betting and casino gambling, whereas the presence of pari-mutuel or casino gambling has a positive impact on EGM gambling. Overall, horse race and pari-mutuel betting, as well as online gambling, appear to be complementary to other forms of gambling, whereas casinos, lotteries, and EGMs appear to cannibalize other sectors more strongly. Conversely, horse race betting, sports betting, and lotteries appear to be the victims of cannibalization more often than casinos, EGMs, and online gambling. This finding suggests that industry relationships also depend on the increasing form of gambling in the market.

Fifth, a significant number of inter-industry relationships are yet unknown. This is particularly the case with sports betting and bingo, which have been largely overshadowed by studies on other types of gambling. Research on these topics might offer other examples of both complete and partial substitution or complementary relationships and provide more insight into issues such as the agglomeration effect and saturation.

This study focused on reviewing the existing evidence on whether market cannibalization takes place. Its main weaknesses were that we searched only English and French references, leaving out a possibly large number of studies conducted in other languages.

We also focused only on whether cannibalization takes place between types of gambling, leaving the possibility of conducting a meta-analysis for future studies. From the conclusions of this study, we recommend that future studies also consider the cannibalization impacts between industries that have received little or no attention in the literature and that more research be done on the relationships between cannibalization and adaptation, saturation, market growth, and the social impacts of gambling. There is also a need to review cannibalization between gambling and other industries to answer the question: At the expense of what other consumption does the gambling industry grow? This systematic review has nevertheless analysed a large body of literature and introduced a comprehensive analysis of gambling industry market relationships that will form the basis for further discussion on the topic.

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