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Essays on Pre-Commitment in Germany

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Summary

The focus of this thesis is to examine groups of gamblers who use different pre-commitment tools that can function as harm minimization strategies on the German gambling market. The main emphasis lies on those who set limits and those, getting excluded from gambling venues. Both groups have been awarded attention in the literature, but rather little work has been conducted on gamblers in the context of Germany and the legal and social conditions prevailing there. The goal is, on the one hand, to find out what drives the number of self-excluders from casinos or gambling arcades. To achieve this, a collective approach using macro data is used. On the other hand, it is examined whether self-initiated limits have an impact on gambling behavior. Based on the findings of the original research presented in this thesis, as well as findings already established in the literature, suggestions for future scientific work and recommendations for action for the programs can be made.

Pre-commitment is a form of self-binding that allows gamblers to limit money and time spent on gambling before they start a session. These tools can differ in the type of their liability. First, they can be designed in a way that they are monitored and enforced by third parties and hence are externally binding. Second, they can be self-management strategies that gamblers themselves voluntarily initiate. This is based on the underlying idea that gamblers will benefit from the fact that expenses and duration of stay are determined before commencing a gambling session, when they are not yet in a state of emotional arousal and hence more capable of deciding rationally. In terrestrial casino gambling, self-exclusions are a frequently used harm minimization strategy and can also be seen as a form of pre-commitment. They represent the most extreme type, where gamblers prevent themselves from entering establishments and hence limit their gambling activity to zero.

Chapter 2 concentrates on analyzing which variables drive the differences in the number of exclusions from casinos throughout German municipalities. The goal is to examine the degree to which socio-demographic factors and proximity measures can be used to explain the variation in the number of excluded gamblers across German communities. The risk factors for problematic gambling serve as a threshold for the socio-demographic background. The method used for estimation of the effects

was OLS. The results of the study suggest that excluders are more likely to be male, between 30 and 39 years old, and less likely to be single. As only few of the socio-demographic variables yield significant results, we can only partially confirm the well-established risk factors for problematic or pathological gambling. Additionally, the results show that the number of exclusions increases with close proximity to gambling establishments.

Chapter 3 deals with a similar research question, which this time is tailored to excluders from gambling arcades in Hesse, Germany, where the first formalized exclusion system for arcade gamblers was established in 2014. The goal was to identify socio-demographic as well as accessibility related predictors that impact the number of exclusion in communities. We control for three different accessibility measures in two models: the share of electronic gambling machines in model I as well as the share of locations and the density of gambling machines at a location in model II. Thereby, the association between EGMs and exclusions of model I can be disentangled into a location and a clustering effect. Again, we are not able to determine a specific socio-demographic background for self-excluders. The accessibility variables, on the other hand, turn out to be significantly associated with the number of exclusions. All three of them are statistically significant and their impact is positive. The results of model II show that the location effect is more pronounced than the clustering effect of EGMs.

The findings from Chapters 2 and 3 show that, with higher aggregated data, no clear socio-demographic profile for excluders can be determined. The results concerning accessibility confirm those established in the literature. An increase in accessibility leads to an increase in the number of exclusions or in other words an increase in the number of vulnerable gamblers.

Chapter 4 deals with self-limitation, which is another type of pre-commitment. As there has existed no formalized limit scheme in Germany, it is left to evaluate voluntary and self-initiated limits that are frequently used as self-management strategies by gamblers. The goal is to analyze the impact of self-initiated limitations on gambling behavior. The analysis shows that there are significant differences in most gambling variables indicating that unwanted behavior occurs less frequently in the group with limits. These results even hold if they are controlled for (gambling-related) self-efficacy. These findings are highly promising and might serve as a starting point for future considerations concerning the topic of pre-commitment in Germany in general and self-limitation in particular.

To my Dad - You are missed!

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Chapter 1

Introduction

Gambling is inseparably connected to the history of mankind, with first evidence for the presence of games of chance dating back to 4000 BC. Possible (monetary) gains paired with the thrill of the uncertain outcome of the game have always fascinated people (G. Meyer & Hayer, 2010).

Over time and with advances in technology, the possibilities to indulge in gambling increased, and with it, the opportunities to make money out of it. Hence, it is not surprising that gambling represents an important and profitable market for many countries. In 2016, the global volume of gross gaming revenue (GGR) is estimated to amount to EUR 367.9 billion (Jung et al., 2017). For Germany, GGR for the regulated gambling market was EUR 10.98 billion in 2017 (Barth, 2018).

The popularity, as displayed by the market volume is also reflected by lifetime prevalence rates. Banz and Lang (2017) show in their report that 75.3 % of the German population has participated at least once in any form of gambling throughout their life. What has to be taken into account is the fact that, in addition to being an allure, gambling can serve a completely different purpose. Namely, it can function as a means of blanking and displacement of stress or conflict (G. Meyer & Hayer, 2010). Consequently, gambling naturally carries the risk of developing problematic or pathological behavior. The estimates of the proportions of those affected vary, always depending on the sampling selection and the instrument[1] used to assess gambling behavior. Considering the estimates of recent German studies, the unweighted mean prevalence rates of studies using the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) are at 0.35 % for pathological and 0.34 % for problematic behavior, whereas the unweighted mean prevalence rates of studies using the South Oaks Gambling Screen are at 0.53 % for pathological behavior and at 0.46 % for

[1] The two instruments compared here are the *Diagnostic Manual of Mental Disorders (DSM-IV)* and the *South Oaks Gambling Screen (SOGS)*. Both are diagnostic tools, which are used to assess the presence of possible problematic or pathological gambling behavior.

problematic behavior (for more detail see Tables 3.5 and 3.6 in section A). Although these estimates appear small, especially when compared to prevalence rates of substance addictions like alcoholism or drug abuse, it can be assumed that more than half a million people[2] are directly affected by their excessive gambling behavior, not including their families, friends and further social costs that might arise.

The German government recognizes the risks involved in gambling. Nevertheless, at the moment, a comprehensive regulation is a rather tough undertaking, as the regulatory sovereignty lies within the legal scope of the federal states. Each state individually enacts implementing legislation which governs organization, operation or taxation of establishments. With the introduction of the Inter-State Treaty on Gambling *(Glücksspielstaatsvertrag (GlüStV))* in 2008 and a renewed and adapted treaty *(Glücksspieländerungsstaatsvertrag (GlüÄndStV))* in 2012, the German state aimed to provide a nationwide and common framework, valid for all federal states and types of gambling. Its overarching goals are

- to prevent the development of gambling addiction as well as to create prerequisites for an effective addiction control
- to steer the natural gambling instinct of the people into orderly and monitored channels and to counteract the development and spread of illegal gambling in black markets
- to ensure youth and consumer protection
- to ensure that gambling is properly conducted, that gamblers are protected from fraudulent activities and that consequential and accompanying crimes associated with gambling are fended off
- to prevent risks to the integrity of sporting competition when organizing and placing sports bets.[3]

We see that the Inter-State Treaty puts an emphasis on youth and consumer protection as well as the prevention of problematic gambling behavior. The term prevention summarizes all tools that either counteract unwanted psychological or physical conditions or that avert them in advance. Prevention can be subdivided into primary, secondary and tertiary prevention, depending on the time of intervention.

Primary prevention can be seen as proactive. The target population are gamblers and non-gamblers, independent of their risk status. Risk groups, like adolescents, are

[2]Summarizing the shares of problematic and pathological gamblers of the more conservative mean estimates and assuming a population size of 82.79 million people.

[3]See Article 1 of the German Inter-State Treaty on gambling.

given particular attention. Measures such as education and promotion of conscious participation in gambling are used to prevent gambling problems in the future. This can be achieved, on the one hand, by structural interventions. Possible are statutory regulations, like the reduction of availability and accessibility, restrictions on advertisements in order to prevent incentives for participation (e.g. prohibition of free spins), restrictions on cashless payment transactions or the prohibition of alcohol and/or tobacco in venues. The latter measure is particularly important, as alcohol as well as tobacco addiction are established co-morbidities for gambling at problematic levels (Welte et al., 2004; Williams et al., 2012). On the other hand, there are educational tools like awareness-raising campaigns in schools and for the public (Hayer & Meyer, 2004).

Secondary prevention aims at gamblers at risk who exhibit moderately problematic behavior and is intended to contribute to early detection or early intervention. Measures of secondary prevention can help to recognize warning signs and avert negative consequences at an (respectively) early stage (G. Meyer & Hayer, 2008). The main goal here is to minimize harm by motivating gamblers to change their behavior early on. Suitable for this purpose are low-threshold offers, like telephone hotlines, but also the strengthening of coping mechanisms (Hayer & Meyer, 2004). This aspect of prevention is especially interesting for this thesis as pre-commitment tools, on which the following chapters focus, can be assigned to secondary prevention.

Tertiary prevention starts the latest and targets pathological gamblers who are often dealing with their severely disturbed playing behavior but also at those who are abstinent or even recovered. The main goals are thereby relapse prophylaxis, the avoidance of consequential damages, the reintegration into society and, of course, working life. Means to achieve these goals are often individual or group psychological therapy (Hayer & Meyer, 2004).

The focus of this thesis is to examine groups of gamblers using different pre-commitment tools that can function as harm minimization strategies on the German gambling market. The main emphasis lies on those who set limits and those, getting excluded from gambling venues. Both groups have been awarded attention in the literature, but rather little work has been conducted on gamblers in the context of Germany and the legal and social conditions prevailing there. The goal is, on the one hand, to find out what drives the number of self-excluders from casinos or gambling arcades. On the other hand, it is examined whether self-initiated limits have an impact on gambling behavior. Based on the findings of the original research presented in this thesis, as well as findings already established in the literature, suggestions for future scientific work and recommendations for action for the programs can be made.

Following Ladouceur et al. (2012), pre-commitment allows gamblers to limit time

and/or money spent on gambling. The most important feature is that these limits are determined before gamblers start their session of play while they are not yet in a state of emotional arousal (Griffiths et al., 2009; Livingstone et al., 2014). Self-exclusions portray a special instrument in the variety of means of pre-commitment. They represent the most restrictive form, as gamblers basically limit their gambling activity to zero by preventing themselves from entering venues at all (Productivity Commission, 2010). The exclusion is not necessarily accompanied by therapeutic measures. It is more an isolated strategy of restriction of demand, which is frequently used in land-based gambling. This drastic step might help gamblers to regain control of their actions. While especially self-exclusions are a rather new tool of player protection and harm minimization in most countries, they have a rather long tradition in German casinos. The possibility to get excluded has existed since the end of World War II, the formalization of the program started in 1991. Next to bilateral self-exclusions, unilateral external exclusion, e.g. by casino staff, can be imposed. They should, however, not be confused with bans issued on the basis of domiciliary rights as the intention behind it is a completely different one (G. Meyer & Hayer, 2010). The demand for a comprehensive exclusion system has been incorporated into the Inter-State Treaty. This shows that the German legislator is convinced of the positive contribution of exclusions to prevention. However, at the moment, there is no German-wide scheme which is valid across all types of games. A formalized one is only existent for casinos and for gambling arcades in the federal state of Hesse, Germany. The latter was introduced in 2014 and is valid state-wide, but not outside of Hesse (Fux, 2017). That is to say that the aforementioned goal of the Inter-State Treaty, namely a comprehensive exclusion scheme valid for all states and all types of gambling could not yet be implemented.

Excluded gamblers are interesting research subjects as, contrary to the popular opinion, they should not be equated to the group of pathological gamblers. Although there is some overlap (Hayer & Meyer, 2011a, 2011b; Ladouceur et al., 2000), the terms *excluded* and *problematic* or *pathological* gamblers should not be used as synonyms. Lischer et al. (2016) and Griffiths and Auer (2016) provide evidence that a large fraction of gamblers use self-exclusion as a means of prevention and the authors are not able to find an unambiguous link between getting excluded and problematic or pathological behavior. In G. Meyer and Hayer (2010), 60 % of the sample states to use the exclusion as a precautionary measure. Hence it makes sense to categorize self-excluders as *vulnerable gamblers* rather than any of the two aforementioned. This means in reverse, that not all insights established about problematic or pathological gamblers can be transferred one-to-one to excluders, hence more research about the latter group is necessary to better understand what drives them, to further improve the exclusion scheme and to adapt it to their needs.

Another feature, which distinguishes the original research presented in the second and third chapter of this thesis from other work dealing with exclusions from gambling, is the fact that no self-reported data is used, but higher aggregated community level census data. This has the advantage that biases, which typically occur when individual level data is used, are avoided. There are no problems with selection bias, i.e. under- or over-representation of certain groups, as census data tries to include all members of a population. Additionally, the data might be less biased due to social desirability or pride than individual level data, as data aggregation ensures that no individual can be singled out, i.e. identified by their answers. This means that they might be more honest. This is especially relevant in light of sensitive questions, e.g. about occupational status or age, which are important predictors in the two chapters of this thesis that are dealing with exclusions.

As there exists no German-wide comprehensive exclusion program, especially gamblers in gambling arcades outside of Hesse have to use other means of pre-commitment. Although there is also no formalized pre-commitment program in place for limit-setting in automated gambling in Germany, many gamblers still choose to determine internally initiated restrictions on money and/or time spent in venues. As these limits are not overseen by any monitoring body, they are not externally binding for the gamblers and should rather be seen as a voluntary control strategy. This specific type of informal pre-commitment can suffer from a lack of effectiveness. There are no possibilities to monitor expenditure or length of stay, hence it might be hard to maintain the overview for gamblers. Formalized systems offer clocks, counters and pop-up messages incorporated into the machines, which draw gamblers' attention to time and losses played. Furthermore, these limits can easily be breached. However, there are also advantages. Certain gamblers still think that pre-commitment is mostly relevant for at least problematic gamblers. They might feel that paternalistic and rigid schemes enforced on them by operators or legislators impair their gambling experience, which might act as a deterrent for them. Consequently, the effectiveness of these mandatory types of programs could also be affected negatively. Obviously, both types of pre-commitment schemes have their pros and cons, Chapter 4 deals with this in more detail.

Having introduced pre-commitment as the main topic and red thread of this thesis, we now turn to the original research. The following chapters consist of three stand-alone research papers, each examining a certain pre-commitment tool more extensively. Chapters 2 and 3 focus on determining drivers of the number of self-exclusions and identifying socio-demographic patterns for excluders, while chapter 4 examines whether there are differences in the gambling behavior of those, who use voluntary and self-initiated limits and those who do not.

Chapter 2, **Profiling Excluders from German Casinos using Municipality Level Data**, aims at analyzing in what way socio-demographic factors and proximity measures can be used to explain the variation in the number of excluded gamblers across German communities. For that purpose, a unique dataset with 3 091 observations containing information about the number of excluders as well as census data and spatial information has been created. The method used for estimation of the effects was OLS. The results of the study suggest that excluders are more likely to be male, between 30 and 39 years old and less likely to be single. Possibly due to flaws in the data, the other socio-demographic factors did not yield significant associations. Additionally, the number of exclusions increases with close proximity to gambling establishments. The distance to the closest casino has a negative impact on exclusions. This is backed up by the finding that there are relatively more exclusions in communities where casinos are directly located.

Chapter 3, **The Relationship Between Exclusions from Gambling Arcades and Accessibility: Evidence from a Newly Introduced Exclusion Program in Hesse, Germany**, examines the exclusion system for gambling arcades that has been introduced recently in the state of Hesse. The aim of this paper is to identify significant predictors that are useful in explaining the variation in the number of exclusions between different Hessian communities. Next to socio-demographic factors, we control for three different accessibility variables in two models: the number of electronic gambling machines (EGMs) in model I, and the number of locations and density of gambling machines at a location in model II. We disentangle the association between EGMs and exclusions of model I into a location and a clustering effect. Considering the socio-demographic variables, the explanatory power of our cross- sectional models is rather low. Only the age group of the 30–39 years old and those who are not in a partnership (in model I) yield significant results. As self-exclusion systems reduce availability for the group of vulnerable players, this analysis provides evidence for the assumption that the two groups — pathological gamblers and vulnerable players — seem to have little overlap concerning socio-demographic characteristics. The accessibility variables, on the other hand, turn out to be significantly associated with the number of exclusions. All three of them are statistically significant and their association is positive. The results of model II show that the location effect is more pronounced then the clustering effect of EGMs, i.e. the effect of an additional single-licensed arcade on the number of exclusions is stronger than the increase in the number of license at one location.

Chapter 4, **The Relationship between Self-limitation and Gambling Behavior among German Gambling Arcade Visitors**, focuses on pre-commitment tools on the automated gambling market in Germany. Slot machine gambling enjoys

great popularity in Germany. In 2016, electronic gambling machines in arcades and pubs had a market share of 51.7 % in the regulated gambling market with a gross gambling revenue of EUR 5,600 million. To decrease the risks of this type of gambling, pre-commitment tools are a frequently used harm-minimization strategy. Germany has not established any formalized self-limitation program for electronic gambling machines yet. Nevertheless, many gamblers use self-initiated limits as a voluntary control strategy. This paper uses a sample of 503 German arcade gamblers to analyze the differences in gambling behavior between gamblers who self-impose limits and those who do not. The results are promising. Unappreciated demeanor, like visiting multiple arcades in a row, occurs less frequently in the group with restricted expenses and time spent in arcades. Additionally, examined gambling parameters like the average expenditure per visit, the average length of stay per visit, and the average monthly expenditure for gambling in general are significantly lower for self-limiters. As it is suspected that these findings might be systematically driven by self-efficacy traits, also a regression model is used. This approach allows to control for self-efficacy and the aforementioned results still consistently hold. Likely, the outcomes for gamblers could be further improved by using an externally binding formalized pre-commitment system. Hence, the results of the present paper could serve as a starting point to rekindle the discussion about the possible features and advantages of such a system for arcades in Germany.

Chapter 5 first summarizes the key findings and discusses limitations of the research. Based on these shortcomings, recommendations for required future research are given. In a last step, recommendations for improvements of the existing exclusion systems and the hopefully soon to be introduced formalized limit program are made.

Chapter 2

Profiling Excluders from German Casinos using Municipality Level Data[1]

1 Introduction

Gambling of all sorts always has been and today still is a gladly used activity among the German population. This is reflected by certain measures that describe the regulated gambling market. In 2015, the volume of gross gaming revenue (defined as the difference between the stakes and the paid out winnings) is estimated to be EUR 10 448 million. Compared to 2014, this is an increase of about 4 % (Barth, 2016). The more or less unbroken interest of the population concerning gambling can also be observed by looking at the figures provided by Haß and Lang (2016). 77.6 % of the respondents between the age of 16 and 70 state that they have participated in some kind of gambling during their lifetime. Considering only the last 12 months before the survey, the fraction of players is lower, but still at almost 40 %. Mostly people play lotteries or take part in privately organized or internet gambling. Interestingly, despite the advance of electronic gambling machines and online gambling providers, casinos seem to regain attractiveness. For the first time since 2008, they could register an increase of gross gaming revenues in comparison to the prior year in 2015. The value is EUR 556 million, which marks a plus of 9.5 % (Bundesverband deutscher Spielbanken, 2015). Additionally, 16.1 % of the BZgA survey participants reported to

[1]This chapter bases on a paper written jointly with Tilman Becker from the University of Hohenheim. It is reprinted with kind permission of the University of Buckingham Press. It was originally published as:
Strohäker, T., & Becker, T. (2017). Profiling Excluders from German Casinos using Municipality Level Data. *Journal of Gambling Business and Economics*, 11(1), pp 38-54. The final publication is available via https://doi.org/10.5750/jgbe.v11i1.1354.

have visited a casino at least once, 1.8 % have done so in 2015 (Haß & Lang, 2016).

However, gambling is not a totally undisputed way to spend some leisure time. While most people pursue their play instinct only from time to time, some happen to lose control over their urge and develop a problematic or even pathological gambling behavior.[2] Haß and Lang (2016) estimate the fraction of at least problematic gamblers in Germany in 2015 to be approximately 0.8 % of the population. Among the games preferably played by this specific group, terrestrial casino games are ranked highly, next to electronic gambling machines, sports bets and online casino games. The fraction of at least problematic gamblers that state to have participated in casino gambling within the last 12 months is 10.5 % (11.7 % traditional table games, 19.8 % automated games), a noteworthy high value. Noteworthy because the fraction of those playing on EGMs, which are often called the "crack-cocaine" of gambling[3], is with 13 % only slightly higher. The authors also used a multivariate model to calculate the risk for developing problematic gambling behavior depending on the chosen type of game. Here again, casino games form a risk group. Automated games are associated with a 3.4, table games with a 2.2 times higher risk for an at least problematic gambling behavior, compared to non participation. In conclusion, gambling at casinos turns out to entail an increased level of risk for developing gambling disorders of some kind.

For casino patrons in Germany who suffer from addictive behavior or simply want to limit their gambling activities, there exists the opportunity of (self-) exclusion. The exclusion is not linked to any therapeutic implications, its sole purpose is to prevent access to the problematic type of gambling and thus help gamblers to regain control. It can be seen as an instrument of secondary prevention, i.e. a means to early motivate affected persons to overthink and change their behavior (Hayer & Meyer, 2011b). While there exists extensive English literature dealing with self-exclusion from gambling arcades and determining excluders' characteristics and motives in the US, Canada or Australia, there is no work explicitly dealing with casino patrons. To fill this gap, the goal of this paper is, for one thing to identify especially socio-demographic characteristics of excluders from terrestrial casinos in Germany, as well as to analyze the role of proximity to establishments. For this task, a unique data set with 3 091 observations containing community level information about the number of excluders as well as census data and spatial information has been created. Compared to individual level survey data, which is often used in gambling research, this higher aggregated data might help to develop a more objective understanding of which

[2] Gambling disorders can be determined using classification schemes like the South Oaks Gambling Screen (SOGS), where individuals have to meet $3-4$ out of 20 diagnostic criteria to be diagnosed with problematic gambling and 5 or more for pathological gambling (Lesieur & Blume, 1987).

[3] See for example Dowling et al. (2005).

factors are associated with the number of exclusions.

The reminder of this paper is structured as follows. In section 2, an overview of the relevant literature will be provided. Sections 3 and 4 describe the data and the results of the analysis conducted to explain the variation of excluders between German communities. The last section concludes.

2 Literature Review

The first part of this review will examine work dealing with the determination of risk factors for problematic or pathological gambling. This is of special interest, because certain authors are able to provide evidence for the fact that the fraction of pathological or problematic gamblers is high among (self-) excluders (Hayer & Meyer, 2011a, 2011b; Ladouceur et al., 2000). Those findings provide the justification to link exclusions and risk factors for problematic gambling (PG hereafter) and use the latter in trying to explain variations in exclusions. However, it has to be noted that the groups of at least problematic gamblers and excluders are not congruent, and the terms should not be used synonymously (Griffiths & Auer, 2016).

The question is, why some people are able to maintain control over their gambling activities while others can't. This is not easy to answer, as (behavioral) addictions are complex illnesses, which are affected by a variety of different factors. Kielholz and Ladewig (1973) describe a model where three factors are driving the advancement of a pathological gambling behavior. First, there is the game itself and its entailed structural features. The second driver is the setting, which includes factors like accessibility and the environment of gambling, social acceptability as well as living conditions and employment relationships of the gambler. Lastly, but not less important, there is the individual itself. This is probably the most complex factor as it is shaped by various influences. Involved are genetic disposition, neuro-biology and personality, family structure during adolescence, gender and socio-demographic characteristics. Due to this diversity, there exists literature from many different disciplines that try to identify factors which foster problematic or pathological gambling behavior. For an extensive overview including work from all relevant fields of research, see Johansson et al. (2009). In the present paper, the focus is on using socio-demographic risk factors and distance to the next casino as one dimension of availability to explain the variation in exclusions from gambling between German communities, hence literature related to these topics will be reviewed in more detail.

The most consistently agreed on determinants for PG are age, gender, employment status, education, migration background and marital status (Haß & Lang, 2016;

Johansson et al., 2009; C. Meyer et al., 2009), where the most coherent empirical evidence is provided for low age, being male and being a migrant. All three of these factors are significant predictors for an increased chance of developing PG (Bondolfi et al., 2000; Götestam & Johansson, 2003; Volberg et al., 2001; Welte et al., 2004). Interestingly enough, Haß and Lang (2016) also found evidence for an increased chance of PG for men between 36 and 45, next to the younger age group.

For the employment status, the results are not as consistent as the ones mentioned above. While certain studies report a significant association between unemployment and an increased risk for PG (Castrén et al., 2013; Feigelman et al., 1995; Hall et al., 2000), others did either not find significant relationships (Albers & Hübl, 1997; Volberg et al., 2001) or even reported a negative influence of unemployment on PG (Götestam & Johansson, 2003).

For education and marital status, the situation is similar. For the first characteristic, certain authors are not able to report a significant influence (Feigelman et al., 1995; Volberg et al., 2001), whereas others can link a lower level of education to an increased risk of developing PG (Castrén et al., 2013; Götestam & Johansson, 2003). Considering marital status, Volberg et al. (2001) identify being single as a highly significant predictor, Bondolfi et al. (2000), on the other hand, report that the group of married are at significantly higher risk of PG. In the study of Götestam and Johansson (2003), civil status is not significant. For Germany, there exist two major studies concerning this topic. Both are able to identify the age under 25, being male and having a low level of education and a migration background to be predictors for gambling problems (Haß & Lang, 2016; C. Meyer et al., 2009). These will be used as a baseline in this paper.

Next to socio-demographic factors, the availability of gambling opportunities might also influence the development of PG and hence the number of exclusions. Availability is a multidimensional construct, which consists of various facets. Vasiliadis et al. (2013) provide an extensive overview of articles dealing with physical accessibility of gambling and conclude, that there might be a positive association between availability of venues and gambling participation in general, yet also an increased risk of PG. In this paper, proximity to casinos is the employed dimension of availability. Numerous studies provide evidence for the hypothesis that the probability of gambling related problems increases with increasing closeness to gaming establishments (LaBrie et al., 2007; Rush et al., 2007; Welte et al., 2016). According to their results, it seems to be the case that exposure to gambling venues is connected to the extent of gambling as such but also to problematic gambling behavior.

Shifting the focus more specifically to exclusions, there exists a large amount of mainly English literature dealing with self-exclusion itself but also its legal implications.

The latter branch is mostly concerned with the evaluation of the legal validity of the self-initiated bans and the resulting ambivalent framework, which aggravates the assessment of liability for gamblers as well as casinos (Faregh & Leth-Steensen, 2009; Kelly & Igelman, 2009; Napolitano, 2003; Nowatzki & Williams, 2002; Rhea, 2005).

The first branch of research is on the one hand interested in determining characteristics of self-excluders. Studies using survey data find that excluders are mostly male, middle aged, employed and married or in a partnership (Ladouceur et al., 2000; Ladouceur et al., 2007). On the other hand, authors are evaluating the effectiveness of the program and provide suggestions for further improvements (Blaszczynski et al., 2007; Nowatzki & Williams, 2002; Tremblay et al., 2008). Additionally, the effect of the ban on the gambler and their motives to take this step play an important role. Concerning the motives of choosing self-exclusion, the results provided by various studies are mostly consistent. Most respondents state self-related reasons like emotional distress, the loss of control and the threat of financial crisis to be the main drivers, influence by other people or venue staff only played a tangential role (Ladouceur et al., 2000; Nelson et al., 2010; Nower & Blaszczynski, 2006, 2008). Regarding effectiveness, the initial outcome for many participants has been positive. There are respondents who report significant reductions in time and money spent on gambling, as well as a decrease in the severity of their PG symptoms. They were now more capable of controlling their behavior and some even stayed abstinent (Nelson et al., 2010; Townshend, 2007). However, a central finding in the majority of these studies is that a lot of self-excluders eventually show a pattern of breaching and/or substitution to other types of gambling (Ladouceur et al., 2007; Nelson et al., 2010).

For Europe, and especially Germany, there exists not as much literature dealing with exclusion. For an comprehensive overview of the development of the legal situation in the past ten years see Reeckman (2015). Hayer and Meyer (2011b) were the first ones to conduct a study examining casino excluders from selected European countries. They found motives similar to the ones described above, mainly loss of control and financial issues, but some respondents also stated to use exclusion as a preventive measure. The results from their longitudinal study also provide evidence for an improvement of the psychological situation of the participants. These initial benefits may, however, decline over time. In their book, G. Meyer and Hayer (2010) discuss the efficiency of casino exclusion in Germany and make some general suggestions for improvement. They are in favor of a comprehensive exclusion scheme, which includes all relevant types of gambling. This would reduce the opportunities of substitution. Furthermore, they promote innovative programs similar to the self-exclusion counselor or educator, but adapted to regional or gambling specific peculiarities. Not less important is the close connection of exclusion and further

treatment possibilities, like debt or addiction counseling. In conclusion, one can say that most exclusion programs provide a good opportunity to make the first step into the right direction, however, they still entail room for improvements.

3 Data

The types of exclusions from gambling in German casinos can be divided into two parts, unilateral external exclusions and bilateral self-exclusions. The first term basically describes the possibility of an exclusion of gamblers mandated by third parties explicitly due to player protection reasons (G. Meyer & Hayer, 2010). The external exclusion can be initiated by relatives or friends of the gambler or the gambling venue itself. Self-exclusion, on the other hand, is characterized by the fact that the gamblers themselves initiate the ban.

The exclusion file used in this analysis contains external as well as self-exclusions, yet they are not distinguishable as a precise differentiation is unfortunately not possible. Due to data protection reasons, the raw file only included the sum of bans in the municipalities, a key to identify the respective district and the first two digits of the postal code for unique assignment of the bans to the related community. This information was used to match the data with the unique German municipality key. When particular allocation was not possible, the entries were filtered and removed alongside some duplicates. The described setup entails the possibility to work with the exclusion data on the community level, a pretty low level of aggregation. Altogether, the adjusted file contains 31 118 exclusions that are spread over 3 091 German communities. The distribution is, as expected, highly skewed to the right, where 75 % of the communities contain one to five bans. The maximum number of 3 724 occurs in the capital city of Berlin. At this point, some data quality problems with the exclusion file have to be emphasized. The list has never been cleared up, so it probably contains also people that are already dead or have changed their residency by now. Basically this means that there are a lot of entries that only exist on paper anymore. Unfortunately, this leads to a possibly large amount of noise in the data, which could affect the results.

To be able to work with the data in the geographical information system ArcGIS, coordinates of the community centroids have been obtained from the homepage of the *German Federal Statistical Office*[4]. This file was then matched with socio-demographic data retrieved from the census database of the *statistical offices of the Federation and the Länder*[5]. Whenever data was not available from the latter

[4]See https://www.destatis.de/DE/Startseite.html.
[5]See https://ergebnisse.zensus2011.de/.

source, missing variables were compensated with information from the *Regional Database*, which focuses on community data, again run by the *Statistical Offices of the Federation and the Länder*. The different files were unambiguously matched using the municipality key.

The main socio-demographic variables of interest were gender, age, marital status, education, employment status and migration background, as certain features of them have been agreed on rather consistently to increase the probability of being involved in (pathological) gambling. As described in section 2, certain authors identify being male and of younger age (20 to 30 years), low education, being unemployed and having a migration background as potential risk factors. Men and young people might have a higher affinity to taking risks than women and older people, who potentially have also a family to support. Lower educated people probably are more prone to the promises of easy gains without much effort and cannot properly asses the true odds of winning. Unemployed persons have a lot of free time and gambling might seem as an entertaining way to fill it. Additionally, there is of course the chance of a huge win, money that could take them out of their desperate situation (Albers & Hübl, 1997). A similar consideration holds for migrants. Many of them are situated within low socioeconomic classes, so gambling could be seen as a way out. Furthermore, a lot of them participate in leisure activities that are passive and lacking content, hence boredom could be another reason for them to gamble (Tuncay, 2016). In a recent paper, Botterill et al. (2015) analyze the effect of the marital status on problematic gambling behavior of older adults in Australia. They suggest that the observed relationship between marital status and gambling problems is actually mainly driven by loneliness, which is known to be a risk factor in the development of the addiction. This is the case for older citizens, but surely not only for them. As loneliness cannot be captured with the data set used in this paper, marital status serves as a legitimate proxy. Of course, these risk factors change with the type of gambling, nevertheless those mentioned above serve as benchmarks in the following analysis. The basic research question is then, whether the explanatory variables identified in prior studies are also able to explain the variation in the number of exclusions from casinos, even if data is used, that is aggregated on a higher than individual level.

Additionally, a proximity measure is included into the analysis to capture possible locational effects and increase the explanatory power of the model. Considering the literature, one would expect a higher number of exclusions in communities close to casinos. Said exposure theory is visually supported by a map displaying the exclusion density as can be seen in Figure 2.1. It is obvious that the density is higher (red and yellow color) around communities where a casino (indicated by the black asterisks)

is located. Where no establishment is around, the density is typically lower (blue color).

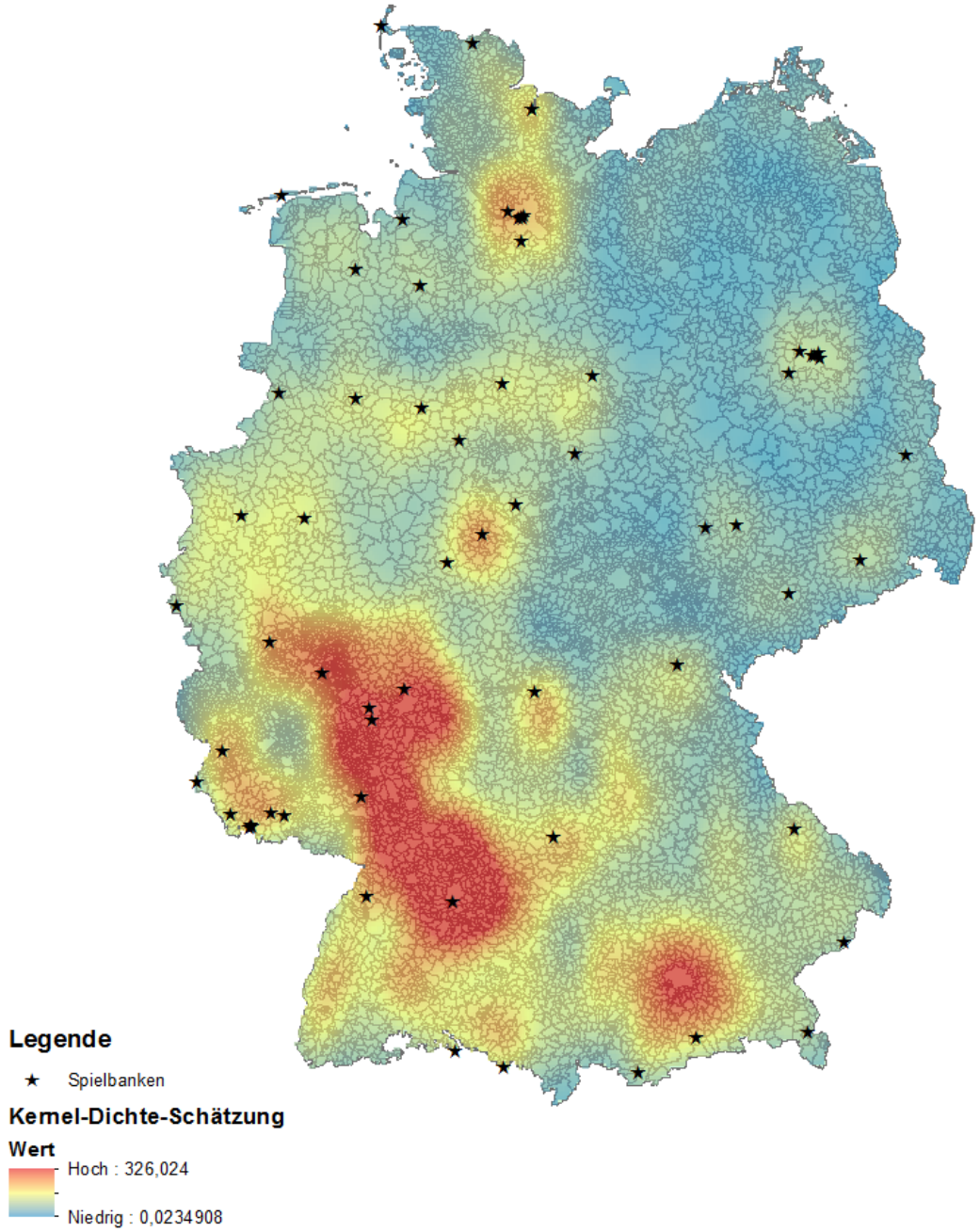

Figure 2.1. Exclusion Density Map. Own presentation.

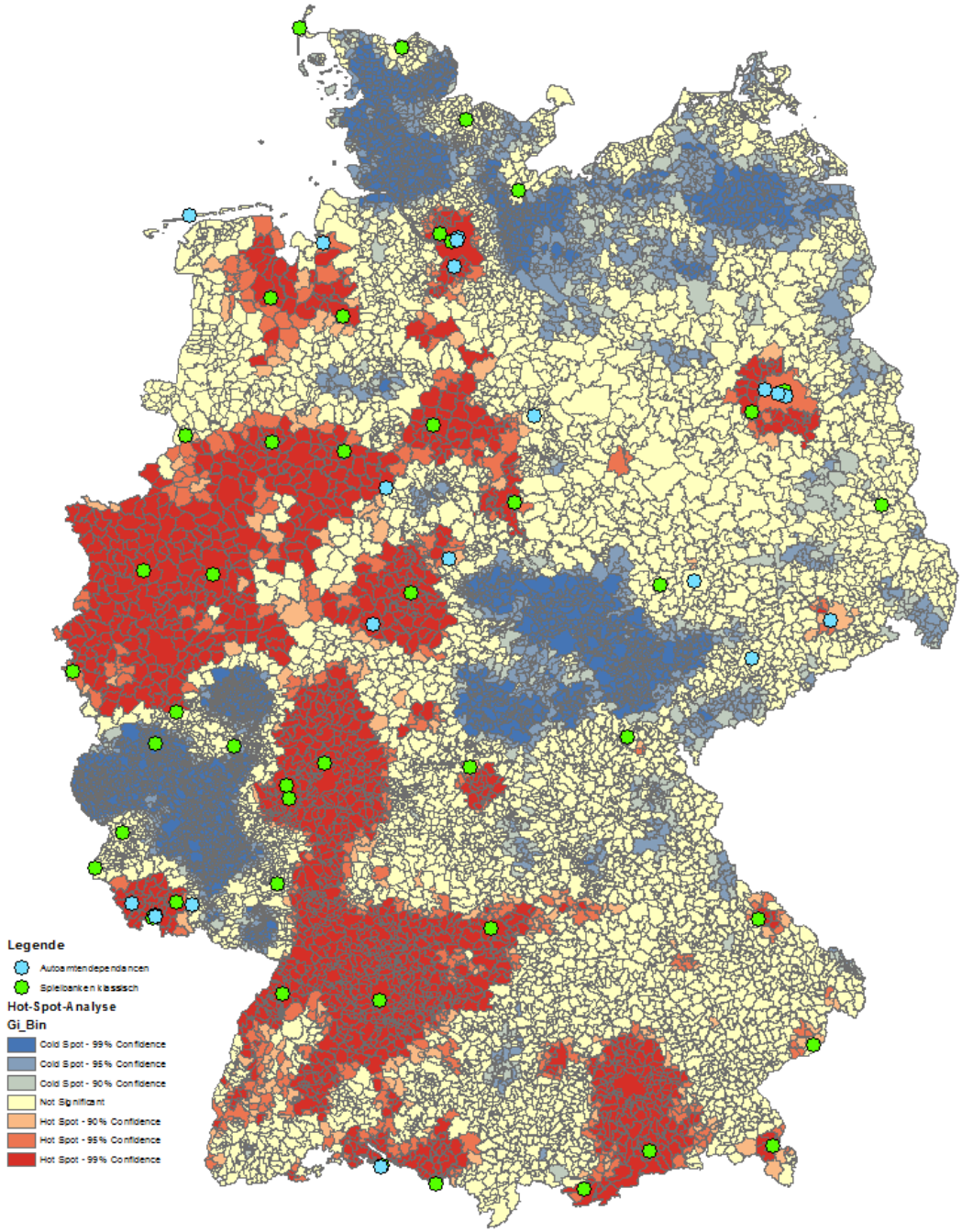

Figure 2.2. Exclusion Hot Spots. Own presentation.

Using ArcGIS, additionally a Hot-Spot-Analysis has been conducted. This is presented in Figure 2.2. The red parts indicate areas where significantly more exclusions

are present, the yellow parts are insignificant and the blue parts indicate significantly low incidence areas. It can be seen that, with few exceptions, the hot spot communities are mainly located around casinos (indicated by light blue and green dots[6]) whereas in the blue areas no gambling establishment is present.

It is left to discuss the definition of the individual variables used in the analysis. An overview can be found in Table 2.1. All socio-demographic variables as well as the number of exclusion will be standardized to shares per 1 000 inhabitants to get rid of population effects. Proximity is measured by one variable capturing distance to the closest casino.

The minimum distances between the communities and the closest casino have been calculated with ArcGIS. To attenuate the influence of extreme values the natural logarithm of this distance is used for the examination. The education variable contains the number of people with German "Abitur" (high school degree) or advanced technical college certificate, in other words it captures highly educated people.The migration variable includes people with migration background and migration experience since further differentiation did not increase informational content. Following the German Statistical Office, migrants are defined as either foreigners without the German nationality, Germans who immigrated to Germany after 1955 or Germans with at least one parent who immigrated to Germany after 1955. People with migration experience form a sub-group of migrants who have not been born in Germany and hence immigrated (Statistisches Bundesamt, 2013).

The addresses of the casinos were obtained from their individual homepages and then geocoded using www.gpskoordinaten.de. Information about the assortment of games (table games and/or automated games) was also retrieved online. According to that, 47 casinos offer classical table games whereas 19 provide solely automated gambling. Furthermore, some control variables have been found to be reasonable extensions. First, it has to be accounted for the fact that people of the newly-formed German states seem to visit casinos less frequently due to the lower density of establishments and the below average income (Hübl, 2008). This can also be seen in Figure 2.1, where the density of exclusions is clearly lower in the eastern part. Hence an "east dummy" is included, which is equal to one, if a community is located in the area of the former GDR and zero otherwise. Hübl (2008) also suggests to include an indicator for the degree of urbanization, as this could be influencing gambling behavior in general. This is taken into account with a categorical indicator variable obtained from the Federal Statistical Office's municipal directory information system. Three degrees are considered, from populated densely over moderately to sparsely. To proxy

[6]The light blue dots represent establishments where only automated gambling is provided, the green ones also offer traditional table games

Table 2.1

Definition of variables.

Variable	**Measure**	**Mean**
(1) Exclusions		
Exclusions	Share of exclusions apparent in a community	0.61
(2) Socio-demographic variables		
Male	Share of men in a community	491.90
Age 30-39	Share of people between 30-39 years of age	110.57
No partnership	Sum of Shares of singles, divorced, widowed	513.65
Education	Share of people with Abitur or advanced technical college certificate	205.40
Unemployment	Share of unemployed people per community	21.45
Migration	Share of people with migration background and/or migration experience	166.71
(3) Proximity variables		
Distance	Logarithm of the distance to the closest casino (simple distance mean = 37 km)	10.24
(4) Casino dummies		
Casino Games	Dummy for casinos which offer classical casino table games	
Automated Games	Dummy for casinos which offer solely automated gambling	
(5) Control variables		
East dummy	Dummy variable which equals 1 if a community is located within the former GDR	
Sparsely populated	Dummy variable which equals 1 if a community is located within a sparsely populated area	
Assistance centers	Share of assistance centers in a county	0.01

Note: All the shares are standardized to per 1 000 *inhabitants.*

the influence of additional information sources like counseling centers and similar institutions on the awareness of the exclusion program or sensitization for gambling addiction as a whole, the share of these centers per 1 000 inhabitants in a county is also included. The reason to use the share of counties is to account for the fact that only a small number of communities have such centers. Additionally, a larger radius might be relevant for affected people, as they are probably more confident to choose a center that is not located exactly within their hometown but a little bit further

away, in order to maintain their privacy.

While performing this analysis, a further question arose, namely whether different types of gambling establishments have different effects on the number of exclusions. For this task, two dummy variables that indicate the immediate presence of a traditional casino offering table games or an automated gambling annex within a community have been included. They are equal to one, if a specific type is located directly within a community, and zero otherwise. For estimation, a simple linear OLS regression has been used. The dependent variable of the model is the share of exclusions in a municipality per 1 000 inhabitants.

4 Results

The results of the regression can be found in Table 2.2.

As expected, the number of exclusions increases with the share of males. This makes sense, as the prevalence rate among men is higher and they seem to have a higher probability of developing problematic gambling behavior which can ultimately result in the decision of restricting themselves from respective establishments (Haß & Lang, 2016). The coefficient is 0.0056 ($p < 0.01$).

The share of those not living in a partnership also has an influence on the bans. If it increases by one unit, the share of exclusions is decreased by 0.0036 ($p < 0.01$). The negative effect of this variable is especially interesting in the light of higher casino gambling prevalence within the group of singles as found by Albers and Hübl (1997). The authors justify this fact with the higher proportion of leisure consumption activities that are usually accompanied by these games, compared to, for example, playing the lottery. One could expect that a higher prevalence rate entails higher probability for problematic behavior and hence more exclusions. However, loneliness, the lack of a support system or not bearing responsibility for a partner or family does not only seem to increase participation, but also negatively impacts the willingness to take the step to get excluded and eventually stop gambling. Although bans initiated by the close environment of the gambler occur rarely, a stable family situation could nevertheless positively influence the decision making process in such a case.

The age profile of the excluded gamblers differs from the suggested risk age of being up to 25 or 30 years old. In this analysis, the largest effect could be found within the group of the 30 to 39 year olds. This is in line with e.g. Castrén et al. (2013), Ladouceur et al. (2000), Ladouceur et al. (2007) and Lischer et al. (2014), who also find excluders to be rather middle-aged. This makes sense when considering the fact that the duration of this whole process takes quite some time. On average, there

Table 2.2

Regression Results.

Dependent variable: Share of exclusions		
Variable	Coefficient (Standard Error)	P-value
Intercept	1.3640 ***	0.1449
	(0.9353)	
Male	0.0056	0.0012
	(0.0018)	
Age 30-39	0.0043 ***	0.0056
	(0.0015)	
No Partner	−0.0036 ***	0.0000
	(0.0007)	
Education	0.0000	0.7492
	(0.0003)	
Unemployment	0.0035	0.1282
	(0.0023)	
Migration	−0.0003	0.2858
	(0.0003)	
Distance	−0.2335 ***	0.0000
	(0.0272)	
Casino games	0.5580 ***	0.0030
	(0.1878)	
Automated games	0.6251 **	0.0395
	(0.3034)	
East dummy	−0.2243 **	0.0167
	(0.0936)	
Sparsely populated	0.3374 ***	0.0000
	(0.0419)	
Assistance centers	4.6300 **	0.0237
	(2.0456)	
Number of observations		3 024
R^2		0.10
Adjusted R^2		0.10
F-Test		27.74 ***

Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

are 13.6 years between first starting to gamble and eventually get excluded (Fiedler, 2015). Additionally, young people lean towards other types of gambling, e.g. EGMs, online gambling or sports betting while the lifetime prevalence for casino games is higher in older age groups (Haß & Lang, 2016). The coefficient of the age variable is positive and also highly significant, meaning that an increase in the share of one unit of this age group leads to a plus of 0.0043 ($p < 0.01$) in the share of exclusions.

The variable concerning the migration background does not have a significant impact. According to Tuncay (2016), this is strange, as one would expect a negative effect, which means that in communities with a higher share of migrants less exclusions should occur. This is justified by various reasons. First, migrants could simply visit casinos less frequently and pursue their urge to play in different establishments. Following Hübl (2008), however, the share of foreigners and inhabitants with migration background in casinos is high, so assuming a low participation rate is not convincing. A second explanation could be that their way of thinking is shaped distinctly by their culture. A consequence of that would then be a decrease in the willingness to admit problematic behavior and in turn increase the barrier to get help, leading to a lower number of bans. During his work with migrants, Tuncay (2016) experienced that problematic gambling behavior is often accompanied by stigmatization and hence feelings like shame, false pride or honor. Additionally, this ethnic group has a rather passive understanding of sickness and health and only little trust in assistance offers. There might also be language barriers or a simple lack of awareness about the opportunity of getting a ban. All of these factors should lead to the fact that migrants make use of the exclusion less often. Nevertheless, the analysis is not able to provide evidence for this.

The same result, namely insignificance, holds for the education coefficient. Usually, it is expected that the influence of higher education is negatively correlated with the participation in gambling, as this group of people has a better ability to realistically evaluate the aspects of games. For casino gambling, however, the situation is different, it even tends to attract the better educated, but not to a significant level (Albers & Hübl, 1997). Hence, due to higher participation rates and probably a better assessment of the situation when first signs of PG behavior are recognized, a positive relationship could be expected for the influence of schooling on exclusions. The same holds for unemployment, which is also not significantly associated with the share of exclusions. As all three variables are usually good predictors in the gambling context, the question is why they fail in this particular case. An unfortunately rather likely explanation could be the flaws in the data as already mentioned above. Those lead to a lot of noise, which in turn lowers the precision of the estimation. This involves higher standard errors and hence an underestimation of the t-values, which has a

clear influence on significance levels (Pischke, 2007). This means that even if there is an effect, the data is not able to provide significance for it.

The dummies for casino games and automated gambling are equal to 1, if an establishment is present within a community, which means that those coefficients basically capture the extreme situation of being located in direct proximity to a casino. The coefficients for both dummies are significant and positive. The immediate presence of a casino that offers traditional games increases the share of exclusions on average by 0.5580 ($p < 0.01$), an automated gambling annex by 0.6251 ($p < 0.05$). Again, this is compared to the baseline case of no gambling establishment being there. The difference between both coefficients is, however, not significant, so there is no evidence that one type of establishment has more or less impact on exclusions than the other. This supports the hypothesis that close proximity to a casino has a positive effect on the number of excluded gamblers. The previous finding is backed up by the effect of the distance to the closest venue on the number of exclusions, which is negative, as expected, and highly significant. If the distance increases, this leads to a 0.2335 ($p < 0.01$) units lower share of bans. The dummy for municipalities in East Germany is, as expected from the visual inspection, negative and significant. Communities in the former GDR exhibit on average 0.2243 ($p < 0.05$) less exclusions than those in western Germany. This is probably due to the already mentioned lower participation rate in general and also the lower density of establishments. Additionally, there were no casinos until after the German unification, hence the western part has a lead in being able to issue exclusions, especially considering the unadjusted data set which might contain old bans that have never been cleared. The population density indicator shows a rather interesting result. If the community is considered to be sparsely populated, this has a significantly higher influence on the number of exclusions than in the baseline case, which is a densely populated community. In those areas, the average of the share of exclusions is 0.3374 ($p < 0.01$) points higher than in highly or moderately urbanized ones. This could be due to different social structures in these communities. They are less anonymous and the influence or pressure exerted by the family or close peers might be higher. The share of counseling centers per 1 000 inhabitants of a county also has a significant positive effect on exclusions. If this share rises by one unit, the share of exclusions increases by 4.6300 ($p < 0.05$). This could be evidence for higher awareness of the program in areas where more information and assistance is offered to gamblers.

5 Conclusion

The goal of this paper is for one thing to provide an overview of the existing literature concerning (self-) exclusions. Secondly, the focus is shifted to the development of a profile of excluders from German casinos by examining, whether the established risk factors also are significant predictors for the number of bans in German communities. To our knowledge, there is no work explicitly examining casino patrons. The approach using a unique data set brought some interesting insights. Some of the considered variables can be confirmed to serve this task in the given framework, whilst others did not yield a statistically significant impact

The most important socio-demographic factors are male gender, being between 30 and 39 years old, and not living in a partnership. The shares of the first two variables have a positive, the latter one a negative influence. Education, unemployment, and migration status, which are usually agreed on to be good predictors, did not exhibit significant results. However, it would be wrong to neglect them, as the outcome is probably owed to noise as well as missing variation in the data, which lowers the precision of the estimation and could lead to insignificance.

The coefficients of the variables that have been included to capture proximity turn out to be consistently significant. Distance to the next casino and the share of exclusions are inversely related, if the distance increases, the share of bans will decrease. The dummies capturing immediate proximity to gambling establishments also provide evidence for this pattern. If a classical casino or an annex is present in a community, this has a positive impact on the share of excluders. Considering only the proximity dimension of availability, the results provide evidence for the hypothesis that higher availability could be a predictor for an increase of bans. However, one has to keep in mind that this explanatory power is also in parts owed to tautology. Only in places where gambling is available in general, players can also get an exclusion.

The additionally included control variables also yield significant results. The coefficient of the indicator for a sparsely populated region shows that the share of excluders in said areas is on average higher than in dense ones. Furthermore, the share of assistance centers in a county positively drives the share of bans. The dummy indicating communities in the former GDR turns out to be negatively associated with the dependent variable. This makes absolute sense, considering the different developments of the gambling markets in these two regions between 1950 and 1990.

To summarize, considering our community level data, excluders from German casinos are more likely to be male and between 30 and 39 years old and less likely to be single. Additionally, they tend to live in municipalities which are located in close

proximity to gambling establishments. On balance, however, the magnitude of the distinct effects on the amount of exclusions is rather small and the model is able to only explain about 10% of the variation in the number of bans, which is a rather small fraction. This is very likely owed to the fact that although problematic or pathological gambling is in parts driven by external socio-demographic factors like age, gender or the marital status, a lot of the behavior is facilitated by internal predisposition which cannot be captured with this model. Nevertheless, many of the proposed risk or, more neutrally stated, influence factors can be confirmed by this analysis specifically adapted to the German terrestrial casino patrons.

Chapter 3

The Relationship between Exclusions from Gambling Arcades and Accessibility: Evidence from a newly introduced exclusion program in Hesse, Germany[1]

1 Introduction

For the majority of people, gambling is solely a recreational pastime. A small fraction, however, develops disordered gambling behavior, which can be accompanied by substantial negative personal, financial or occupational consequences. There are wide variations in disordered gambling prevalence rates across different countries in the world (Calado & Griffiths, 2016). Even for one country these prevalence rates may differ due to different survey methods, instruments, cut-offs and periods used to assess these prevalence rates among the adult population.

Beginning in the year 2006, several epidemiological studies have been conducted in

[1]This chapter bases on paper written jointly with Tilman Becker from the University of Hohenheim. It is a post-peer-review, pre-copyedit version of an article published as
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The authors want to thank the anonymous reviewer for his/her valuable comments.

Germany. These studies come up with different estimates of the prevalence rates of disordered gambling, depending on the instrument used. For an overview, see Tables 3.5 and 3.6 in the appendix. Positive responses to five or more items in the South Oaks Gambling Screen result in a designation of "probable pathological gambler" (Lesieur & Blume, 1987) or, for short, a pathological gambler. In these prevalence studies a positive response to three or four items result in a designation as a potential problem/pathological gambler or problem gambler. The same cut-off points are used for the DSM-IV. If five or more criteria are met, the gambler is classified as pathological gambler and if three or four criteria are met, as a problem gambler. The unweighted average of the five studies available that use the SOGS for assessing pathological gambling in the German adult population is 0.53 % with 0.46 % for problem gambling. The unweighted average of the four studies available using the DSM-IV is 0.35 % for pathological gambling and 0.34 % for problem gambling. As expected (Stinchfield, 2002), the South Oaks Gambling Screen results in higher estimates than the DSM-IV.

If we assume a prevalence rate of 0.35 % for pathological and 0.34 % for problem gamblers in the German population between 18 and 65, this means there are 183 902 pathological and 178 647 problem gamblers[2] Germany-wide. For our work, the number of problem and pathological players in Hesse might be of interest. The numbers in this federal state are 21 616 pathological and 21 000 problem gamblers[3]. As of March 2016, in Hesse 11 902 players have excluded themselves from gambling.

In the German Inter-State Treaty of 2008, the prevention of pathological gambling was stated as the main goal justifying gambling regulation. In the new and current Inter-State Treaty of 2012 addiction prevention is only one among several goals: preventing fraud, manipulations and crime, securing the protecting of the integrity of sports and channeling the demand towards the legal offers. The German state tries to legally enforce player protection measures. Next to other tools, exclusions from gambling play an important role (Reeckmann & Walter, 2014).

In particular, self-exclusions, which usually make up a large share of bans, are consistently seen as a well-suited means for harm minimization that helps affected gamblers to regain control over their behavior by preventing them entering gambling establishments (Hayer & Meyer, 2011b; Lischer et al., 2016). Self-exclusion is a voluntary obligation that gamblers take which is usually accompanied by immediate positive consequences. The pressure to gamble as well as gambling related stress decrease, affected players regain control over their behavior and report an improvement

[2]Starting from a baseline population size of 52 543 373 in the age group between 18 and 65 in Germany, status as of 31.12.2015 (retrieved from https://www-genesis.destatis.de).

[3]Starting from a baseline population size of 6 176 172 in the age group between 18 and 65 in the state of Hesse, status as of 31.12.2015 (retrieved from https://www-genesis.destatis.de).

of psychological functioning (Gainsbury, 2014; G. Meyer & Hayer, 2010). Based on these beneficial effects, the German Inter-State Treaty on gambling of 2012 requires giving gamblers the opportunity to exclude themselves from gambling.

The casino industry has already been operating a well-established system since 1981, first on a voluntary basis in order to prevent claims under civil law of self-excluded players. This system is supported to some extent by the legal responsibility of casinos to act responsible in the interest of players, who have self-excluded themselves. Since the Inter-State Treaty of 2008, the public and private casinos are required to run a self-exclusion system for all casinos. A self-exclusion system covering arcades however is a novelty. This is surprising, as electronic gambling machines (EGMs) are highly addictive. If the clients in therapy or the therapeutic institutions are asked for the importance of different forms of gambling for their gambling problems, about 64 % of the clients (G. Meyer & Hayer, 2005) or, according to the therapists, 69 % of the clients (Becker, 2009) claim that the gambling machines in gambling arcades and pubs are their main problem causing form of gambling. Next are gambling machines in casinos with 13.5 % and 11.4 % respectively.

In May 2014, the federal state of Hesse was the first to introduce a statewide self-exclusion scheme for gambling arcades. The legal foundation is provided by § 6 of the Hessian law on gambling arcades from June 2012, which requires that every operator contributes to the program. Next to voluntary self-exclusions, also external exclusions by the operator or other third parties are possible. The exclusion is valid in all Hessian arcades and its minimum duration amounts to one year. All bans are stored in a central file (OASIS) to which all establishments have access. If gamblers want to be excluded, they have to go to an arcade where their personal data is recorded. The operator is then required to disseminate the information into OASIS within the next twenty-four hours. The gamblers will get a written confirmation about the validity of their exclusion. For enforcement, everyone who wants to enter an arcade has to undergo an identity check. If a person is a registered excluder, the system will show it and the person is not allowed to enter the establishment. Despite initial problems, the program today seems to work in a satisfactory way (Fux, 2017). However, extensive and ongoing evaluation is nevertheless absolutely necessary.

Thanks to this recently introduced program, we are now able to work with up to date information on excluders. Using a unique and low aggregated community-level data set, the present paper sheds some light on the relationship between the number of excluders in Hessian communities and different dimensions of physical accessibility of arcades, while also controlling for socio-demographic factors. In contrast to individual-level survey data, community-level data provides a more objective and less biased picture, which helps to identify the main drivers of exclusion. Next to

analyzing the impact of the number of EGMs on the number of exclusions, the association of accessibility and bans is further refined by splitting the availability effect into a location and a cluster effect.

The remainder of the paper is structured as follows. Section 2 provides an overview of the relevant literature on accessibility and gambling participation. Section 3 describes the data set and the variables that are relevant for the estimation. In section 4, the results are reported while section 5 compares the findings to already existing literature. Section 6 summarizes and concludes.

2 Literature

Often, exclusion programs are only discussed in connection with problematic or pathological gambling behavior. However, the situation should be regarded in a more differentiated manner. It needs to be emphasized that excluded gamblers are not necessarily fulfilling the criteria for problematic or pathological gambling. Although Hayer and Meyer (2011a, 2011b) or Ladouceur et al. (2000) provide evidence that the proportion of gamblers with problematic gambling behavior is high among excluders, it has to be clarified that these two groups are not totally congruent and that the terms excluded gambler and pathological gambler should not be used synonymously. Lischer et al. (2016) conducted a study on the relationship between exclusions and an at least problematic gambling behavior. They directly talked to people who applied either for the ban or for its revocation. They identified high losses, prevention means and too much time spent in the venues to be the main reasons for getting self-excluded. Griffiths and Auer (2016) examine the situation specifically for self-excluders and come to the conclusion that the majority of those, who ban themselves voluntarily, are non-problem gamblers who get excluded for preventive measures or simply because they are annoyed with the operators. The authors are not able to find an unambiguous association between pathological or problematic gambling behavior and self-exclusion. Hence, it is meaningful to categorize self-excluders as vulnerable rather than problem or pathological gamblers. This is an important implication for the present study, as it can be assumed that the majority of exclusions in our list are also self-initiated. Fux (2017) reports data from December 2016, where the total number of exclusions in Hessian arcades was 13 385 and only 141 were externally induced. This means that around 99 % of the observations in our data set are self-excluders. Based on the conclusion drawn by Griffiths and Auer (2016), the share of at least problematic gamblers in our data can be assumed to be rather low. This is supported by our analysis. The socio-demographic risk factors associated with problem or pathological gambling in our analysis have only little influence on

the number of self-exclusions.

Considering the reasons for being excluded, it is suggested that the number of bans is correlated with a more intense gambling behavior. People spend too much time at venues, they lose large amounts of money which leads them to feel in danger of losing control(Ladouceur et al., 2007; Lischer et al., 2016). These effects, however, can be related to the accessibility of gambling opportunities. Following a paper by the Productivity Commission (2010), eight different dimensions of accessibility can be distinguished. This list consists of proximity to a venue, density of establishments and EGMs, distribution of venues which are close to community locations, opening hours, limits in play time, basic costs, lack of difficulty in use and social accessibility. In a best-case scenario, all of these factors would be considered simultaneously while analyzing the relationship between accessibility and gambling activity. As this is usually not possible, most authors restrict themselves to one or two aspects. For an extensive overview of work dealing with different types of physical accessibility, see Vasiliadis et al. (2013).

In this paper, the number of EGMs, the number of arcade locations and the license to location ratio are the considered factors. The relationship between EGM density and gambling participation rates is well established. Higher participation rates are found in regions with a high EGM density. An increased availability of opportunities to play might lead to higher gambling involvement (Marshall, 2005; Mason, 2008; Pearce et al., 2008). This seems to be the case especially in areas with low socioeconomic status (SES hereafter) (Marshall & Baker, 2002). Accordingly, a study on the local communities in Baden-Wuerttemberg, a state in southwestern Germany, has shown that there are more EGMs in communities which are characterized by a lower SES (Xouridas et al., 2016). This is in line with the findings of Wheeler et al. (2006) for New Zealand and Wardle et al. (2014) for Britain. Living in a poor neighborhood can expose people to gambling and place them at higher risk of problem gambling. Similar results are reported for the relationship between EGM density and expenditure on gambling. People living in high density areas tend to spent more money on EGMs (Marshall, 2005; Productivity Commission, 2010; SA Centre for Economic Studies (SACES), 2008). These findings emphasize the importance of accessibility on gambling participation and hence exclusions.

Next to availability, socio-demographic characteristics are important factors in explaining gambling involvement. The well-established risk factors for problematic and pathological gambling will serve as a threshold for the analysis. These factors are age, gender, education, migration background, and employment as well as marital status (Botterill et al., 2015; Haß & Lang, 2016; Johansson et al., 2009; Ladouceur et al., 2000; Ladouceur et al., 2007; C. Meyer et al., 2009).

In particular, education, employment status and likely migration background are closely related to the SES. There seems to be a relationship between EGM gambling involvement and the SES. Welte et al. (2002) find that frequent gambling and problem gambling declined as the SES becomes higher. Various attempted explanations are possible for this relationship. The reasons for this link are likely rather complex, as there are individual (van der Maas, 2016) as well as social and neighborhood influences involved (Pearce et al., 2008). Furthermore, the influence of planning law has to be taken into account. In Germany, the location of gambling arcades in disadvantaged neighborhoods is largely driven by planning law. Gambling arcades are regarded as places of entertainment and are only allowed in areas which are already characterized by low socio-economic status. Furthermore, the location of gambling arcades in disadvantaged neighborhoods might be due cheaper housing prices.

The focus of our research is on the social and neighborhood influences. First, there is the before mentioned significantly higher supply of EGMs in deprived areas, so one reason for the link between SES and gambling could be the sheer exposure to gambling opportunities for people living in these communities. Additionally, people belonging to the low SES class tend to have lower education, the unemployment rate in this group is comparatively high and if they work, they often have to stick with low-paid jobs. All of these factors can have an impact on gambling demand. Albers and Hübl (1997) comment on the first two groups. Unemployed, on the one hand, have a lot of involuntary free time to fill which could drive them into gambling arcades. People with less education, on the other hand, might not be able to assess the probabilities of winning or the degree of chance involved objectively. This could make them more prone to gamble excessively, for example to try to chase losses. Following Tuncay (2016), having a migration background is also correlated with a low SES. He looks explicitly at Turkish migrants, who form a large part of migrants in Germany. Due to the lethargy, which often accompanies their situation, a lot of them preferably participate in passive leisure activities that are lacking content; hence, boredom could be a reason for them to gamble. Further, a similar rationale to the before mentioned can be applied. They hope to win money in order to be able to support their family and hence protect their honor. Additionally, gamblers with migration background tend toward playing games that are linked to a higher risk for problem gambling. The increased risk stems from structural characteristics of the respective games, like high event frequency or more frequently than random near wins. This might lead to wrong beliefs related to winning probabilities and could hence provoke persistent gambling (Kastirke et al., 2015). This can then turn into problematic gambling behavior. The main factor that drives people with a low SES into problematic gambling may be the deceiving chance of making a lot of money

with comparatively little effort. For them, gambling might seem as a windfall way out of their poor situation and a chance to move up the social ladder (Schissel, 2001).

While the risk factors discussed above are suitable predictors for addictive gambling behavior, they are also related to gambling propensity in general. Albers and Hübl (1997) use a probit model to estimate the impact of different socioeconomic variables on gambling propensity. They significantly identify the before mentioned factors to be predictors for gambling participation. The only exception is the migration status, as it is not included in the analysis. Given the importance of the socio-economic risk factors for problem and pathological gambling and the possible overlap between problem and pathological gamblers and gamblers who choose to exclude themselves from gambling, we included the above-mentioned risk factors in our analysis.

3 Data

The OASIS exclusion file was the starting point of the data merging process. It contains bilateral self- and unilateral external exclusions. External exclusions are a rather unique feature of the German exclusion scheme and can be initiated by third parties such as family members or the venue staff. Unfortunately, the data is aggregated in a way that makes it impossible to distinguish between the two forms. Following Fux (2017), it can be assumed that up to 99 % on our list are self-excluders. To protect the private information of the excluders, the raw file only encompasses the sum of bans per community and the postal code that allowed for unique assignment of the bans to the related municipalities via the German municipality key. As of March 2016, the file contains 11 902 exclusions that can be unambiguously assigned to 191 Hessian communities. The maximum value of 1 184 bans is observed for Frankfurt am Main, on average 62 exclusions have been issued per community. The mean number of locations in Hessian municipalities is 5. Relating the amount of bans to locations, the average value for exclusions per location is 18.

To measure accessibility, different variables are included. First, there is the *number of EGMs per* 1 000 *inhabitants* of a community with a mean value of 2.8. Secondly, the *number of gambling venues per* 1 000 *inhabitants* is used to capture the locational effect of the playing possibilities. On average, there are 0.2 arcades per 1 000 inhabitants. In the analysis, these variables are used as a share to eliminate present population effects. Furthermore, we add a variable containing the *license to location ratio*, capturing the EGM density per location. In Germany, only one license (allowing for 12 EGMs) per venue is permitted. However, especially big operators circumvent this stipulation by simply putting more than one arcade into a single location. These establishments

hence provide an outstandingly high density of EGMs. The ratio variable is used to control for the effect of EGM clustering or, in other words, the above average gambling supply of these specific venues. Multiple licenses can be observed in 51 % of the respective communities. The values of these measures have been taken from Trümper and Heimann (2014) and are only available for municipalities with more than 10 000 inhabitants. For an overview of the accessibility measures, see Table 3.1.

Table 3.1

Overview of EGMs and Venues in Hesse. Source: Trümper and Heimann (2014) and own calculations.

	Mean absolute	Mean of share[a]	Sum	Maximum Value
Number of EGMs	62	2.8	12 717	1 688 in Frankfurt a.M.
Number of licenses	8	0.3	1 134	169 in Frankfurt a.M.
Number of locations	5	0.2	634	87 in Frankfurt a.M.

[a] The share is calculated per 1 000 inhabitants.

We also control for socio-demographic factors that are consistently known to have an influence on gambling participation in general and are regarded as risk factors for problematic gambling and thus will probably also be related to the number of exclusions, which is likely a consequence of increased gambling behavior. The main variables of interest are gender, age, marital status, employment status, migration background and education. Men and young people could be more ready to take risks than women and older people. Lower educated people might not be able to correctly evaluate the true odds of winning and hence are more easily captured by promises of rather effortless gains. Unemployed persons have a lot of spare time and gambling is often seen as an entertaining way to fill it. Additionally, there is of course this idea of winning a large sum of money, which could help to solve their financial problems. A similar consideration can be made for migrants. Many of them are situated within low socio-economic classes, so gambling could be seen as a way out. Additionally, being lonely can be an influencing factor when it comes to gambling. As loneliness cannot be captured with the data set used in this paper, marital status serves as a legitimate proxy.

The socio-demographic data is taken from the German Census 2011[4] and is merged by using the unique municipality keys. Whenever data was not available from the latter source, missing variables were compensated with information from the *Regional*

[4]See https://ergebnisse.zensus2011.de/.

Database. This database focuses on community level data and is run by the *Statistical Offices of the Federation and the Länder*. To control for population density and the degree of urbanization, an additional indicator variable is included. This follows from Hübl (2008), who suggests that the degree of urbanization is likely to influence gambling participation in general and hence also the share of exclusions. These data are taken from the *Federal Statistical Office's* municipal directory information system. To sum up, this unique data set contains low aggregation community data on the number of exclusions, different accessibility measures and the relevant socioeconomic characteristics.

To estimate the relationship between exclusions and the above-described independent variables a linear OLS regression model is used. Due to significant correlations (c.f. Table 3.2) between the accessibility measures, the analysis is split into two parts to avoid multicollinearity problems. The models have been checked for multicollinearity, heteroscedasticity and autocorrelation of the error terms. These possible violations of the OLS assumptions do not pose any problems in our analysis. The distribution of the residuals, however, is not normal. This is likely due to the presence of outliers in the dataset. As this deviation does not lead to biased estimators and the outliers are meaningful and consistent, we chose to work with the proposed models despite the violation. The highest level of type I error accepted is 5 %, hence only coefficients with p-values smaller than 0.05 are considered as being statistically significant.

Table 3.2

Correlation matrix for accessibility variables.

	Share of EGMs[a]	Share of locations[a]	License to location ratio
Share of EGMs[a]	1.00	0.68[b]	0.58[b]
Share of locations[a]	0.68[b]	1.00	-0.09
License to location ratio	0.58[b]	-0.09	1.00

[a] The share is calculated per 1 000 inhabitants.
[b] These values are significantly correlated on a 1 % level.

4 Results

Table 3.3 provides an overview of the estimation results from the first regression model where the impact of the EGM availability on exclusions is considered. The socio-demographic factors do not play an important role in explaining the intersectorial variation in the share of exclusions. Only for the variables *age* 30 *to* 39

and *no partner* positive and significant relationships can be reported. If the share of the people in the respective age group increases by one unit, the share of exclusions will increase by 0.0410 units ($p < 0.05$). Other age groups (starting from 18 to 65 and older) have also been examined in the course of the analysis, however, only the before mentioned group yielded a significant association, hence it was the only one

Table 3.3

Regression Results Model I: Share of exclusions on share of EGMs and socio-demographic variables.

Dependent variable: Share of exclusions

Variable	Coefficient (Standard Error)	P-value
Intercept	−3.6839	0.7397
	(11.0626)	
Accessibility Variable		
EGMs per 1 000 inhabitants	0.6857***	0.0000
	(0.0537)	
Socio-demographic Variables		
Male	−0.0187	0.3714
	(0.0209)	
Age 30-39	0.0410*	0.0238
	(0.0179)	
No Partner	0.0171*	0.0301
	(0.0078)	
Education	−0.0014	0.5704
	(0.0025)	
Unemployment	−0.0396	0.1650
	(0.0283)	
Migration	−0.0038	0.3100
	(0.0037)	
Sparsely populated	1.2338	0.0990
	(0.7424)	
Number of observations		191
R^2		0.59
Adjusted R^2		0.56
F-Test		22.51***

All socio-demographic variables are shares per 1 000 inhabitants.

Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

that stayed in the model. If the share of those not living in a partnership increases by one unit, the share of bans increases by 0.0171 units ($p < 0.05$).

Following Strohäker and Becker (2017), Hessian counseling centers on the county level have been included into an earlier stage of the analysis, as they have been found to be significantly associated with exclusions in the Germany-wide casino case. However, in the case of Hesse, the coefficient for this explanatory variable did not yield any significance. This is probably due to a lack in variation in this comparatively smaller sample.

Compared to the socio-demographic factors, the variable capturing accessibility exhibits far more explanatory power in our model. If the share of EGMs increases by one unit, the share of exclusions increases by 0.6857 ($p < 0.001$) units. One additional EGM per 1 000 inhabitants leads to 0.7 more exclusions per 1 000 inhabitants.

In a second step, the effect of EGMs on exclusions is further differentiated by introducing a modified model, in which accessibility is captured by two new variables. Firstly, the *share of venues per* 1 000 *inhabitants* is introduced to capture pure locational effects, i.e. to see what happens to the amount of bans, if the number of points of contact for EGM gamblers is increased. Secondly, the *license to location ratio* is introduced to control for the effect of EGM clusters. By German law, only one license, allowing for 12 gambling machines, is permitted per location. Up to now, it is however possible to circumvent this requirement by establishing more than one arcade at a single location. This means the before mentioned ratio is equal to one, if all locations in a community handle only the allowed number of licenses, and bigger than one, if certain providers handle multiple licenses per location. In conclusion, if the license to location ratio is bigger than one, there will be EGM clusters at one location in a community.

Usually, it is hard to incorporate two accessibility measures into one model, as they tend to be highly correlated, which in turn introduces problems of multicollinearity. The two variables as described above are, however, specified in a way that they are not significantly correlated (c.f. Table 3.2), which makes it possible to consider them both simultaneously. The results are presented in Table 3.4.

The coefficients for the socio-demographic variables are largely consistent with the ones from the previous estimation. Again, the coefficient for *age 39-30* is positive and significant on a 5 % - level, while its magnitude remains nearly constant. *No partner*, which is significant on a 5 %- level in the first model, loses significance. Although the adjusted R^2 is 7 percentage points lower than in the first estimation, the second model is still able to explain 53 % of the cross-section variation in the share of exclusions. The estimates of the two accessibility variables yield some interesting

Table 3.4

Regression Results Model 2: Share of exclusions on share of locations, license to location ratio and socio-demographic variables.

Dependent variable: Share of exclusions

Variable	Coefficient (Standard Error)	P-value
Intercept	2.0798	0.8638
	(12.0954)	
Accessibility Variables		
Locations per 1 000 inhabitants	10.7426^{***}	0.0000
	(1.6640)	
License to location ratio	1.4571^{***}	0.0000
	(0.0229)	
Socio-demographic Variables		
Male	−0.0343	0.1362
	(0.0229)	
Age 30-39	0.0491^{*}	0.0142
	(0.0198)	
No Partner	0.0145	0.0928
	(0.0085)	
Education	−0.0017	0.5579
	(0.0028)	
Unemployment	−0.0199	0.5197
	(0.0308)	
Migration	−0.0065	0.1287
	(0.0043)	
Sparsely populated	1.1046	0.1720
	(0.8039)	
Number of observations		132
R^2		0.53
Adjusted R^2		0.49
F-Test		15.19^{***}

All socio-demographic variables are shares per 1 000 inhabitants.

Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

insights. Both coefficients are highly significant ($p < 0.001$) and positive. If there is one more location per 1 000 inhabitants in a community, this will increase the number of exclusions by 10.7. Taking the EGM coefficient of model I, 12 more EGMs will increase the number of self-exclusions by 8.2. The results from the two models are consistent. The reason for the magnitude difference in effects is likely due to the specification of the accessibility variables in model II. The *location* coefficient only captures the effect of accessibility of the location but not the effect of a clustering at a location. The *license to location ratio* is measuring the accessibility of EGMs at one location. If the license to location ratio is increased by one unit, i.e. one additional license per location, this increases the share of exclusions by 1.4571, so there will be about one and a half more exclusions per 1 000 inhabitants. If this number is compared to the 10.7 for one additional location with one license, it shows that the location effect is more strongly associated with exclusions than the clustering effect (density of EGMs per location).

5 Discussion

Considering the results for the socio-demographic regressors, the findings in this paper are to some extent consistent with existing literature. For the age variable, the outcome is in line with the self-exclusion system of German casinos (Strohäker & Becker, 2017) and similar findings are reported by Castrén et al. (2013), Ladouceur et al. (2000), Ladouceur et al. (2007) and Lischer et al. (2014). Mostly using survey data, they also find excluders to be middle-aged (around 40 years old) rather than young. This makes especially sense when considering the fact that development of potentially problematic gambling behavior takes quite some time. On average, there are 13.6 years between first starting to gamble and eventually getting excluded (Fiedler, 2015).

Albers and Hübl (1997) report an increased participation for EGM gambling in the group of singles. Their explanation for this finding is the high share of leisure consumption activities that characterize these games. It could be inferred that single people might have more spare time to kill, which can easily be done in gambling arcades. Additionally, not having a partner or family can lead to loneliness. Women in particular might use gambling to escape this feeling (Castrén et al., 2013), in older age groups loneliness is a predictor for gambling involvement for women as well as men (Botterill et al., 2015). On the other hand, however, one might argue that the social pressure for married persons to exclude themselves might be higher. Analyzing the mentioned self-exclusion systems of casinos, we have found statistical significant negative influence of no partnership on self-exclusion. The influence of

marital status on exclusions seems to be unclear.

For the other socio-demographic variables, no significant association can be found with our data set. This is interesting, since with individual level data and an analysis targeted specifically to problem or pathological gamblers, these factors usually turn out to be significant predictors in gambling related frameworks. This finding might support the hypothesis of the other research mentioned above, that self-excluders and pathological gamblers are hardly congruent.

Considering the availability variables, the results are in line with previous findings. The positive association between the number of EGMs and increased gambling involvement, in the present paper measured with self-exclusions, are also reported for Australia (Marshall, 2005; Productivity Commission, 2010) and New Zealand (Mason, 2008; Pearce et al., 2008). Not only is the average participation higher in high density areas, but also the amount of money spent on EGM gambling (Marshall & Baker, 2002; Productivity Commission, 2010; SA Centre for Economic Studies (SACES), 2008).

There are many studies dealing with the impact of EGM density on the prevalence of disordered gambling behavior or gambling participation in general, often measured by average expenditure on gambling (Barratt et al., 2014; Marshall, 2005). The majority of this work concludes that a reduction in the density of EGMs might be a meaningful way to decrease gambling related expenditure and problems. The relationship is, however, not as straightforward and as strong as it seems. In his study, Delfabbro (2008) examines a policy initiative that aimed to decrease EGM density by removing 2 000 gambling machines in South Australia. To analyze the effect of the reduction in EGMs, he conducted a survey where people were asked about their gambling behavior before and after the initiative. The results suggest at most moderate effects of the EGM removal on gambling participation. Concerning expenditure, he finds that people spend similar amounts of money after the decrease in the number of EGMs. In other words, this means that gambling behavior does not heavily depend on the density of gambling opportunities. The outcome of the present paper is in line with Delfabbro (2008) as it shows the minor importance of actual EGM density.

6 Conclusion

Socio-demographic variables are well-established risk factors for problematic or pathological gambling. A self-exclusion system reduces availability for the group of vulnerable players. While the group of pathological gamblers is well analyzed, little

is known about self-excluders. In our cross-sectional analysis of self-excluders at the community level and controlling for accessibility, the socio-demographic risk factors have only minor or no importance. Our research did not find other risk factors than age to be significant in both models. This could be interpreted as supporting the hypothesis of Griffiths and Auer (2016), that only a minority of self-excluders show problematic or pathological gambling behavior. The two groups - pathological gamblers and vulnerable players – seem to have little overlap. A self-exclusion system seems to be more important as a prevention measure for vulnerable players than as a harm reduction measure for pathological players.

The accessibility variables, on the other hand, turn out to be significantly linked to the number of exclusions. The coefficient of the share of EGMs is positive and highly significant. This is in line with literature, where the number of EGMs is often found to be related to higher gambling participation, which in turn certainly influences the number of exclusions. There is a large literature dealing with the relationship between the manifold dimensions of accessibility of gambling opportunities and gambling behavior and the majority of the work is able to identify a positive link between the variables of interest.

We show that an increase of one EGM will increase the number of self-exclusions by 0.7. This number is of course due to the already mentioned particularities of the self-exclusion system, but as such, it could act as a benchmark. The positive influence of availability on self-exclusion is not surprising at all, but the magnitude of the effect is. One additional EGM will result in 0.7 additional self-exclusions, given the present structure of the system. Of course, the coefficient depends not only on the self-exclusion system itself but also on the time since its foundation. We have analyzed a rather newly established system. In a second model, the summary effect of EGM availability is further disentangled into a location and a clustering (i.e. EGM density per location) effect. Again, the association of both accessibility variables is highly significant and positive. An increase in locations as well as an increase in the license to location ratio leads to an increase in the number of exclusions. The magnitude of the effect, however, is very different. The location effect is 7.4 times more important than the clustering effect.

This research has shown that the group of vulnerable players needs much more attention. The vulnerable players joining a self-exclusion system seem to have no specific socio-demographic characteristic in common. Furthermore, we have good indicators for the lack of socio-demographic similarities between vulnerable and pathological gamblers.

A Appendix

Table 3.5

Estimates for prevalence rates of disordered gambling in Germany.

Instrument: South Oaks Gambling Screen[a]

Study	Year of Survey	Age of respondents	Number of Respondents	Prevalence rate	
				problematic	pathological
German Federal Center for Health Education	2015	16 to 70 years	11 501	0.43	0.37
German Federal Center for Health Education	2013	16 to 65 years	11 500	0.68	0.82
German Federal Center for Health Education	2011	16 to 65 years	10 002	0.51	0.49
German Federal Center for Health Education	2009	16 to 65 years	10 000	0.64	0.45
German Federal Center for Health Education	2007	16 to 65 years	10 001	0.51	0.49

[a] People with scores of 3-4 points are classified as problematic gamblers, people who score 5 points and higher are classified as pathological gamblers.

Table 3.6

Estimates for prevalence rates of disordered gambling in Germany.

Instrument: DSM-IV[b]

Study	Year of Survey	Age of respondents	Number of Respondents	Prevalence rate	
				problematic	pathological
PAGE	2011	14 to 64 years	15 023	0.31	0.35
Sassen et al.	2009	18 to 64 years	8 006	0.19	0.27
Bremer Institute for Drug Research	2006	18 to 65 years	7 981	0.64	0.56
Bühringer et al.	2006	18 to 64 years	7 817	0.27	0.18

[b] People meeting 3-4 criteria are classified as problematic gamblers, people who meet 5 and more criteria are classified as pathological gamblers.

Chapter 4

The Relationship between Self-limitation and Gambling Behavior among German Gambling Arcade Visitors[1]

1 Introduction

Slot machine gambling enjoys great popularity in Germany. In 2016, electronic gambling machines (EGMs hereafter) in arcades and pubs had a market share of 51.7 % in the regulated gambling market with a gross gambling revenue of EUR 5,600 million (Barth, 2017). A study by the German Federal Center for Health Education has shown a lifetime prevalence of 19.4 % for EGM gambling (Haß & Lang, 2016). In other words, nearly one fifth of the population has at least once tried automated gambling. While this is completely unproblematic for the majority of people, some find it hard to keep track of the money and time they spend in arcades. Blaszczynski et al. (2008) report that gamblers generally gravitate towards spending more money and time on gambling than they initially intended. Especially EGM users often and extensively underestimate the amount of time and money actually spent (Nower & Blaszczynski, 2010). It is, however, important to note that not only problematic or pathological gamblers are affected, but also a fraction of

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purely recreational gamblers (Blaszczynski et al., 2008; O'Connor & Dickerson, 2003). Impaired control over gambling behavior is therefore a very common problem across different types of gamblers. One possibility to face this issue is provided by measures of pre-commitment.

Pre-commitment is a harm-minimization strategy and can be assigned to the wide field of responsible gambling. It is mostly described as a scheme which allows gamblers to place restrictions on money and/or time spent on gambling during a fixed period of time (e.g. per visit, per week, etc.). The underlying idea is that decisions on expenses and length of stay are made before commencing a gambling session, when gamblers are still in a state of non-emotional arousal and hence able to make rational choices (Griffiths et al., 2009; Ladouceur et al., 2012; Livingstone et al., 2014). Pre-commitment encourages deliberate decisions related to expenditure and gambling time and can thus be seen as a protective method to prevent excessive behavior (Ladouceur et al., 2012).

Pre-commitment encourages deliberate decisions related to expenditure and gambling time and can thus be seen as a protective method to prevent excessive behavior (Ladouceur et al., 2012). If there is no formalized pre-commitment scheme, gamblers still have the possibility to use internal self-regulation strategies to manage their gambling. Those include measures such as self-limitation of time and money, generally avoiding venues like arcades or casinos, or limiting the amount of alcohol consumed during a gambling session (Moore et al., 2012).

The opinion of gamblers regarding pre-commitment in general and self-limitation in particular are somewhat mixed. A few gamblers do not consider the aforementioned measures relevant for them, as setting limits is often perceived to be a tool directed towards problematic gamblers and they do not deem themselves as such. Hence, there might be a sort of stigma associated with self-limitation, especially if it is a voluntary option (Delfabbro, 2012; Livingstone et al., 2014; Williams, 2010). On the other hand, there are gamblers who tend to be more open and appreciative of self-restriction. Bernhard et al. (2006) found that especially moderate risk and problem gamblers (current and in recovery) have a positive attitude towards the possibility of restricting their behavior. The majority of gamblers queried in the study agreed that pre-commitment could be a very helpful tool.

In Germany, personalized player-cards and limit setting options used for prevention measures are a recurring topic. Becker, 2012 supports the idea of a centralized network system with a card enabling the users to comprehensively set limits and exclude themselves from all types of gambling across Germany. A study by Quack (2018) has shown that the approval rate for limits amongst casino gamblers in Germany is very high. Patrons were asked to assess if they think it is important

to set a monetary and time limit during gambling and 94.2 % of the women and 89.7 % of the men agreed completely. As Germany has not established any formalized self-limitation program yet, these findings, combined with the ones from the present paper, can be an interesting starting point for future considerations concerning the topic of self-limitation.

2 External versus Internal Limits

There are different possibilities for gamblers to access self-limitation. It can be differentiated between externally-enforced and internally-initiated limits. Pre-commitment, as discussed in the literature, usually falls into the first category. Following Ladouceur et al. (2012), the term pre-commitment describes a method that enables gamblers to determine monetary and/or time-related restrictions before they start a gambling session.

There are various configurations of pre-commitment schemes. They are mainly distinguished by their degree of comprehensiveness and voluntariness. The Productivity Commission (2010) defines four different models labeled as full and partial as well as voluntary and mandatory systems. Full pre-commitment systems are characterized by the necessity to use some kind of identification, e.g. a player card, to be able to gamble at all. Additionally, after a limit is reached, it is not possible to continue a session. Partial pre-commitment is less strict. With this model, gamblers are free to choose whether they want to use a player card and the associated features like limit setting or behavior monitoring. Within this setup, schemes can be further voluntary or mandatory. Voluntary models allow deciding whether pre-commitment measures are used, while mandatory systems inevitably require limit setting for gamblers. Hybrid schemes are also possible (Ladouceur et al., 2012; Thomas et al., 2016). The individual limits can then be differentiated by their period of validity (per day, per week . . .) and, especially monetary limits, by type. Possibilities are play limits (maximum amount of money that can be played with at a time), deposit limits (maximum amount of money that can be paid in at a time), bet limits (maximum bet size that can be placed at a time), or loss limits (maximum amount that can be lost in a session). Mandatory limits can further be fixed in a way that all games and/or gamblers have the same restrictions or vary with the gamblers and gambling modes (Wood & Griffiths, 2010).

The effectiveness and utilization rate of the system is closely linked to its design. For optimal efficacy, the scheme should be available jurisdiction-wide, comprise all types of gambling, be mandatory, be flexible considering limit types and durations,

be non-exceedable and biometric information should be used for identification, so that card swapping is not an option (Williams, 2010). Generally, voluntary limits chosen by gamblers involve higher utilization rates than restrictions imposed by operators or the government (Auer et al., 2015). While a very comprehensive, full, and mandatory scheme with no possibility to exceed and breach provides the highest level of protection for gamblers, it might also lead to serious rejection if it is perceived to be too paternalistic. So optimally, it should be rather basic, easy to use, but include crucial limit setting options (Thomas et al., 2016). It is important to note, that there is no panacea as not all systems are feasible everywhere. Practicability heavily depends on prevailing technical and regulatory standards as well as the cultural background of the population. A restrictive and paternalistic system like those operated in Norway or Austria would likely be impossible to implement for instance in the United States due to strongly differing mentalities (Bernhard et al., 2006; Blaszczynski et al., 2014).

Depending on the type of gambling, the application types of pre-commitment systems differ. The online gambling sector is particularly suitable for pre-commitment as all activities can be documented and associated directly with individual gamblers (Williams et al., 2012). This becomes more obvious when considering the wider range of feasible pre-commitment features compared to land-based gambling. Due to technical prerequisites, it would be even possible to monitor and limit gambling behavior (duration of gambling, deposits, losses) in real time, provide the option to exclude only from specific types of games, provide a clear overview of the gambling volume and also use interactive features like tools for self-help or self-assessment (Haefeli et al., 2011).

In land-based, and thereby particularly casino gambling, self-exclusion is a very frequently used tool. It can be seen as the most restrictive form of pre-commitment, where gamblers prevent themselves from entering establishments and hence restrict their gambling activity to zero (Productivity Commission, 2010). For studies discussing the effectiveness of self-exclusions, see for example Gainsbury (2014), Ladouceur et al. (2007) or G. Meyer and Hayer (2007, 2010). The most common way to apply pre-commitment measures on gaming machines are player cards. Depending on the structure of the system, gamblers must or can insert them before a session. These cards usually contain personal information and can thus be used for authentication. Initially, player cards had mostly been utilized as loyalty or debit cards, but recently, an increasing number of providers and jurisdictions have started to use them as a means to enable gamblers to monitor and/or restrict their gambling (Williams, 2010). Austria, Norway, and Sweden are utilizing player cards with their full pre-commitment programs. The Norwegian state-owned provider Norsk Tipping

has used player cards since 1992. New EGMs, including pre-commitment features, have been introduced as of 2009 and people are required to use smart cards if they want to gamble. Additionally, the Norwegian government imposed global limits like maximum daily and monthly net losses, which cannot be exceeded (Hoffmann, 2012; Rintoul & Thomas, 2017; Thomas et al., 2016). Sweden was the first country that introduced card-based pre-commitment features for online gambling in 2008. In 2013, a full pre-commitment scheme for EGMs was established. In 2014, this scheme has been extended to all forms of legal gambling (Rintoul & Thomas, 2017). In Austria, all EGMs have to be connected to the federal computer center as of 2017. All gambling providers offer a player card solution. To start a gambling session, the smart card has to be inserted into the machine. As EGMs cannot be used without cards, playing at numerous EGMs simultaneously is prevented (Bundesministerium für Finanzen, 2014). The establishment of a full pre-commitment system for EGMs in Australia has been recommended by the Productivity Commission (2010) but the plans were discontinued. However, partial systems are operated in the Australian states New South Wales, South Australia, Queensland, and Victoria. The programs differ in their design, i.e. mainly their comprehensiveness, but all of them offer some features of pre-commitment like limit setting (Rintoul & Thomas, 2017; Thomas et al., 2016).

The effectiveness of pre-commitment systems heavily depends on their design (Livingstone et al., 2014). Voluntary programs, for instance, often entail lower utilization rates (Delfabbro, 2012; Polatschek et al., 2013; Productivity Commission, 2010; Rintoul & Thomas, 2017), which in turn decrease effectiveness. The same applies to exceedable or revocable limits (Williams, 2010; Williams et al., 2012). The most comprehensive study dealing with this topic has been conducted by Ladouceur et al. (2012). They review existing literature particularly dealing with pre-commitment in EGM gambling and state that it is not possible to make conclusive objective claims concerning pre-commitment effectiveness mostly due to limitations in the examined work. Possibilities to gamble outside the system or card swapping are just a few issues which make a clear assessment nearly impossible. Considering the subjective opinion of the gamblers queried, most of them are positively inclined towards pre-commitment opportunities (Ladouceur et al., 2012; Schottler Consulting, 2006). Monitoring features are rather popular and very frequently used. Unfortunately, it is not possible to assign an effect of this tool to an actual change in gambling behavior. Regarding expenses for gambling, most of the gamblers state an estimated decrease in expenditure. However, some of them seem to have spent even more while using the system. These self-assessments have been confirmed by card-data. Limit-setting options are only used by 30 % of gamblers and mainly monetary limits play a role here. Certain trials found initial decreases in expenditure and/or time

gambled (Focal Research, 2007; Productivity Commission, 2010) but due to the voluntary and partial nature of the examined programs, it cannot be ruled out that people used other cards to continue gambling or proceeded to play outside the system (Ladouceur et al., 2012). Clearer statements can be made for online gambling. Auer and Griffiths (2013) show that voluntary limits have a significant and positive effect on gambling behavior of at least high-intensity gamblers. Nelson et al. (2008) also find a reduction in the gambling extent for gamblers imposing limits.

All of the above-discussed pre-commitment schemes have the aspect of external commitment in common. Depending on the degree of comprehensiveness and voluntariness, there can be maximum limits prescribed by law (Norway), legal requirements to set limits (Sweden or Austria), or at least the technical possibilities to set limits, if desired (Australia). However, even if these opportunities are not provided by law or operators, gamblers can still use internally-initiated self-limitation. This type of voluntary and self-initiated control strategy, which is not monitored by a third party, is frequently used by gamblers. McDonnell-Phillips Pty Ltd (2006) state that almost all gamblers in their sample internally set a monetary limit and hence try to self-regulate their expenses. Moore et al. (2012) report that self-management linked to time as well as expenses is used by the majority of gamblers queried in their survey. Interestingly, this strategy can mostly be found for all types of gamblers: problematic as well as non-problematic gamblers (Thomas et al., 2010). However, it must be borne in mind that this form of limitation has a distinct effect on gambling behavior, as it makes a difference whether you are only committed to yourself or if the determined limits are also externally binding. On the one hand, internal self-limits are easily breached and as overspending is a frequent problem of gamblers (Nower & Blaszczynski, 2010), they might not be as effective as external ones. Especially gamblers with problematic behavior might be less successful in adhering to them (Thomas et al., 2010). Without a monitoring tool, it is difficult to maintain an overview of money and time spent. Gamblers might not even realize that they exceed their limit. From this point of view, external limits seem to be advantageous for gamblers. On the other hand, legally enforced schemes might act as a deterrent and thus lose effectiveness. As mentioned before, pre-commitment is often perceived to be only relevant for problematic or pathological gamblers (Delfabbro, 2012; Livingstone et al., 2014; Williams, 2010). Consequently, certain groups of gamblers might feel that their gaming experience is impaired by it. In conclusion, both internal and external limits have their advantages and disadvantages and their effectiveness heavily depends on gamblers' self-efficacy skills (internal) or rather the design of the schemes (external).

So far, there has been no externally binding pre-commitment system for EGMs in

Germany. This means that the limits referred to in the analysis presented in this paper are voluntary and self-initiated internal limits. With the available data, it is impossible to determine the actual value of the limits set or whether they have been exceeded. However, the remainder of this paper will examine the question if gambling behavior of German arcade visitors, who state to use voluntary and internal restrictions to self-manage their gambling, significantly differs from the behavior of those, who do not.

3 Data

The data for this study is based on a survey, which has been conducted in cooperation with the department for advertising, market research and media of the SCHMIDT group, one of the four leading providers on the German automated gambling market. They are present at more than 170 locations throughout Germany and mostly operate so-called "Modern Entertainment Centers", which hold several licenses and are usually rather spaciously laid out. Like the three other large chains, these venues advertise with state-of-the-art and innovative games and a stylish and modern atmosphere. The venues of these chains have to be distinguished from the other type of automated gambling provider, the small arcades, often handling single licenses and run by individual owners. As the latter operate on a much lower scale, they might not have the opportunity to provide the same standards as the chain venues, especially in terms of equipment, atmosphere and service and hence likely attract a completely different clientele.

The survey was performed as an interview, where the survey period ranged from 30 November to 13 December. During this time, 513 visitors were interviewed at 16 arcade locations in six different federal states in Western Germany. The city sizes, where venues are located, range from rather small (<10 000 inhabitants) and rurally situated to major cities with more than 500 000 inhabitants. The venue size varied, there were smaller ones with single licenses and bigger ones, which hold multiple licenses and hence provide a higher EGM density. Interviews have been conducted at different weekdays and different times during the day to avoid querying only specific types of gamblers. Hence, it can be concluded that sample selection was as random as possible. The interviewers used a questionnaire, which queried a multitude of topics. It contained questions considering the awareness and use of different types of gambling, gambling behavior within the arcade, cognition, motives for gambling, utilization of internet and new media, gambler protection, and sociodemographic information.

The surveyed arcades are located in industrial areas or rather close to highways. On grounds of building law, smaller arcades are usually situated in city centers. Hence, the sample is certainly representative for arcades of the SCHMIDT group and likely for the ones of the three other big providers operating on a similar level on the market but might not be for small, independent arcades in Germany.

Regarding the socio-demographic classification of the sample, some remarks are necessary. Compared to the German population, men (70 vs. 49 %) and the young to middle-age group (65 vs. 41 %) are clearly over represented. The same holds for people with an intermediate educational level (45 vs. 26 %). Furthermore, the income of the respondents is above the German average. Of the respondents, 44 % have a household net income of more than EUR 2 500 compared to 36 % in the German population. Reference values are taken from the database of the *German Federal Statistics Office*[2]. Next to the general German population, the present sample is contrasted to a study by the Institut für Therapieforschung (IFT) (2010), which also focuses on EGM gamblers in arcades. The respondents considered in the present paper are characterized by a higher proportion of women (30 vs. 24 %). This can likely be associated with the targeted female share of 40 %. There are also higher proportion of Germans (90 vs. 80 %), higher educational attainment (21 vs. 14 % with A-levels), higher income (61 vs. 46 % with at least EUR 2 000 household net income) and a higher proportion of working people (83 vs. 70 %). Considering these comparisons, it can be concluded that the customers of the surveyed arcades can be regarded as comparatively upscale customers. Due to the modern and precious presentation of the chain venues, the higher socio-demographic status of the patrons fits the picture. These gamblers certainly prefer this more appealing setting to small arcades, which might not have the opportunities to offer the same atmosphere and service.

Since this paper focuses on analyzing differences in gambling behavior between groups with different self-limitation habits, the relevant questions capturing the aforementioned behavior will be introduced more extensively. Table 4.1 provides an overview.

First, there are the two questions of the Lie/Bet gambling screen for pathological gambling behavior. One question is about whether a person has ever wanted to spend an increasing amount of money on gambling. The second question is about lying to peers with respect to the extent of gambling. This screen bases on DSM-IV criteria and the chosen items have proven to be good predictors of pathological behavior (Johnson et al., 1997). These variables are measured on a binary scale; only the answers yes or no are possible. From these items, an index has been constructed. It

[2]See https://www-genesis.destatis.de/genesis/online.

Table 4.1

Overview of questions concerning gambling behavior.

Nominal level of measurement:
Have you ever had to lie to people you care about about the extent of your gambling?
Have you ever felt the need to bet more and more money while gambling?
Ordinal level of measurement:
Do you play at several EGMs at the same time during a visit to the arcade?
Do you visit several arcades in a row?
Metric level of measurement:
How much do you spend on average per visit to an arcade (in €)?
How much do you spend on average on gambling in general per month (in €)?
How long do you stay on average per visit to an arcade (in minutes)?
Average monthly duration of stay in arcades in general (in minutes)[1]

[1] Calculated from the questions: *How much time do you spend in this arcade (in minutes)?* And: *What percentage of the total time you spend in arcades is allocated to this arcade?*.

takes the value 0 for respondents who negated both questions, 1, if chasing behavior was affirmed, 2, if lying was affirmed, and 3, if the answer to both questions was yes. About half of the respondents show no signs of problematic gambling behavior, 30 % admit to chasing, 8.3 % say that they had lied about gambling, and 14.7 % affirm both questions.

Second, there are two questions concerning gambling intensity, which are measured on an ordinal scale. The answer space in both cases ranges from *almost always* over *often*, *sometimes*, *seldom* to *never*. The information requested relates to predominantly undesirable behavior in arcades. More than one third of the respondents regularly plays on more than one EGM simultaneously and almost 13 % visit at least *sometimes* more than one arcade in a row.

Third, there are four open questions, where the interviewer asked about estimates for expenditure and length of stay in arcades in euros or minutes, respectively. If the entire sample is considered, on average, respondents spend about EUR 70 per visit and EUR 262 on gambling per month. Again, compared to the IFT study, the present values are lower. They report mean expenses of EUR 136 per visit and EUR 495 per month. The mean length of stay is 117 minutes (about 2 hours) per visit and 1 274 minutes (about 21 hours) per month. An overview of the descriptive statistics

can be found in table 4.2.

Table 4.2

Descriptives for metric gambling behavior variables.

Descriptive Statistics							
Variable	Mean	Max	25 %-Quartile	50 %-Quartile	75 %-Quartile	Valid	Missing
Avg. expenditure (per visit)[1]	69.74	1 000	25.00	50.00	100.00	503	0
Avg. monthly expenditure (gambling in general)[1]	226.25	2 500	100.00	200.00	300.00	500	3
Avg. length of stay (per visit)[2]	117.49	600	60.00	120.00	120.00	495	8
Avg. length of stay (arcades in general)[2]	1 274.81	24 000	240.00	600.00	1200.00	503	0

[1] Measured in €.
[2] Measured in minutes.

It should be mentioned that the distributions of all four variables are positively skewed, with outliers in each variable. Considering the average monthly length of stay in arcades in general, for instance, 75 % of the respondents spend less than 20 hours in arcades. However, there is one person, who claims to spend 400 hours per month gambling. Although certain values are extreme, the information appears to be consistent. Hence, the decision was to keep these observations. The few cases that turned out to be truly inconsistent were removed from the data set, producing a total sample size of 503.

Next to gambling behavior, there are questions about certain personality traits that are closely linked to impulse control or self-efficacy and could therefore be interesting in the context of self-limitation. First, gamblers were asked about how often they plan something without implementing it eventually. The second question asked how often it happens that a person gambles, even though they had actually intended not to do so. As these two questions are related in content, they were placed at different spots in the questionnaire to avoid bias. Possible answers were again *almost always*,

often, *sometimes*, *seldom* and *never*. More than half of the respondents answered the first two questions with *seldom* or *never*, whereas solely 13 % (self-efficacy in general) and 16.3 % (self-efficacy related to gambling) stated that they do so regularly.

Lastly, it remains to discuss how the limit variable used to distinguish the two relevant groups is generated. In the questionnaire, there are two questions dealing with self-restrictions. One is aimed at expenditure; the second is aimed at the length of stay. The respondents are asked whether the expenses or the length of stay per visit to the arcade is fixed, whether they vary depending on winnings or losses, or whether they vary independently of winnings and losses. From these questions, two dummy variables are defined. They are equal to 1, if the expenses (or length of stay) is stated to be fixed and 0, if they vary in any manner. It is therefore possible for respondents to state that they set themselves either no limit, exactly one limit (monetary or temporal) or both a time and an expenditure limit. The dummy variables then form the basis to specify a categorical variable, which will be used to check for differences in gambling behavior. This variable is equal to 1 for observations with no limit, 2 for observations with a temporal limit, 3 for observations with a monetary limit, and 4 for observations with both limits. The frequencies for the limit variable can be found in table 4.3.

Table 4.3

Frequency distribution of the limit variable.

	Frequencies	
Limit Category	Absolute	Relative
No limit	239	50.1 %
One limit	147	30.8 %
Of which: time limit	24	16.3 %
Of which: money limit	123	83.7 %
Both monetary and time limit	91	19.1 %
Valid	477	100 %
Missing	26	
Total	503	

Of the respondents, 50.1 % state that they do not set themselves any limits. Consequently, a share merely below 50 % limits their gambling in any manner. The proportion of gamblers who declare to set any limit varies greatly in the literature. The Productivity Commission (2010) reports that only 1 % of the loyalty card holders

in South Australia use voluntary pre-commitment features at all. Among those who do, monetary limits were the preferred tool. Within a sample of online gamblers, Nelson et al. (2008) identify a share of 1.2 % of gamblers who set a limit. Wohl et al. (2013), however, find that 87.1 % of EGM gamblers state that they limit their expenses before they enter a gambling establishment. With a share of 80 % among VLT gamblers, Lalande and Ladouceur (2011) provide a similar result. Self-limit habits seem to differ between the types of gambling but also between different groups of gamblers. Again, these results are not consistent. While Nower and Blaszczynski (2010) report a significantly lower proportion of limit-setters among the group of problem gamblers compared to recreational or at-risk-gamblers, Thomas et al. (2010) find moderate use in all groups and Moore et al. (2012) even state a higher utilization rate for (low-frequency) problem gamblers.

The gamblers in the present sample, who set a limit, clearly prefer the monetary to the time limit. This is consistent with the literature a large majority of studies find a lower use of temporal restrictions (Blaszczynski et al., 2014; McDonnell-Phillips Pty Ltd, 2006; Schottler Consulting, 2006; Thomas et al., 2016; Williams, 2010). The reason for this could be a subjectively higher utility or efficacy in monetary limits (Griffiths et al., 2009; Turner et al., 2007).

A preliminary analysis was conducted with the above-described categorical variable. It clearly showed that in each case, the most significant results are found for the two extreme groups, namely, no limit and both limits. Additionally, the time limit individually never had any significant influence and seems to take effect only in combination with the expense limit. One reason for this result could be the small number of people in the sample who set only a time and no monetary limit. Due to this finding and for simplicity's sake, a detailed separation was dispensed with and the focus was placed on differences between the two extreme groups rather than including all four of them. To this end, a binary dummy variable is used, which is equal to 0, if no limits are set and equal to 1, if both a time and a monetary limit are used.

In order to find differences in the gambling behavior between groups with varied limit setting habits cross tabulations, parametric t-tests and non-parametric Mann-Whitney-U-tests are used. As it is suspected that personality traits related to self-efficacy could in fact drive some of the results, we additionally a regression analysis was conducted, which allows to control for supposedly spurious factors.

4 Results

The following section is structured as follows. First, it is checked whether there are any significant differences regarding the socio-demographic backgrounds between the two limit groups. Second, it is analyzed any differences with respect to self-efficacy. Third, the focus will be on examining disparities in the gambling behavior.

4.1 Socio-demographic background

From the survey, information is available on gender, age, migration background, income, education and employment status. The results can be found in Table 4.4. The goal was to see, if any patterns regarding socio-demographic characteristics are recognizable. Interestingly, however, the results of the conducted hypothesis tests are consistently insignificant. Therefore, based on socio-demographic variables, no statement can be made regarding groups of people that are more likely to restrict their gambling.

Table 4.4

Results for difference in means test in socio-demographic variables.

Variable	Test Statistic	P-value
Binary variables	Pearson's Chi^2	
Gender	1.799	0.180
Migration background	1.894	0.169
Education	3.670	0.055
Employment status	0.021	0.885
Ordinal variables	Mann-Whitney-U	
Household income	−0.228	0.819
Personal income	−0.362	0.718
Metric variable	T-test	
Age	−1.558	0.121

Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

4.2 Self-efficacy

In the next step, it is checked whether there are differences in the two aforementioned personality variables, which capture aspects of respondents' ability to control impulses. For the first variable, which models self-efficacy in a very general way, there are no significant differences between the two groups ($Z=-2.209$, $p = 0.027$). Considering the variable that is related to gambling, the result is distinct. For - *How often do you gamble, even though you had actually decided not to play?* - significant differences can be found ($Z=-5.898$, $p < 0.001$). When people state to limit their gambling time and expenses, the queried behavior occurs less frequently. The results can be found in Table 4.5. About 25 % of those without a limit state to behave like this regularly, compared to approximately 7 % of those with both limits. On the other hand, twice as many gamblers in the both limits group indicate to *never* behave like this. In conclusion, this means that gamblers who set limits report to less often feel the urge to spend increasingly more money than those gamblers, who refrain from using limits.

Table 4.5

Frequencies of self-efficacy variables.

Variable	Sample distribution in percent				
	Almost always	Often	Sometimes	Seldom	Never
How often do you plan something without implementing it eventually?					
No Limit	1.3	12.1	36.0	33.1	17.6
Both Limits	3.3	5.5	29.7	33.0	28.6
How often do you gamble, even though you had actually decided not to play?					
No Limit	3.3	20.9	31.4	25.1	19.2
Both Limits	1.1	5.5	12.1	39.6	41.8

4.3 Gambling behavior

First, it is examined, if there are differences concerning the Lie/Bet screen items between the two groups. For this task, the generated problem index, ranging from 1 to 4, is used. The association between the variables is significant (Pearson's $\text{Chi}^2 = 25.264$, $p < 0.000$). From the frequencies, as displayed in Table 4.6, it becomes evident that the non-problematic behavior occurs almost twice as common in the group with both limits. On the other hand, the most severe gambling demeanor emerges more than three times more frequently in the no-limit-group. The direction of this effect is of course not sufficiently clarified. It is in fact possible that problematic gambling behavior actually occurs less often due to the limit setting. On the other hand, perhaps with an increase in the problem index, limits are set less frequently.

Table 4.6

Frequencies of the Lie/Bet problem index.

Limit category	Index category Sample distribution in percent			
	Lie/Bet=no	Bet=yes	Lie=yes	Lie/Bet=yes
No Limit	37.2	36.0	8.4	18.4
Both Limits	67.0	20.9	6.6	5.5

Second, it is examined if there are differences in the gambling behavior parameters that have been measured on an ordinal scale. They measure the habits within the arcade and capture mostly undesirable behaviors. For both questions, there are significant differences in the frequency of the queried behavior between the two groups. Almost 50 % of those without limits regularly gamble on more than one EGM simultaneously, compared to about 30 % of those with limits. The difference in frequencies is significant ($Z = -4.059$, $p < 0.000$). Of the group without any self-initiated restrictions, 15 % visit more than one arcade in a row at least sometimes, whereas only 4 % of those with restrictions report to do so. The difference is again significant ($Z = -2.920$, $p = 0.004$). It can be concluded that the undesirable behavior occurs less frequently for gamblers who use limits as a self-regulation strategy. The complete frequency distribution is displayed in Table 4.7.

Next to the above-mentioned variables, respondents were also asked about expenses and length of stay per arcade visit and per month. These values are further interesting indicators for gambling demeanor.
The factors that are examined more extensively are

Table 4.7

Frequencies of ordinal gambling variables.

Variable	Sample distribution in percent				
	Almost always	Often	Sometimes	Seldom	Never
Do you play at several EGMs at the same time during a visit to the arcade?					
No Limit	25.9	22.2	16.3	11.7	23.8
Both Limits	11.0	20.9	9.9	11.0	47.3
Do you visit several arcades in a row?					
No Limit	1.3	1.7	11.7	17.2	68.2
Both Limits	-	1.1	3.3	12.1	83.5

1. Average expenditure per visit (in €)
2. Average monthly expenditure for gambling in general (in €)
3. Average length of stay per visit (in minutes)
4. Average monthly length of stay in arcades in general (in minutes).

The descriptive statistics for each variable for the two limit categories can be found in Table 4.8. Obviously, the means for all four considered variables is consistently higher in the group without any limits.

To see if these differences are also significant, an independent samples t-test has been performed for each behavioral measure. Significant differences were found for all behavioral variables: average expenditure per visit (t-statistic = 6.678, $p < 0.001$), the average monthly expenditure for gambling in general (t-statistic = 7.573, $p < 0.001$), the average length of stay per visit (t-statistic = 5.144, $p < 0.001$), and average monthly length of stay in arcades in general (t-statistic = 3.533, $p < 0.001$).

As analyzed before with the differences in means, there seems to be a link between the gambling-related self-efficacy and the limit variables. Hence, it could be suspected, that the difference in gambling behavior is not mainly induced by the limit setting habits, but should rather be accredited to the considered personality traits. To check for significant differences in expenses and time spent in arcades, four regression

Table 4.8

Descriptive statistics for the metric gambling behavior variables.

Average expenditure per visit (in €)		
	No Limit	Both Limits
N	239	91
Mean	91.36	39.18
Max	1 000.00	100.00
Average monthly expenditure for gambling in general (in €)		
	No Limit	Both Limits
N	238	91
Mean	323.13	135.88
Max	2 500.00	500.00
Average length of stay per visit (in minutes [hours])		
	No Limit	Both Limits
N	234	90
Mean	132 [2]	94
Max	600 [10]	240 [4]
Average length of stay in arcades in general (in minutes [hours])		
	No Limit	Both Limits
N	239	91
Mean	1 496 [25]	807 [14]
Max	24 000 [400]	4 800 [80]

models controlling for self-efficacy are run. The results are presented in Table 4.9. It can be seen that the coefficient for the limit dummy is consistently significant for all four models. The coefficients are always negative meaning that setting both limits decreases the respective gambling behavior parameter compared to the baseline group, which is the one with no limit. This is in line with the expectations considering the results of the descriptive analysis.

Interestingly, the difference remains significant even though the models control for personality traits related to impulse control. Gamblers with both limits spend on average EUR 44 per visit and EUR 150 per month less than those who do not

restrict themselves. They also spent 40 minutes per visit and even 12 hours per month less in arcades. As the differences in the gambling parameters decreased

Table 4.9

Regression Results.

	Dependent variable:			
	Average expenditure per visit	Average monthly expenditure for gambling in general	Average length of stay per visit	Average monthly length of stay in arcades in general
	(1)	(2)	(3)	(4)
Constant	340.46***	702.47***	291.61***	4 547.8***
	(43.10)	(139.66)	(36.00)	(1 040.0)
Limit	−44.46***	−149.86***	−40.52***	−725.8*
Dummy[a]	(11.99)	(38.88)	(10.12)	(289.2)
Gambling against intent[b]				
Often	−35.99	−8.96	−25.80	1 145.4
	(33.71)	(109.24)	(28.15)	(813.4)
Sometimes	−88.45***	−180.65*	−58.35**	255.6
	(33.00)	(106.91)	(27.59)	(796.1)
Seldom	−84.29**	−180.65*	−58.35**	255.6
	(33.45)	(108.47)	(27.98)	(807.0)
Never	−92.45***	−212.82*	−51.98*	516.2
	(33.70)	(102.20)	(28.15)	(813.0)
Adhere to intent in general[b]				
Often	−169.93***	−179.41	−125.61***	−3 139.4***
	(41.56)	(134.66)	(34.71)	(1 002.7)
Sometimes	−188.21***	−247.87*	−129.42***	−3 764.9***
	(39.58)	(128.25)	(33.07)	(954.9)
Seldom	−161.95***	−172.07	−105.07***	−3 840.5***
	(39.85)	(129.12)	(33.29)	(961.4)
Never	−187.70***	−293.91**	−112.49***	−3 772.9***
	(40.41)	(130.96)	(33.76)	(975.1)
N	330	329	324	330
R^2	0.19	0.17	0.13	0.09
Adjusted R^2	0.17	0.15	0.11	0.06
F-Test	8.57***	7.26***	5.40***	4.4***

Standard errors in brackets.

Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

[a] *The reference group is "No Limit".*
[b] *The reference group is "Always".*

compared to the raw descriptives, a certain fraction can probably be attributed to personality differences. Generally, however, limit setting itself seems to influence gambling demeanor.

5 Discussion

The limits analyzed in this study differ from those usually discussed in the literature, as they are not imposed, monitored and enforced by a third party and hence, not externally binding. Taking this difference into account, the following section still aims to compare the results with the outcomes of similar studies.

Considering the question, if there exist significant differences in the socio-demographic characteristics between people who impose limits and those who do not, the results are not clear. The present analysis does not show any patterns related to the socio-demographic background. There are no significant differences between men and women, different levels of education, Germans and foreigners, or employed and unemployed persons. Additionally, there are also no significant disparities between differing age or income groups. These results are in line with O'Neil and Delfabbro (2014), who also report no obvious patterns in the profile of limiters. However, there are studies reporting distinct characteristics for the groups. McDonnell-Phillips Pty Ltd (2006) finds that, for example, older people are more likely to restrict their number of gambling activities. Additionally, females set a limit concerning maximum expenses significantly more often, the same holds for people with a higher level of education. Divorced or separated gamblers are more prone to restrict their gambling activities than married ones or singles. People with dependent children have a higher probability to limit their time spent on gambling. Moore et al. (2012) also find significant gender differences with males being more likely to set limits. Examining a sample of online gamblers, Nelson et al. (2008) describe self-limiters to be younger and more probable to be male than non-limiters.

If the relationship between limit setting and problematic gambling behavior is considered, the results are again mixed. The present study finds a significant association, where the frequency of those who do not set limits increases with more severe gambling behavior. From this insight, it can be concluded that it is less common for problematic and pathological gamblers to set limits. This is in line with Nower and Blaszczynski (2010) who report a lower probability for problem gamblers to use pre-commitment strategies compared to recreational or moderate-risk-gamblers. McDonnell-Phillips Pty Ltd (2006), however, find that problem gamblers do set limits at similar or even higher frequencies than non-problem gamblers. In line with this

result, Thomas et al. (2010) also state that limits are used by all types of gamblers. They do not find differences depending on the degree gambling extensiveness.

With respect to gambling behavior in general, the performed analysis indicates a positive link between limits and a more controlled demeanor. Undesired behavioral patterns like gambling on more than one EGM simultaneously or visits to more than one arcade in one day occur significantly less frequently with gamblers using self-imposed limits. When looking at the surveyed expenditure and duration variables, it can be ascertained that mean values are significantly lower for limiters. The results for an altered expenditure are mostly in line with the literature. Focal Research (2007) finds a decrease in expenditure for video lottery players using responsible gambling tools. For online gamblers, Auer and Griffiths (2013) show that voluntary (monetary) restrictions lead to significant decreases in expenses and length of gambling sessions. Especially high-intensity gamblers altered their demeanor in a positive way. For a sample of online sports betters, Nelson et al. (2008) report changes in some gambling parameters after limits have been imposed. The frequency of sessions and the total amount wagered was significantly decreased. Bernhard et al. (2006), on the other hand, provide completely different results. In their study, they find users of responsible gambling tools to play more than twice as much per week and have cash-ins that are 2.5 times higher compared to gamblers who are not using any pre-commitment tools.

In the present study, an isolated time limit is consistently not associated with significantly lower gambling parameters. According to these findings, Auer and Griffiths (2013) also report no significant reductions in length of play for gamblers with isolated time limits. Similar results are found by Ladouceur and Sevigny (2009) who state that setting a time limit is not an effective means to control gambling time. Although the time limit itself is not very popular and does not seem to alter gambling behavior significantly, it should, at least in the short-run, not be neglected. Kim et al. (2014) state that time limits are relevant given the very fact that monetary losses and the duration of gambling sessions are positively correlated. They find that if people are prompted to limit their session time, they will do so and this will decrease the time spent on EGMs. Polatschek et al. (2013) also find that the time limit feature mitigates the negative effects, particularly for problem or at risk gamblers. The results of the present paper indicate that, especially in combination with monetary limits, restrictions on time still play an important role. Additionally, it might help people to control their expenses and time spent in arcades when longer periods are considered. Some people might find it useful to mitigate conflicts with their families (Bernhard et al., 2006). These inconsistencies in the outcomes are again likely influenced by the design of the respective systems. If, for instance, limits

are flexible and not pre-set by providers, the beneficial effects are generally more pronounced.

Considering gambling related impulse control, the analysis of the present paper showed that there are significant differences between the distinct groups. Gamblers who use restrictions indicate to have problems with impaired control less frequently. To my knowledge, there has existed no work explicitly dealing with this relationship so far. Further investigation is needed, as self-efficacy is of course a more complex personality trait, which cannot be captured fully with the data at hand. Because of this link, the possibility that the differences in gambling behavior cannot be assigned to the actual limit setting but are likely due to systematic differences in personality traits of the distinct limit categories, has to be considered. For this reason, a multiple regression analysis of the metric gambling behavior parameters on the limit variable as well as the indicators for self-efficacy was performed. With this method, it becomes possible to examine relationships, while controlling for spurious variables. As the coefficients for the limit dummy are still highly significant, this indicates that the consistently lower means in gambling parameters in the group of limiters are not solely a by-product of systematic differences of the here considered personality traits, but are also explicitly influenced by self-limitation habits.

One major limitation of the present study is the fact that it heavily relies on self-reported assessments of the gamblers, as the analyzed limits are internal ones. Next to possibly biased estimates of gambling behavior, there is no possibility to determine the heights or excess of the imposed limits. Additionally, it should again be called to mind that the sample mainly consists of rather upscale arcade visitors. This means that it might not be representative for all EGM gamblers in Germany. Those who prefer small, independent arcades should be excluded. However, representativeness likely holds for the patrons who visit the chain venues of the four big providers, as their venues are similar considering their design and offer. Although the findings cannot be generalized without restrictions, they are highly relevant, as these four leading operators make up for more than 14 % of the locations German-wide. Additionally, it has to be recalled that they usually handle multiple licenses at one location, so their share of EGMs of the total market is certainly a lot higher. This market position makes their customers a highly relevant group and worthwhile to examine.

The present paper is the first one examining the differences in gambling behavior between gamblers who set limits and those who do not in Germany. Furthermore, there are, to my knowledge, no studies examining the link between setting limits and gambling related impulse control yet. Hence, it should be seen as a pilot study with promising first findings, which can be used as a justification for the need of more elaborate and comprehensive research.

6 Conclusion

Although results regarding effectiveness are mixed, researchers as well as the majority of gamblers evaluate pre-commitment systems and in particular, possibilities to impose limits positively. Especially externally binding pre-commitment tools can help to transform vaguely formulated limits into concrete decisions. This might help gamblers to adhere to the restrictions (Kim et al. 2014). People willing to actually deal with limits tend to be enthusiastic. Some problem gamblers state that these features might have helped them in earlier stages of their "gambling-career"(Bernhard et al. 2006). For recreational gamblers, it may be an opportunity to mitigate the danger of exceeding their self-imposed limits. This generally beneficiary impression is confirmed by the results of the present study dealing with the link between gambling behavior and voluntary self-imposed internal limits for a certain group of EGM gamblers in Germany. Although no clear-cut socio-demographic profile for limiters can be determined with the analyses, there are still findings that help to get a better impression of self-limiting gamblers, especially concerning their gambling behavior. Unappreciated demeanor occurs less frequently in the group with restricted expenses and time spent in arcades. Gamblers who set limits seem to have problems with compromised control less often. The established link between gambling related self-control and limit setting could hint toward systematic differences in personality traits between the two examined groups, which could be confounding the relationship between gambling and limit setting. However, the positive effect of self-restriction on gambling behavior can still be clearly ascertained after controlling for self-efficacy. This leaves no doubt that limits, too, have a positive effect. Examined gambling parameters like the average expenditure per visit, the average length of stay per visit, and the average monthly expenditure for gambling in general are significantly lower for self-limiters. Additionally, it is less common to set limits for more severe gamblers. For them, but also for recreational gamblers, the outcomes could likely be further improved by using an externally binding pre-commitment system, which so far has not been established in Germany. Monitoring options could help gamblers to keep track of actual amounts of time and money spent during a session as these represent values that are commonly underestimated by gamblers. If the restrictions were non-exceedable, it would be easier for gamblers to adhere to them. Additionally, an account-based system led to a wealth of data, which in turn could be used to advance research in this promising field of gambler protection. Hence, the results of the present paper, together with the findings from Quack (2018), could serve as a starting point to rekindle the discussion about the possible features and advantages of such a pre-commitment system.

Chapter 5

Critical Discussion and Conclusion

This thesis examines groups of gamblers who use different tools of pre-commitment that are currently available in Germany. The focus of Chapters 2 and 3 is to analyze which socio-demographic and accessibility related factors drive the number of exclusions at the community level. The third paper in Chapter 4 deals with the impact of self-initiated limits on gambling behavior among German arcade gamblers. For this task, individual level survey data is used. In the remainder of this chapter, the research outcomes are briefly summarized and shortcomings are discussed. Furthermore, the presented research is related to sufficiently similar work for Germany (where there is any), to be able to give recommendations for required future research. In a last step, recommendations for action considering the design of the pre-commitment tools are given.

Although the analyses dealing with exclusions in Chapters 2 and 3 are similarly structured, both are equally important. While in other countries various types of gambling are often offered at single locations, the organizational and legal conditions are specific in Germany. A distinction is made between basically two types of terrestrial establishments, which both provide a different assortment of gambling. First, there are *casinos* which offer classical table games like Poker, Roulette or Black Jack as well as automated gambling (via *Glücksspielautomaten*). They are licensed and owned by the state and governed by the German Inter-State Treaty on Gambling as well as federal law. Second, there are gambling arcades which solely offer automated gambling (via *Geldspielgeräte mit Gewinnmöglichkeit*). They are privately operated and regulated in parts by the Inter-State Treaty, but mainly by corporate law. However, the establishments not only vary in how they are regulated. Casinos are more stylishly designed. Often times, visiting a casino resembles more an event rather than mere gambling. This is not only due to the prevailing dress code but additionally, of course, due to the more glamorously presented classical table

games. Although both types of locations offer electronic gambling, it is important to note that the machines differ substantially. The legal requirements regarding maximum stakes, maximum losses or maximum wins are higher for gambling arcades. For example, the maximum stake is EUR 0.20 for a game of 5 seconds, the maximum loss per hour must not be greater than EUR 60[1]. Additionally, there must not be more than 12 machines per arcade. These rules do not apply for the devices at the casinos. The machine density can be higher, and so can the stakes and losses. Hence, the gambling incentive for automated gambling in casinos may be considered higher. It can thus be concluded that, with the varying offers of games and additional characteristics, both establishments clearly attract distinct clienteles. Therefore, it is sensible to consider both groups of gamblers separately.

Due to similar approaches and hence similar limitations of the papers regarding the exclusions, those will be discussed jointly after the respective summaries.

The first original research paper, as presented in Chapter 2, analyzes the relationship between the number of exclusions from casinos in German communities and various socio-demographic as well as accessibility variables. The data used was aggregated on the community level and not, as is often the case in gambling literature, individual level data. The decision to use group data was owed to the fact that there was no information available about excluders at any lower level of aggregation. The provided exclusion file only contained the number of exclusions per community. To explain the variation in the number of exclusions between the different municipalities, the well established risk factors for problematic or pathological gambling are incorporated into the model first. Second, to capture proximity effects, different accessibility measures are included. The regression results for the socio-demographic variables are not consistently significant; Only the coefficients for gender, the age group 30-39 and the group of those without a partner yield significance. The accessibility measures, on the other hand, turn out to be significant drivers of the number of exclusions in the communities. The findings hence suggest that there are more exclusions, or in other words, there is a higher share of vulnerable gamblers in municipalities with close proximity to casinos. The same holds for municipalities where the share of men and the share of people between 30 and 39 is higher. In communities with a higher share of singles, the share of exclusions is lower.

The second paper, as presented in Chapter 3, deals with a similar research question. Regarding the previous chapter, there are two main differences. First, it concerns arcade gamblers, i.e. people playing on slot machines as the research subjects. Second, the data set is geographically limited to the federal state of Hesse, Germany. A

[1]For more information check the gambling ordinance (https://www.gesetze-im-internet.de/spielv/SpielV.pdf)

regression model is used to identify significant socio-demographic and locational predictors for the variation in the amount of exclusions. The socio-demographic variables are congruent with the aforementioned and once more based on the risk factors for problematic and pathological gambling. Regarding the accessibility variables, different measures are used for two different models. In the first model, the share of EGMs per 1 000 inhabitants captures the effect of pure EGM density per community. In the second model, this raw density effect is disentangled by using the number of locations per community (*location effect*) and the license to location ratio (*clustering effect*). Again, the socio-demographic variables do not exhibit much explanatory power, which leads to the conclusion, that there might indeed be little overlap between vulnerable and problematic or pathological gamblers. Only the age group 30-39 and the share of singles yield significant results. The situation is more interesting when considering the accessibility variables. They are significant in model I as well as model II. Increased availability also increases the share of exclusions in the respective communities, the magnitudes of the effects in both models are consistent. Focusing on the results of model II, it becomes clear that the location effect is more pronounced than the clustering effect, i.e. one additional location at a community is linked to an about ten times higher number of exclusions than an additional license per location. This result suggests that restrictions on the number of locations might be a more effective measure to decrease the number of vulnerable gamblers than decreasing machine density at locations. One example for such a restriction is be the minimum distance regulation between arcades which is currently to be enforced in Germany.

To conclude, there are two main findings that can be taken away from these chapters. First, no consistent socio-demographic patterns can be detected with our macro-level analysis. Second, it becomes apparent that an increase in accessibility, regardless whether measured as proximity or density, is a significant and positive driver for the number of exclusions and hence the number of vulnerable gamblers. Therefore, the findings on the macro level confirm the mostly consistent results established in the literature, namely, that availability seems to have an impact on gambling intensity, in this thesis represented by the value of exclusions.

This work expands existing literature on exclusions primarily by putting the emphasis specifically on Germany and the general conditions prevailing there. Second, it differs as macro (aggregated) data is used for the analyses of gamblers who use pre-commitment tools. This means that a rather ecological, i.e. collective approach is pursuit. Although aggregated data has its advantages, as briefly discussed in Chapter 1, there are also shortcomings. When working with data on the community level there is a loss of information. Hence, the likely complex relationships present on

the underlying individual level can often not be captured sufficiently while analyzing the data. Additionally, it is reasonable to assume that there might be rather little variation between communities on the group level, at least for certain explanatory variables (e.g. the share of men). This can lead to biased estimates when using OLS, as it is easier to trace out the true relationship between the dependent and independent variable, if the latter is more spread out[2]. Taking this into account, the pre-dominant insignificance of the socio-demographic variables in the models can hint to non-congruence between excluders and problematic or pathological gamblers as it was also established in other work. However, this result should not be accepted without a doubt. Insignificance could also stem from flaws in the data as discussed before. Furthermore, it has to be clear that with the variables used, only certain aspects impacting exclusions are covered. Not taken into account are, for example, psychological determinants. If they are indeed correlated with variables in the model, this can lead to omitted variable bias (Wooldridge, 2009). However, if the found insignificance in the results is true, it should be kept in mind that links which exist (or do not exist) at a group level do not necessarily apply at the individual level. The misapprehension of trying to infer from higher (macro) to lower (micro) levels of analysis is known as the *ecological fallacy*[3]. This means that even if we are unable to identify a socio-demographic profile for excluders on the group level, we cannot infer that this result holds for the individual level. Nonetheless, we can conclude from this research that, on the community level, socio-demographic variables like gender, education, employment or migration status only play a subordinate role in explaining the variation in the number of exclusions. For the accessibility variables, on the other hand, the outcomes confirm those found in the literature.

Having used this collective approach to get first insights, the next step for research should be to examine the relationship on the micro level. This will allow to soundly evaluate the underlying complex links and to contrast these results to the ones found on the macro level. There exist two studies evaluating the existing German exclusion programs.

First, G. Meyer and Hayer (2010) queried excluders in cooperation with casino staff using the *Bremen Questionnaire on Exclusions from Gambling (Bremer Fragebogen zur Spielersperre)*. The questionnaire was handed out to gamblers during their exclusion process as a supplementary component. The focus of the authors was on psychological aspects, like the motivation to get excluded and the general assessment

[2]The variance of the regression coefficient is defined as $Var(\hat{\beta}) = \frac{\sigma^2}{\sum(x_i - \bar{x}^2)}$ (Wooldridge, 2009). From this formula it can be seen that the variance of the estimator decreases if the variance of the regressor in the denominator increases. The lower the variance of $\hat{\beta}$ the less biased is the estimator.

[3]For more information on this topic see for example Clark and Avery (1976), Freedman (1999) or Robinson (1950).

of the ban. They conducted a longitudinal study to see how the psychological well-being changes after getting excluded. Compared to the research of this thesis, little focus was put on the socio-demographic background of excluders. Accessibility does not occur at all. Additionally, the priority was not exclusively on Germany, the authors also included Austrian and Swiss casinos. This makes a comparison of the results more difficult. Nonetheless, as data collection poses a major problem in the sensitive gambling context, their survey procedure including support by casino employees can serve as an example for future studies on exclusions.

For the first cross-location exclusion system for commercial EGM gambling in Hesse, Hayer et al. (2018) conducted an evaluation study. For parts of their research they also use the OASIS exclusion file. They obtained a few socio-demographic measures and extended the information by geographical parameters. When examining the socio-demographic background of the excluders, they find 88 % to be male and 47 % to be migrants. Further, they confirm the suggestion that the majority of exclusions (99 %) are self-initiated. Regarding the age of the excluders, almost two thirds of the sample were between 18 and 34 years old, i.e. they form a comparatively young group. The authors also state that excluded gamblers usually live close to the community where the arcade initiating the ban is located. Although they did have access to some individual level data (gender, age and migration status of the excluders), the amount of information was still rather limited. They did not have additional socio-demographic variables, no valid information about possible problematic behavior and only aggregated geographical data that could be used for the analysis.

In general, the opportunity to get excluded from gambling establishments is a low-threshold and readily convertible means of player protection and a frequently used tool for prevention. This is the case especially for gamblers, whose behavior is getting out of hand. This positive impression is reflected in increasing usage rates of the rather new program in Hesse. Hayer et al. (2018) report 12 253 entries in the exclusion file on September 7th 2016 when they first retrieved data and already 14 675 in July 2017. This marks a growth of about 20 percent. Of course, this increase was also owed to the newness of the system, since then, a satiation point has been reached and the newly initiated bans have been leveling off at about 200 per month. Still, the uptake rate shows great approval for the program.

It can be concluded that at the moment, mainly due to data protection reasons, it is hard to conduct research regarding this sensitive topic, which does not rely on self-reported survey data and might be considered more objectively valid. The main problem regarding research is hence to generate reliable data to substantiate the present results. One possibility to facilitate this process is to use anonymization techniques with less loss of information in the future, which would allow for a more

extensive analysis of the exclusion files (Hayer et al., 2018). As these files likely represent the most objective source of information, this would be a great improvement. To be able to enforce this, communication and confidentiality must be ensured. If much personal information is asked from gamblers during the exclusion process, this might act as a deterrent and increase the threshold to complete the procedure. Therefore it is absolutely necessary for gamblers to understand (and believe) that they will never be identified personally and that their data is only used for research purposes, which helps to further improve the program.

Considering the design and the awareness of the program, there still is a need for optimization. As certain gamblers might not recognize the beneficial effect of the exclusion by themselves, one approach can be to force the involvement of providers. This makes sense when considering the very low share of exclusions initiated by arcade or casino employees. However, this also poses problems. Gamblers who consider getting excluded are usually characterized by a rather extensive behavior, thus they generate turnover. Conversely, this means that providers find themselves stuck in a dilemma, where entrepreneurial interest contradicts social responsibility (Fiedler et al., 2017). A better way to enforce external exclusions might be to instruct a third authority with organization and administration issues. This independent entity could install trained staff at gambling establishments and hence provide support in recognizing early indicators of problematic behavior and hence ease the pressure of providers (Fiedler, 2015). This approach is of rather paternalistic nature and might meet with little approval on the part of the gamblers. Usually, decisions like getting an exclusion are more efficient, if they are made by gamblers themselves. Another potential improvement of the program would be the structural interlocking of the exclusion with voluntary therapeutic offers, e.g. addiction support groups. The interaction of professional therapeutic care and the demand restraint can contribute to make optimum use of the synergy effects of both measures (Hayer et al., 2018). The most important point, however, is certainly that the centralized, German-wide exclusion system, valid across all types of gambling, as required by the German Inter-State Treaty, will be implemented. This will decrease the opportunity of evasive movements and hence the possibility to breach the exclusion by exploiting another form of gambling. In the course of this implementation, certain structural factors should be taken into account: the system and especially the revocation process should be standardized to increase transparency, duration should be handled more flexible (no more “one-size-fits-all”) and the level of awareness should be further boosted in order to reach those who are affected. Additionally, the need for constant evaluation of the program remains unchanged (G. Meyer & Hayer, 2010).

The third paper, as presented in Chapter 4, deals with the impact of voluntary and

self-initiated monetary and time limits on the gambling behavior of German arcade patrons. Using survey data, the differences in various gambling parameters between those who restrict themselves and those who do not, are analyzed. The results show two aspects. First, no clear socio-demographic pattern can be found for gamblers using the limit. Second, the self-imposed limits show effect, even though they are not monitored or enforced by a third party. Unappreciated behavior appears less often in the group of self-limiters and variables like average expenditure per visit is consistently and significantly lower in this group. These outcomes remain unchanged even if they are controlled for self-efficacy.

This work is, to my knowledge, the first one to explicitly put the focus on German arcade gamblers. There are studies analyzing voluntary limits and their impact, but mostly for the Anglo-Saxon region. Germany has not established a formalized limit program for gambling arcades yet. This means that the limits, as described in Chapter 4, should be seen as *internal* limits, which are self-initiated by gamblers. They differ from those used in most of the literature, as they lack any form of external commitment and could also be described as a self-management strategy. This makes it difficult to relate the results to existing studies.

They data used in this chapter is self-reported survey data, collected via face to face interviews. As gambling is a very sensitive topic, it might be possible that, due to social desirability, not all respondents answered truthfully. Misinterpretations of individual items cannot be completely ruled out either. This could bias the data base. To avoid this as much as possible, pre-tests were conducted in advance and the design was adapted thereupon. Trained interviewers were then commissioned to carry out the field research. As the focus of the survey was not on limits, but on digital behavior, there are potentially interesting variables that are missing. For example, there is no information about the level of the limit or how often it is breached.

As mentioned before, the study is the first one to also examine self-efficacy, albeit in an admittedly restricted way. Although the results are interesting, there is a need for more elaborate research here, since self-efficacy is far more complex and equipped with more facets than could be grasped with the underlying survey. Additionally, the sample of the study is representative for one group of customers that is highly relevant but also specific. Conversely, this means that not all arcade gamblers are considered. Those who prefer smaller venues operated by single owners have not been targeted with the survey. That is unfortunate in the sense that so far only little is known about this group. It can be assumed that it differs systematically from the one examined in Chapter 4, especially in terms of socio-demographic characteristics. This means that the impact of limits might differ for those gamblers. As a more exhaustive and generally valid consideration of arcade gamblers is desirable, future

research should focus on using an instrument tailored to the limit context and try to generate a more complete and representative sample.

The main recommendation for action regarding limits is to establish a formalized and centralized pre-commitment system for EGMs in Germany. This could be also linked to the comprehensive exclusion system. As the results show, a big fraction of gamblers is already using limits as a self-management strategy. They could, however, still benefit from the features that are entailed by a formalized scheme. Monitoring options can help to keep track over time and money spent, if limits were non-exceedable it would be easier to adhere to them. Additionally, an account-based system using player cards can solve the problem of data generation, as there are many possible gambling behavior parameters that could be observed and used for research. Considering the design of the program, more research specifically for the German context is needed. Generally, it is effective to provide a certain degree of flexibility for the gamblers. The more rigid a program is, the more dissuasive it can be. Furthermore, even though time limits usually have lower utilization rates, they should not be neglected as they can strongly complement the monetary limits.

This thesis shows, that pre-commitment tools represent a frequently used means of prevention for gamblers. When considering the situation in Germany, it can be concluded that there exists a good basis in the case of exclusions. Nevertheless, there is room for improvement. Limit setting, on the other hand, is still at the very beginning. The presented results are promising and might serve as a starting point for future action.

In general, there is a need for more extensive research dealing explicitly with German gamblers. Findings from other countries can be used as references but legal and societal environments differ. To name only one example, there is the aforementioned differentiation between casinos and arcades, which is not as common in many other countries. Country-specific results are therefore indispensable in order to not only improve the existing pre-commitment tools, but also to expand them tailored to the environment prevailing in Germany.

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