

Evaluation of the Pathologic Potential of Gambling Products

1 Problem

In discussions of gambling addiction to specific games, the market size and the proceeds generated by the game are usually disregarded. Inclusion of these parameters results in a relativization of the picture of gambling addiction. A fundamental principle for such an analysis is the separation between absolute numbers and ratios, which is a common procedure in economic contexts.¹

Absolute numbers comprise individual values, sums, differences and means. They are unrelated to any other value. Their significance is limited because they state the facts in a purely absolute and isolated way. Examples with reference to gambling and pathological gambling are:

- Gross proceeds in billion €, or
- Number of pathological gamblers.

Ratios are percentages, relative frequencies or indices (Table 1).

Numerator is... of the denominator	Numerator and denominator are	
	of the same kind	of different kinds
part	Relative frequencies ²	-
not part	Index number ³	Relative number ⁴

Table 1: Types of ratios⁵

¹ Exemplary uses: absolute and relative costs, profit shares, or terms such as absolute and relative poverty.

² Examples from economics are market shares (sales, profit shares), unemployment rates (unemployed persons related to labour force), and federal, state and local shares of a country's total debt.

³ The best-known indices refer to comparisons of economic facts at different times or different periods, e.g. of sales, prices, unemployment rates, stock indices, or gross domestic products.

⁴ Examples from economics are income per capita or gross domestic product per capita. These numbers relate absolute numbers such as the GDP to the population, making possible, for instance, reasonable comparisons of regions with different populations. Other examples are productivity indicators or profitability indicators.

⁵ Rößler, I., Ungerer, A. (2008): Statistik für Wirtschaftswissenschaftler, Heidelberg, p. 193.

Ratios are often more expressive than absolute numbers, because they allow a comparison, i.e. the statement of a relation:

- Relative frequencies: The observed number is divided by the reference number, which is expressed in the same unit (e.g. turnover for a type of game [in €] / total turnover in gambling [in €]).
- Relative numbers: Two mutually non-subordinate parameters of different types that have a common point of reference (e.g. sales [in €] / number of pathological gamblers [in heads]).
- Indices: A relation is made between two coordinated parameters of the same type with only one distinguishing characteristic (e.g. sales of game type 1 [in €] / sales of game type 2 [in €]).

Having equal units in the numerator and the denominator, both indices and relative frequencies are dimensionless by definition (Table 2).

	Ratios		
	Relative frequencies	Relative numbers	Indices
Meaning	Quotient of two measures that relates a statistical subpopulation to the total population. ⁶	Quotient of different measures.	Quotient of equivalent, mutually non-subordinate parameters that differ in factual, local or temporal respect.
Purpose	For the structural description of a statistical population.	For the analysis of different statistical populations.	For comparative purposes.
Properties	Standardized, dimensionless (sometimes in per cent or per mill).	Non-standardized, dimension given as quotient.	Non-standardized, dimensionless.

Table 2: Meaning, purpose and properties of ratios

The interpretation of ratios is subject to some restrictions. No causality can be inferred from relative numbers, e.g.:

$$\text{Cancer risk of smokers} = \frac{\text{number of cancer cases}}{\text{number of smokers}}$$

The ratio does not provide the logical basis for excluding the possibility that all cancer patients were nonsmokers. The numbers of cancer patients and of smokers may have been established independently, e.g. the former on the basis of health insurance data and the latter by sampling and subsequent extrapolation to the general population. The two global measures may have been linked only afterwards, whereas the observations were actually independent. The connexions "Person x

⁶ In a breakdown, if all categories are mentioned, the list is preceded by "of which", else by "including", e.g.: Six million automobiles were produced, of which five million passenger cars and one million trucks. There are several car producers, including VW (1.2 million), Daimler (1 million), BMW (0.5 million).

smokes and has cancer” and “Person y does not smoke and has no cancer” would be impossible to make. Assumptions of causal relationships are, however, often the reason for calculating ratios.⁷

Many of the available studies dealing with gambling in the Federal Republic of Germany show only absolute numbers of pathological gambling (number of pathological gamblers / total of gamblers in the sector under consideration). The number of gamblers alone, however, is no basis to infer the potential for pathological gambling behaviour. Nonetheless, the intensity of gambling and the profit generated by each of the gambling products or forms is not considered in the predominant studies.

A relative analysis yielding a numerical expression of the pathologic potential therefore appears necessary. Such an analysis is subject to various restrictions in the context of available studies and market analyses:

- Surprisingly there are no statistically clear absolute and relative numbers of pathological gamblers and their prevalence in specific forms of gambling. There are, however, data from representative polls concerning the participation in gambling as well as gambling problems and their determinants.
- Attention must be paid to the fact that a reliable clear-cut assignment of gambling problems to types of gambling is hardly possible because persons may engage in multiple gambling.⁸
- Analyses of the gambling market differ according to such indicators as profit and gross gaming revenues. Some analyses also include “grey markets”.

These restrictions need to be considered. Nevertheless, an exemplary analysis of the pathologic potential of gambling products seems to be a useful extension of previous analyses.

This analysis consists of the following components:

$$\frac{\text{Percentage of pathological gamblers in a game type [in \%]}}{\text{Market share of this game type [in \%]}}$$

or:

$$\frac{\text{Number of pathological gamblers in a game type [in heads]}}{\text{Total of pathological gamblers in the whole market [in heads]}}$$

$$\frac{\text{Revenues generated by the game type under examination [in €]}}{\text{Revenues generated by the whole market [in €]}}$$

⁷ Kromrey, H. (2006): Empirische Sozialforschung, 11th edition, Stuttgart, p. 471 f.

⁸ Buth, S., Stöver, H. (2008): Glücksspielteilnahme und Glücksspielprobleme in Deutschland: Ergebnisse einer bundesweiten Repräsentativbefragung, in: Suchttherapie, Vol. 9, p. 3 – 11.

2 Pathologic potential coefficients

Before the pathologic potential can be analyzed – with potential being understood in the context of an “exhausted dimension” – it is necessary to establish and define the reference parameters.

Determining the pathologic potential of a specific form of gambling on the basis of prevalence rates is not useful. The prevalence of gambling is only indicative of the percentage of persons who were or were not active in a game within a defined period.⁹ A more useful basis for the analysis of the pathologic potential seems to be the population risk (prevalence of pathological gambling, as calculated on the adult population). In such an analysis, both the attractiveness in the population (gambling behaviour) and the gambling risk¹⁰ are considered.

Definition: “Population risk” is the risk of a “Pathological gambling” (PG) diagnosis according to DSM-IV for persons who preferred a certain game in the past 12 months, expressed as a game-specific percentage of current gamblers with a PG diagnosis in the population.

If, for instance, the pathological gambling risk is rather low, but many people engage in the game, the population risk may well be relevant (in Germany this is true, for instance, for lotto).¹¹

This reference parameter appears plausible also in so far as the market volume of a gambling product is generated not only by pathological gamblers, but mostly by occasional, i.e. normal gamblers. The reference parameter used must therefore include all types of gamblers.

Information on the population risk is found in Bühringer et al. (Table 3).

Extrapolation of the affected gamblers to the adult population shows that about 12,000 persons (potential size) in the lotto group show pathological gambling, while this is the case in about 31,300 persons (potential size) engaging in slot machine gambling. The number of affected people would be 16,900 persons for online games – Internet bets and Internet card games – and 18,800 persons for casinos (games of chance, slot machines).

⁹ BZgA (2010); Glücksspielverhalten in Deutschland 2007 und 2009. Results of two representative samplings, p. 33.

¹⁰ Gambling risk: DSM IV TR diagnoses, as related to a preferred game, on the basis of persons wagering an amount of 50 € or more a month.

¹¹ IFT Institut für Therapieforschung (2009): Comment on the motion of the parliamentary group BÜNDNIS 90/DIE GRÜNEN titled: „Prävention der Glücksspielsucht stärken“ – Document of the Federal Parliament 16/11661; <http://www.spielv.de/vdai/bundestag-anhoerungen-2009-127-stllg-ift.pdf>, p. 3.

Type of game	Population risk ¹² pathological - in % -	Calculated on the adult population (52,010,517)	In % - calculated on all gamblers with PG diagnosis
Lotto/football pool/keno	0.024	12,241	11.9
Lotteries	0.000	-	-
Sports betting, of which	0.046	23,765	23.1
▪ Lottery offices	0.027	13,899	13.5
▪ Internet	0.019	9,865	9.6
Casino ¹³ , of which	0.050	25,848	25.1
▪ Games of chance, slot machines	0.036	18,805	18.3
▪ Internet card games	0.014	7,042	6.8
Slot machines	0.060	31,304	30.4
Other	0.018	9,675	9.5
All gamblers with PG diagnosis	0.198	102,833	100

Table 3: Population risk of gambling products¹⁴

These figures must be related to the economic importance of each type of gambling products. Possible reference parameters are the revenues/turnover and specifically the gross gaming revenues. Especially for games with high gambling frequencies (e.g. casinos, slot machines), the gross gaming revenues are often reported as “turnover”.¹⁵ The high frequency results in a constant circle of winnings and losses.

The money being wagered again and again generates a high turnover as well as a high stake per gambler. The gross gaming revenues¹⁶ of lottery products are likewise calculated by subtracting the amounts paid out from the money wagered. For many analyses, the gross gaming revenues are therefore the appropriate parameter in the gambling business (Table 4).

¹² Prevalence of the preferred game (12 months) and gambling risk of the preferred games.

¹³ Including Internet casino and Internet card games.

¹⁴ Bühringer, G. et al. (2007): Pathologisches Glücksspiel in Deutschland: Spiel- und Bevölkerungsrisiken, in: Sucht: Zeitschrift für Wissenschaft und Praxis, 53(5), p. 296 – 307.

¹⁵ The gross gaming revenues are the difference between the participants’ stakes and their winnings.

¹⁶ The gross gaming revenues are often shown in the statistics of gambling companies.

Gross gaming revenues (2008 – 2010)	2008	2009	2010
Slot machines	3.37	3.70	3.94
Casinos	0.7226	0.6176	0.556
German “Lotto- und Totoblock”	3.396	3.50	3.25
Class lotteries	0.37	0.273	0.227
Television lotteries	0.473	0.473	0.448
“PS-Sparen”/“Gewinnsparen” (savings-linked lotteries)	0.14	0.141	0.143
Betting on horse	0.016	0.0165	0.0145
Online games	0.25	0.45	0.8
TOTAL	8.74	9.17	9.38

Table 4: Gross gaming revenues in the gambling market in Germany 2008 – 2010 in billion €¹⁷

Below, suitable pathologic potential coefficients are calculated on the basis of the gross gaming revenues of 2008 (Table 5). The year 2008 is chosen in order to be as close as possible to the results of Bühringer’s study of the population risks of gambling products.

Gross gaming revenues	2008 in billion €	Percentage - rounded
Slot machines	3.37	38.56
Casinos	0.7226	8.27
German “Lotto- and Totoblock”	3.396	38.86
Class lotteries	0.37	4.23
Television lotteries	0.473	5.41
“PS-Sparen”/“Gewinnsparen” (savings-linked lotteries)	0.14	1.6
Betting on horse	0.016	0.18
Online games	0.25	2.86
TOTAL	8.74	100

Table 5: Specific forms of gambling as percentages of the gross gaming revenues of 2008

¹⁷ Sources: Archives and information bureau of the lotto and football pool companies; Stiftung Warentest; our own calculations.

An analysis based on the calculation of pathologic potential coefficients relativizes the picture of the gambling market (Table 6).

	Type of game	Market shares in %	In % - calculated on all gamblers with PG diagnosis (2007)	Pathologic Potential Coefficient ¹⁸
1	Lotto/football pool/keno	38.86 ¹⁹	11.9	0.31
2	Casinos ²⁰	8.27	18.3	2.21
3	Slot machines	38.56	30.4	0.79
4	Online games ²¹	2.86	16.4	5.73
5	Other ²²	11.45	23.0	2.01
Σ	Total	100.0	100.0	-

Table 6: Pathologic potential coefficients

The following results can be deduced:

- Lotto/football pool/keno: 1% market share – calculated on the annual gross gaming revenues (2008) – binds 0.3062%, on the average, of all gamblers with a PG diagnosis in Germany.
- Casinos: 1% market share – calculated on the annual gross gaming revenues (2008) – binds 2.2128%, on the average, of all gamblers with a PG diagnosis in Germany.
- Slot machines: 1% market share – calculated on the annual gross gaming revenues (2008) – binds 0.7884%, on the average, of all gamblers with a PG diagnosis in Germany.
- Online games: 1% market share – calculated on the annual gross gaming revenues (2008) – binds 5.7343%, on the average, of all gamblers with a PG diagnosis in Germany.
- Other: 1% market share – calculated on the annual gross gaming revenues (2008) – binds 2.0087%, on the average, of all gamblers with a PG diagnosis in Germany.

A certain degree of uncertainty exists especially for online gambling, since no reliable statistics of the gross gaming revenues in this sector are available for the time being. The estimate presented here is likely to be rather low.

¹⁸ Percentage of pathological gamblers / market share.

¹⁹ 3.396 billion € / 8.74 billion €.

²⁰ Games of chance plus slot machines.

²¹ Internet sports betting, Internet card games.

²² Including sports betting (lottery offices), class lotteries.

These results can also be interpreted in monetary units (Table 7).

	Type of game	Pathologic potential coefficient	1	Revenues per one percent of pathological gamblers (rounded values) ²⁴
			Pathologic potential coefficient ²³	
1	Lotto/football pool/keno	0.3062	3.2658	285 million €
2	Casinos ²⁵	2.2128	0.4519	39 million €
3	Slot machines	0.7884	1.2684	111 million €
4	Online games ²⁶	5.7343	0.1744	15 million €
5	Other ²⁷	2.0087	0.4978	44 million €

Table 7: Monetary interpretation of the pathologic potential coefficients (I)

In this view, the gross gaming revenues are related to the percentage of pathological gamblers.

- Lotto/football pool/keno: $8,740,000 \text{ €} \cdot 3.2655 : 100$: Every 285 million € of gross gaming revenues binds 1 % of pathological gamblers.
- Casinos: $8,740,000 \text{ €} \cdot 0.4519 : 100$: Every 39 million € of gross gaming revenues binds 1 % of pathological gamblers.
- Slot machines: $8,740,000 \text{ €} \cdot 1.2684 : 100$: Every 111 million € of gross gaming revenues binds 1 % of pathological gamblers.
- Online games: $8,740,000 \text{ €} \cdot 0.1744 : 100$: Every 15 million € of gross gaming revenues binds 1 % of pathological gamblers.
- Other: $8,740,000 \text{ €} \cdot 0.4978 : 100$: Every 44 million € of gross gaming revenues binds 1 % of pathological gamblers.

When for ease of understanding, these results are standardized to the percentage of pathological gamblers per 100 million € of gross gaming revenues, the types of gambling examined here show the following picture (Table 8):

²³ Market share / percentage of pathological gamblers.

²⁴ 1 / Pathologic potential coefficient · gross gaming revenues total : 100 [€].

²⁵ Games of chance plus slot machines.

²⁶ Internet sports betting, Internet card games.

²⁷ Including sports betting (lottery offices), class lotteries.

	Type of game	Pathologic potential coefficient	Revenues per one percent of pathological gamblers (rounded values) ²⁸	Percentage of pathological gamblers per 100 million € of gross gaming revenues
1	Lotto/football pool/keno	0.3062	285 million €	0.35
2	Casinos ²⁹	2.2128	39 million €	2.56
3	Slot machines	0.7884	111 million €	0.90
4	Online games ³⁰	5.7343	15 million €	6.67
5	Other ³¹	2.0087	44 million €	2.27

Table 8: Monetary interpretation of the pathologic potential coefficients (II)

The relative distribution of pathological gambler binding in the Federal Republic of Germany is thus as follows:³²

- Lotto/football pool/keno: Every 100 million € of gross gaming revenues binds 0.35% of pathological gamblers.
- Casinos: Every 100 million € of gross gaming revenues binds 2.56% of pathological gamblers.
- Slot machines: Every 100 million € of gross gaming revenues binds 0.90% of pathological gamblers.
- Online games: Every 100 million € of gross gaming revenues binds 6.67% of pathological gamblers.
- Other: Every 100 million € of gross gaming revenues binds 2.27% of pathological gamblers.

Missing data result in a certain degree of uncertainty in this view, too, especially as far as the online games sector is concerned. This does not affect the basic tendency of the results, though.

²⁸ 1 / Pathologic potential coefficient · gross gaming revenues total : 100 [€].

²⁹ Games of chance plus slot machines.

³⁰ Internet sports betting, Internet card games.

³¹ Including sports betting (lottery offices), class lotteries.

³² Data taken from: Bühringer, G. et.al. (2007): Pathologisches Glücksspiel in Deutschland: Spiel- und Bevölkerungsrisiken, in: Sucht: Zeitschrift für Wissenschaft und Praxis, 53(5), p. 296 – 307.

3 Conclusions

Data on the numbers of pathological gamblers (population risk) per type of game can be related to the intensity of gambling and the resulting gross gaming revenues seen with the respective gambling products. This relative approach yields an index that is termed pathologic potential coefficient here.

The present analysis suggests that the current view of the pathologic potentials of the predominant types of gambling may be completely wrong as far as their relative importance is concerned. A figure often coming up in discussions is, for instance, that up to 80 % of all pathological gamblers are recruited in the sector of commercial instant money games. The figures for slot machines show, however, that 1 % of the market share calculated on the gross gaming revenues binds 0.7884 % of all pathological gamblers in Germany. This means in a monetary interpretation that 0.9 % of the pathological gamblers are bound by every 100 million € of the gross gaming revenues generated by slot machines. The figures obtained for casinos and especially online games are markedly higher in part so that slot machines appear to be substantially less harmful under this aspect. Some forms of games including betting on horse or poker – in particular online poker – are disregarded in this analysis because the available data are insufficient.

In conclusion, the analysis shows that further research is necessary:

- There is no statistically unambiguous data about the absolute and relative numbers of pathological gamblers / their frequencies in specific types of gambling.
- Statistical data of the gambling market differ by indicators such as revenues/turnover or gross gaming revenues. A segment that needs to be taken into account is online gambling, which has markedly grown in recent years.

The aforesaid limitations need to be considered. Expanding earlier analyses by exemplary examinations of the pathologic potential seems useful and necessary nevertheless.