Study on online gambling and adequate measures for the protection of consumers of gambling services

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C. Codagnone, F. Bogliacino, A. Ivchenko, G. Veltri, G. Gaskell

Client:

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The Consumer, Health and Food Executive Agency (CHAFEA)

12, Rue Guillaume Kroll

L-1822 Luxembourg

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Client Contact:

Cristiano Codagnone

MediaTic, Roc Boronat 117

08018 Barcelona – Spain

Tel: +34934505351

Mob: +34676837591

Consortium LSE & Partner:

London School of Economics

Tech4i2 Limited

Block de Ideas

Universitat Oberta de Catalunya

Authors:

C. Codagnone, F. Bogliacino, A. Ivchenko, G. Veltri

Approved by:

G. Gaskell, LSE

Date:

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Signed:

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Executive Summary

I. Objectives and theoretical grounding

The main objective of the study was to assess the behavioural response of consumers of online gambling services to protective measures tested in experimental settings. The measures tested in two behavioural experiments included: a) measures that exist in some Member States and/or are adopted by some of the online gambling operators (hereafter 'existing measures' such as for instance warnings about the risks of addiction, the logo of the national information provider, etc.); b) new measures that could be introduced in the future (such as for instance fixed or self-defined monetary limits and various forms of pop up alerts). While online gambling is cross-border by nature, consumers' protective measures are fragmented across Member States, there are no common EU level measures, and not all consumers and citizens may be sufficiently protected across the EU. An objective of the Commission is to work with Member States to achieve a common set of measures that: a) ensure the general protection of consumers and b) deter the emergence of problem gambling. This study was launched in light of the lack of evidence on the effectiveness or adequacy of existing measures that are intended to protect online consumers.

The behavioural approach to policy is very salient in the domain of gambling where the big research and policy questions are: *"Why so many individuals keep playing even in the face of steady losses that, in the case of problematic gamblers, can ruin their lives?"; "Given the low probability of winning, shouldn't prolonged play be aversive and rare?"* One kind of answer to such questions is embedded into the behavioural analysis of heuristics and biases. Players of online gambling services may suffer from classical gambling biases analysed and documented by behavioural scholars such as for instance: the 'gamblers' fallacy' (Tversky & Kahneman, 1971); 'near-miss' (Dixon et al., 2013; Reid, 1986) related to frustration and regret (Harrigan, 2008; Reith, 2003); 'overconfidence' (Alpert & Raiffa, 1982; Fischhoff et al., 1977; Goodie, 2005); 'illusion of control' (Langer, 1975; Thompson et al., 1998), the 'self-attribution bias' (Gilovich, 1983; Gilovich & Douglas, 1986); 'personalisation of outcomes' (Delfabbro & Winefeld, 2000; Griffiths, 1995); hot and cold streaks (Gilovich et al., 1985); chasing losses(Kahneman & Tversky, 1979; Karlsen, 2011; Staw, 1976). On the other hand, different kind of answers to why gamblers keep gambling and losing are provided by a multidisciplinary literature that, rather than focussing only on individual characteristics and cognitive processes,

consider as crucial the dimension of human-machine interaction (Abbott, 2007; Brown, 1989; Dowling, et al., 2005; Fisher, 1993; Fogg, 2002, 2003; Griffiths, 1999, 2002, 2003; Hardoon & Derevensky, 2001; Jacobs, 1986; Johansson & Gotestam, 2004; King et al., 2010; Schüll, 2012; Selnow, 1984; Shaffer, 1996; Shaffer & Kidman, 2003).

The protective measures that were tested in the two experiments are grounded in these two approaches. Some measures such as for instance the pictorial and textual warnings aimed just at individual biases and heuristics to deactivate impulsive hot cognition to activate slow and accurate thinking (Petty & Cacioppo, 1986; Streff & Geller, 1988). Others such as the monetary limits and pop-up alerts aimed both at altering the 'human-machine interaction' and at inducing heuristics such 'mental accounting and house money' (Thaler, 1985; Thaler & Johnson, 1990) that can stop fast spinning and lead individuals to think about the money they are spending.

II. Design, response variables, and analysis

II.1 Design

The two experiments, one in laboratory settings and one conducted online were designed as randomised control trials with treatment and control groups. In both experiments subjects were randomly allocated to either play a gamble and being exposed to some of the protective measures (treated group) or to just gamble without exposition to any protective measures (control group). The effectiveness of the measures was assessed using a multidimensional set of response variables (see II.2). A website and two types of online gambles were programmed and designed – a slot machine and a roulette wheel. The website closely reproduced the gaming sites and the conditions offered by online gambling operators. These two types of online gambles were chosen only for technical reasons related to the characteristics of the experiments and to maximise comparability across countries. They were not chosen because they are deemed or demonstrated as being more or less addictive than other types of gambles.

In the design '**pre-gamble**' and '**in-gamble**' protective measures were clearly distinguished so as to mirror realistically the different stages at which consumers of online gambling services may be exposed to them. When consumers first go on a gambling website and when they are offered to trial sessions for free they are typically exposed to 'pre-gamble measures'. For instance the logo of the national information provider with an indication of a helpline could appear at that stage. Once consumers proceed to the real gamble they can be exposed to 'in-gamble' measures. These include many of the protective measures that were tested, such as monetary limits.

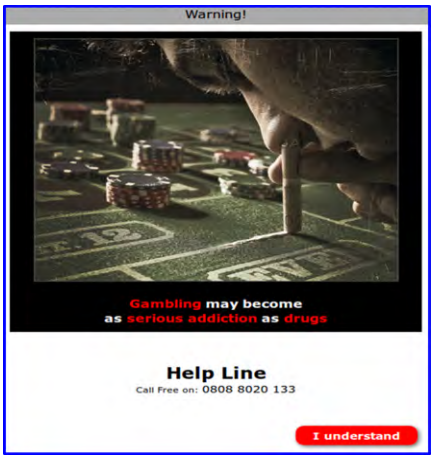
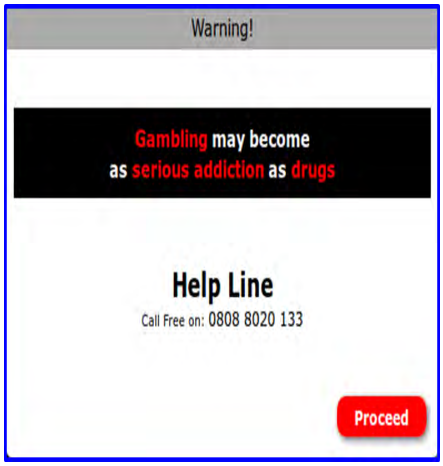
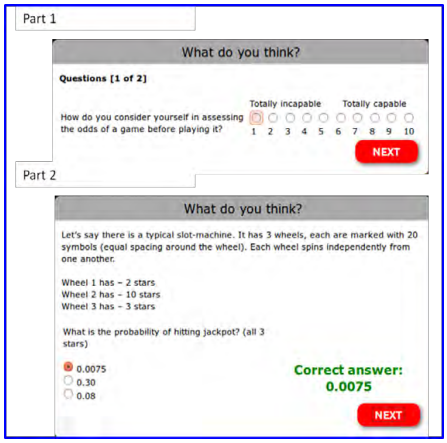
- **Laboratory experiment (hereafter simply 'LAB')**. A laboratory experiment was conducted between September-October 2013 at the London School of Economics (LSE) in the Behavioural Research Laboratory to test both 'pre-gamble' and 'in gamble' measures. A convenience sample of 522 subjects (which yielded 81.4% participants with previous gambling experience and 18.6% with no previous gambling experience) recruited from LSE

Behavioural Research Lab panel. For the sake of ecological validity (realism) subjects were given real money performance related incentives. They could gain more than the usual basic bonus that is paid in any laboratory experiment and they could also lose is if they decided to play longer;

- **Online experiment (hereafter simply 'ONLINE')**. A multi-country (7 countries: Estonia, France, Germany, Italy, Spain, Sweden, United Kingdom) online experiment was conducted between October-November 2013 to test the 'pre-gamble' measures and how subjects reacted to some of these measures (especially the registration process). A simple random sample of 5997 subjects (about 850 per country) was drawn that is representative of the general Internet population of each country. No quota was imposed *ex ante* on previous gambling experience (*ex post* the sample split is: 91.4% had a least a previous gambling experience 8.6%% had never gambled in their life).

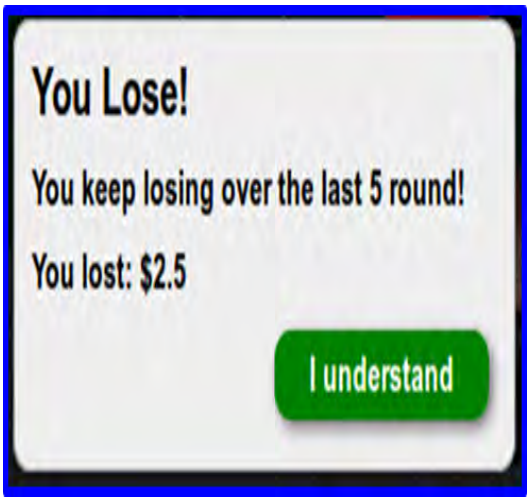
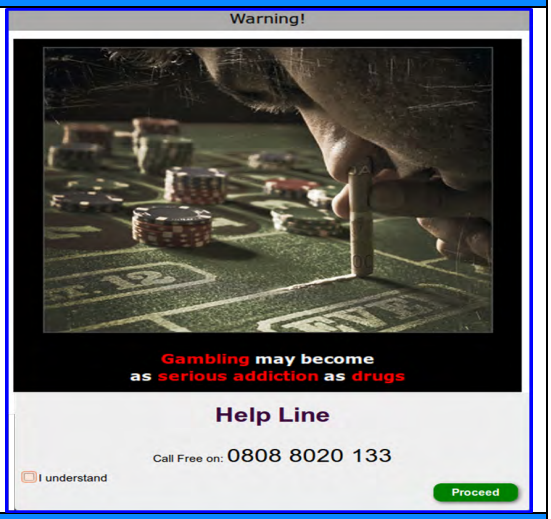
The next tables provide screenshots of the tested measure and show what subjects saw during the experiments.

Screenshots of treatments (1/3)

<table>
<tr><th>Pop up pictorial warning (LAB & ONLINE*)</th><th>Pop-up textual warning (LAB & ONLINE*)</th></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><th>Over confidence task (LAB & ONLINE*)</th><th>Small Logo (LAB & ONLINE*)</th></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

(*) For online same concept but adapted to countries (translation, logo, helpline number)

Screenshots of treatments (2/3)

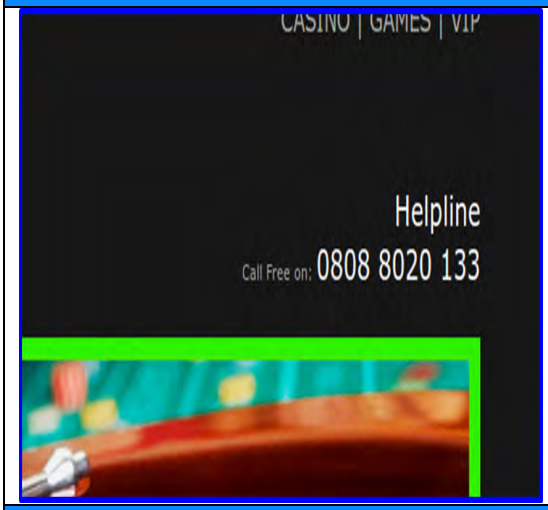
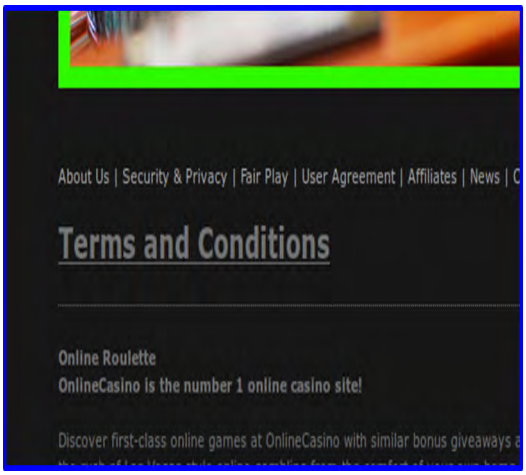
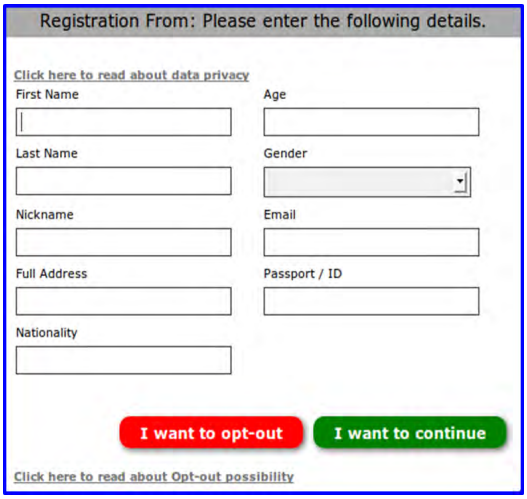
Example of feed back (LAB *)	Pop up pictorial warning 2 (LAB **)
	
Pop up textual warning 2 (LAB **)	**Larger/contrast logo/banner (ONLINE ***)**
	

(*) This is just one example of the feedback alerts shown (other are variations of this)

(**) Warnings with check box to tick and button proceed to push (LAB in gamble step 2)

(***) Adapted to countries (translation, logo, helpline number)

Screenshots of treatments (3/3)

Helpline only (ONLINE*)	Terms & Conditions (ONLINE**)
	
Standard registration form (ONLINE*)	**Extended registration form (ONLINE*)**
	

(*) Adapted to countries (translation, logo, helpline number)

(**) Could be clicked and information popped up (adapted to countries)

II.2 Response variables

In this experimental behavioural study the key and most important response variables were those that recorded subjects actual behaviour when playing the two gambles: time and amount of money per bet. Other self-reported response variables were also measured through post-treatment questionnaire, but were considered complementary and of secondary importance. The most important measures to ascertain whether a measure was a effective was the extent to which it reduced the amount subject bet in each spin of the two gambles and/or increased the time it took them before betting. Self-reported variables used consolidated psychometric scales to measure cognitive, emotional, and international responses. For instance, the subjects were posed the following question: "*Thinking about the*

game you have just played, please indicate to what extent when encountering information regarding gambling you would be willing to stop and think about it" (possible answers from 1 "not at all"-to 5 "Extremely"). This variable is called 'cognitive processing' (or also depth of processing). These and other self-reported measures are not obtained through observation of a concrete behaviour and the answers subjects provide to the questions may either not capture unconscious elements or be shaped by unconscious affective mechanisms. Hence, for emotional, cognitive, and conative reactions self-reported measures are the only resort, but being aware of their limits in a behavioural study the key measures are 'behavioural variables'.

II.3 Analysis performed

The effectiveness of a given treatment was obtained by comparing how it affected a response variable for the subjects who were exposed to it (treated group) and for those not exposed (control groups). For instance, monetary limits were deemed effective if the subjects exposed to it bet less money per spin compared to the subject in the control groups (who just played with no monetary limits). In more technical terms the treatment effects were recovered through regression analysis. The treatment effect, in fact, corresponds to the difference in means between participants exposed to the treatment (i.e. monetary limits) and participants exposed to the control condition (i.e. playing with no monetary limits) with respect to any given response variable. Randomized controlled trials ensure that differences in means between the treated and the control groups is a consistent estimator of the causal effect. Econometrically, the latter difference in means is equivalent to running a regression in which the dependent variable is the response variable, and the independent variables are dummies, equal to one if the subject has been exposed to the treatment. The omitted category is the control condition. The 'b' coefficient estimated by the regression analysis is equal to the treatment effect or the difference in mean of a given response variable 'y' for those exposed to treatment and those exposed to control. In order to estimate the treatment effects OLS (ordinary least square) regressions were run or other specifications when required by the type of scale measuring the response variables. Robustness checks that corroborated the results of the OLS regressions were performed. In all regressions for both experiments control for all socio-demographic variables, for the different type of gambles played, and in the ONLINE also for country effect were performed. It is, therefore, very important that to stress that the results presented r hold, regardless of the socio-demographic profiles of the subjects, and regardless of the country. All these variables are controlled for.

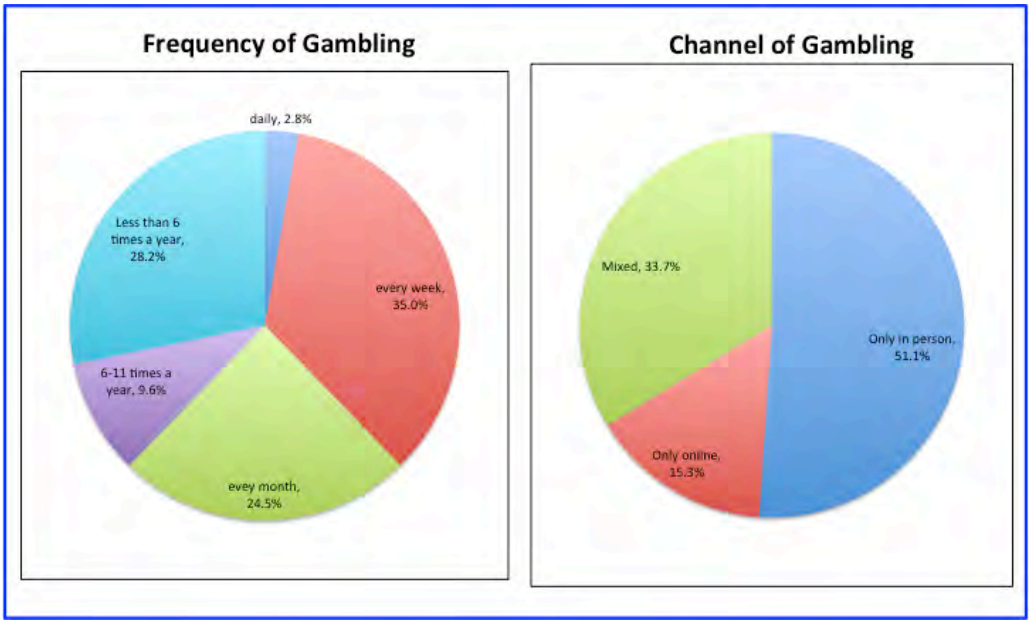
III. Findings

III.1 Main descriptive findings of the online experiment

The more meaningful and interesting descriptive findings to report and comment are those of the ONLINE, since the sample was drawn randomly and is representative of the general Internet population in seven opportunely selected EU countries. Only 8.6% of the respondents had never gambled (either online or offline). The sample includes a relatively large proportion

of individuals who gamble with some regularity and even 2.9% of very regular gamblers (playing every day). The sample confirm what is known from other surveys: there is not a clear-cut distinction between those who gamble only off line and those who gamble only online; there is a sizable proportion of individuals who do both (33.7%). A total of 15.3% are online gamblers only, which is in the range reported in other surveys.

Frequency & channel: ONLINE sample



Finally, the contingency table reported below documents unequivocally a statistically significant relation existing between frequency of gambling and preferred channel.

Gambling Frequency and preferred channel: ONLINE sample

Channel / Frequency	In-Person (A)	Online (B)	Mixed (C)	Total by row
Every day (1)	30	40	82	152
2-3 days a week (2)	144	131	333	608
About once a week (3)	526	230	554	1310
2-3 days a month (4)	277	107	240	624
About once a month (5)	380	115	225	720
6-11 times a year (6)	301	62	161	524
Less than 6 times a year (7)	1142	151	252	1545
Total by column	2800	836	1847	5483[1]

The table contains absolute values by column and by row so that the readers can make their own re-elaboration such as for instance that in the next table were both frequency and channel are reclassified.

[1] The total sample was 5997 individuals, of which 514 (that is 0.085709%, or about 8.6%) answered they had never gambled even once in their life. The questions producing table 1 were not asked to these respondents. Hence, the total base for table 1 is 5483.

Frequency & channel profiles: our sample (online experiment)

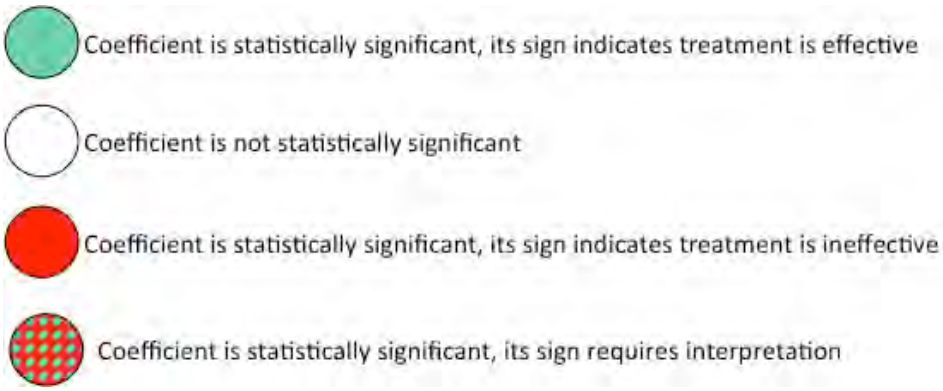
Channel / Frequency	In-Person (A)	Online/Mixed (B+C)	Total by row
Regular (1+2)	22.9%	77.1%	100.0%
Intermediate (3+4)	41.5%	58.5%	100.0%
Occasional (5+6+7)	65.4%	34.6%	100.0%

Source: re-elaboration of data in previous table

Respondents reporting that they play every day or at least 2-3 times a week, in 22.9% of cases also reported that they play only in person, whereas in 77.1% of the cases they reported that either the play only online or that they play both online and off line The picture with respect to channel preference is exactly the opposite if we consider the answers of those respondents reporting that they play much more rarely (once a month, 6-11 times a year, less than 6 times a year). It is important to stress that the ANOVA and chi-square test performed are statistically significant. This means that these results are not merely descriptive, but rather that there is a clear relation between frequency of gambling and preferred channel that deserve being further explored in future studies: regulars gamblers seem to play more online than occasional ones.

III.2 Laboratory experiment findings

The following graphical notation is used to report in more intuitive fashion the key results of the regression analysis performed for both the LAB and the ONLINE.



What does not work? In brief almost none of the pre-gamble treatments seem to work as almost no statistically significant effects are detected either in terms of reducing amount and speed of betting or in terms of cognitive and emotional responses. Only the 'over-confidence task' has a significant effect on just one emotional variable. In the case of the logo treatment with regard to cognitive recall negative effects are actually found meaning that the treatment is less effective than the control condition.

What works? The table considers the effects on behavioural variables of the combination of monetary limits and alerts.

LAB synoptic table in-gamble: limits and alerts, bet and time

	Full sample Bet per spin	Gamblers Bet per spin	Full sample Time per spin	Full sample Time per spin
Fixed limits, push feedback	●	●	●	●
Fixed limits, pull feedback	○	●	○	○
Fixed limits, lose feedback	●	●	●	●
Self defined limits, push feedback	●	●	●	●
Self defined limits, pull feedback	●	●	○	○
Self defined limits, lose feedback	●	●	●	●

As clearly visible, a very 'green' picture appears indicating several statistically significant and effective results. Four combinations work systematically across both amount and time per bet irrespective of the sample considered these are: fixed limits with push feedback; fixed limits with push feedback 'you lose'; self-defined limit with push feedback; self-defined limit with push feedback 'you lose'. When the feedback is in 'pull' form it seems that the effectiveness is only slightly decreased. With respect to the scales used most of the coefficients are of a sizeable dimensions, and for all treatments the R2 is acceptable and in some case substantial.

What requires interpretation? Looking at the emotional reactions to the combination of limits and alerts many statistically not significant results are found but there are also several green/red circles suggesting the need of interpretation. One example is provided for the PANAS (Positive and Negative Affect Scale). It can be observed that subjects exposed to a few treatment report more positive emotions and feelings than the control group. Here there are three possible interpretations: a) the confounding effect of gambling (it is a gaming activity and there is the 'human-machine' interaction effect) make subject enjoy the experience; b) some treatments are reassuring (limits are fixed, I am reminded how I am doing) and neutralise any possible worry or anxiety; c) because of the confounding effect of gambling and of the self-reported nature of the variables these findings should be taken with care and lead to suspend judgement.

LAB synoptic table in-gamble: PANAS scale, limits and alerts average response

	Full sample Positive affect	Gamblers Positive affect	Full sample Negative affect	Full sample Negative affect
Fixed limits, push feedback	◉	◉	○	○
Fixed limits, pull feedback	◉	◉	○	○
Fixed limits, lose feedback	○	○	○	○
Self defined limits, push feedback	◉	○	○	○
Self defined limits, pull feedback	○	○	○	●
Self defined limits, lose feedback	○	◉	○	○

III.3 Online experiment findings

Ad hoc analysis of 'opt out' option. In the online experiment the subjects, after being exposed to the treatments, were given the choice of opting-out, meaning they would not gamble, would do a filler task, and then proceed to the final post-treatment questionnaire.

ONLINE synoptic table all treatments: Opt out choice

	Intention to gamble in the future
Pictorial Warning	-.19 (.08)**
Textual Warning	-.18 (.08)**
Overconfidence	○
Logo	○
Wide Banners	○
Terms and Conditions	○
Helpline	○
Std. Registration Form	1.27 (.07)***
Ext Registration Form	1.90 (.08)***

As shown in the table above the effect is positive, very significant, and the coefficient is very large for the standard registration form and, especially, for the extended registration form. The results of the regression mean that many more people opted out after being exposed to these two treatments (and markedly more for the extended form). This difference occurs not only in comparison with the subjects in the control group but also with the subjects exposed to the other treatments. Further analysis of the participants opting-out support the interpretation that the extended registration form is discounted by the regular gamblers already familiar with online gambling, but it rather alienates the beginners or occasional consumers of online gambling services with the possible counterproductive effect of sending them off to non licensed and even illegal website.

What does not work? To a large extent no treatment seem to have statistically significant effects of the desired sign on any of the cognitive, emotional, and intentional self-reported response variables, and in some cases the treatment ingenerate more positive emotions and stronger intention to gamble in the future than it is observed for the control groups.

What works? In terms of effects on behavioural variables (amount and time per bet) there are a few but not fully systematic effective results at least in reducing betting speed (but not in reducing bet amount), as shown in the table below.

ONLINE synoptic table all treatments: amount and time per bet

	Average bet per spin	Average time per spin
Pictorial Warning	○	●
Textual Warning	○	○
Overconfidence	○	●
Logo	○	○
Wide Banners	○	○
Terms and Conditions	○	○
Helpline	○	○
Std. Registration Form	●	●
Ext Registration Form	○	○

IV. Discussion and policy implications

IV.1 Pre-gambles treatments

In general the pre-gamble treatments, both the four tested in the LAB (pictorial warning, textual warning, overconfidence, small logo) and the nine tested in the ONLINE (pictorial warning, textual warning, overconfidence, small logo, wide/contrast logo, only helpline, terms and conditions, standard registration form, extended registration form) can be deemed to be systematically not effective especially for behavioural measures and to a large extent also for the self-reported measures. In this respect no systematic evidence is found that pre-gamble treatments reduce the amount bet or slow down the rhythm of betting.

A separate mention is needed for the interpretation of the findings concerning the standard and extended registration form. In the online experiment the subjects exposed to the two registration forms and especially to the extended one opted out in much greater numbers than the control group and than all other subjects exposed to different treatments. This cannot be interpreted as an 'experimenter' effect due to the lack of performance related incentive inducing subjects to finish the experiment quicker and get away with their participation incentive. Opt-out, in fact, occurred in statistically significant larger dimension only for the two registration forms. Neither could be accepted the interpretation that is an effective treatment discouraging online gambling. The combined reading of the regression analysis and of the bivariate analysis supports the interpretation that the registration forms are potentially counterproductive measures that may lead especially new and occasional consumers of online gambling services not willing to register to flock to those websites not requesting registration (especially the extended one).

IV.2 In-gambles treatments

The findings of the laboratory experiment are unequivocal in demonstrating that monetary limits combined with alerts have fairly systematic effects in slowing down the spinning and in reducing the amount subjects choose to bet per spin. In addition, 'Self defined limits with pull feedback' also reduce the number of subjects that decided to play another session instead of finalising the experiment. Considering these measures with respect to the discussion of heuristics and biases and of ways to de-biasing them then in-gamble treatments are quite theoretically and empirically grounded. Fixed monetary limits leverage the power of the default option and the inertia effect this may have on betting decisions. This is important also in view of the fact that in the online context there is a demonstrated 'status quo' bias and people stick to default settings. Self-defined limits leverage mental accounting: individuals construct dedicated 'budgets' for specific activities keeping under control spending (Thaler 1985). All variants of alerts (push, pull, or push with 'you lose') are a practical realisation of the solutions the relevant literature suggests as ways to activate slow but accurate reasoning (Strack et al 2006; Streff & Geller 1988; Petty at al. 1986).

Moreover, the effectiveness of these measures resides also in the fact that they alter the 'human-machine' interaction. When the wallet is empty, even if refill is automatic, the subject

needs to stop playing and think about how much they have bet both with fixed and with self-defined limits. The push pop up with information about time and amount spent also disturb the 'flow in the zone' that typically captures the mind of those who gamble. The prompt to activate the pull pop up, even if the subjects do not activate it, is also a source of disturbance to the spinning rhythm. In general, it can be said that these measures go to the core of the problem, the 'human-machine' interaction, and alter/disturb/interrupt this interaction.

IV.3 Policy implications

It was beyond the mandate of this study to formulate any specific and formal policy recommendations as to which protective measures should be introduced and which should not be introduced among those that were tested. The aim of the study was to test the effectiveness of a set of consumer protective measures from a strictly experimental behavioural perspective. Effectiveness was measured above all by the extent to which the tested measures led the participants to the experiments to bet less money and more slowly. A secondary measure of effectiveness was the extent to which the protective measures tested generated in the subjects some concern about gambling, made them more aware about the risks, and influenced their intention to gamble in the future.

From the findings of the two experiments carried out it can only be inferred whether or not these effects were produced by the tested protective measures. If such effects were not produced, then the measures were deemed ineffective. Ineffectiveness does not mean, however, that the tested protective measures are harmful and does not imply they should not be used. As long as they provide consumers with some source of information it cannot be ruled out that they can be useful. It is a matter of consideration for the Commission to assess the costs and benefits of proposing or not some of these measures in light of the results of this study. Hence, only some preliminary policy implications are presented here that do not go beyond what the findings strictly show. Only in the case of the registration forms some interpretative considerations on their possible consequences are added. These interpretative considerations spring from the observation that consumers' protection can decrease if an operator website is not regulated or controlled. The risks for consumers stem in particular from operators or websites operating outside any form of control, or under lax control. Hence, consumers' protective measures may be counter-productive if due to unintended forms of over-regulation they push consumers to use the service of unregulated and non-controlled operators' sites.

Three policy implications are, thus, presented below for: a) all pre-gamble measures except standard and extended registration forms; b) standard and extended registration forms; and c) in gamble measures.

Pre-gamble measures. Pictorial warnings, textual warnings, overconfidence task, logos (in their different variants), helpline, terms and conditions were not effective in terms of reducing cognitive biases, of making consumers more aware about the risks of gambling, and of altering their behaviour (did not reduce amount bet or the speed of betting). It must be added that these findings come both from the laboratory experiment and the online experiment, which means that they are fairly robust and externally valid, thus, warranting generalizability. These pre-gamble protective measures may nonetheless serve the purpose of providing consumers with information about the operator they are playing with, about the conditions they are signing up to (e.g. pay backs of winnings, use of data provided, information about the

games/bets), a well as for enabling consumers to compare sites/prices. They are not effective from an experimental behavioural perspective, but they could still be used as a non-invasive form of consumer information, which is not harmful and for sure cannot be considered as over-regulation. Consumers may not bother to read terms and conditions or to look at logos at helpline numbers, or they may not be impressed by warnings, yet it is safe to state that these measures are not invasive for consumers can start right away to play and simply ignore them. Hence, it is part of the mandate of this study to signal their ineffectiveness from a behavioural perspective but the study provides no grounds for advising against their usage.

Registration forms. Besides being ineffective exactly as the other pre-gamble measures with regard to all the response variables, the registration forms (and in particular the extended registration form) may represent an instance of overregulation that may push consumers toward website or operators not requiring such registrations. This is the interpretation given to the findings that only the registration forms (and more so the extended one) cause a large majority of the subjects to early opt out from the experiment. If the early opt out, which occurs in systematic fashion only for this measure, is seen as a reaction of discomfort (if not of clear aversion), then it is not unreasonable to expect that consumers encountering the request of an extended registration in a regulation compliant operating website would abandon it and turn to another operating website (possibly non regulation compliant if not fully illegal). This is more important also considering that the extended registration form seems to be refused more by new and occasional consumers than by regular gamblers with experience in using the Internet channel to gamble. The latter seem not to be affected by the need to register and report positive feelings and emotions after gambling. However, the former may be inadvertently pushed to non-regulated and possibly illegal website and this is even less desirable considering these are not regular gamblers. These results come from the sample of the online experiment, which is a representative multi-country sample and warrants generalisation.

In-gamble measures. Last but certainly not least, it can be safely stated that the monetary limits and the alerts are by far the most effective consumer measures among those tested. It is, thus, advisable that the Commission work on them, if not for the short term, certainly for future recommendations and/or communications. The reasons why these measures are suggested not for the short term is that the findings come only from one laboratory experiment in one country. Given the high internal validity and realism of this experiment it could be expected that the findings would be replicated if tested in other countries, but naturally in a EU28 context this statement would hardly be acceptable. Hence, it is proposed shortly here how these findings should be re-tested. It would not be feasible to replicate the level realism obtained in the in-gamble part of the laboratory experiment within the context of an online experiment. It is, therefore, suggested a mix of laboratory experiments and smaller explorations in a total of 10 countries. It would recommendable to test only the monetary limits and alerts in a full factorial design. With six conditions plus control this would require a sample of about 210 individuals. Five laboratory experiments could be conducted in the largest markets: France, Germany, Italy, Spain, and the United Kingdom. In other five countries opportunely selected to cover the EU cultural and geographical areas (probably 2 Nordic countries, 2 Eastern countries, and 1 additional southern country) exploratory experimental focus groups and interviews could be conducted, having the participants interact with the programme website and gambles, register their behaviour by observing and making questions to them as they gamble.

1 Introduction

This is the Final Report of the "Study on online gambling and adequate measures for the protection of consumers of gambling services" that, within the Framework Contract on Behavioural Studies managed by The Consumer, Health and Food Executive Agency (CHAFEA) (Framework Contract No EAHC / 2011 / CP / 01/LSE), the Directorate General Internal Market and Services requested from LSE & Partners. The overall objective and scope of the study defined in the Terms of References (hereafter 'ToR') are summarised below.

The main objective of the study was to assess the behavioural response of consumers to protective measures, both testing the relative effectiveness of different measures and consumers' reactions in terms of choices to some example protective measures. In line with the ToR, the measures to be tested in two behavioural experiments included:

a) Measures that exist in some Member States and/or are adopted by some of the online gambling operators (hereafter 'existing measures');

b) New measures that could be introduced in the future.

The scope of the study was defined as including:

a) A preparatory review of the main behavioural biases concerning gambling, and of the main behavioural biases concerning online activities;

b) An experimental phase requiring two experiments: a behavioural laboratory experiment in one EU country and a behavioural online experiment in seven EU countries covering the main cultural-geographic areas and the different approaches to consumer protective measures;

c) Analysis of results and extraction of policy implications.

Underlying the behavioural experimental objective of the study is the current policy objectives and activities of the Commission, in particular concerning the Communication on online gambling adopted in 2012[2].

While online gambling is cross-border by nature, consumers' protective measures are fragmented across Member States, there are no common EU level measures, and not all consumers and citizens may be sufficiently protected across the EU. An objective of the Commission is to work with Member States to achieve a common set of measures that: a)

[2] COM(2012) 596 final, and the accompanying Staff Working Document (SWD(2012)345/2)

ensure the general protection of consumers and b) deter the emergence of problem gambling. Pathological gambling or 'gambling disorder' is the urge to continuously gamble despite harmful negative consequences and is considered as a mental disorder both in the World Health Organisation (WHO) International Classification of Disease (ICD) and in the American Psychiatric Association (APA)[3]. "Problem gambling" on the other hand, is a used to refer to early signs of gambling-related problems, with increased risk of transition into a gambling disorder (Blaszczynski & Nower, 2002).

This study was launched in light of the lack of evidence on the effectiveness or adequacy of existing measures that are intended to protect online consumers. The aim was also to contribute to an evidence-based approach in the on going work regarding the protection of consumers of online gambling services.

In summation, the scope of the study can be defined as follows:

1) Measures:
    a. Existing measures;
    b. New measures;
2) Testing:
    a. The relative effectiveness of measures assessed in terms of behavioural responses;
    b. Consumers' reactions to the tested measures, assessed in terms of behavioural choices;
3) Target:
    a. Consumers of online gambling services in general, with no *ex ante* and specific focus on social segments;
4) Activities:
    a. Secondary sources review;
    b. Experimental tests;
    c. Statistical analysis and extraction of policy implications.

A general high-level scoping of the supply and demand dimensions of the online gambling services is presented in § 1.1. The operational objectives and high level design of the study are contextualised and illustrated in § 1.2. The last section of the introduction illustrates the structure and content of the report and also clarifies important terminological and conceptual issues.

[3] See more on classification criteria to define pathological gambling in § 5.1.5 of the Appendix.

1.1 Online gambling: an emerging policy issue

In the last decade, online gambling has grown from a minor window show on the Internet into a substantial global industry. According to worldwide market estimates (see box 1 below), in 2012 online gambling reached 9.5% (i.e. about €27bn) of the total worldwide gaming revenues (€283bn also in 2012). It employs an increasing number of people, including the kind of high-tech jobs most economies compete for, and generates sizeable amounts of tax revenues. The volume of online gambling in the EU account for 45% of global revenues and it is a fast growing industry as revenues are expected to more than double in 2015 compared to 2008 (going from €6.16bn to €13bn)[4]

Box 1 Main Market Figures

- In 2010 the global gambling market (land-bases and online) generated Gross Gaming Revenues (GGR=stakes less prizes but including bonus) of €283bn, of which the EU had a market share of 29% (about €82bn in the EU).
- The total global Internet gambling market (all products) was worth in 2012 €27 bn. The EU online gambling market represented 45% of the world market share.
- Worldwide online gambling profits (GGR) amounted to €16.39bn in 2008, of which €4.7bmn comes from the 6.84 million European consumers;
- The largest gambling markets in Europe are: Italy, United Kingdom, Spain, France, Germany, and Sweden.

Source: H2 Gambling Capital (http://www.h2gc.com/)

The take up of online gambling is not a purely supply-driven phenomenon as clear demand side trends and factors drive it as well. Internet penetration in EU27, for instance, has grown by a 24 per cent between 2005 (51%) and 2013 (73%)[5], an increase of about 120 million potential consumers. The accessibility and availability of online gambling, including mobile technology, makes it a very attractive alternative to in person gambling. The increase in the potential pool of consumers and the relative advantages of accessibility and availability are all factors interlinking supply and demand. In the relevant scientific literature figures about the prevalence of online gambling vary depending on the survey and on the countries. Although available data is hard to compare the number of consumers playing online is between 5% and 30% of the population (Gainsbury, 2010; Petry, 2006; Wardle et al., 2011; Wood & Williams, 2009). According to market estimates in Europe there are about 6.8 million consumers of online gambling services[6]. At the same time, this figure differs if both the individuals who

[4] H2 Gambling Capital.

[5] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Information_society_statistics#Households_and_individuals

[6] COM(2012) 596 final.

regularly play only online and those who regularly play both online and off line are included into a total estimate[7].

The rapid take up of online gambling has given rise to concerns that this may contribute to increase the dimension of 'pathological' and/or 'problematic' gambling. In some surveys the rates of problem gambling are higher among those who use the Internet to gamble than among those who do not (Griffiths et al., 2009; Ladd & Petry, 2002; Olason et al., 2011; Wood & Williams, 2009). On the other hand, other sources suggest that the rates of gambling disorder have remained relatively stable over the last years. Yet, this does not seem to be the case in a number of countries[8]. Other studies indicate that the relationship between Internet gambling and problem gambling is mediated by engagement with land-based gambling (LaPlante, Nelson, laBrie, & Shaffer, 2009). However, this is beyond the scope of the present study.

A random sample of a total of 5997 respondents made up the online experiment. These are representative of the Internet populations in Estonia, France, Germany, Italy, Spain, Sweden and the United Kingdom. According to this sample, (see Tables 1 and 2) regular consumers of online gambling services (playing every day and/or 2-3 days a week) play online more than occasional gamblers (playing about once a month and/or 6-11 times a year or less).

Table 1 Gambling Frequency and preferred channel: our sample (online experiment)

Channel / Frequency	In-Person (A)	Online (B)	Mixed (C)	Total by row
Every day (1)	30	40	82	152
2-3 days a week (2)	144	131	333	608
About once a week (3)	526	230	554	1310
2-3 days a month (4)	277	107	240	624
About once a month (5)	380	115	225	720
6-11 times a year (6)	301	62	161	524
Less than 6 times a year (7)	1142	151	252	1545
Total by column	2800	836	1847	5483[9]

Source: online experiment (cross tabulation of answers to Q9 & Q10, see Annex II)

[7] Using the data from the online sample of the study participants reported in table 1, provides that 2.9% of the sample comprises regular consumers of gambling using only the online channel and another 6.9% includes regular gamblers playing both offline and online. If these percentages are applied to EU28 relevant aggregate (Internet users aged 16 and above: about 243 million) gives around 6.9 million individuals regularly gambling only online but also 16.8 million individuals regularly gambling both offline and online. These figures may be representative of individuals playing both within a regulated and unregulated environment.

[8] SWD(2012) 345/2 Commission Staff Working Document Online gambling in the internal market, accompanying the Commission Communication 'Towards a comprehensive framework for online gambling'

[9] The total sample was 5997 individuals, of which 514 (that is 0.085709%, or about 8.6%) answered they had never gambled even once in their life. The questions producing table 1 were not asked to these respondents. Hence, the total base for table 1 is 5483.

Table 2 Frequency & channel profiles: our sample (online experiment)

Channel / Frequency	In-Person (A)	Online/Mixed (B+C)	Total by row
Regular (1+2)	22.9%	77.1%	100.0%
Intermediate (3+4)	41.5%	58.5%	100.0%
Occasional (5+6+7)	65.4%	34.6%	100.0%

Source: re-elaboration of data in Table 1

Respondents in the sample reporting that they play every day or at least 2-3 times a week in 22.9% of cases reported that they play only in person, whereas in 77.1% of the cases they reported that they play only online or that they play both online and offline[10]. The picture with respect to channel preference is exactly the opposite if we consider the answers of those respondents reporting that they play much more rarely (once a month, 6-11 times a year, less than 6 times a year): they play mostly in person and very rarely online.

Another element regarding gambling concerns the potential risks and impact for children and adolescents (de Freitas & Griffiths, 2008; Derevensky & Gupta, 2007; Griffiths & Parke, 2010). In addition, the convergence between gambling and digital media is a source of risk as many online games and video-games simulate gambling situations into the playing experience (King et al., 2010). Data from a recent national survey of 8,017 British adolescents, aged between 12 and 15 years of age, show that 8% admit gambling on line (Griffiths & Wood, 2007). A national survey in France similarly shows the vulnerability of adolescents, reporting that the prevalence of problem gambling is 2 to 4 times higher among adolescents than among adults (Caillon et al., 2012). The potential link between video games and gambling is supported by findings from a survey of 563 adult regular online gamblers (some showing signs of problematic gambling). Circa 75% of these respondents play gambling type games without money (McBride & Derevensky, 2009).

These and other challenging dimensions of this newly relevant socio-economic trend are reflected in documents of the European Commission (European Commission, 2011a, 2011b, 2012a, 2012b). Of relevance, the Communication "*Towards a comprehensive European framework for online gambling*" has defined a roadmap for a series of initiatives regarding online gambling, where consumers' protective measures figure prominently.

Since 2012 the European Commission has started to test policy options using behavioural experiments that, as explained in a recently published Joint-Research-Centre report (van Bavel et al., 2013), can help policy makers improve their policy with evidence going beyond the often unrealistic assumption that people are always rational and react as such to policy measures.

A fundamental assumption in traditional economic theory (and to some extent in most of traditional policy making) is that individuals act as rational decision makers weighing up the costs and benefits of different alternatives before choosing the one that maximises their utility, using all available information unless obtaining it is too costly. Behavioural economics

[10] In this case calculated using as a base 5483.

and more broadly defined behavioural sciences focus on situations where human information processing and decision-making behaviour clearly deviate from this stylised picture of the rational actor and by contrast choices are made on the basis of cognitive and behavioural biases.

> "Our comforting conviction that the world makes sense rests on a secure foundation: our almost unlimited ability to ignore our ignorance." Daniel Kahneman, Thinking, fast and slow (2011)
>
> When the top prize is very large, ticket buyers appear indifferent to the fact that their chance of winning is minuscule. Daniel Kahneman, Thinking, fast and slow (2011)
>
> "

The two citations above from a classic in this discipline (Kahneman, 2011) condense the premises and the bottom line of the behavioural approach. The behavioural sciences approach starts from the theoretical framework developed by cognitive psychology where the brain is conceived as a processor of information and not as an impulse response mechanism (Neisser, 1967). Emotional reactions interact with cognition and with conation (motivation) while the brain is processing the information. Our cognitive systems tend to be more active if we are emotionally aroused and emotions closely interact with motivation and intentions to act. Emotion, cognition, and conation may shape actual behaviour but not necessarily, and not always in ways we are fully aware of or that correspond exactly to our cognitive processing. Starting from these premises behavioural economics presents evidence-based critiques to homo economicus as formalized in standard economics, it acknowledges human limits on computational power or will power, and brings increasing realism to the assumptions about human judgement and choice. One of the primary interest of behavioural economists is a better understanding of the way in which people actually make choices, including in situations of uncertainty. In brief, this has been vividly and accessibly pictured by Kahneman (2011) with the distinction between ***System 1*** and ***System 2*** as two components of the mind that always interact both in processing information and in making decisions / taking actions[11]. System 1 is automatic, affective (highly impacted by emotions) and heuristic-based, which means that it relies on mental "shortcuts." It quickly proposes intuitive answers to problems as they arise. Such heuristics, however, can be the source of biases in analysing situations and responding to stimuli, and can lead to what amounts to suboptimal choices if judged by an external observer. By contrast System 2 follows controlled processes, it is slow, effortful, conscious, rule-based and can also be employed to monitor the quality of the answer provided by System 1. This approach is relevant for the current study in two respects, the first related to the ultimate objective and the second to the distinction between behavioural and self-reported measures.

[11] For a more concrete and nuanced application of this distinction to consumer behaviour see for instance Samson & Voyer (2012) and Strack et al (2006).

The non-mediated application of System 1 can results in biases that are harmful to consumers. According to best seller book "Nudge"(Thaler & Sunstein, 2008), policy makers can use behavioural insights to introduce 'de-biasing' mechanisms better known as 'nudges', by shaping the choice architecture of consumers with simple and non-intrusive measures.

As further illustrated in § 1.3, the overall objective of this study was to measure the relative effectiveness of existing and possible new measures for the protections of consumers of online gambling services by means of behavioural experiments. As explained in next section and in greater detail in chapter 2, in the context of gambling ignoring the assumption of the rational actor and employing a behavioural perspective is the only possible way to identify effective protective measures that do not run the risk of producing counterproductive effects (i.e. switching to the website of non regulated operators). The treatments tested in the two experiments of this study, informed both by the review of extant regulatory measures and by the input from the Commission, can be considered as 'nudges' aimed at better protecting consumers engaging in online gambling. However, in the context of online gambling the classical behavioural economics insights and corresponding nudges are not necessarily sufficient. As will be outline there is a need to go beyond the nudges targeting the individual and act on the human-machine interaction.

1.2 Context, objectives, and key features of the design

In order to contextualise the specific objectives presented earlier and the overall design of the study some of the challenges and issues in the domain of gambling are briefly discussed.

Broadly, policy makers face the challenge, in regulating online gambling, of balancing three factors: a) the public concern about the social and health risks associated with gambling as well as the costs; b) taking into due consideration the sizeable revenues for industry and countries, and creating jobs[12]; c) avoid over-regulating the industry, which could have the unintended effect of favouring unregulated operators that are not subject to any form of control or monitoring, with negative impacts on consumers (i.e. such websites are less likely to have protective measures). The very nature of the online environment and the cross border nature of online gambling pose regulatory challenges[13]. When trying to balance these different aspects the supply, the demand and the public budget should be weighed against social considerations that pathological and problem gamblers give rise to. Yet, the social and

[12] A typical argument used by the industry, as in a white paper of the powerful American Gaming Association (AGA, 2011, p. 2), is that over-regulation makes consumers flock to offshore websites, producing loss of revenues and high-tech jobs for the regulating country.

[13] See for instance "French ISPs fight requirement to block illegal betting sites," Telecom Paper, March 18, 2011; and "ISP Block Failure Forces Italy to License Poker Cash Games and Casino Games," EGR Magazine, September 6, 2009.

numerical[14] relevance of gambling disorders and whether or not risks can spread to wider segments of gamblers remain highly contested topics. This concerns gambling in general and not simply online gambling. According to some studies the gambling industry gladly bought the medicalization of pathological gambling and argued that the problem is not in the 'machine' but within the minds of the individuals (Abbott, 2006; Castellani, 2000)[15]. However, there are counter-arguments to this view, which do not minimise the risk or seek to restrict it to pathological gamblers[16]. Discussions about the potential for the emergence of pathological or problem gambling and whether this is a matter of individual personality traits or whether it is, in large part, a response to product design are on-going[17]. This is further discussed in Chapter 2.

In summary, the issues to which this study aims to contribute by way of two behavioural experiments are: a) the relative effectiveness of measures targeting only consumers' cognitive processes as compared to measures targeting the interaction between the consumers and the technical functioning of the gambles (hereafter 'human-machine interaction'); and b) consumers' reactions in terms of choices to some specific protective measures (see *infra*). These objectives shaped the design of the two experiments, which is explained in more details in Chapter 3.

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[14] As per the prevalence of pathological and problematic gambling it must be premised that existing evidence does not allow incontestable conclusions in general, and especially across the EU, given the few, diverse and limited surveys and studies to date. According to estimates reported by the FP7 Project ALIC-RAP in the EU pathological gamblers range from 0.1% to 0.8% of the adult population and problem gamblers between 0.1% and 2.2%[14]. Other estimates taken from international clinical studies but not directly referable to Europe place pathological gambling between 0.5% and 2.2% of the general population and that of pre-pathological but problematic gamblers between 1.3% and 3.8% (Esposito, 2013; Schull, 2012). According, to the European Gaming and Betting Association (EGBA) the rate of problem gambling in Europe is typically between 0.5% and 3%[14].

[15] After the American Psychiatric Association (APA, 1980) included pathological gambling among mental disorders in its DSM-III (Diagnostic and Statistical Manual of Mental Disorders), the question was medicalised and the gross and inaccurate distinction between pathological gamblers and the rest of all other gamblers reified (Castellani, 2000).

[16] Taking the total population as a base is misleading, for the percentage of problem gamblers over the total population of regular gamblers is estimated to reach up to 20% (Abbott & Volberg, 2000; MacNeil, 2009; Productivity Commission, 2009, 2010). Furthermore, most people who gamble, when they do it for some time, encounter the same problems as the pathological and problem gamblers: difficulty in controlling time and money spent. Indeed scholars have argued that prevalence measures should follow a continuum approach (Dickerson, 2003; Volberg, 2004) and one study has shown that half of the individual gambling in front of a video machine at any point in time exhibit problematic behaviours (Schrans et al., 2004).

[17] In this respect it is worth nothing that in 2013 the APA released a new manual (DSM-V) where a very important change was introduced: gambling disorder was placed alongside substance-related addictions in a renamed group called "Addiction and Related Disorders."(APA, 2013). This change makes pathological gambling similar to substance-based addictions. Evidently, this makes it more difficult to claim that the object of addiction is neutral.

The design

Two experiments were designed as randomised control trials with treatment and control groups. The experiments included multiple measures of effectiveness.

In order to measure the effectiveness the following were included:

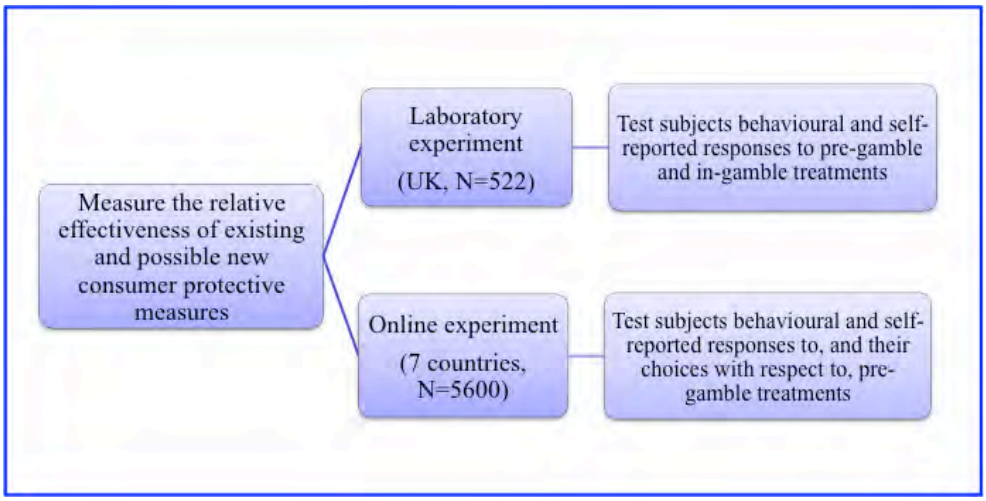
a) Variables reflecting subjects' behaviours in response to the tested measures (how much and how fast they bet); and

b) Variables reflecting self-reported emotional, cognitive, and intentional (conative) reactions to the tested measures.

A website and two types of online gambles were programmed and designed – a slot machine and a roulette wheel. These were used for both experiments. The website closely reproduced the gaming sites and the conditions offered by online gambling operators. These two types of online gambles were chosen in particular for technical reasons related to the characteristics of the experiments and to maximise comparability across countries. They were not chosen because they are deemed or demonstrated as being more or less addictive than other types of gambles. The rationale for identifying these two types of gambles for the experiments is explained in more detail in the technical appendix of this report.

In the design '**pre-gamble**' and '**in-gamble**' protective measures were distinguished so as to mirror realistically the different stages at which consumers of online gambling services may be exposed to them. When consumers first go on a gambling website and when they are offered to trial sessions for free they are typically exposed to 'pre-gamble measures'. For instance the logo of the national information provider with an indication of a helpline could appear at that stage. Once consumers proceed to the real gamble they can be exposed to 'in-gamble' measures. These include many of the protective measures that were tested, such as monetary limits.

Figure 1 Objective and experiments



- **Laboratory experiment (hereafter 'LAB')**. A laboratory experiment was conducted between September-October 2013 at the London School of Economics (LSE) in the Behavioural Research Laboratory to test both 'pre-gamble' and 'in gamble' measures. A

convenience sample of 522 subjects (which yielded 81.4% participants with previous gambling experience and 18.6% with no previous gambling experience) recruited from LSE Behavioural Research Lab panel. For the sake of ecological validity (realism) subjects were given real money performance related incentives. They could also gain more than the usual basic bonus that is paid in any laboratory experiment and they could also lose the bonus;

- **Online experiment (hereafter 'ONLINE')**. A multi-country (7 countries: Estonia, France, Germany, Italy, Spain, Sweden, United Kingdom) online experiment was conducted between October-November 2013 to test the 'pre-gamble' measures and how subjects reacted to some of these measures (especially the registration process). A simple random sample of 5997 subjects[18] (about 850 per country) was drawn that is representative of the general internet population of each country. No quota was imposed *ex ante* on previous gambling experience (*ex post* the sample split is: 91.4% had a least a previous gambling experience 8.6%% had never gambled in their life). Given the less controlled settings of an online experiments, subjects were only given the basic bonus for participation. It was not possible to set up a performance related incentive system unlike in the laboratory experiment.

The two tables below report the measures (treatments) that have been tested in the two experiments.

Table 3 Pre-Gamble and In-Gamble treatments tested in the laboratory experiment[19]

Abbr.	Measure (Treatment)
Pre-Gamble Treatment 1: PT1	A pop-up pictorial warning about the risks of gambling
Pre-Gamble Treatment 1: PT2	A pop-up textual warning about risks of gambling
Pre-Gamble Treatment 1: PT3	A over-confidence task about understanding of probabilities
Pre-Gamble Treatment 1: PT4	Logo/banner of national information provider with helpline
Pre-gamble control: PT5	Start gambling without being exposed to any of the above
In-Gamble Step 1: IS1.1.1	Monetary limits (fixed) for each gamble session
In-Gamble Step 1: IS1.1.2	Monetary limits (self-defined) for each gamble session
In-Gamble Step 1: IS1.2.1	Push pop up clock with length of play, winnings/ losses
In-Gamble Step 1: IS1.2.2	Pull pop up clock with length of play, winnings/ losses
In-Gamble Step 1: IS1.2.3	Push pop up "You lose" (if subject is losing)
In-gamble Step 1 control:IS1.3	Start gambling without being exposed to any of the above
In-Gamble Step 2: IS2.1.1	Same as PT1 but with boxes to be checked to continue playing
In-Gamble Step 2: IS2.1.2	Same as PT2 but with boxes to be checked to continue playing
In-gamble Step 2 control:IS2.2	Start gambling without being exposed to any of the above

[18] The target was 5600, but ended up reaching more subjects without altering the technical parameters.

[19] The abbreviation in the first column is the one that will be used in some of text of chapter 3, whereas the second column provides a short illustration of what the measures are about.

Table 4 Pre-Gamble treatments tested in the online experiment

Abbr.	Measure (Treatment)
Online Treatment 1: OT1	A pop-up pictorial warning about the risks of gambling
Online Treatment 2: OT2	A pop-up textual warning about the risks of gambling
Online Treatment 3: OT3	A over-confidence task about understanding of probabilities
Online Treatment 4: OT4	Logo/banner of national information provider with helpline
Online Treatment 5: OT5	Wider Logo/banner of information provider with helpline
Online Treatment 6: OT6	Only helpline with no logo/banner
Online Treatment 7: OT7	www link "Terms and Conditions"
Online Treatment 8: OT8	Standard registration form (name, age, gender, e-mail)
Online Treatment 8: OT9	Extended registration form (same as above plus ID number)

The theoretical justification of these measures is presented in Chapter 2. Chapter 3 shows how the treatments were inserted into the overall randomisation and procedures of the two experiments. Screenshots from the two experiments are also presented in Chapter 2.[20] These serve to show the reader what the subjects saw and/or what they were requested to do. These measures are only briefly discussed in this chapter in order to explain and justify the different testing done in the two experiments.

There are pros and cons for using the laboratory context or alternatively the online context to conduct behavioural experiments. The choice of testing both pre-gamble and in-gamble measures in the LAB and only the pre-gamble ones in the ONLINE follows general methodological principles grounded in substantive reasoning, and took into consideration feasibility constraints. The four key pre-gamble measures were tested in both experiments, which enabled us to have a single-country test with higher internal and ecological validity, and then repeat the test with a larger multi-country sample ensuring greater external validity and potential for generalisation. In the online experiment five additional pre-gamble measures were tested, but in reality two of them (OT5: wider banner/logo; and OT6: only helpline without logo) are just a variation on the PT4 measure tested in the laboratory experiment (banner/logo of national information provider with helpline number). So, the key additions in the online experiment were the 'terms and conditions' measure and the two versions of the registration forms, with the extended one asking to fill in also sensitive personal data.

In general the pre-gambles measures can be characterised as follows: a) they target the individuals and attempt to de-bias their cognitive processes and behavioural choices by activating 'cool' as opposed to 'hot' cognition[21] in different ways; b) they include most of the measures that are adopted by some licensed operators in the countries included in the two experiments; c) in the online experiment they include measures the aim of which was to test respondents' choices: for instance opting out when asked to register in either forms. As many

[20] They are presented in larger format in the Technical Appendix (see § 5.3.3 for the LAB and § 5.4.2 for the ONLINE)

[21] On cool and hot cognition see Strack et al (2006).

of these measures are already in existence and/or are more likely to be introduced in the short run it was important to test some them twice and to have a larger sample for generalisation of the findings. The limited duration prescribed for an online experiment (a maximum of 20 minutes) and the logistic difficulty of setting up and implementing a performance related incentive system in a multi-country experiment militated against the testing of in-gamble measures in the online experiment. On the other hand, the in-gamble measures include mostly potential new measures for which a first test was needed in the laboratory settings ensuring more control on the subjects and reproducing more realistically the condition of gambling with larger monetary stakes.

Naturally, the findings of the laboratory experiment for in-gamble measures are very robust and internally valid, but no generalisation is drawn from them given that the experiment was conducted only in one country and with a convenience sample not representative of the general population. On the other hand, it is reasonable to expect that, ceteris paribus[22], the findings of the in-gambles treatments tested in the laboratory experiment are likely to be replicated even if tested under more externally valid settings (tested similarly in several countries in laboratory settings). If the pre-gamble measures can be seen as 'nudges' aimed exclusively at the individuals, the in-gamble one aims at both the individual and at altering/interrupting the 'human-machine' interaction and the flows into which those who play are pushed by design features of online gambling. This is an important distinction that will be fundamental for the interpretation of the findings. It is explained in depth in section 2.2 of chapter 2, for it requires going beyond the more classical cognitive oriented behavioural approach (see in particular § 2.2.1).

The tested protective measures target the consumers of online gambling services with the aim of deterring the emergence of problem gambling. However, they do not target pathological gamblers for whom more in-depth and personalised clinical interventions are needed. Hence, the sampling strategy did not include specific quotas to reach particular segments of the 'universe' of the consumers of online gambling services. That said, in the laboratory experiment a screening question was used to ensure having at least 80% of subjects with at least one prior experience of gambling, broadly defined. In the online experiment a simple random sample was drawn, for which ex post the percentage of those who had had at least one gambling experience was 91.4%.[23] This notwithstanding, as shown later (chapter 3, § 3.1.1), both samples include all the range of gambling profiles: from regular gamblers (gambling every day or at least 2/3 times) to occasional ones (once in six or more months); from those gambling only in person, to those gambling only online; to those using both the offline and the online channels. Therefore, the two samples warrant conclusions that are

[22] Same experimental stimuli, same treatments, and same performance related incentives as those used in the LAB of this study..

[23] The questions about gambling experience and preferences are in Annex I and Annex II , as well as the questions reported in in Box 2, page 56

generally relevant both for broadly defined consumers and occasional gamblers and for more regular gamblers (possibly including also some problematic segments).

Finally, we claim that this study represents an important contribution to current understanding and evidence on the behavioural and psychological aspects of online gambling. In the last decade the growing popularity of online media has attracted critical attention and debate(de Freitas & Griffiths, 2008; Griffiths, 2008; Petry, 2006) and has been the subject of several surveys (International Gaming Research Unit, 2007; Ladd & Petry, 2002; Lloyd et al., 2010; Matthews et al., 2009; Wood et al., 2007). Yet, as pointed out by King et al (2010), the psychological literature and understanding of the phenomenon remains relatively limited. The empirical literature on online gambling consists only of cross-sectional survey, with no experimental designs, and based on self-selected samples (McBride & Derevensky, 2009)[24]. This study is unique in at least three ways: a) it consists of two experiments designed as randomised control trials (including one based on a representative sample of the general population); b) it tested measures that are theoretically grounded, and c) it goes beyond the classical behavioural economics and related approaches to policy nudges.

1.3 Structure and scope of the report

In the following chapter (**Chapter 2**) a discussion of the theoretical and empirical literature that grounds the design of the protective measures tested and guides the interpretation of gambling behaviour is presented. First the classical behavioural economics perspective on both gambling specific and online specific biases is discussed (§ 2.1). Next, a different perspective coming from a particular branch of psychological theory (ecological psychology), as well as from anthropological, ethnographic, and sociological exploration of electronic gambling as human-machine interaction is considered (§ 2.2). The chapter closes with a presentation of the tested measures, their rationale, the *ex ante* hypotheses about their possible effects (§ 2.3).

Chapter 3, after illustrating the main commonality and differences existing between LAB and ONLINE in terms of design and methods (§ 3.1), presents the main findings of the laboratory experiments (§ 3.2) and the online experiment (§ 3.3). The account of the findings in this chapter is largely descriptive.

Chapter 4 presents the interpretation and discussion of the findings for what concerns pre-gamble measures (§ 4.1) and in-gamble measures (4.2). It concludes with the policy implications of the findings (§ 4.3).

Chapter 5 comprises the Technical Appendix, and is supported by two Annexes. Most of the technical details are presented in the Technical Appendix, whilst the protocols and questionnaires used for the laboratory and online experiments are found, respectively in Annex I and in Annex II. Apart from a more theoretical discussion in chapter 2, the report avoids too many technical details when presenting and discussing the findings of the study.

[24] In this experiment participants were recruited from a banner placed in an online gambling newsletter.

The statistical tables with the results of the analysis performed are also placed in the Chapter 5, where the findings are illustrated using more intuitive synoptic tables with graphic notations rather than numbers.

Terminology

So far the term 'measure' has been used, mostly to refer to the consumer protective measures that exist whether as a results of regulation or self-regulation. From here on when the finding of the experiments are described and presented the term 'treatment' (or alternatively 'nudge') is used. There are two reasons for this: a) to distinguish the experimental measures tested from those existing in practice; and b) when describing the experiments and their findings the term 'measure' may be used in its technical meaning (the measurement of a variable). So far, at times the expression 'consumers of online gambling services' or 'gambler(s)' has been used. Rather than using the expression 'consumers of online gambling services' from here on 'subjects', 'participants', or 'respondents' is used when referring to the individuals who participated to the two experiments. The expression 'gambler(s)' is used when: a) this is warranted by the source cited or used; b) in chapter 5 to distinguish subjects who previously had some form of gambling experience from those that had never gambled once in their life.

As regards the potentially disputed concepts of consumers, pathological gamblers and problem gamblers, it is fully understood and acknowledged in this study that, whereas actual quantifications are controversial and not conclusive, there is a large percentage of consumers for whom gambling remains a recreational activity. By analogy it is equally fully understood and acknowledged that, even if pathological and problem gambling prevalence is relatively small, nonetheless preventive/control measures are required to keep gambling in check and to be able to monitor behavioural pattern changes that seem risky. In other words, in the report when referring to needed protective measures and discussion in the literature, the perspective is not assumed that everyone who gambles is an actual or potential problem gambler.

2 Grounding the treatments: between biases and 'human-machine' interaction

This chapter reviews the literature on cognitive biases relevant to gambling in general and online behaviour focussing on individual cognitive processes (§ 2.1), as well as another strand of literature that looks at the 'human-machine interaction' in the context of both gambling in general and of online gambling[25]. The aim of the review was to theoretically ground *ex ante* the hypotheses on the effect of the tested measures and *ex post* the interpretation of the findings of the two experiments. As a result of the reading of the directly or indirectly relevant literature, in § 2.3 the rationale of the treatments tested and the earlier cited *ex ante* hypotheses about their possible effects are presented.

In the context of gambling there are probably only two certain and empirically non controversial findings: a) the gambling industry and countries generate large revenues; b) the overwhelming majority of gamblers lose money given the very slim probability of winning (especially in gamble of pure chances[26]). The research and policy questions are: *"Why so many individuals keep playing even in the face of steady losses that, in the case of problematic gamblers, can ruin their lives?"; "Given the low probability of winning, shouldn't prolonged play be aversive and rare (Dowling et al., 2005; Walker, 1992)?"*

One strand of answers to such questions is found in the theoretical and empirical analysis of heuristics and biases in so-called behavioural economics; this would be better labelled simply as 'behavioural sciences or studies'[27]. These answers focus around the concepts of heuristics

[25] This literature originally emerged to study traditional machine gambling but its implications have been later applied by analogy to online gambling.

[26] Where good information (i.e. sports betting) or some elements of skills (i.e. poker) play a role there is probably a larger but still small group of gamblers, including professionals who manage to profit from gambling.

[27] Key insights came from social and cognitive psychologists much before the disciplinary label 'behavioural economics' became popular. Commenting on how this fact is related to the publication of the best-seller book Nudge (Thaler & Sunstein, 2008), Nobel Prize Winner Daniel Kahneman recently noted that: "*Unfortunately, because the two authors of Nudge were an economist and a jurist, respectively the intellectual leaders of behavioral economics and of behavioral law and economics, not only the ideas they produced themselves but also many of the contributions of cognitive and social*

and biases. Stated simply heuristics are mental short-cut: simple and efficient rules of thumb that people often use to form judgments and make decisions, and they usually involve focusing on one aspect of a complex problem while ignoring others. Most of the time these heuristics help people moving quickly and efficiently in everyday life, but some times they can turn into harmful biases in judgements and decision-making. The two concepts are clearly related but different, in that generally a particular heuristic underlies a particular bias. According to the theory and empirical evidence from behavioural sciences it can be reasonably stated that individuals tend to exhibit rather consistent heuristics and biases when cognitively processing information, which can evidently affect participation in games of chance.

Some of the most well-known and classical heuristics and biases (i.e. loss aversion, availability, representativeness) are the source of gambling specific biases. These heuristics and biases give insight into why gamblers do not learn from their past losses and help to explain what appears to the external observer as irrational behaviour (Corney & Cummings, 1985; Delfabbro, 2004; Ladouceur, 2004; Presson & Benassi, 1996; Wagenaar, 1988)[28]. The effect of such biases on gambling may be manifested in terms of duration of play, money played, and satisfaction or dissatisfaction with play. In § 2.1 both the specific gambling related heuristics and other biases/heuristics that may apply to online behaviour are discussed. However, the latter have not been specifically related to online gambling, as yet.

On the other hand, a different type of answer to the question of why gamblers keep gambling and losing comes from a multidisciplinary literature including clinical studies, a particular branch of psychology (ecological psychology), and from anthropological and ethnographic explorations, and in-depth analyses of gambling industry practices. All of these approaches have in common a strong focus on the human-machine interaction rather than only on the heuristics and biases characterising individuals information processing and choices. This approach is discussed in § 2.2.

As a way of introducing and anticipating the content that follows it is possible to summarise that the risk factors regarding gambling are: a) the characteristic of the gambling activity itself (e.g. speed, wins, losses); b) social factors (e.g. access, availability, etc.); and c) individual factors. In addition, some researchers propose that certain forms of gambling have higher risks and the potential to generate addiction, although empirical evidence on this has yet to be generated..

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psychology on which they had relied were labeled 'behavioral economics' in the press. And so it came to pass that many applications of social and cognitive psychology came to be called behavioral economics, and many psychologists discovered that the name of their trade had changed even if its content had not" (Kahneman, 2013, pp. viii-ix).

[28] Another reason for non-rational and inconsistent conduct is agents' nonlinear sensitivity to probabilities (Allais, 1953; Kahneman & Tversky, 1979; Tversky & Fox, 1995).

2.1 Behavioural gambling and online biases

The first section of this chapter considers heuristics and biases directly or indirectly related to gambling in general (§ 2.1.1). This is followed by insights on heuristics and biases concerning online behaviour in general and some additional effects and risks inherent in online gambling in particular (§ 2.1.2). Finally, § 2.1.3 sums up and links the considerations developed in the previous two sections.

2.1.1 General gambling biases and heuristics

There are basically 7 biases that are either very gambling specific or related to gambling (but applicable to other domains): the 'gambler's fallacy', 'the near–miss fallacy', 'over-confidence', 'illusion of control', 'personalisation of outcomes', 'hot and cold streaks', and 'sunk cost fallacy' (or also referred to as 'entrapment' or 'losses chasing'). They result from classical heuristics such as 'representativeness heuristics', 'availability heuristics', 'simulation heuristics', and 'loss-aversion'. The illustration of the biases is complemented in footnotes by reference to the underlying heuristics. In addition, 'mental accounting and house money heuristic' are considered not because it is a source of biases but rather because it is the basis of some treatments that could be used to nudge gamblers.

Gambler's fallacy. The gambler's fallacy is a particular form of representativeness heuristic[29] where people rely on the law of small numbers and perceive small samples to represent the relevant population to the same extent as large samples (Tversky & Kahneman, 1971). An outcome that reflects a more even distribution is regarded as more representative than an outcome that reflects an uneven distribution, even within a small number of trials. Therefore, when a sequence of randomly generated trials repeatedly strays in one direction (e.g. a die rolls on to the number 6 three times in a row) people mistakenly expect the opposite to be more likely over the next few trials. Gamblers affected by this bias are more willing to bet after losses and less willing to bet after wins. Stated simply, the average gambler does not reason according to the tenets of probability theory. They react differently to losses and wins, which allegedly explains why people keep gambling even in the face of steady losses.

Near-miss fallacy. A near miss is a special kind of failure to reach a goal, one that comes close to being successful (Reid, 1986). A very recent experiment using skin-conductance (a physiological measures of emotional arousal) has demonstrated that near misses behaviourally reinforce gamblers persistence in playing (Dixon et al., 2013). Near misses may keep gamblers

[29] The representativeness is the improper attribution of characteristics to an entity or process based on evidence received in a limited setting. In particular, it occurs when judgements about expectancy and causality are based on the extent to which a specific event is seen as typical of a large group of events. Simply speaking, it describes the tendency for people to think something is more likely if it reflects their beliefs of a situation. As an example (Tune, 1964), when subjects are asked to create a random sequence of imaginary coin tosses, they produce sequences where the proportion of tails in a short sequence is closer to 50% than chance would predict.

play in current session or in future sessions, due to the cognitive bias that they are getting close to success, although in game of chances the probability of winning remains the same from draw to draw. Gamblers act as if they could influence the chance of an outcome occurrence (see also biases 'illusion of control' and 'personalisation of outcomes'), and in this case, the occurrence of a near miss can be considered as an encouraging signal, confirming the gambler's strategy and raising hopes for future success. Behavioural-psychological explanations for why near misses are so compelling include the 'frustration theory of persistence' in which near misses 'have an invigorating or potentiating effect on any behaviour that immediately follows it' and the related theory of "cognitive regret (related to the simulation heuristic[30]) in which players circumvent regret at having almost won by immediately playing again (Harrigan, 2008; Reith, 2003). "Almost hitting the jackpot," noted the behaviourist psychologist Skinner in 1953, "increases the probability that the individual will play the machine, although this reinforcer costs the owner of the device nothing (Skinner, 1953, p. 397).

Overconfidence. This is a well-known bias in which individuals' subjective confidence in their judgments is reliably greater than their objective accuracy, especially when confidence is relatively high (Alpert & Raiffa, 1982; Fischhoff et al., 1977). Overconfidence stems partly from the illusion of knowledge. The human mind is perhaps designed to extract as much information as possible from what is available (so partially related to availability heuristic[31]), but may not be aware that the available information is not adequate to develop an accurate forecast in uncertain situations. Another factor contributing to overconfidence is the illusion of control (see next). This bias is very common especially among pathological and problematic gamblers (Goodie, 2005).

Illusion of control. This bias refers specifically to over-estimations of the personal capacity to influence outcomes, so that people have a subjective probability of winning that is greater

[30] The heuristic used by individuals to simulate the occurrence of an event of which they have no prior information and on the basis of which they express regret and use counterfactual thinking (Kahneman & Tversky, 1982). Kahneman and Tversky individuate a number of general situations in which people revert to using the simulation heuristic: simulation of an event of which an individual has no prior information, judging the probabilities of certain events occurring, prediction, counterfactual assessment, assessing causality. Individuals may tend to discount as improbable those events that are difficult to picture mentally, such as a huge loss while gaming, but possibly theft or non-protection of their funds in the account they have opened (so this clearly bridge with online behaviour).

[31] This bias is given by the tendency to make judgments about the probability of events by how easy it is to think of examples (Kahneman & Tversky, 1973). For instance, in the gambling context seeing others winning around you and thinking that this is likely to happen to you too. It is evident how the manufacturers of the land-based slot machine placed in Casinos are aware of this process. The slot machines are set up such that when someone wins, there are many lights, bells and whistles, so that everybody can see and hear the winning slot machines, supporting the availability heuristic since wins would easily come to mind. On the other hand if the slot machines would not have lights and bells, people would only notice their own loosing performance, which would become more representative and available.

than the objective odds (Langer, 1975; Thompson et al., 1998)[32]. This illusion arises in taking part in gambling activities where people have a strong intention to achieve outcomes and where the gambler is likely to perceive a link between her actions and outcomes. This illusion can be reinforced by the self-attribution bias (Gilovich, 1983; Gilovich & Douglas, 1986), which makes people attribute the loss to external factors and the win to personal skill so that the perception of control is maintained despite being unwarranted.

Personalisation of outcomes. This is the belief that one deserves to win or that the gaming machines are unfair (Griffiths, 1995). In this case gamblers continue to play due to a great personalization of the experience or because they believe in principle of fairness. In some cases they personalize the task by talking to the gaming machines or start to believe that the croupier or the machine is trying to damage them (Delfabbro & Winefeld, 2000).

'Hot and cold streaks'. Believing in hot and cold streaks make gamblers willing to bet after wins and less willing to bet after losses. More generally, this is the failure to understand the concept of regression to the mean. People underestimate the role of chance when they interpret time series data. As an example many investors misjudge a temporary increase in the earnings of a company as evidence of a permanent change in its profitability (La Porta, 1996; Lakonishok et al., 1994). In the same way, consumers who make or miss two or three shots in a row are thought to be hot or cold instead of lucky or unlucky (Gilovich et al., 1985)

Sunk cost fallacy (i.e. chasing losses). This can be seen as particular manifestation of the 'loss aversion'[33] that can have a specific interpretation in the context of gambling. When individuals face the choice between a loss that is certain because it has occurred already, and a larger loss that is just a probability (i.e. there is a chance of no loss), diminishing sensitivity can result in excessive risk taking. This explains why private investors and especially gamblers, once they are losing, keep going in the hope re-gaining what they have already lost, since they value this more than the uncertain further loss. Some examples of this behaviour are given by Staw (Staw, 1976), who argues that adverse results can bring to an increase in the resources committed in an attempt to justify the original investment. Finally Kahneman and Tversky (1979) argue that a person who has not made peace with his losses is likely to accept gambles that would be inadmissible otherwise. In some specific literature on gambling this same mechanism is called 'entrapment' as reported in (Karlsen, 2011). Entrapment is related to the point at which, despite mounting losses, players feel obliged to continue betting ("investing") both time and money through some internal sense that they have gone too far to give up now.

Mental Accounting and house money. This is a set of cognitive processes used by individuals to rationalise the use and saving of their assets. According to this principle, people tend to

[32] According Thompson and colleagues this bias spring from a 'control heuristic' depending on: a) an intention to create the outcome; and b) an assumed relationship between the action and outcome.

[33] Loss aversion refers to people's tendency to strongly prefer avoiding losses to acquiring gains (Kahneman & Tversky, 1979; Kahneman & Tversky, 1984). Typically gamblers are risk averse for gains, but risk seeking for losses (Kahneman and Tversky 1979).

organise expenditures into groups, which are ranked in order of priority in case of financial constraints. This approach to income was suggested by Thaler (Thaler, 1985), according to whom funds coming to an individual are categorised by their source, so that income from salary or wages are treated differently from income from gambling, considered as a "windfall" gain, to be spent without the usual care. As an example Thaler describes the treatment of casino winnings by a successful gambler: winnings are habitually placed in a different location from the seed money. This amount, which is defined as "house money", is easily gambled away without concern because it is a windfall. In the same way a gambler may be cautious after a loss as she may think than now is her money at stake. The opposite of the house money effect is the break even effect: when a consumer is already loosing money, a gamble represents less of a risk, so a consumer might as well continue gambling in an effort to get even (Thaler & Johnson, 1990). This cognitive heuristic is a shortcut used by agents to manage their budget, and to offset near miss fallacy, overconfidence and personalization of outcomes.

2.1.2 Biases in general online activity

Evidence that consider online gambling from the perspective of biases and heuristics is rather limited. To fill the gap we take insights from indirectly related sources on typical biases affecting the behaviour of individuals when they do things online (i.e. eCommerce, use of social media, etc.).

Use of information and rational ignorance. Behavioural studies have shown that the rational consumer model is not entirely correct exactly because consumers do not use all the information at their disposal (even when there are no searching costs) and the limited evidence reviewed suggest that this is even more marked in online settings (London Economics, 2011). For instance, information overload leads consumers of eCommerce services not to read relevant contractual conditions (Lucian et al., 2007). Very few online users and shoppers bother with the terms and conditions and the privacy/security policies and provisions of websites (Acquisti, 2004; Acquisti & Gross, 2006). It has been argued that especially in relation to privacy this is a sort of 'rational ignorance' heuristic[34] in that consumers do not read when the evident cost of processing the information is considered higher than the distant and indirectly perceived (i.e. avoiding identity theft and the likes) benefits (Acquisti & Grossklags, 2008).

Framing effects. The quality of consumer decision-making is sensitive to the way information is presented to them (OFT, 2010). This is called the framing effect, which seems to be clearly at work in the online context. For instance, more informally designed webpages lead people to disclose more personal information online (Leslie et al., 2009; Sukumaran et al., 2011). Neat

[34] Vila et al (Vila et al., 2003) have given an explanation using an analogy from the famous article by Akerlof on the lemon markets (Akerlof, 1970). If consumers cannot distinguish a privacy abiding website from a non abiding one and they are flooded with information, they will rationally decide to remain ignorant for the cost of learning is higher than the perceived benefits.

appearance of a website influences online surfers appraisal of its level of security and trustworthiness (Acquisti & Grossklags, 2008).

Status quo bias. The so-called status quo bias (Samuelson & Zeckhauser, 1988) is the tendency of individuals not to look for solutions or alternatives because they prefer, on average, for things to stay relatively the same. People stick to the status quo and show inertia toward default settings. This bias is clearly at work in the online world: it was found that among social media users, supposedly more advanced and technology savvy, very few check and change their default browsers' security settings (Acquisti & Gross, 2006). As shown amply by Thaler and Sunstein (2008), default settings can be 'malignant' or 'benign' and be exploited either against or in favour of consumers' interests.

Concentration of self-serving biases. Evidence available suggests that among very experienced and confident online users one can find a valence effect - the illusion of control, illusion of knowledge, and self-attribution biases. The valence effect refers to the tendency for individuals to over-estimate the likelihood of favourable events happening to them relative to other individuals. Surveys of eCommerce and social media sites users (Acquisti, 2004; Acquisti & Gross, 2006; Acquisti & Grossklags, 2008) found that the respondents acknowledged that there are risks entailed in using websites when the question was general but think that they will not incur such risks. So, yes it can happen to others but not to me. This effect is related to, and compounded by, the tendency of experienced online users to be more confident in their knowledge or abilities than what would be warranted by facts coming in the form of self-attribution, illusion of knowledge, and illusion of control. For instance, these bias have been shown to be at work for online traders, amongst whom the most experienced trade more aggressively (Barber & Odean, 2002).

Reciprocity, fairness, inequity aversion. It has been documented that in interactions around 'public goods' people expect reciprocity and fairness and dislike inequity (Fehr & Gächter, 2000; Fehr & Schmidt, 1999). These mechanisms explain online behaviours that may otherwise appear irrational. It is well documented that online users resent being asked to register on a website before having received any service in return or answering survey questions before having received the reciprocal bonuses. This is well understood by providers who offer something immediately, so that consumers do not bother about other important contractual and privacy issues, as well as about registration and age verification.

The anticipated compounding effects (besides overconfidence and related self-serving biases) and risks associated with online gambling are reported below.

Socially related risk factors specific to online gambling. It is a simple observable fact requiring no evidence that online gambling is more accessible and available (24/7/365'). Similarly indisputable is the fact that online gambling is more anonymous in terms of the environment, in particular as regards use of the internet at home and asocial than traditional casinos. Gamblers can both better insulate themselves (see later about gambling as insulation) from the world, and from the fact that they may be chasing losses for example or from potentially being seen by others as a ''problem'' gambler. At the same time gambling services can be

accessible, through the development of online technologies, wherever internet connection is available and in light of the convenience of mobile applications. According to some researchers (e.g. King et al 2010), online the gamblers are allegedly able to incur losses at a faster rate due to the rapid pace of online gambling games (i.e. online slot machines often feature a faster ''reel spin'' enabling to place more wagers in a given time period). On this latter factor, however, the evidence is not unequivocal for there are also plenty of examples of very fast land-based gambles. However, it can be speculated (though not demonstrated) that online gambling might present some additional risk factors as compared to off line gambling.

The risks for children and adolescents. Concerns have been raised about the potential impact and risks for children and adolescents (de Freitas & Griffiths, 2008; Derevensky & Gupta, 2007; Griffiths & Parke, 2010). It is has been documented for more than three decades that gambling is appealing to children and adolescents because it is stimulating and can alleviate painful emotional states (Jacobs, 1986). The gambling literature has long suggested that young people are the most vulnerable sub-population of gamblers (Delfabbro & Thrupp, 2003). Nearly two decades it was reported that adolescent problem gambling prevalence rates were more than double those of adults (Lesieur & Rosenthal, 1991). More recently, it has been estimated that, in Great Britain, up to 6% of adolescents report significant pathological or problem patterns of gambling (Griffiths, 2009), whereas 10–15% remain at risk of the development of severe gambling problems (Hardoon & Derevensky, 2001). Comparable prevalence rates have been reported in other industrialised countries, such as the U.S. (Shaffer & Hall, 1996), Canada (Poulin, 2000)and Australia (Jackson et al., 2008).The convergence between gambling and digital media is a source of risks in view of the fact that many online games and video-games incorporate gambling situations and games of chance into the playing experience (King, et al., 2010). King et al (2009) have reviewed several of these games and, for instance, report that in the video game Fable 2, the player is able to participate in a number of gambling activities that are modelled on blackjack, roulette, and slot machines. The player can place wagers using the game currency (coins) and may win or lose virtual currency depending on chance events. In the video game Grand Theft Auto: San Andreas, players can enter a casino and play to win virtually unlimited sums of 'in-game' money. In these examples, gambling is portrayed as fun and exciting, with the potential to ''win big'', and the activity is accompanied by sound and music effects to heighten player arousal. Moreover, in such gaming context the gambles are presented within the context of a predominantly skill-based game, which may misrepresent the degree of skill required within the gambling scenario (Monaghan et al., 2008). Finally, with respect to adolescent and online gambling there is the risk that adolescents access gambling websites in the home, for instance by using the credit card of another family member such as a parent or older sibling (Griffiths & Wood, 2000). Furthermore, there are some bank cards (such as Electron or Solo cards) that children as young as 12 years old can legally have access to (Smeaton & Griffiths, 2004).

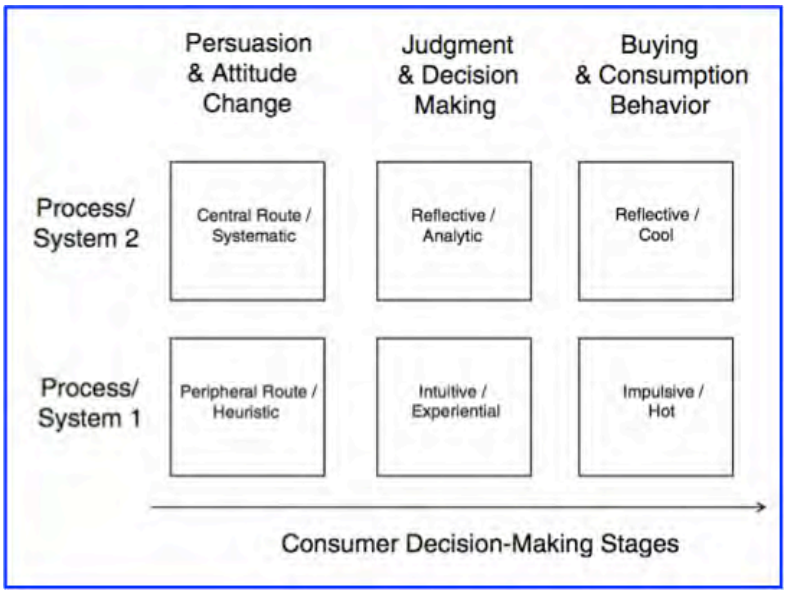
2.1.3 Summing up

There are several cognitive biases that have been cited in the literature to explain what may seem the irrational behaviour of gamblers. To a large extent the more nuanced picture presented earlier can be simplified by saying that these biases point at two main and intertwined general features: a) errors in the judgement of the probability of events (i.e. gambler's fallacy and near miss fallacy; b) self-serving or self-delusional biases resulting from

'hot' cognition applied to occurring events (over-confidence, illusion of control, personalisation of outcomes, hot and cold streaks, etc.). The distinction between 'hot' and 'cool' cognition has parallels but is a different specification to the system 1 and system 2 modes of thought as outlined by Kahneman in particular in the role of emotion.

Ideally, measures (treatments) should help gamblers be aware about their judgement errors and induce a cooler form of cognition stopping the more intuitive and experiential mechanisms leading to hot and impulsive behaviour. In this respect, the 'mental accounting and house money heuristic' may warrant the design of a de-biasing nudge further considered in the final section of this chapter. The treatment tested in the experiments are grounded in the insight developed by Strack et al (2006) and other authors on the strategy to activate slow and accurate thinking (Petty & Cacioppo, 1986; Streff & Geller, 1988).

Figure 2 Hot and cool cognition and action



Source: (Strack, et al., 2006)

From the analysis of the online context at least three issues can be identified;

1) It is possible but yet to be demonstrated empirically that the online medium accentuate over-confidence and similar biases (illusion of control, self-attribution, illusion of knowledge) especially among those individuals who consider themselves to be technological savvy in general and in the domain of gaming and gambling through the Internet. A corollary may be that this is more accentuated among those who regularly surf for entertainment or for work (i.e. online traders) and among the younger so-called 'screen-agers';
2) Surveys of eCommerce and social media users suggest that there is online a clear 'status quo bias' with regard to various browsing settings that could be exploited favourably (the power of default options) in the design of nudges;
3) Biases such as 'near-miss' and 'hot and cold streaks' seem to be linked to the speed of gambling and could, thus, be amplified as long as online gambling is indeed faster than

it off line counterparts (a speculative hypothesis still in need of robust empirical confirmation);

2.2 The dynamic of human-machine interaction

The previous analysis is grounded in a current psychological approach. This section covers, a less known branch of psychology that better than the previous behavioural approaches sheds light on the importance of how individuals interact with broadly defined artefacts, of which electronic gambling machines or their online versions are one clear example (2.2.1). Then § 2.2.2 looks first at a more macro perspective, switching back to the micro-level of the individual but from a more anthropological and sociological perspective, and also at the meso level represented by the industry practice[35]. Finally, 2.2.3 sums up the main lessons from this section.

For ease of reference the two questions posed at the beginning of this chapter are reported again here: "*Why so many individuals keep playing even in the face of steady losses that, in the case of problematic gamblers, can ruin their lives?*"; "*Given the low probability of winning shouldn't prolonged play be aversive and rare?*"

From the perspective illustrated here the answers to the two questions cannot come simply from a focus on the individuals, but rather from an understanding the complex human-machine interaction. This is a perspective that requires going beyond behavioural economics and incorporating insights from ecological psychology, and from anthropological, ethnographic, and sociological exploration of the interplay between humans and technology. Indeed, the cognitive biases discussed earlier are defined with respect to a reference point (what would a rational consumer do?) and do not consider 'human-machine interaction'. Yet, this interaction in the context of gambling is ' an affective confounder and obfuscator' that makes the hypothetical rational reference behaviour to some extent a fiction. To use an expression explained in next paragraph, both traditional and online gambling provide 'affordances' that by definition invite the individuals to switch off their knowledge and awareness about the fact that you cannot beat the machine. So, in a way, gambler's fallacy or similar biases appear from this perspective to some extent 'tautological'.

2.2.1 Affordances of online gambling

There is branch of psychological theory and research termed 'ecological psychology' that has long influenced 'Human-Machine' interaction studies. At the bases of ecological psychology is the work of Gibson (1979, 1982a, 1982b), who developed an influential critique of mechanistic

[35] The book 'Addiction by Design' inspires the account provided in § 2.2.2 (Schull, 2012). Most of the literature sources and all the extracts from interviews with gamblers cited in § 2.2.2 have been found in this book. The literature sources were then retrieved, analysed and adapted to the issue at hand in this report.

conceptions of perception and action in agents. In Gibson's view, the environment consists of action possibilities, which he termed **'affordances'**. Of particular importance is Gibson's argument that the agent's environment consists of opportunities for action, and not simply of stimuli that causes the agent's perception and action. In Gibson's framework, the environment is conceived not as a collection of causes, but as a manifold of action possibilities. The notion of affordances has been very influential in ergonomics (the study of designing equipment and devices that fit the human body and its cognitive abilities, in the case of gambling also weaknesses) and it is a very important concept in human-machine interaction studies. The reason of this influence is that designing, for example, online interfaces are often conceived as set of action possibilities in which the (human) agent's choices and the interface possibilities interact constantly. This expands the approach of cognitive psychology in which the agent and its mental maps (and possibly its heuristics and biases) or representations are the only focus. One reason this extension is needed builds on a key insight of human-machine interaction studies - that technological and physical objects mediate activity. Cognitive sciences have largely ignored the study of artefacts, insisting on mental representations as the proper locus of study. This has led to a vast body of studies on 'mentalistic' phenomena such as 'plans' and `mental models' and 'cognitive maps', 'heuristics', and 'biases' with insufficient attention to the physical world of artefacts—their design and use in the world of real activity. Moreover, other typical psychological concepts such as 'motivation' can be redefined by an ecological approach. One recent development of an ecological approach in human-machine interaction is the design of 'persuasive interfaces' or 'captology'. In this area, the work of Fogg (2003) at Stanford University and its 'persuasive technology lab' has been influential. According to Fogg's experiments, human beings are hardwired to respond to cues in the environment, especially to things that seem alive in some way and that include computers and software (i.e. video or online games). The fact that people respond socially to computer products has significant implications for persuasion.

In the domain of gambling, there are many applications of the concepts described above from the prospective of the industry operators. Gambling website are designed carefully crafting 'affordances' so that players can play more and longer. Persuasive cues are present in the visual presentation. This is true even for physical slot machines in casino. A very famous example comes from the world of gambling, in the form of Banana-Rama slot machine (Fogg, 2002). This slot machine has two onscreen characters—a cartoon orang-utan and a monkey—whose goal is to persuade users to keep playing by providing a supportive and attentive audience, celebrating each time the gambler wins. From the perspective of a regulator, intervening in the human-machine interaction, changing the environmental affordances of playing online is a promising field.

2.2.2 Human-machine interaction in the 'experience' economy[36]

Until the more recent change in the DSM-V placing pathological gambling together with substance-related addictions in the re-named group "Addiction and Related Disorders."(APA, 2013), it has been widely debated whether the problem is in the mind of the individual or in the machine. The same applies for a domain closely related to online gambling (Smith & Campbell, 2007). Yet, it is clear that technology cannot be a neutral object. As extensively explored and argued (Latour, 1988, 1992, 1994, 1999), the designers of technological interfaces can shape human-machine interaction and use scripts that favour certain actions and make others less likely.

Classical authors commenting in the 1960s and 1970s on video-based machines observed that such game situations were occasions for 'character contests' and provided the opportunity for 'action' outside of a disciplined society (Geertz, 1973; Goffman, 1961). So, here the macro-social context explaining why agents use the 'affordances' inscribed in games by designers is exposed. As technology and its entertainment components moved from the computer to the new online social world and to games, they have become an 'affect management instrument', a way for individuals of any age to create their own world isolated from the real world of uncertainties, constraints, and risks (Turkle, 1984, 1997, 2011). Computers, video games, mobile phones, iPod, and the like are means for the individuals to manage their affective states and create their personal buffer zone (Biehl & Moran-Thomas, 2009; Latour, 1994, 1999). The relevant industries cater exactly to this aspect following the mantra of the best-selling 'experience economy' slogan (Pine & Gilmore, 1999) with market and delivery strategies that have been deemed part of a new emerging form of '***Affect-Based Ludo-Capitalism***' (Andrejevic, 2007, 2009; Callon et al., 2002; Dibbell, 2006; Thrift, 2006). In this respect the much-heralded concepts of user-centricity and co-creation are seen critically as new ways to extract value from enhanced consumer experience and mine a new phenomenological substrate (Thrift, 2006).

Electronic gambling performs for gamblers the role of 'an affect management instrument'. Interviews with gamblers reported in Schüll (2012) clearly suggest that they find in gambling a mechanism by which they ensure a buffer insulation zone from the outside world. The continuity of machine gambling deflects away from 'worldly contingency' - one gambler tells of feeling as if she is in the 'eye of a storm'. The recurrent expression is reaching the 'zone' by gambling. She says that is not about money but rather about having more 'time on the machine' and that winning is just a way to increase such time and losing less money (but still losing). It is a way for being suspended from world (Borrell, 2008). It is not about winning money, they claim, but rather about a self-delusional and self-imposed form of entrapment as

[36] In light of the type of gambles that have been replicated for the purpose of the study the literature reviewed rests more on that concerning gambling machines. However this is not intended to ignore that there are other studies available about gambling in general or on other types of gambling, and which may be different or which may have similar features to these two types of gambles.

put it by another gambler: '*having lost the plot as to why you are there in the first place*'(Borrell, 2006, pp. 182-183). Another explicitly admits to turning off her mind (or a part of it) "*I'll often block out what I know about the machines because if I admit to myself that it's a completely random event that has nothing to do with my actions, then I'm just not going to have the experience that I want to have. So I sort of shut that side of my mind off. It's like I delude myself*" (reported in Schüll 2012). So, she does know that it is a random event she cannot influence, but she intentionally switches off that knowledge. In other words the illusion of control and other biases seen earlier (personalisation of outcomes, self-attribution) are intentionally enacted and they are probably difficult to switch off since the technology is designed to keep them alive. It is the hidden processes by which the machines deliver wins and losses that sets continued play in motion.

Taking inspiration from Weber's famous essay '*Science as a Vocation*' (Weber, 1946 [1922]) where the great German sociologist discussed the process of disenchantment and rationalisation of the world, Schüll (2012) argues that gambling machines are forms of 'disenchantment' that in a calculative and rational way have been designed both for the rationalised pursuit of profit and for 're-enchanting' the world of gamblers during the time they manage to keep them attached to the machine. They cater to human spontaneity and inclination resistant to rational justification (Bauman, 1991, p. 125) or, in Weber's words, to 'irrational and emotional elements that escape calculation' (Weber, 1946 [1922], p. 216). In that famous essay Weber also claimed that rationalisation did not make modern man more knowledgeable of the condition where he lived than an American Indian. We know nothing about the technological conditions surrounding us and we count on them to work. Gamblers know or can now what the odds are and how the machine work, but they prefer to count on them to work according to their emotions. Schüll (2012) also reports that industry practitioners are fully aware of this kind of mystic of gambling and refer to the acronym RNG as meaning 'Really New God' when instead it stands for 'Random Number Generator'. The sense of magic and wonder that gambling machines provoke in their users has a great deal to do with the hiddenness and opacity of the "means and calculations" by which they mediate chance. The industry knows it and designs accordingly.

Using a clustering technique the designers of slot machine can make sure that the number of near-misses gamblers can visualise is larger than it would occur by chance (Harrigan, 2007, 2009). Harrigan has calculated that if gamblers observed all near miss and made calculation on them they would be led to assume a potential payback percentage or likely "return to player" in the range of 192 to 486 per cent (2007). A participant in one study (Blaszczynski et al., 2001, p. 86) affirmed that "*It makes you want to press the button and continue. You live in hope because you got close and you want to keep trying. You get to learn the pattern and just need to get it right.*"

Another important element that emerges from analysis of gaming industry materials is that the strategic goal of the gambling industry are exactly those that make electronic gaming similar to a stimulant that energizes and de-energizes the brain in short and repeated cycles. Productivity means from the perspective of the industry faster, longer, and more intense

gaming by the gamblers. Design strategies are aimed at making people bet faster, relentlessly, and intensely as to maximize REVPAC (revenue per available customer). Productivity in this industry is not output per worker, but rather 'play per gambler per interval' and the magic word is 'Expediting'. This refers to facilitating gaming action as to make gamblers more productive in that they play faster, extend for a longer interval, and/or involve more money per period than would otherwise be expected (Cummings, 1997). This is particularly easy today with remote gaming (i.e. online gambling) and credit card payments. Consider for instance that, as reported by an industry expert quoted in Turdean (2012, p. 11), in the old times of mechanical machines (1960s and 1970s) when a gambler won more than 20 coins he/she had to stop playing and wait until the attendant verified his/her win and paid him/he off. This did not only slowed down the play but it suggested a kind of a closure, the end to the game, it tempted the player to cease the game. This is no longer the case with sophisticated land-based video machines, and certainly not for online gambling.

2.2.3 Summing up

There is an elective affinity between some particular emotional motivations in gamblers and the way electronic gambling is designed. Gamblers turn off their awareness about how machines work, they are intentionally obfuscated and emotionally confounded, and the machine are designed to invite and reinforce these two aspects. While the literature considered so far mostly focussed on land based electronic slot machines, there are no reasons why these insights cannot be applied by analogy to their online interfaces that simply reproduce the mechanisms of their land based counter parts. Actually, online this logic is applied also to gambles (i.e. roulette, scratch card, and poker) that in the physical world are not played electronically.

Electronic machine gambling, whether land based or online, is faster and more repetitive than its *mechanical or physical* counterparts. Electronic machines or online interfaces are geared to 'expedite' gamblers to play faster, without intervals, and with intensity. It is, thus, evident that targeting the human-machine interaction matter as much, if not more, as addressing gamblers' mental processes. There are many elements, analyses, and evidence that corroborate this interpretation some of which are recalled below.

Following the concept of 'affordances' and drawing from industrial design it has been argued that objects are not merely functional, but always affect the agent emotionally, making certain behaviours more likely to occur (Withagen et al., 2012). In this sense, 'affordances' provided by electronic land based and online gambling invite gamblers to switch off their cool cognition and to surrender to their biases. The convergence between gambling and digital media is creating a new world of online entertainment inspired by the industry strategy of creating 'experience economies' and where online gaming and online gambling are increasingly converging (King, et al., 2010). In this respect researchers have long noted many psychological, structural and situational similarities between video games and gambling slot machines (Griffiths, 1999, 2002; Johansson & Gotestam, 2004). Again the similarities cannot be attributed only to individual traits but involve human-machine interaction. That the problem lays as much in the technology as in the personality traits of the individual gamblers has been recently recognized by the Australian Productivity Commission (Productivity Commission, 2010), and there is psychiatric evidence that repeated interaction with a specific object or

array of objects produces a subjective shift (Shaffer, 1996; Shaffer & Kidman, 2003). Some have claimed that electronic gambling (both land-based and online) because of their continuous and repeated interaction and their greater speed compared to the mechanical 'machine' of the past function as 'psychostimulants' and that electronic forms of gambling are like crack for cocaine(Dowling, et al., 2005). Since they are faster than their mechanical counterparts they energize and de-energize the brain in more rapid cycles. The important role technology has long played in the innovation of gambling practices has been clearly underscored by scholars of gambling since the end of the 1990s (Griffiths, 1999, 2003) and before (Brown, 1989; Jacobs, 1986; Selnow, 1984). Early start with video games creates attachment to a gaming machine (Brown, 1989) or 'electronic friendship' (Selnow, 1984) because of affinity between personal and social needs and the way technologies are designed. This can later develop into a pathological dependency on gambling machines in adulthood. The increase social exposure to gaming and gambling in a given population increases the prevalence of gambling and gambling-related problems (Abbott, 2007; Fisher, 1993; Hardoon & Derevensky, 2001). In the study of persuasive technology it is mentioned how technology can socially impact behaviour through opportunely designed formats (Fogg, 2002).

2.3 Tested treatments and their rationale

This final section first provides an overview of the treatments rationale and the measure of effectiveness used (§ 2.3.1). Then it moves then into the details of each treatment further illustrating the rationale, the corresponding research question, and the *ex ante* hypotheses on the effects with respect to the relevant response variables (§ 2.3.2). Finally, it concludes with a few summarising considerations (§ 2.3.3).

2.3.1 Overview

Before providing an overview of the treatments across the two experiments, the procedure is very briefly anticipated (more details are in chapter 3 and in the Technical Appendix).

In the LAB, subjects first entered the pre-gamble phase and were randomly allocated to one of the pre-gamble treatments or to the control conditions and participated in the pre-gamble session. After the pre-gamble treatments they were given the possibility of opting out. Those that did so were given a filler task before leaving the Lab. Those who did not opt out proceeded to the in-gamble phase. This consisted of two steps: step 1 comprised alert pop-ups and monetary limits treatments; step 2 comprised the repetition of pictorial and textual warning with compliance (box 'I understand' to be checked; button 'proceed' to be clicked). Subjects were randomised both to treatments and to either start with in-gamble step 1 or in-gamble step 2. In these two steps subjects were randomly allocated to see a treatment or to the control condition, which in all cases is playing and not being exposed to any treatment (this applying to both the LAB and ONLINE studies). Subjects answered pre-treatment questions (on socio-demographic and on gambling activities) and post-treatments questions at different stage of the experiments (providing self-reported cognitive and emotional response variables). As subjects played the system automatically recorded their behaviour in terms of amount bet and speed of betting.

As anticipated, the ONLINE consisted only of pre-gamble treatments. Subjects were exposed to the treatments, after which they were given the possibility of opting out. If they decided to continue, they played several sessions after which they also answered post-treatment questions to measure cognitive and emotional self-reported response variables. Before the experiment started they also answered pre-treatment questions (on socio-demographic and about gambling activities). Even in this case, as subjects played the system automatically recorded their behaviour in terms of amount bet and speed of betting.

The next two tables report the treatments in the first column and, in the second column, a short description of the rationale and some comments that reflect the discussion conducted in the previous two sections of this chapter. In next paragraph (§ 2.3.2) screenshots of the treatments and more details treatment by treatment are provided.

Table 5 Pre-gamble treatments high-level rationale

Treatments	Rationale
Pop-up Pictorial warning (PT1, OT1)	Directly raise awareness about risks, activate system 2 (cool cognition) leveraging affect heuristic (image aim to emotionally arouse about risk).
Pop-up Textual warning (PT2, OT2)	Directly raise awareness about risks, activate system 2 (cool cognition).
Overconfidence task (PT3, OT3	De-biasing overconfidence and related biases.
Logos/banner (PT4, OT4, OT5, OT6)	Indirectly raise awareness about risks, activate system 2 (cool cognition). Different versions test whether there is an online framing effect.
Terms & Conditions (OT7)	Activation of slow but accurate reasoning "reflective thinking" through information provision. Uncertain effectiveness in the online context. It may be deactivated by typical online heuristic/bias (non use of information / rationale ignorance)
Registration (OT8)	Same as above. It can be deactivated by online biases related to reciprocity, fairness, inequity aversion
Extended Registration (OT9	Same as above plus testing if there is a framing effect

As anticipated in § 1.2, the scope of the study as defined in the ToR included a preliminary list of the treatments to be tested. The study team discussed these treatments with the Commission and used its expertise and the insights from the literature to ground them theoretically and as empirical questions. For instance, with the use of a full factorial design for the in-gamble phase of the laboratory experiment it was possible to test the interaction effects of exposing subjects to both monetary limits and alert pop ups, instead of testing them separately (in a main effect design). As shown later, the findings support this choice.

The second consideration is that the pre-gambles treatments were designed to test the biases and heuristics presented in § 2.1.

The third consideration is that the in-gamble treatments were designed both in terms of bias and heuristics and in some limited attempts to alter the 'human-machine' interaction. Altering the interaction in ways to slow down the expediting effect and forcing subjects to interrupt the 'flow' at least for a short time. In other words 'forcing a break' can serve to re-focus the mind / behaviour of the player.

Table 6 In-gamble treatments high-level rationale

Treatments	Rationale (biases/nudges)	Rational (human-Machine)
Fixed monetary limits (IS1.1.1)	The power of default, leveraging status quo bias to reduce betting	Subject needs to stop and replenish it, rhythm of spinning is interrupted
Self-defined monetary limits (IS1.1.2)	Activate mental accounting heuristic, creation of mental budget activating cool cognition	Subject needs to stop and replenish it, rhythm of spinning is interrupted
Push alert pop up (IS1.2.1)	Activate more accurate thinking and cool cognition providing alerts/warning about time and money spent	Disturb/interrupt the flow, slow down spinning
Pull alert pop up (IS1.2.2)	Same as above plus testing possible framing effects	Disturb/interrupt the flow, slow down spinning
Push alert pop up 'you lose' (IS1.2.3)	Same as above plus testing possible framing effects	Disturb/interrupt the flow, slow down spinning
Pictorial warning with check box (IS2.2.1)	As in PT1: Directly raise awareness about risks, activate system 2 (cool cognition) leveraging affect heuristic (image aim to emotionally arouse about risk). In addition subject must check two boxes to continue playing	Subject needs to stop, read (in theory), check boxes. It may slow down spinning (if subject pays attention and does not simply quickly check boxes)
Textual warning with check box (IS2.2.2)	As in PT2: Directly raise awareness about risks, activate system 2 (cool cognition). In addition subject must check two boxes to continue playing	Subject needs to stop, read (in theory), check boxes. It may slow down spinning (if subject pays attention and does not simply quickly check boxes)

The next two tables provide a simplified snapshot of the variables used to measure the effectiveness of the various treatments. The reader will find a more detailed discussion of our approach to this issue in chapter 3 (§ 3.1.2) and the full and detailed list of variables, including the kind of scale that measure them, in the Technical Appendix (Table 45, page 126 for LAB; Table 64, page 149 for ONLINE).

Table 7 Behavioural response variables

Variable	Where
Average bet per spin	LAB (pre-gamble & in-gamble) ; ONLINE
Average time per spin	LAB (pre-gamble & in-gamble); ONLINE
Change in average bet per spin	LAB (in-gamble)
Change in average time per spin	LAB (in-gamble); ONLINE
Keep gambling	LAB (in-gamble, when they can stop)

Table 8 Self-reported response variables

Variable	Where
Negative/positive affect (PANAS scale)[37]	LAB & ONLINE (post-treatment)
Emotional valence/arousal (SAM scale)[38]	LAB & ONLINE (post-treatment)
Intention to gamble in the future	LAB & ONLINE (post-treatment)
Use of Logos	LAB & ONLINE (post-treatment)
Cognitive processing (think about risks)	LAB & ONLINE (post-treatment)
Advocacy (speak to others about risks)	LAB & ONLINE (post-treatment)
Noticeability (for specific treatments)	ONLINE (post-treatment)
Willingness to continue (for specific treatments)	ONLINE (post-treatment)

The behavioural variables were registered automatically by the experimental output programme and correspond to the actual choices/actions made by the subjects, including how much they bet per spin; how much time elapsed between one spin and the next; whether when they could stop playing they stopped or continued,, plus changes in the amount per bet and time per bet after specific treatments (the pop up pictorial and textual warnings where they had to check a box to proceed). In this case the 'desirable' effect is easy to explain: the treated subjects should have lower amounts per bet, longer times per bet, that they stopped more when they could, etc. compared to the control group. If treated subjects bet less and more slowly, then the treatment is effective.

The other variables were measured after the subjects had gambled and had been exposed (treated) or not (control). This involved a post-treatment questionnaire. (see more on this in § 3.1.2). The variables included emotional, intentional (conative), and cognitive variables. Here, it is more difficult to specify what findings would indicate effectiveness of the treatment. The basic question is whether there are statistically significant differences in the emotional, intentional, and cognitive reactions of the treatment group compared to the control group. In principle from the perspective of biases and heuristics the treatment (especially pre-gambles) would be effective if they manage to activate reflective thinking and stop hot cognition. This would imply that, if the treatments are effective, the treated subjects should show higher degree of cognitive processing (thinking about the risks and talking to others about them), less intention to gamble in the future, and possibly more negative emotional reactions. On the

[37] See Figure 10, page 87.

[38] See Figure 11, page 88.

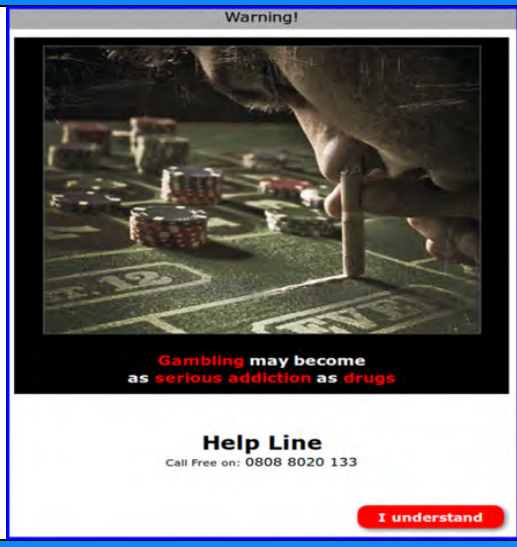
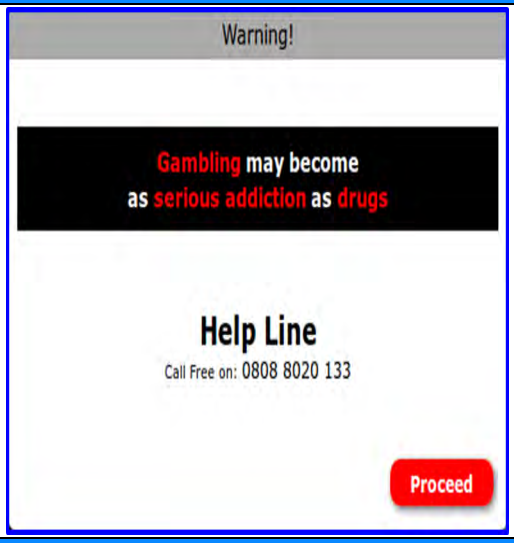
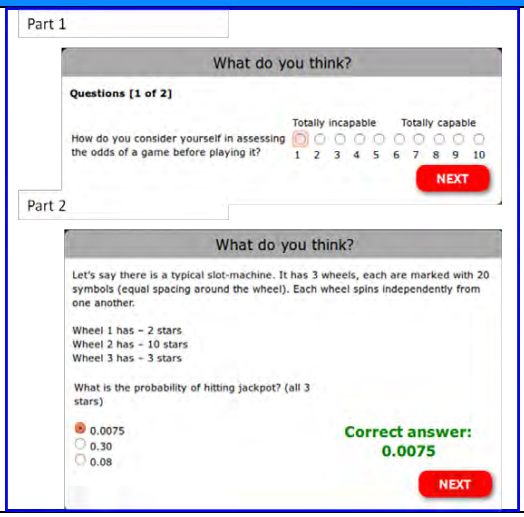
other hand, they are playing and this could have the opposite effect, even if they bet less and more slowly (that is when behavioural measures show effectiveness). They may report positive emotions and more intention to play in the future. This could be possibly due to the fact that some treatments may reassure them (i.e. monetary limits) and neutralise the possible worries generated by the awareness about the risk of gambling.

The next paragraph discusses each treatment in detail. In cases where different treatments are in practice a variation of the same measure to test the effects of different framing they are discussed under the same heading (i.e. logos/banner; different registration forms; monetary limits; different forms of alert).

2.3.2 Treatments in detail

In the next three tables we show the screenshot of what subjects saw during the experiment, including the treatments.

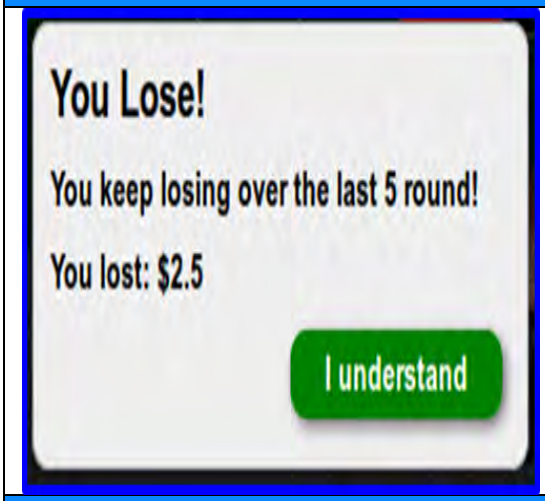
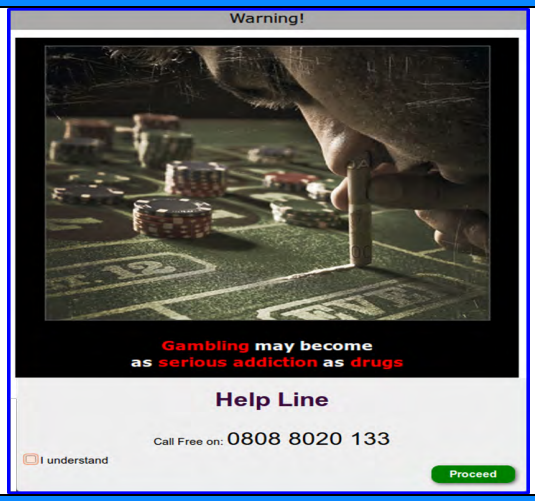
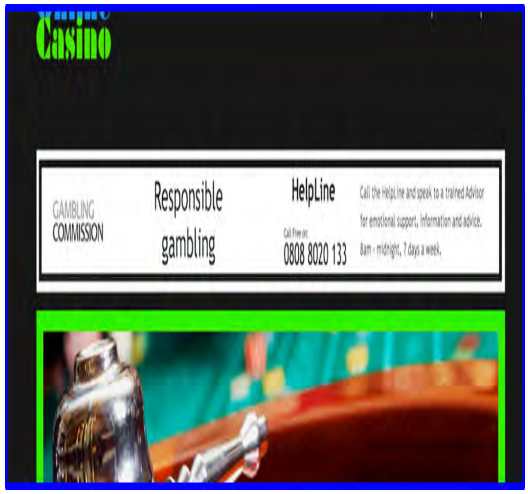
Table 9 Screenshots of treatments (1/3)

Pop up pictorial warning (LAB & ONLINE*)	Pop-up textual warning (LAB & ONLINE*)
	
Over confidence task (LAB & ONLINE*)	**Small Logo (LAB & ONLINE*)**
	

(*) For online same concept but adapted to countries (translation, logo, helpline number)

Note that in the case of the ONLINE treatments the opt-out option is visible only in the two registration treatments. However, it was available in all other treatments.

Table 10 Screenshots of treatments (2/3)

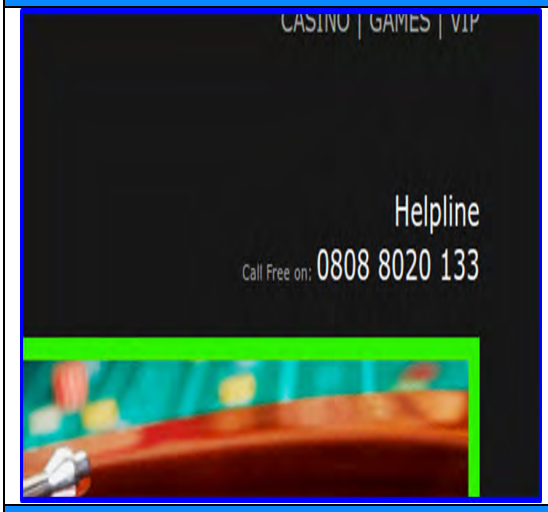
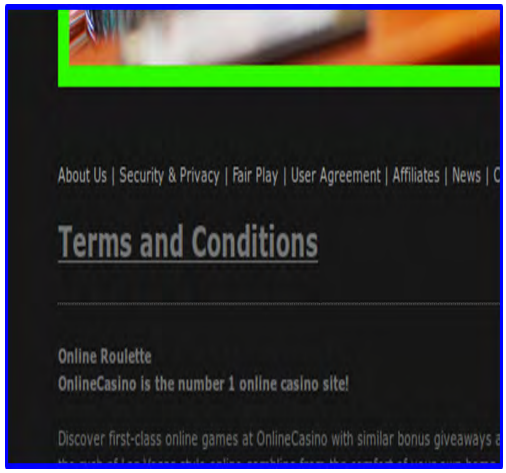
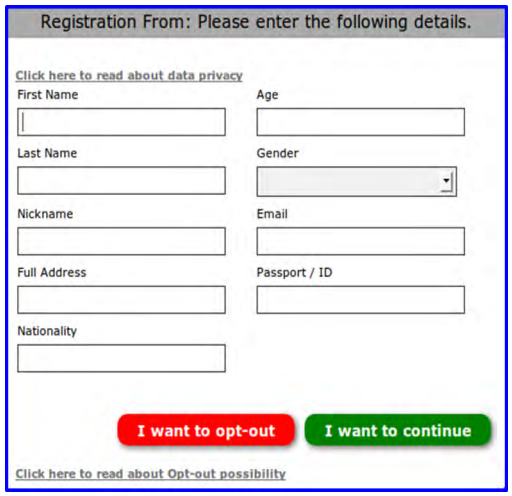
Example of feed back (LAB *)	Pop up pictorial warning 2 (LAB **)
	
Pop up textual warning 2 (LAB **)	**Larger/contrast logo/banner (ONLINE ***)**
	

(*) This is just one example of the feedback alerts shown (other are variations of this)

(**) Warnings with check box to tick and button proceed to push (LAB in gamble step 2)

(***) Adapted to countries (translation, logo, helpline number)

Table 11 Screenshots of treatments (3/3)

Helpline only (ONLINE*)	Terms & Conditions (ONLINE**)
	
Standard registration form (ONLINE*)	**Extended registration form (ONLINE*)**
	

(*) Adapted to countries (translation, logo, helpline number)

(**) Could be clicked and information popped up (adapted to countries)

2.3.2.1 Pictorial warning (PRE-GAMBLE, LAB & ONLINE)

Rationale: Activation of 'reflective thinking' by inducing unpleasant/worrying emotions using an unsettling picture. It attempts to leverage the 'affect heuristic'. The picture aims at emotionally and directly conveying the risks of gambling.

Questions: Does the introduction of a warning message with an emotions targeting picture have an effect on emotional, cognitive, an intentional reactions? Does it also affect the gambling behaviour of subjects? Does it have an effect on emotional and cognitive experience of gambling as compared with the logo? Does the picture have an added value compared to the simple textual warning?

Effects: For both LAB and ONLINE, in the case of this treatment effectiveness would be established primarily by self-reported measures (more or less to be intended always compared to the control group): more negative and unsettling emotional reactions; more cognitive processing (think about risks, speak to other about them); less intention to gamble in the future. Secondarily one may expect, in case of effectiveness, lower bet per spin and longer time per spin. Only ONLINE: less willingness to continue the experiment; higher opt-out rate compared to control.

2.3.2.2 Textual warning (PRE-GAMBLE, LAB & ONLINE)

Rationale: Activation of 'reflective thinking' directly with a message about the risks of gambling but without the emotion tapping picture. It may nonetheless leverage the 'affective heuristic'.

Questions: Does the introduction of a textual warning message have an effect on emotional, cognitive, an intentional reactions? Does it also change the gambling behaviour of subjects? Does it have an effect on emotional and cognitive experience of gambling as compared with the logo?

Effects: For both LAB and ONLINE, in the case of this treatment effectiveness would be established primarily by self-reported measures: more negative and unsettling emotional reactions; more cognitive processing (think about risks, speak to other about them); less intention to gamble in the future. Secondarily one may expect, in case of effectiveness, lower bet per spin and longer time per spin. Only ONLINE: less willingness to continue the experiment; higher opt-out rate compared to control.

2.3.2.3 Overconfidence task (PRE-GAMBLE, LAB & ONLINE)

Rationale: Subjects are first asked how good they consider themselves at probability and then they are asked to answer a multiple choice question about calculating the probability of a particular occurrence in slot-machines or roulette. After they answer they are provided with feed-back (right or wrong answer). This is aimed specifically at de-biasing overconfidence and related self-serving biases and it

could inhibit other biases such as near miss and gambler's fallacy. The use of the online medium can give rise to self-attribution, illusion of knowledge and illusion of control, amplifying the gambling biases. Moreover given the faster wheel spin obtained in online gambling, biases like near miss fallacy and hot and cold streaks are amplified. Hence, countering these biases would be crucial in the context of online gambling.

Questions: Is it possible to de-bias subjects from overconfidence? Does the introduction of an overconfidence task have an effect on the gambling behaviour of individuals? Does it have an effect on emotional and cognitive experience of gambling?

Effects: For both LAB and ONLINE effectiveness should result in lower bet per spin and longer time per spin, but also in less intention to gamble in the future, and possibly in less positive emotional reactions. Only ONLINE: less willingness to continue the experiment; higher opt-out rate compared to control.

2.3.2.4 Various logos/banner treatments (PRE-GAMBLE, LAB & ONLINE)

Rationale: The rationale here was to test the typical protective measures currently used by some operators' website. These raise awareness about the risks of gambling indirectly by pointing out that there is a national regulator and a help-line. Different versions were tested to detect whether in the online context framing this measure differently could change its effectiveness (i.e. especially large versus small logo/banner).

Questions: Does the presence of existing logos of national gambling regulators have an effect on the gambling behaviour of individuals in terms of money, time and spins and on emotional reaction? Is there a clear noticeability and recall effect? Do subject affirm looking at logo when they enter a website?

Effects: If effective, it should stimulate cognitive processes and risk awareness that would be reflected in less and slower betting. It should also be readily recalled and noticed by subjects. The relevant variables are use of logo (LAB and ONLINE) and noticeability (ONLINE). For ONLINE it was not possible to formulated ex ante any hypothesis of the effect on the opt-out option.

2.3.2.5 Terms & Conditions (PRE-GAMBLE, ONLINE)

Rationale: The rationale here was, again, to test whether the traditional and typical protective measures already used by some operators' websites actually work. The aim is to target gambling biases that may be deactivated by typical online heuristic/bias (non-use of information / rationale ignorance). In the online context the terms and conditions are more effective if provided as a default (Status quo bias) and if they are short and readily intelligible.

Questions: Does the presence of terms and conditions with a link have an effect on the gambling behaviour of individuals in terms of money, time and spins, opt out

but also emotional and cognitive experience of gambling? Does it have an effect in terms of recall, noticeability and relevance?

Effects: If effective, it should stimulate cognitive processes and risk awareness that would reflect on betting slower and less. It should also be readily recalled and noticed by subjects (this treatment is only in the ONLINE). For ONLINE it was not possible to formulated ex ante any hypothesis of the effect on the opt-out option.

2.3.2.6 Simple and extended registration (PRE-GAMBLE, ONLINE)

Rationale: This is a test of another traditional and typical protective measure already in use in the majority of the operators' website. The aim is to target gambling biases but may be deactivated by typical online heuristic/bias. The registration form was designed to be user friendly. In this case the rational ignorance, inequity and fairness, and the status quo biases are all the more important given that the effort in completing the extended registration form is higher than in the case of the simple registration form. While the registration forms were framed in a user-friendly way it is expected that this treatment will be effective in a very specific way, i.e. by inducing higher rates of opt out.

Questions: Does the registration forms have an impact on self-reported and behavioural measures (if subjects do not opt out)? Or does it lead to higher opt out rates?

Effects: Effectiveness would be evidenced by higher rates of opt-out compared to the control group and other treatments. Note in the real world gamblers may end up searching for website without registration requirements.

2.3.2.7 Combination of monetary limits and alerts (IN-GAMBLE STEP 1, LAB)

As anticipated, in the case of step 1 of the in-gambles treatment in the laboratory experiment a full factorial design was adopted and this was exploited to test the effects of the following six combinations resulting from the monetary limit (two values) and the alert (three values) treatments:

- Fixed monetary limits with push pop up (standard);
- Fixed monetary limits with pull pop up;
- Fixed monetary limits with push pop up ('you lose');
- Self-defined monetary limits with push pop up (standard);
- Self-defined monetary limits with pull pop up;
- Self-defined monetary limits with push pop up ('you lose');

Rationale: The Monetary fixed limits can leverage the power of the default option and the inertia effect this may have on betting decisions[39]. At the same time, when the wallet is empty, the subject needs to stop and replenish it, and the rhythm of spinning is interrupted. With self-defined monetary limits there is a similar effect on the human-machine interaction, while there is also the attempt to leverage mental accounting. Individuals construct dedicated 'budgets' for specific activities keeping spending under control (Thaler 1985). This could also slow down betting and activate more accurate thinking. All variants of alerts (push, pull, or push with 'you lose') are potential ways to activate slow but accurate reasoning (Strack et al 2006; Streff & Geller 1988; Petty at al. 1986). This may inhibit biases such as the near miss fallacy, gambler's fallacy, sunk-cost (entrapment, related to 'loss aversion and reflection heuristic), and hot and cold hand streaks. At the same time, the monetary limits and the alerts are an intervention in the online gambling environment that changes the affordances (the possibility of interactions) between the gambler and the machine (the software). They disturb/interrupt the 'flow into the zone', slowing down spinning. Finally, administered in combination the effects could be reinforced.

Questions: Does the introduction of these combined measures limit have an effect on the gambling behaviour of individuals in terms of money, time and spins but also emotional and cognitive experience of gambling? Does the altering/interruption (replenishing virtual wallet, tracking one's status) have an effect on the gambling behaviour of individuals in terms of money, time and spins but also emotional and cognitive experience of gambling? Is there any added value in the different way the measures are framed (fixed versus self-defined limits; pull versus push pop ups; framing of alert in negative terms 'you lose)?

Effects: The effectiveness of these treatments should result into lower amount per bet and longer time per bet. The effects on self-reported emotional, intentional, and cognitive measures are more difficult to predict *ex ante*.

2.3.2.8 Pictorial and textual warnings with compliance (IN-GAMBLE STEP 2, LAB)

Rationale: Pictorial and textual warning were re-tested as nudges introduced in the second game (in-gamble step 2) of the laboratory experiment with an important variation: after the pop-up appeared, subjects had to first check the box 'I understand' and then click the button 'proceed' (see Figure 30 and Figure 31, at page 133). This may force them to pay more attention to the messages. It may slow down spinning, if subjects pay attention, but it may not if they quickly and automatically check the box and click the buttons just to keep playing.

[39] On the general concept of how default options can produce policy desirable out comes see Johnson & Goldstein (2003).

Questions: Does the introduction of a warning message with an emotion targeting picture and with check box and click button have an effect on emotional, cognitive, an intentional responses? Does it also affect the gambling behaviour of subjects? Does it have larger effects compared to the pictorial warning without check box and click button? Does the introduction of a textual warning message with check box and click button have an effect on emotional, cognitive, an intentional reactions? Does it also affect the gambling behaviour of subjects? Does it have larger effects compared to the textual warning without check box and click button? Is there a difference between pictorial and textual warnings with check box and click button?

Effects: The effectiveness of these measures should result in average change in the amount per bet and time per bet following the treatment. Secondly it should have the same effects on self-reported emotional, cognitive, and intentional measures as depicted previously outlined for the simple pictorial and textual warnings.

2.3.3 Summing up

It has been illustrated how the tested treatments were grounded and framed in the theoretical and empirical evidence reviewed in this chapter, with an indication of the hypotheses made *ex ante* on their possible effects. It was also clarified how the treatments are part of a list of measures identified by the European Commission for policy relevance. Particular attention was given to: a) the best possible framing of these measures taking into consideration the relevant literature; and b) the most effective design features, such as the application of a full factorial design to the first step of the in-gamble phase of the laboratory experiment.

For some of the pre-gamble treatments cognitive biases and heuristics typical in online behaviour may reduce the effectiveness (logos, terms and conditions, registration forms). For some others, an informed conjecture based on the existing literature in behavioural studies suggests that they could work (pictorial and textual warning, plus overconfidence tasks). By the same token, it is reasonable to assume that the in-gamble treatments of the laboratory experiments may have a stronger impact since they use nudges that at the same time attempt to act on the individual through well documented mechanisms (default, mental accounting, activation of slow and accurate thinking) and also sort of alter/ disturb the 'human-machine' interaction.

3 Experimental design and findings

In this chapter the relevant design aspects and the main findings for both the LAB and for the ONLINE are presented, as well as those elements that are needed for a valid interpretation of the findings (in § 3.1 commonalities and differences for the two experiments, in § 3.2.1 for the LAB and in § 3.3.1 for the ONLINE). The main findings are presented in § 3.2.2 and § 3.2.3 for the LAB and in § 3.3.2 and § 3.3.3 for the ONLINE. Having presented the findings they are discussed in chapter 4.

3.1 Commonalities and differences

The main commonalities between the LAB and the ONLINE include the use of multiple response variables and the type of analytic procedures given that both experiments are designed as randomised control trials (see § 5.1.1) with treatment and control groups. These two aspects are discussed in the next two paragraphs of this section. One additional commonality is that both experiments used the same two gambles (slot-machines and roulette), the justification of which is presented in § 5.1.4 of the Technical Appendix. Finally, there is a commentary on both the similarities and differences, in particular, sampling issues and the gambling profile of the respondents. The *ex ante* justification of our approach to select the target sample is presented also in the Technical Appendix (see § 5.1.5), whereas the ex post presentation of the gambling profiles of subjects in the LAB and in the ONLINE is illustrated in next paragraph 3.1.1.

First, the main difference between the studies is to a large extent the outcome of the different strengths and constraints imposed by these two experimental procedures, as explained in § 1.3 and as further discussed in the Technical Appendix (§ 5.2). Both pre-gamble and in-gamble treatments were tested only in the LAB and a larger set of pre-gamble treatments in the ONLINE. Whereas, in general, the LAB has a higher degree of realism[40] (in-gambles with performance related incentives) compared to the ONLINE, nonetheless the ONLINE is not without a degree of realism. Furthermore in the ONLINE the same output of programming consisting of a realistic website with a full operational gamble (roulette) functioning exactly as those of industry operators was used. In addition, logos/banners and other elements of

[40] In technical parlance 'ecological validity' (see Technical Appendix § 5.1.2).

protective measures were placed mirroring the situation in each of the seven countries surveyed. While gambles in the LAB led to performance related incentives, this was not possible in ONLINE. Yet, as noted by (Mac Bride & Derevensky 2009), regular and even problematic adult gamblers also play with non-monetary forms of gambling (where wins and loss are virtual). This suggests that even without real stakes the gambling behaviour in the ONLINE sessions can be taken as reasonable proxy of gambling choices.

On the other hand, the external validity of the ONLINE is higher: covering seven countries and using a random sample representative of the general Internet population as compared to a convenience sample in one country with a much younger age structure and overrepresentation of subjects with tertiary educational level. In this respect, however, it must be must stressed that it is the standard practice in all behavioural experiments conducted in laboratories to recruit subjects from the student population, and that LSE LAB panel includes individuals from 18 to 35, so it is less biased toward the youngest subjects if compared to the average in laboratory experiment. In any event, the trade off between higher internal and ecological validity in the LAB versus higher external validity in the ONLINE is inevitable.

Related to the above, it is standard practice for LAB sessions to last longer than ONLINE, the latter lasting for no more than twenty minutes. Issues related to time and to statistical power (see § 5.1.3) also explain why different designs both within different phases of the LAB and between the LAB and the ONLINE (classical between subject main effect design, between subject with repeated measures main effect design, and between subject with repeated measures full factorial design) were used.

In conclusion, for common treatments consistency was ensured between the LAB and the ONLINE so that for pictorial warnings, textual warnings, small logo/banner, and over-confidence task the findings of the LAB can be compared with those of the ONLINE. So, these key measures are first tested under more realistic settings and then re-tested in the more externally valid setting. The results obtained for these four measures can be considered conclusive. For the additional pre-gamble measures tested in the ONLINE (two variations on the logo/banner, terms and conditions, plus simple and extended registration forms) it can be assumed that the results are fairly conclusive on account of external validity and the fact that the pre-gamble session for the subjects in the ONLINE, as argued earlier, is not without some degree of realism. Finally, the findings from the LAB for in-gamble measures can be treated as exploratory, requiring further testing under different settings in order to have a conclusive answer. Laboratory experiments are by definition internally valid but have lower external validity. There is, thus, is no attempt at generalising the findings of the laboratory experiment.

3.1.1 Sampling and subjects gambling profile in LAB & ONLINE

Sampling for LAB. A sample of 522 subjects was recruited from the LSE Panel attached to the Behavioural Research Laboratory. As is standard practice for Laboratory experiments, a non-probability sampling technique known as convenience sampling (sometimes referred to also as grab, accidental, or opportunity sampling) was used, whereby a sample is drawn from that part

of the population that is close to hand. The LSE Behavioural Lab Panel comprises some 3000 contacts, who have expressed an interest in participating in paid research. The pool of subjects consists primarily of LSE students and staff, but also of individuals from surrounding universities[41]. Once the laboratory experiment was set up an email was sent advertising the study, participants were screened for gambling experience (see *infra*) and a sample split 80:20 between subjects who had gambled (at least once) and subjects who had never gambled was recruited. The LAB sample is obviously composed by subjects who are on average younger and more highly educated than the population at large (see graphs on socio-demographic in § 5.5 of Technical Appendix).

The sampling strategy did not aim at recruiting necessarily regular or experienced gamblers, but the objective was to ensure that the sample included a large majority of subjects who, prior to the experiment, had had at least some experience of gambling whether off or online. For the screening questions and for the additional questions to profile their gambling experience/activity a number of items from the latest edition of the British National Gambling Survey (NatCen 2011) were adapted. These are reported in next box.

Box 2 Gambling profiling questions

- Have you ever spent money on any of the following? (Exhaustive list of gambling activities presented, see Q7 Annex I, multiple answer possible. In the list subject could check only ' I never gambled' in which case they skipped all the following questions).
- In the last 12 months have you spent money on any of the following? (Same list as above asked only to those who did not answer above 'I never gambled')
- How often do you engage in the kind of gambling activities listed earlier? (Every day, 2-3 days a week, about once a week, 2-3 days a month, about once a month, 6-11 times a year, less than 6 times a year);
- How do you most often engage in the gambling activities you reported to spend money on? (Only in person, only online, mixed).

Source: Annex I and Annex II (our adaptation from NatCen 2011)

Sampling for ONLINE. In the case of the online experiment no *ex ante* quota was imposed on gambling experience. Following recruitment the subjects were asked the same set of questions listed in the box above. So, whereas in the LAB a quota was used, in the ONLINE the split between those with some experience and those who never gambled (90:10) simply reflects the general Internet population from which the sample was drawn in the seven countries surveyed. The online experiment was carried out on a sample of seven European countries, with about 800 respondents for each country, with a total of 5997 respondents (N=5997).

[41] These characteristics are typical of all laboratory experiments where participants tend to be recruited from the student population. However, the sample is more varied since there are respondents that are part of the university administration and from other establishments in London and not students alone

Table 12 Sample size per country (ONLINE)

Country	Sample	Country	Sample
France	853	Sweden	797
Germany	858	United Kingdom	868
Italy	878	Estonia	886
Spain	857	TOTAL N= 5997	

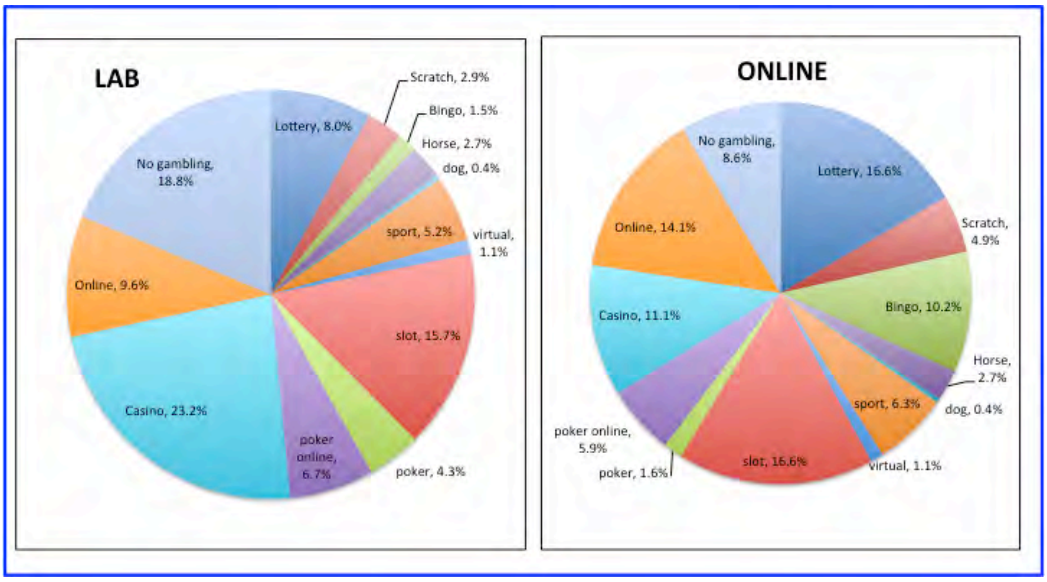
The table 12 above and 13 overleaf provide the main summary characteristics of the sample. The sample was drawn as a random representative sample of the Internet population in each country, which insured all socio-demographic characteristics are reflected (see graphs on socio-demographic in § 5.5 of Technical Appendix). The seven countries surveyed cover the four macro-regions of Europe (North, South, West, and East) and, with the exception of Estonia, countries were selected on market strength to increase the likelihood that the sample included a large enough number of respondents with online gambling experience. Eastern countries are all in the process of introducing or changing the legislation and there was no information on the prevalence of online gambling, except for Estonia, which has recently been described as one of Europe's most vibrant and growing gambling markets. The selection of countries was also informed by the aim of covering different approach to consumers' protective/preventive measures.

Table 13 Sample technical parameters (ONLINE)

Parameters	Sample
Population	General population aged 18 to 65 years old
Scope	Estonia, France, Germany, Italy, Spain, Sweden, United Kingdom
Methodology	Online (quantitative survey)
Sample size	N= 5997 (about 800 interviews per country)
Quotas	By country, gender and age group: 18-30 y.o. / 31-50 y.o. / 51-65 y.o.
Sampling error	+/- 1.25% for overall data and +3.53% for country-specific data.
Weighting	Ex ante by age group/gender/ country to be able to interpret the country data.
Sampling	Simple random draw

Compared gambling profiles. As stated, graphs summarising the socio-demographic characteristics of the two samples are reported in the Technical Appendix (§ 5.5). Figures 3 and 4 below provide basic data on the gambling profiles of respondents in both the LAB and ONLINE samples.

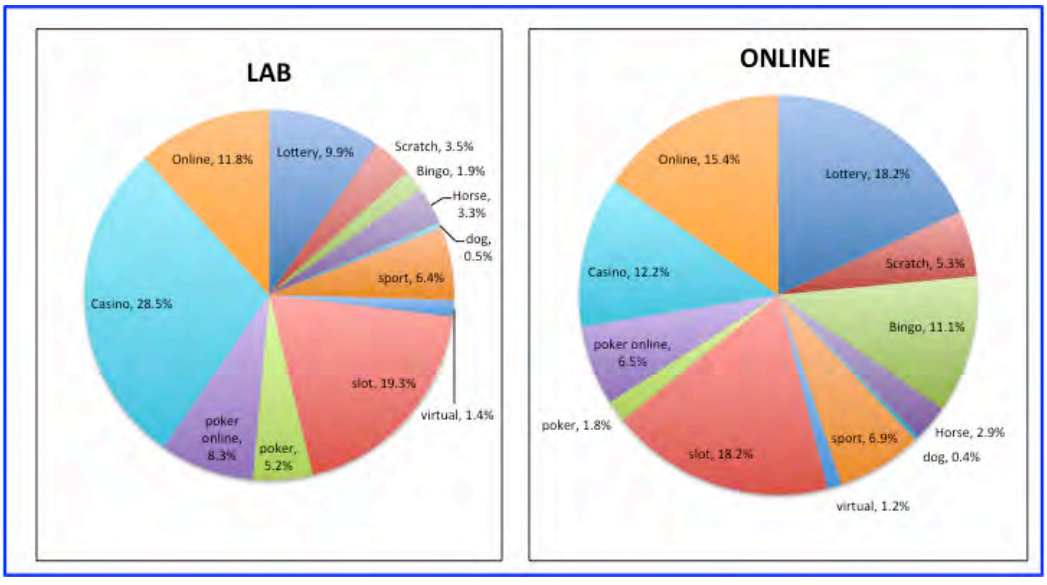
Figure 3 General gambling experience: LAB & ONLINE*



* Online is abbreviation for: 'Online fruit/slot machine style games or online instant win games'

Note the two samples are by definition not comparable (a convenience sample of, on average, younger and more educated individuals, versus a random representative sample of the entire Internet population), and the different gambling profiles reflect such sampling differences. A comparative account is nonetheless provided so that the readers can later form their own interpretation of the findings of the two experiments. From Figure 3 it can be seen that the percentage of non-gamblers is 18.6% in the LAB and 8.6%% in the ONLINE. The top two games for LAB subjects are casinos and slot machines, whereas slot machines and lotteries are the most frequent mentions of the ONLINE sample.

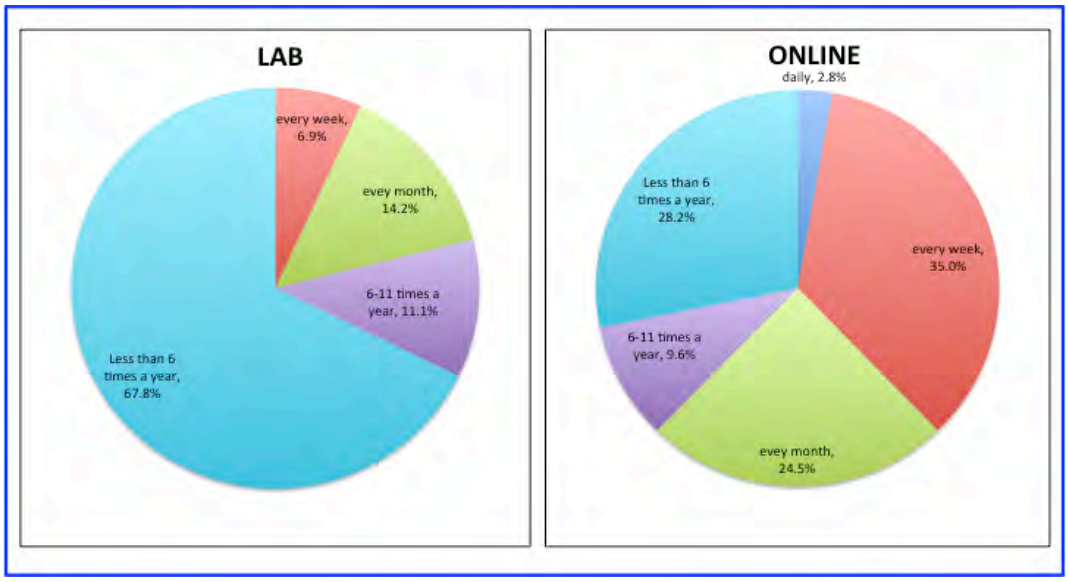
Figure 4 General gambling experience in the last 12 months: LAB & ONLINE



* Online is abbreviation for: 'Online fruit/slot machine style games or online instant win games'

Eliminating those who had never gambled (figure 4) the percentages of those who had gambled online is 11.8% in LAB and 15.4% in ONLINE, but the top two games do not change.

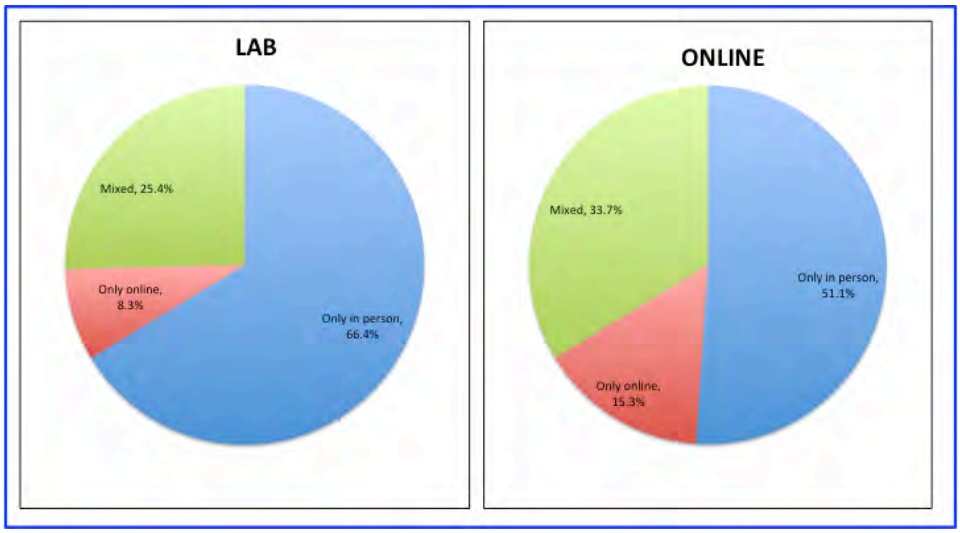
Figure 5 Gambling frequency in the last 12 months: LAB & ONLINE



It is evident that the ONLINE sample includes a larger proportion of individuals who gamble with some regularity as compared to that of the LAB. The profile of ONLINE, which is a representative sample, is comfortably in line with those of other surveys reported in the Technical Appendix (§ 5.1.5). Although it cannot be concluded that those who gamble daily are pathological gamblers, their proportion (2.9%) is clearly in line with prevailing figures about problem gamblers, not necessarily pathological but who may develop the pathology. On the other hand, the overwhelming majority of subjects in the LAB sample are simply occasional gamblers.

On the preferred channel for gambling, although in different proportions, both the LAB and the ONLINE samples confirm what is known from other surveys (see § 5.1.5): that there is not a clear-cut distinction between those who gamble only off line and those who gamble only online; there is a sizable proportion of individuals who do both. On the other hand, as in other surveys, in the samples those who gamble only offline is the large majority (66.4% in LAB sample) and (51.1% in ONLINE sample). Considering only the ONLINE, one can conclude that in the sample taken as a whole a total of 15.3% are online gamblers only (including all types from regular to occasional gamblers). This is in the range reported in other surveys (variation of online gambling in general population in different countries is between 5% and 30%).

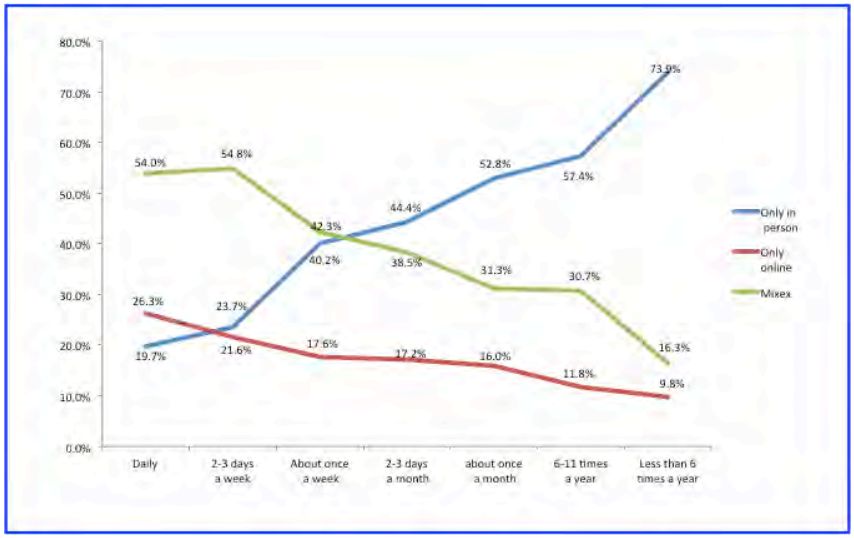
Figure 6 Gambling preferred channel in the last 12 months: LAB & ONLINE



Finally, Figure 7 provides a very interesting picture where the frequency of gambling is mapped against the preferred channel for gambling (i.e. looking more in depth at the data presented in § 1.1 in Tables 1 & 2). There appears to be a clear relation between the self-reported frequency of gambling and the preferred channel. For instance, taking the two extreme cases of daily gamblers and of occasional gamblers the following contrast is visible: the daily gamblers prefer in person gambling in 19.7% of cases (54% used mixed channels and 26.3% only online), whereas the occasional gamblers prefer in person gambling in 79.3% of cases (16.3% used mixed channels and 8.3% only online).

It is evident that the use of the online channel increases as function of frequency of gambling, or to put it differently online gamblers tend to be more concentrated among regular gamblers. The lines in the figures below are clear and the underlying contingency table chi-square test shows a statistically significant relationship.

Figure 7 Frequency of gambling by preferred channel (ONLINE sample)

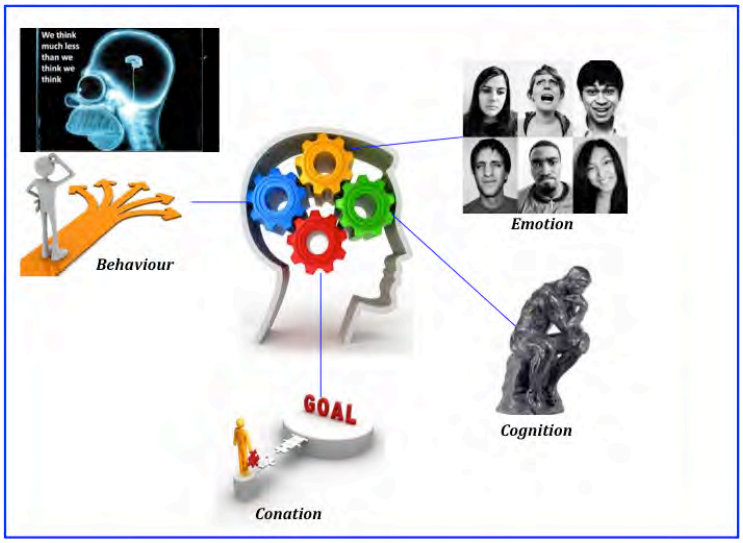


3.1.2 Multidimensional response variables

In this paragraph the distinction between self-reported and behavioural variables and why we used both (in the case of self-reported variable several types) is explained.

For example, the subjects were posed the following question: "*Thinking about the game you have just played, please indicate to what extent when encountering information regarding gambling you would be willing to stop and think about it*" (possible answers from 1 "not at all"- to 5 "extremely"). This variable is called 'cognitive processing' (or depth of processing). It is an important measure of the possible effects of a protective measure (treatment) as it tells the extent to which a textual warning about the risk of gambling, for instance, has activated cognitive processing and left a mark (if answer is towards '5'). Yet, it is a self-reported measure in that it comes from a question whose answer must be taken at face value. The measure is not obtained through observation of a actual behaviour, and it could not be otherwise since 'cognitive processing' is an unobservable construct and the only way to measure is by asking subjects. There are no alternatives here to a self-reported measure, but its limitation should be kept in mind.

Figure 8 Different types of response variables



Source: our elaboration

The interaction between System 1 and System 2 and the fact that our judgements are not always entirely conscious bring to the fore these limitations. The answers subjects provide to the questions used to measure self-reported variables may either not capture unconscious elements or be shaped by unconscious affective mechanisms. Answers may include noise if subjects are tired and answer without care or if they show 'social desirability' and/or 'hypothesis guessing' effects (I answer what I think would be socially desirable or I answer to confirm or refute what I think is the hypothesis of the interviewer). As a result, there can be clear gaps between self-reported preferences or intentions and actual behaviours. Hence,

while emotional, cognitive, and conative reactions[42] a self-reported measure is the only feasible option, we must be aware of the limits in a behavioural study in which the key measures are 'behavioural variables'.

As this study, is based on behavioural experimentation it tried as much as possible to base its conclusions on behavioural response variables that could be measured; recording the actual behaviours of subjects when they performed the experimental tasks. The time or money subjects decide to spend in gambling, depending on whether or not they are exposed to a treatment have been automatically recorded by the software supporting the experiment and is a measure of behaviour.

Figure 8 provides a graphic and intuitive answer to the next question a reader may have wanted to ask: why use all these different types of variables? Ideally having measures of all the four type above is the best possible way to assess the effectiveness of a treatment, from the perspective of both cognitive psychology and behavioural sciences. Behavioural measures should be considered first and then complemented and triangulated with the other three kinds. The extent to which one finds consistent result for a given treatment across the four types of variable is clearly a sign of a systematic effect, although having significant effect primarily on behavioural variables is also a key indication of effectiveness. In this respect the findings can be assessed in terms of how much they are systematic across scales and treatments.

3.1.3 Analysis performed

As documented (Technical Appendix § 5.1.1), under the conditions of a classical counterfactual experimental design (randomized controlled trial) as used in both the LAB and in the ONLINE, one can identify the treatment effect through regression analysis. The treatment effect corresponds to the difference in means between participants exposed to the treatment (i.e. pictorial warning) and participants exposed to the control condition (i.e. no warning before they start playing) with respect to any given response variable. Randomized controlled trials, provided that correct sampling procedures and implementation of the experimental protocol are respected, ensures that differences in means between the treatment and the control groups is a consistent estimator of the causal effect. Econometrically, the latter difference in means is equivalent to running a regression in which the dependent variable is the response variable, and the independent variables are dummies, equal to one if the subject has been exposed to the treatment. The omitted category is the control condition. The 'b' coefficient estimated by the regression analysis is equal to the treatment effect or the difference in mean of a given response variable 'y' for those exposed to treatment and those exposed to control.

Hence, for both experiments regressions were run where the independent variables are the treatments and the dependent variables are the various response variables illustrated earlier.

[42] Intentionally behavioural, that is to say a self-reported intention to act.

If the coefficients indicate a statistically significant impact of the predicted direction (i.e. negative for amount per bet, but positive for the time per bet) then this means the treatment is more effective than the control condition (otherwise the contrary is true). Statistical significance means passing a statistical test indicating that the identified effect is a real effect (rejection of null hypothesis) and could not have been detected by chance (null hypothesis).

In order to estimate the treatment effects OLS (ordinary least square) regressions were run or other specifications when required by the type of scale measuring the response variables. The appropriateness of OLS for the estimation of the treatment effect is also justified by experimental design adopted, but nonetheless several robustness checks that corroborate the results of the OLS regressions were performed[43]. Descriptive statistics (distributions) were also checked for all response variables before running the regression analysis in order to verify any possible anomaly in the answers provided by respondents (i.e. random answers due to tiredness resulting in uniform distributions). No such anomalies were detected. It must be stressed that the online experiment included very strong internal consistency checks including the eliminations of respondents who were replying to the questions at random.[44]

In all regressions for both the experiments we controlled for all socio-demographic variables, for the different type of gambles played, and in the ONLINE also for country effect. It is, therefore, important that the readers keep in mind that the results presented later hold, regardless of the socio-demographic profiles of the subjects, regardless of whether they played one gamble or the other, and regardless of the country. All these variables are controlled for. In addition, in the laboratory experiment separate regressions for the sample as a whole and for the sub-sample of those who reported having gambling experience prior to the experiment (81.4%) were also run. The latter was not done for the ONLINE since in this case the sub-sample reaches 91.4% of the total sample (only 8.6% reported that they had never gambled). In the regressions the type of gamble played was also controlled to ensure the treatment effects found are not influenced by the fact that a subject played roulette or slot-machine.

[43] First, robust regressions were performed using iteratively reweighted least squares, assigning a weight to each observation, reducing those of the outliers in order to minimize their impact. Second, Tobit regressions were used since most of the data from the scales used are "censored". Third, since many of the employed response variables are 'ordered categorical variables" (see glossary) ordered probit and logit regressions were also run. The robustness checks confirmed to a large extent the goodness of fit of the OLS regressions.

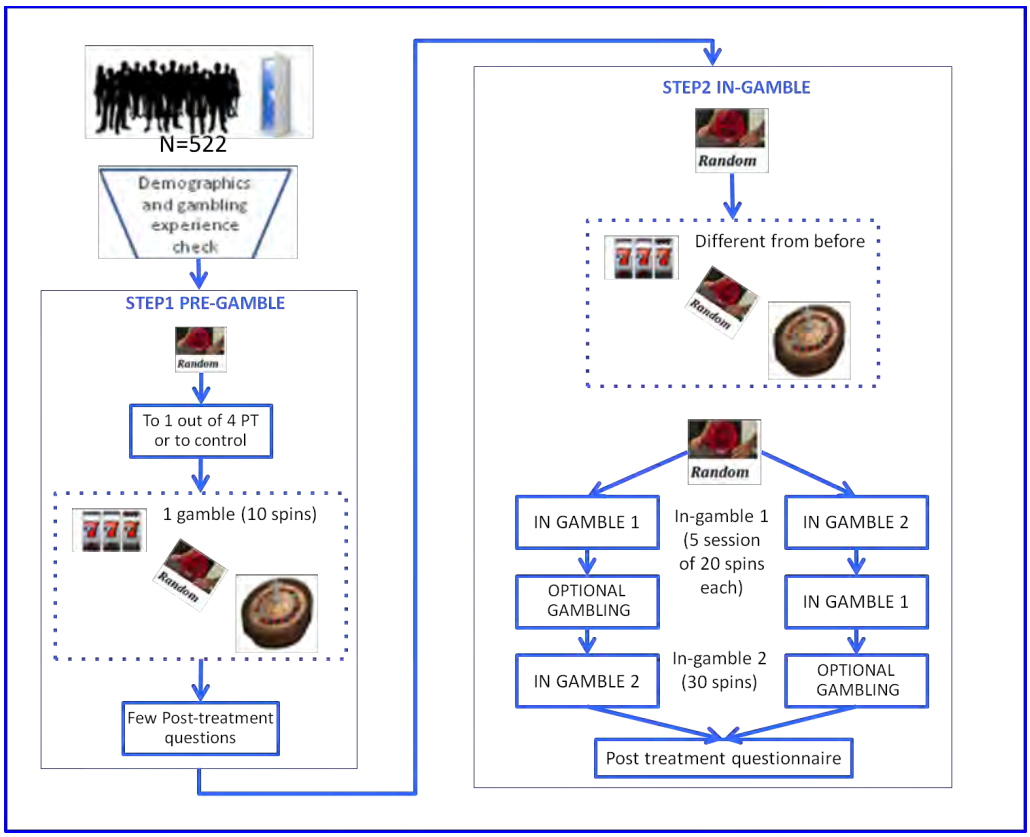
[44] At several points during the experiment there were control questions and if the respondents clicked randomly this produced nonsensical answers leading to the automatic discard of the respondent.

3.2 Laboratory experiment

3.2.1 Snapshot of design

The treatments tested (as well as the pre-gamble and in-gamble distinction) were outlined in § 1.2, a full grounding for them was provided in § 2.3, and the full account of the experiments procedure is provided in the Technical Appendix (§ 5.3.3) where graphic screenshots of the treatments are included to help readers visualise and understand more intuitively what measures the subjects were exposed to. Figure 9 shows a graphic snapshot of the experimental procedures.

Figure 9 Snapshot of laboratory experiment design



The experiment was designed as a randomised control trial including both classical between-subject main factor design (Step 1 and Step 2 IN GAMBLE 2) and a 'between-subject' with repeated measures full factorial design (Step 2 IN GAMBLE 1). These features of the design ensure the internal validity of the experiment (on validity see § 5.1.2). The experimental stimuli programmed and the performance related incentive schemes ensure ecological validity. A detailed presentation of the incentive scheme is in § 5.3.1, but the main characteristic is that there is a standard fixed participation fee of 10 GBP (which is reduced to 5 in case of opt out because length of the experiment is also significantly reduced), and a performance related payment, in the sense that virtual wallet can be exchanged for real money.

Pre-gamble. After entering the Lab, signing the participation sheet, and answering preliminary questions (on socio-demographic items, and on gambling experience, frequency, and preferred channel) subjects started the pre-gamble Step 1 they were randomly allocated to 1 out of 4 treatment or the control conditions and to either play roulette or slot machine. The first gambling session comprised 10 spins. The treatments are summarised below.

- **Pre-gamble Treatment 1 (PT1): pop-up pictorial warning:** an evocative picture followed by the messages 'gambling is addictive if you cannot stop call the helpline';
- **Pre-gamble Treatment 2 (PT2): pop-up textual warning.** Same as above but without picture.
- **Pre-gamble Treatment 3 (PT3): over-confidence task.** Subjects were first asked to self-assess their capacity with calculating the odds of a game and the given an exercise to test in practice such self-assessment. After answering they were told whether their answer was correct or not.
- **Pre-gamble Treatment 4 (PT4): Logo of national gambling information provider.** The logo of the national info provider appeared one the screen as in the figure below
- **Control condition (PT5).** The subjects allocated to control went immediately into the warm up and trial gambling without being shown any of the four treatments above.

After being exposed to the treatments, subjects could choose to opt out from the gambling (in which case they were move to a filler task, and when they finished it they were paid the basic incentive of 5 GBP). If they did not opt out, they played 10 spins/rounds. As they play their behavioural choice are automatically registered. After completing the pre-gamble step, subjects were asked questions on emotions, intentions, and the use of logos. Next they proceeded to the in-gamble Step 2 that consisted of two sub-steps referred to as IN GAMBLE 1 and IN GAMBLE 2. Whether they started with one or the other of the two sub-steps was randomly allocated, whereas those who had played slot machine in pre-gamble, they played roulette and vice versa. If they started with IN GAMBLE 1 they then proceed to IN GAMBLE 2 or again vice versa.

IN GAMBLE 1. In summary the treatments were:

- **IS1.1 Monetary limits:** this concerns fixing the amount of money that they can bet in each of the five session of 20 spins/rounds (so 100 in total exactly as for the control group) of IN GAMBLE 1 consists[45]. This treatment takes two possible forms:

[45] On the issue of monetary limits the following clarification is in order as to avoid any possible misunderstanding. In the case of self-defined limits: a) before starting to bet, participants have to decide how much they can spend maximum for a session of 20 spins. Lets assume it is 10 virtual dollars for the session of 20 spins with total of 5 sessions that they can play. ; b) So while they play during session 1, participants have to choose manually how much they want to spend per each spin while having a limit of 10 dollars per session. If the participant lost all 10 dollars by spin #10 (remember, there are 20 spins in each session), then he/she automatically starts session 2 again with 10 dollars available for spins. This is self-defined limit (setting 10 dollars per session) with automatic refill (if 10 dollars of session 1 are

- IS1.1.1 Fixed limits with automatic refill possibility
- IS1.1.2 Self-defined limits with automatic refill possibility

► **IS1.2 Feedback on winnings and losses:** this concerns different forms of pop up informing the gamblers (in different ways) about how are they doing:

- IS1.2.1: Push pop up clock with length of play, cumulative winnings and losses (appearing after 10 spins/rounds);
- IS1.2.2 Pull pop up clock with length of play, winnings and losses;
- IS1.2.3 Push pop up "You lose" message similarly based on participant's performance;

► **IS.1.3 Control**: no monetary limits and no feed back on winning and losses.

IN GAMBLE 2. The treatments comprised:

► **IS2.1:** Warnings with box 'I understand' to be checked and proceed button to be clicked[46]:

- **IS2.1.1 Pop-up pictorial warning**: as as per pre-gamble treatment but with the adddition of checking-box "I understand" and button "continues" and it is a push pop up appearing while they gamble
- **IS2.1.2 Pop-up textual warning:** as as per pre-gamble treatment but with the adddition of checking-box "I understand" and button "Proceed" and it is a push pop up appearing while they gamble.

► **IS2.3 Control**: no warning

After having completed both IN GAMBLE 1 and IN GAMBLE 2 all subjects completed a common post-treatment questionnaire used to measure other self-reported measures.

Note also that in both cases (starting with one or the other of the in-gamble sub-steps) subjects at a certain point are given the option to proceed to the next step of the experiment or to continue playing for an extra session where, if they lost all of the available wallet, they

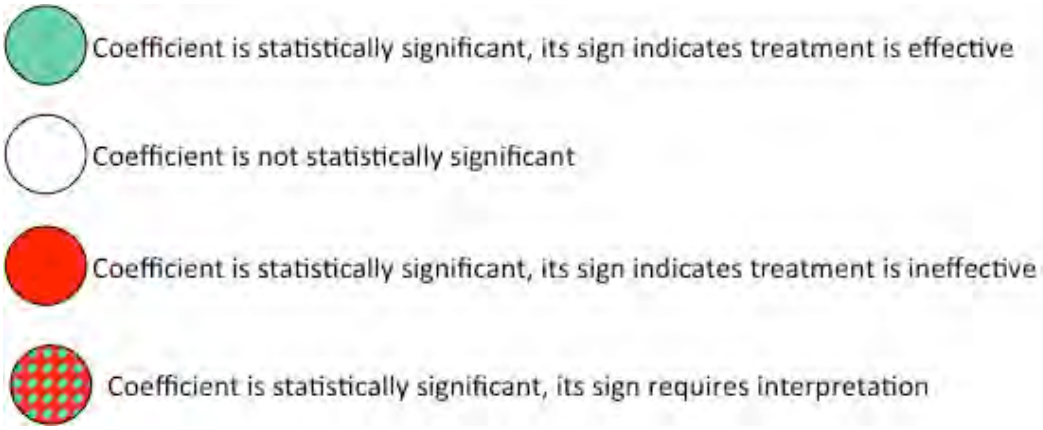
depleted, participant automatically get another 10 dollars and starts session 2). In case of fixed limits participants cannot choose how much they can spend per session. The Computer depending on the virtual wallet size assigns the amount available per session. Therefore, in general one can conclude that participants do have to make cognitive decision and manually select the amount they want to bet per spin out of session's limit.

[46] Here, two of the four treatments already administered in the pre-gamble step were re-used, but in clearly different form and context. Whereas in the pre-gamble these two types of warning messages appeared before subject started gambling in this case: a) they are push pop up appearing on the screen while subjects are already gambling; b) for the subjects to continue gambling they have to do an action: check a box (I understand) and the click on a button to proceed. Default state of the checkbox is not active. Therefore, the likelihood of cognitive processing of the whole warning message should increase compared to the variant when pop-up warning message can be closed by just clicking "OK" button. In other words, participants had to consciously opt-in for proceeding with experiment (based on Johnson, Bellman, & Lohse, 2002) while acknowledging the dangers of gambling activities. After closing the pop up message, subjects were able to do another 10 spins for measuring the effect of a treatment. The control group received no such pop-up.

can also decide to bet the basic 10 GBP participation fee. If they lose, they leave the experiment with no participation fee.

3.2.2 LAB Main findings

As explained, the more complex technical tables with the results of the regression analysis are reported for the LAB in the Technical Appendix (§ 5.3.4). The sub-paragraphs that follow present and comment on simpler synoptic tables using the following graphical and intuitive notation:



Regardless of other technicalities reported in the statistical tables, there are four possible synthetic outcomes that are relevant from a policy perspective. This is illustrated using a hypothetical example - the textual warning with regard to the response variable 'average amount per bet' for the first two cases, the logo and the variable use of logo for the third, and any of the combinations of limits and alerts for emotional variables.

First, if the coefficient of the regression analysis, representing the treatment effect of the textual warning on amount bet, is statistically significant and its sign is negative, then it can be concluded that the textual warning is effective since those exposed to the warning, bet less than the individuals in the control group who gambled without being exposed to any form of warning.

Second, if the coefficient is not statistically significant the null hypothesis that the result obtained could have emerged by chance rather than because a true relation between treatment and response cannot be rejected. In this case it cannot be concluded that the treatment is effective, but neither can it be stated with full certainty that it is not effective. The result is inconclusive although given the condition of design and the sample size one could conclude that it is unlikely that it is effective.

Third, considering the treatment 'Logo' with regard to the response variable 'use of logo', if the coefficient is statistically significant but the sign is negative, then the treatment is ineffective as it implies that those exposed to the logo of the national information provider on average report that they look at such logos less than those in the control group.

Fourth, for the combination 'fixed limits + push feedback' the exemplification is done for the response variable measuring positive and negative feelings and emotions.

In principle, one may want to induce some anxiety in the subjects and would expect that they report more negative feelings than those in the control group.

On the other hand, if they report more positive feelings is the treatment ineffective? This depends on interpretation and, for instance, having limits and alerts may be reassuring and make the gamble a pleasurable activity. These cases will have to be considered one by one.

To sum up the tables of the response variables presented earlier in § 2.3.1 are reported with an indication of when, provided the coefficient is statistically significant, it can either be concluded that a treatment is effective or case by case interpretation is needed.

Table 14 Behavioural response variables and effectiveness (LAB)

Variable	Treatment effective if coefficient sign
Average bet per spin (pre-gamble & in-gamble)	Negative
Average time per spin (pre-gamble & in-gamble)	Positive
Change in average bet per spin (in-gamble)	Positive
Change in average time per spin (in-gamble)	Negative
Keep playing (in-gamble)	Negative

For the behavioural variables the interpretation is straightforward, effectiveness is demonstrated when the treated subjects bet less (negative coefficient) and slower (positive coefficient) than the control group, whereas when the option is given of playing an optional session the coefficient should be negative assuming treatments have induced doubts and raise awareness about the risks of gambling. I

n this case, however, there is a possibility of the opposite interpretation arguing the emotional confounding effect of gambling may neutralised the impact of the nudges.

For the first five self-reported measures the situation is more blurred when moving from pre-gamble to in-gamble treatments.

It is always straightforward for the pre-gamble treatments as they aim in different ways to raise awareness about risks, induce doubts, and potentially make the experience less pleasurable. In this case effectiveness is demonstrated if the treated subjects show less positive (items 1-10, figure below) and more negative (item 11-20, figure below) feelings and emotions compared to the control group.

Table 15 Self-reported response variables and effectiveness (LAB)

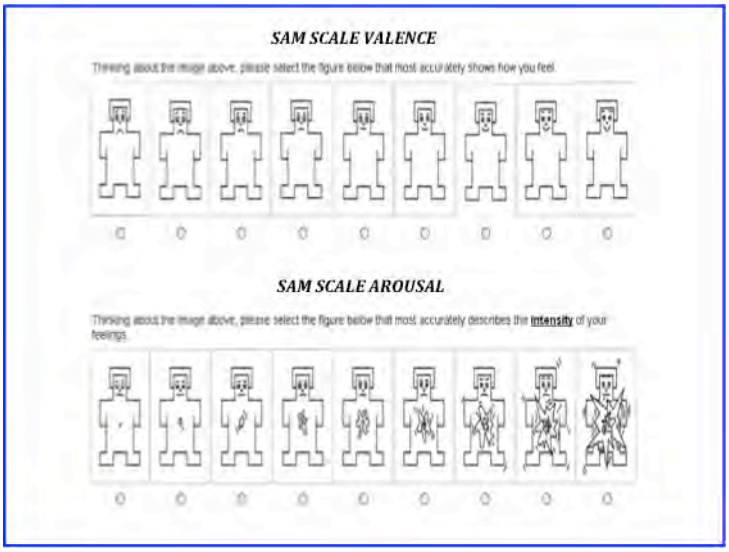
Variable (all in pre- and in- gamble steps, but cognitive and advocacy)	Treatment effective if coefficient sign
Positive affect scale, PANAS (items 1-10), see Figure 10 in next page.	Negative for pre-gamble; need interpretation for in-gamble
Negative affect scale (items 11-20), See Figure 10 in next page.	Positive for pre-gamble; need interpretation for in-gamble
Type of emotion, SAM (Valence), see Figure 11 in next page.	Negative for pre-gamble; need interpretation for in-gamble
Intensity of emotion, SAM (Arousal), see Figure 12 in next page.	Positive for pre-gamble; need interpretation for in-gamble
Intention to gamble in the future	Negative for pre-gamble; need interpretation for in-gamble
Use of Logos 1 Figure 12, page 80	Positive for both
Use of logos 2 Figure 12, page 80	Positive for both
Use of logos 3 Figure 12, page 80	Negative for both
Cognitive processing (think about risks)	Positive (in-gamble)
Advocacy (speak to others about risks)	Positive (in-gamble)

Figure 10 The PANAS Scale[47]

Q11.	Below you will find several words that describe different feelings and emotions. Please read each word and indicate to what extent you feel this way right now using the scale next to each word.					
		Not at all	A little	Moderately	Quite a bit	Extremely
1.	Interested	1	2	3	4	5
2.	Distressed	1	2	3	4	5
3.	Excited	1	2	3	4	5
4.	Upset	1	2	3	4	5
5.	Strong	1	2	3	4	5
6.	Guilty	1	2	3	4	5
7.	Scared	1	2	3	4	5
8.	Hostile	1	2	3	4	5
9.	Enthusiastic	1	2	3	4	5
10.	Proud	1	2	3	4	5
		Not at all	A little	Moderately	Quite a bit	Extremely
11.	Irritable	1	2	3	4	5
12.	Alert	1	2	3	4	5
13.	Ashamed	1	2	3	4	5
14.	Inspired	1	2	3	4	5
15.	Nervous	1	2	3	4	5
16.	Determined	1	2	3	4	5
17.	Attentive	1	2	3	4	5
18.	Jittery	1	2	3	4	5
19.	Active	1	2	3	4	5
20.	Afraid	1	2	3	4	5

[47] See (Crawford & Henry, 2004).

Figure 11 The SAM[48] Scale



Also the treated subjects should show a negative type of emotions (valence, first part of the figure above) and this is reflected into a negative coefficient and more intensity (arousal, second part of the figure above) of such emotions (positive coefficient). The pre-gamble treatments should also reduce the intention to gamble in the future (negative coefficients).

On the other hand, for all these variables the coefficient for the in-gamble treatments will have to be interpreted case by case recalling that during the in-gamble the subjects enter into the real 'human-machine' interaction with real stakes which make the emotional reactions and future intentions difficult to predict.

Figure 12 Logos and Labels Usage

Before starting the prior gambling session, the webpage of a hypothetical gambling operator was shown on the screen. Now think about informational labels and logos located closer to the bottom of that screen.

How much do you agree with each of the following statements regarding information on those logos and labels? Please use a scale from 1 to 5 in which 1 means you completely disagree and 5 you completely agree with that statement.

		Completely Disagree				Completely Agree
Q15	When I enter websites, I always check informational labels and logos	1	2	3	4	5
Q16	Only when I enter for the first time, I check information on information labels and logos	1	2	3	4	5
Q17	I never check the information on information labels and logos	1	2	3	4	5

[48] See (Bradley & Lang, 1994; Bradley et al., 2001; Lang, 1969; Lang, 1980).

For the three items composing the variable 'Use of Logo' the interpretation is straightforward for both pre-gamble and in-gamble treatments. For the first two items effectiveness would be measured by positive coefficients (the treatment group being more aware of the logo and related information), whereas for the third by a negative coefficient. The same applies for the degree to which subjects exposed to treatment affirm that they will be thinking in the future about the risks of gambling (called 'cognitive processing') and/or they are willing to speak with other people about these risks (called 'advocacy'). These two variables together are taken as a proxy of 'depth of processing', meaning the extent to which subjects were influenced by the information received, cognitively processed it and became aware about the risks. Effectiveness here is demonstrated by positive coefficients indicating that the treated subjects have a deeper processing than the control group.

Therefore, each of the tables that follow will report in the rows the treatments, in the columns the response variables, and in the cells either a green (effectiveness), white (statistically not significant, red (ineffectiveness, or red/green (need interpreting) circle to convey the four possible results explained above. As anticipated, separate regressions are run for the sample as a whole and the sub-sample for those who had gambling experience. The reader should take into consideration that there is a difference of 102 observations between the full sample (522) and the 'gamblers' sub-sample' (420) and some of the differences between the two should be interpreted with care as they might merely be the outcome of having more or less observations.

3.2.2.1 Pre-gamble: Behavioural variables

As can be seen from the table below, the four pre-gamble treatments do not show any significant coefficient indicating effectiveness.

Table 16 LAB synoptic table, pre-gamble treatments: amount and time per bet

	Full sample bet per spin	Gamblers Bet per spin	Full sample Time per spin	Gamblers Time per spin
Pictorial warning	○	○	○	○
Textual warning	○	○	●	●
Overconfidence	○	○	●	○
Logo	○	○	○	○

Source: Table 47,page 134

However, it can also be observed that subjects exposed to the textual warning bet faster than those in the control group (both in full sample and for the sub-sample of gamblers). Furthermore, we find that those subjects who were exposed to the 'overconfidence task' treatment (in this case only for the sample as a whole) also bet faster (but this could all be the results of the larger number of observation). Hence, it seems that these treatments typically

aiming at activating a more accurate and reflective thinking do not have the impact of reducing amount bet and of slowing down betting.

3.2.2.2 Pre-gamble: Self-reported variables

The table below reports the results for the PANAS scale shown in Figure 11, which includes 10 adjectives for positive feelings and emotions and 10 for negative ones. The regressions have been computed separately for the average positive and negative responses.

Table 17 LAB synoptic table, pre-gamble treatments: PANAS scale, average response

	Full sample Positive Affect	Gamblers Positive Affect	Full sample Negative Affect	Gamblers Negative Affect
Pictorial warning	◯	◯	◯	◯
Textual warning	◯	◯	◯	◯
Overconfidence	◯	◯	●	◯
Logo	◯	◯	◯	◯

Source: Table 48,page 134

As can be seen, only the overconfidence task is effective in eliciting on average more negative feelings and emotions as compared to the control group. It does so only for the full sample, whereas the effects does not hold when considering only individuals who have had a gambling experience prior to the experiment. It is difficult to discern from the data available whether this is just the effect of more statistical observations, or rather to the fact that individuals with gambling experience discount the fact that they do not know much about probabilities, but this does not unsettle them.

On the other hand, the other measures of emotional reaction reported below show that none of the pre-gamble treatments have statistically significant effect, which makes the previous effective impact of overconfidence task an isolated case.

Table 18 LAB synoptic table, pre-gamble treatments: SAM Scale

	Full sample SAM Valence	Gamblers SAM Valence	Full sample SAM arousal	Gamblers SAM arousal
Pictorial warning	◯	◯	◯	◯
Textual warning	◯	◯	◯	◯
Overconfidence	◯	◯	◯	◯
Logo	◯	◯	◯	◯

Source: Table 49, page 135

Similarly no significant effects are detected for the four pre-gamble treatments on the intention to gamble in the future.

Table 19 LAB synoptic table, pre-gamble treatments: intention to gamble in the future

	Full sample	Gamblers
Pictorial warning	○	○
Textual warning	○	○
Overconfidence	○	○
Logo	○	○

Source: Table 50, page 135

Table 20 LAB synoptic table, pre-gamble treatments: usage of Logo

	Full sample Always (USE1)	Full sample Only 1st time (USE2)	Full sample Never (USE3)
Pictorial warning	○	○	○
Textual warning	●	○	○
Overconfidence	●	○	○
Logo	●	○	●

Source: Table 51, page 136

More interesting, and confirming what is known especially about younger people and how they use information online, are the results concerning use of logos reported in the previous table. Three 'ineffective' results are found showing that the those in the treatment groups with textual warning, overconfidence task, and logo, report that they use informational logos and labels when they enter a website less often than the control group. In other words, being exposed to the treatments does not influence the importance they give to informational logos and labels. Here the question was specific for the treatment 'logo' but aimed at testing whether other forms of information also had an impact on usage of such logos and labels. Even more telling, is that the subjects who were exposed to the logo itself are the only group of subjects reporting more than the control group that they never check informational logos and labels. The reader should recall that the same question was also asked to the control group including subjects who started the pre-gamble phase of gambling without being exposed to any of the treatments.

3.2.2.3 In-gamble: behavioural variables

The next two tables consider the effects on behavioural variables of the combination of monetary limits and alerts. On account of the full factorial design we were able to test interaction effects. The first table compares the average bet and time per spin for the treatment group in their first session of 20 spins (in total there were 5 non-optional sessions) with the control group. The control group, however, played 100 spins with no breaking sessions (no need, given absence of monetary limits). Hence, in the second table the average amount and time per bet made by the treatment group in all of the five non-optional sessions are compared with the control group. In both cases averages are involved and the results change only marginally.

Table 21 LAB synoptic table, in-gamble treatments: limits and alerts (session 1)

	Full sample Bet per spin	Gamblers Bet per spin	Full sample Time per spin	Full sample Time per spin
Fixed limits, push feedback	●	●	●	●
Fixed limits, pull feedback	○	●	○	○
Fixed limits, lose feedback	●	●	●	●
Self defined limits, push feedback	●	●	●	●
Self defined limits, pull feedback	●	●	○	○
Self defined limits, lose feedback	●	●	●	●

Source: Table 52, page 137

As is apparent, a much 'greener' picture is apparent indicating several statistically significant and effective results. Four combinations work systematically across both amount and time per bet irrespective of the sample considered these are: fixed limits with push feedback; fixed limits with push feedback 'you lose'; self-defined limit with push feedback; self-defined limit with push feedback 'you lose'. When the feedback is in 'pull' form it seems that the effectiveness is only slightly decreased. With respect to the scales used most of the coefficient are of a sizeable dimensions, and for all treatments the R2 is acceptable and in some case substantial.

Table 22 LAB synoptic table, in-gamble treatments: limits and alerts (all sessions)

	Full sample Bet per spin	Gamblers Bet per spin	Full sample Time per spin	Full sample Time per spin
Fixed limits, push feedback	●	●	●	○
Fixed limits, pull feedback	○	○	○	○
Fixed limits, lose feedback	●	○	●	●
Self defined limits, push feedback	●	●	●	●
Self defined limits, pull feedback	●	●	○	○
Self defined limits, lose feedback	○	○	●	●

Source: Table 53 & Table 54 pages 138-139

When the comparisons are based on averages from all non-optional sessions, there are a few changes but in general the findings hold. When subjects had played all the 5 non-optional sessions they were given the choice of proceeding to the next step of the experiment or of playing an extra gambling session of another 20 spins. The next table reports the results for the variable called 'keep playing'. In this case most results are not statistically significant, except for the combination 'self-defined limits with pull feedback'. As it is an isolated result, the interpretation is not straightforward. It is possible that the 'mental accounting' heuristic worked and subject calculated in this case that it would be better not to continue gambling. Yet, given such isolated result this is just a matter of speculation.

In the IN GAMBLE 2 subjects, while playing where again exposed to a pictorial warning or to a textual warning as in the pre-gamble step, but as already stressed in § 2.3.2.8 this time they had to check a box 'I understand' and then click the button continue. If subject did look, thought, and then checked box and click button it could be expected to have results similar to those found for monetary limits combined with alerts.

Table 23 LAB synoptic table, in-gamble treatments: limits and alerts (keep playing)

	Full sample Probit	Gamblers Probit	Full sample Logit	Full sample Logit
Fixed limits, push feedback	○	○	○	○
Fixed limits, pull feedback	○	○	○	○
Fixed limits, lose feedback	○	○	○	○
Self defined limits, push feedback	○	○	○	○
Self defined limits, pull feedback	●	●	●	●
Self defined limits, lose feedback	○	○	○	○

Source: Table 55, page 140

Table 24 LAB synoptic table, in-gamble warnings: changes in bet and time post warning

	Full sample Change in bet	Gamblers Change in bet	Full sample Change in time	Full sample Change in time
Pictorial warning	○	○	●	●
Textual warning	○	○	●	●

Source: Table 56, page 141

From the table above it is apparent that these two warnings had the effect of slowing down the betting but not in reducing the amount bet.

3.2.2.4 In-gamble: Self-reported variables

Looking at the emotional reactions to the combination of limits and alerts we find many statistically non-significant results. However, there are several green/red circles suggesting the need of interpretation. First, however, for ease of reference the figures illustrating the SAM and PANAS scales are reported again below.

Figure 13 The PANAS Scale (repetition)

Q11.	Below you will find several words that describe different feelings and emotions. Please read each word and indicate to what extent you feel this way right now using the scale next to each word.					
		Not at all	A little	Moderately	Quite a bit	Extremely
1.	Interested	1	2	3	4	5
2.	Distressed	1	2	3	4	5
3.	Excited	1	2	3	4	5
4.	Upset	1	2	3	4	5
5.	Strong	1	2	3	4	5
6.	Guilty	1	2	3	4	5
7.	Scared	1	2	3	4	5
8.	Hostile	1	2	3	4	5
9.	Enthusiastic	1	2	3	4	5
10.	Proud	1	2	3	4	5
		Not at all	A little	Moderately	Quite a bit	Extremely
11.	Irritable	1	2	3	4	5
12.	Alert	1	2	3	4	5
13.	Ashamed	1	2	3	4	5
14.	Inspired	1	2	3	4	5
15.	Nervous	1	2	3	4	5
16.	Determined	1	2	3	4	5
17.	Attentive	1	2	3	4	5
18.	Jittery	1	2	3	4	5
19.	Active	1	2	3	4	5
20.	Afraid	1	2	3	4	5

Figure 14 The SAM Scale (repetition)

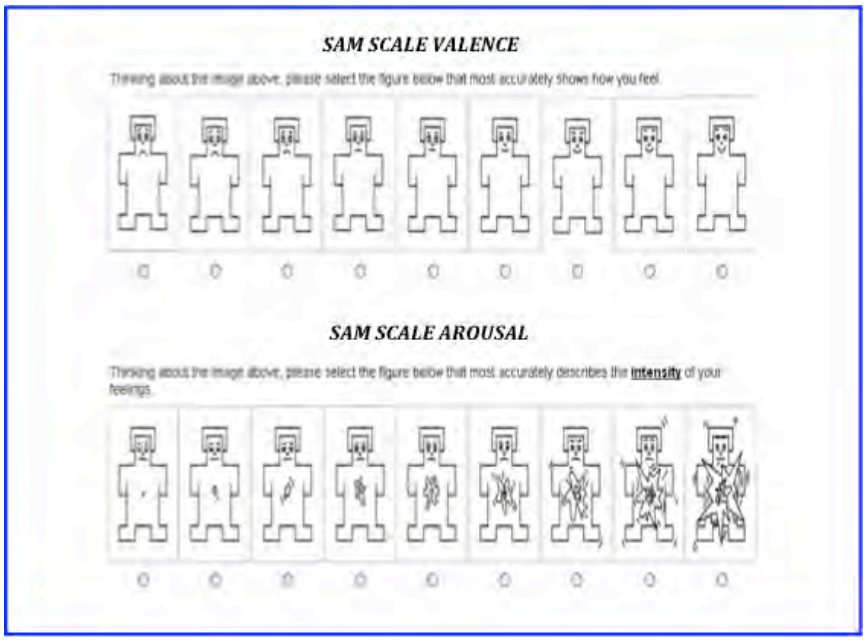


Table 25 LAB synoptic table, in-gamble treatments: PANAS scale (average response)

	Full sample Positive affect	Gamblers Positive affect	Full sample Negative affect	Full sample Negative affect
Fixed limits, push feedback	◐	◐	○	○
Fixed limits, pull feedback	◐	◐	○	○
Fixed limits, lose feedback	○	○	○	○
Self defined limits, push feedback	◐	○	○	○
Self defined limits, pull feedback	○	○	○	●
Self defined limits, lose feedback	○	◐	○	○

Source: Table 57, page 142

For instance, it can be observed that subjects exposed to a few treatment ('fixed limits with push feedback'; 'fixed limits with pull feedback'; 'self-fixed limits with push feedback'; and 'self-fixed limits with push feedback you lose') report more positive emotions and feelings than the control group. Here there are, in our view, some possible interpretations: a) the confounding effect of gambling (it is a gaming activity and there is the 'human-machine' interaction effect) make the subject enjoy the experience (so this interpretation takes at face value the results that come from self-reported answers with all their limitation); b) some treatments are reassuring (limits are fixed, I am reminded how I am doing) and neutralise any possible worry or anxiety (also this interpretation takes the answers at face value); c) because of confounding effect of gambling and of self-reported nature of variable these findings should be taken with care.

Table 26 LAB synoptic table, in gamble warnings: PANAS scale (average response)

	Full sample Positive affect	Gamblers Positive affect	Full sample Negative affect	Full sample Negative affect
Pictorial warning	○	○	○	○
Textual warning	○	○	○	○

Source: Table 58, page 143

For the warning treatments no statistically significant effects are found in terms of positive or negative affect (PANAS scale).

Table 27 LAB synoptic table, in gamble treatments: limits and alerts SAM scale

	Full sample Valence	Gamblers Valence	Full sample Arousal	Gamblers Arousal
Fixed limits, push feedback	●	●	●	○
Fixed limits, pull feedback	●	●	○	○
Fixed limits, lose feedback	○	○	○	○
Self defined limits, push feedback	○	○	○	○
Self defined limits, pull feedback	●	●	○	○
Self defined limits, lose feedback	○	○	○	○

Source: Table 59, page 144

Table 27 shows the effect of the combination of limits and alerts on thee SAM scale, which has two components: a) valence, meaning type of emotions (a negative sign indicate unsettling emotions more than the control group and a positive one pleasurable emotions more than the control group); and a) arousal, meaning the intensity of the type of emotions measured by valence (a positive sign indicate more intensity compared to the control group, a negative sign less intensity).

It is apparent that with fixed limits and push feedback the treatment subjects report more positive and more intensively positive emotion than the control group. For 'fixed limits with pull feed back' and 'self-defined limit with pull feed back' treatment subject report more positive emotions than control group but coefficients for the intensity of these emotions are not statistically significant. For the warning treatments there are no statistically significant effects in terms of emotional valence and arousal (SAM scale).

Table 28 LAB synoptic table, in gamble treatments: warnings SAM scale

	Full sample Valence	Gamblers Valence	Full sample Arousal	Gamblers Arousal
Pictorial warning	○	○	○	○
Textual warning	○	○	○	○

Source: Table 60, page 145

For limits and alerts in the majority of cases statistically significant effects on intention to gamble in the future are not detected, although three coefficients with a positive signs (see cells with red/green circles) are found where the treated subjects show higher intention to gamble in the future compared to the control group.

Table 29 LAB synoptic table, in gamble treatments: limits & alerts, intention to gamble

	Full sample	Gamblers
Fixed limits, push feedback	○	●
Fixed limits, pull feedback	○	○
Fixed limits, lose feedback	○	○
Self defined limits, push feedback	○	○
Self defined limits, pull feedback	○	○
Self defined limits, lose feedback	●	●

Source: Table 61, page 146

For the warning treatments there are no statistically significant effects on intention to gamble.

Table 30 LAB synoptic table, in gamble treatments: warnings, intention to gamble

	Full sample	Gamblers
Pictorial warning	○	○
Textual warning	○	○

Source: Table 62, page 147

Finally, no statistically significant effects either for limits/alerts or for the warnings with regard the 'depth of processing' variable (cognitive processing: think about the risks; advocacy: talk to other about the risks) are found. Again this may be the possible result of the emotional confounding effects of gambling.

Table 31 LAB synoptic table, in gamble treatments: depth of processing

	Full sample Cognitive	Gamblers Cognitive	Full sample Advocacy	Gamblers Advocacy
Fixed limits, push feedback	◯	◯	◯	◯
Fixed limits, pull feedback	◯	◯	◯	◯
Fixed limits, lose feedback	◯	◯	◯	◯
Self defined limits, push feedback	◯	◯	◯	◯
Self defined limits, pull feedback	◯	◯	◯	◯
Self defined limits, lose feedback	◯	◯	◯	◯
Pictorial warning	◯	◯	◯	◯
Textual warning	◯	◯	◯	◯

Source: Table 63, page 148

3.2.3 Summing up LAB findings

First, with regard to pre-gamble treatments, the results suggest that it is not possible to detect their effectiveness in a statistically robust sense neither in terms of behavioural variables nor in terms of the self-reported measures. For the laboratory experiment this is a systematic finding in that clear ineffectiveness is also found in term of importance given to informational labels and logos, whereas there is only one isolated effective result for the 'overconfidence' treatment (inducing negative feelings only for the sample as a whole).

Second, there is a fairly systematic effectiveness for monetary limits and alerts treatments on behavioural variables: the treatments induced slower (time) and smaller (money) bets. For the warning treatments effectiveness is detected with regard to making betting slower.

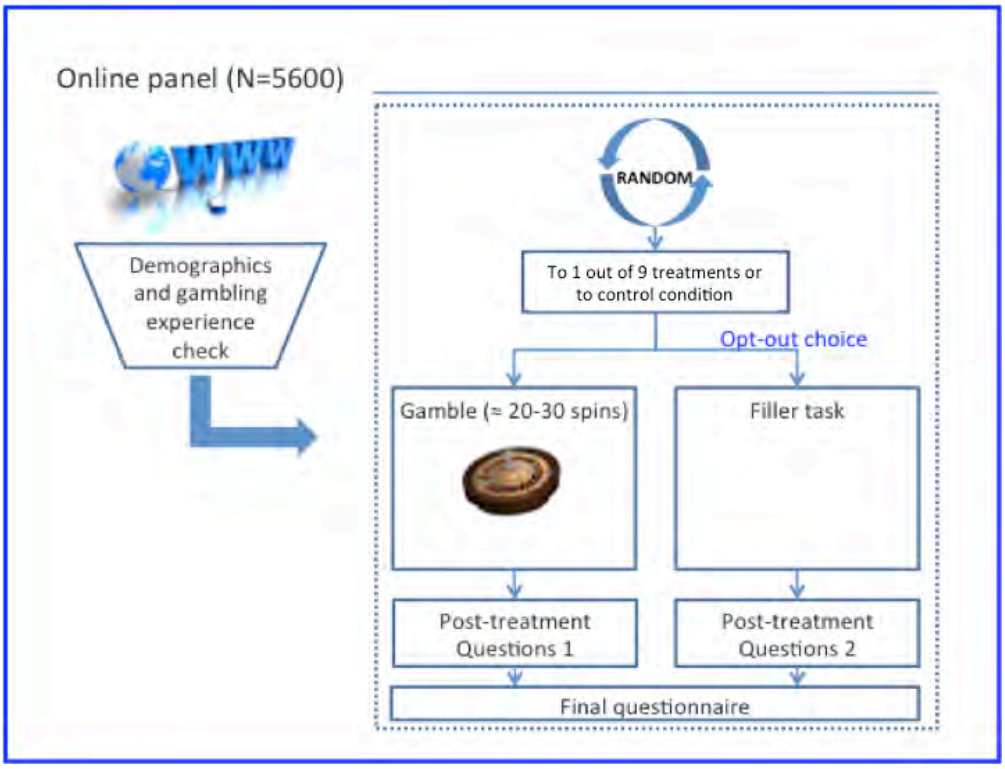
Third, on emotional, cognitive, and intentional reactions the in-gamble treatments either show statistically not significant results or results that need interpretation, some of which were anticipated earlier.

3.3 Online experiment

3.3.1 Snapshot of design

The treatments tested were anticipated already in § 1.2, a full grounding for them was provided in § 2.3, and the full account of the experiments procedure is provided in the Technical Appendix (§ 5.4.2) where graphic screenshots of the treatments are reported as to help the readers visualise and understand more intuitively to what measures the subjects were exposed. Hence, the following graphic snapshot is shortly commented and the treatments tested are briefly recalled.

Figure 15 Snapshot of online experiment design



The experiment was designed as a randomised control trial based on classical between-subject main factor design. This aspect of the design ensures the internal validity of the experiment whereas the experimental stimuli programmed provide a fair degree of realism. The random sample representative of the general Internet population in seven opportunely selected European countries warrants a high degree of external validity and the potential of generalisation of findings.

Subjects were randomized only to one out of nine treatments or to control and they played only one gamble (for 20 spins) as to stay within the strict 20 minutes limit prescribed for online experiment.

The randomly drawn subjects clicked on a link and accessed the experimental platform online, read the instruction, were asked some general demographic questions and some information regarding their gambling experience, and were then randomly allocated to 1 out 9 treatments or to control condition. They play for 20 spins and their behavioural choices are automatically recorded, after which they answer a post-treatment questionnaire used to measure the self-reported variables (psychometric scales for cognitive, emotional, and intentional reactions). After that, the experiment is completed.

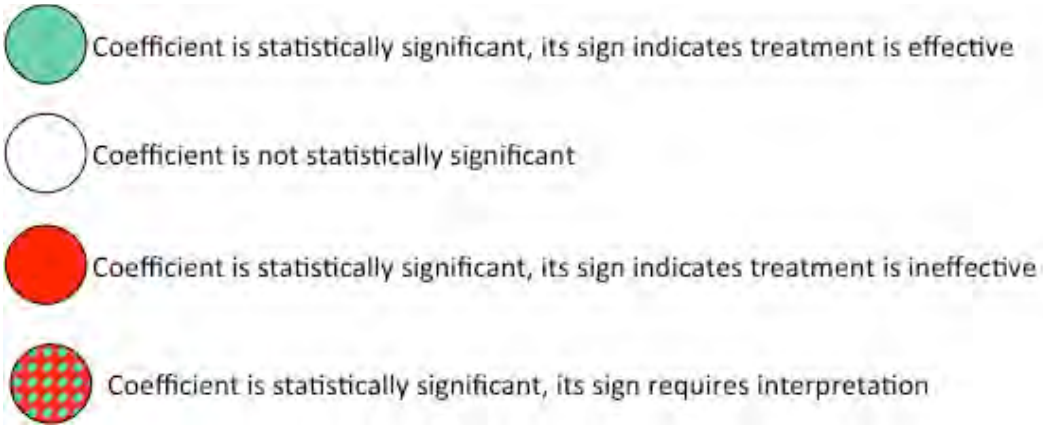
Note, however, that after being exposed to the treatment the subjects were given the possibility of early opt-out that, if chosen, is a key behavioural variable for the online experiment.

Treatments. The treatments are briefly recalled below:

- **OT1: pop-up pictorial warning.** Same as in the LAB.
- **OT2: pop-up textual warning.** Similar to the previous one, but only the textual warning without the picture appeared on the screen.
- **OT3: over-confidence task.** Subjects exposed with this treatment were first asked to self-assess their capacity with calculating the odds of a game and then given an exercise to test in practice such self-assessment.
- **OT4: Logo of national gambling information provider.** The logo of the national info provider appeared in the screen.
- **OT5: Wide Logo/Banner.** A wider banner with more contrast with respect to the website background.
- **OT6: Helpline.** No logo/banner, only helpline.
- **OT7: Terms and Conditions.** Terms and conditions clickable link.
- **OT8: Standard Registration Form.** Simple form asking standard data.
- **OT9: Extended Registration Form.** Extended form asking also for ID number.
- **Control condition.** The subjects allocated to control went immediately into the warm up and trial gambling without being shown any of the treatments above.

3.3.2 Main findings: ONLINE behavioural measures

As per the LAB findings, the more complex technical tables with the results of the regression analysis are reported in the Technical Appendix (§ 5.4.). In next tables the same approach and notation explained earlier for the LAB (except for the results of the opt-out choice, see § 3.3.2.1) are used.



The two tables below summarise the response variables and when they can be considered effective, provided the coefficient is statistically significant. Most of the explanation provided earlier for the LAB applies here and are note repeated.

Table 32 Behavioural response variables and effectiveness (ONLINE)

Variable	Treatment effective if coefficient sign
Average bet per spin (pre-gamble & in-gamble)	Negative
Average time per spin (pre-gamble & in-gamble)	Positive

Table 33 Self-reported response variables and effectiveness (ONLINE)

Variable	Treatment effective if coefficient sign
Positive affect scale, see Figure 10 at page 79 .	Negative
Negative affect scale, see Figure 10 at page 79.	Positive
SAM (Valence), see Figure 11 at page 80.	Negative
SAM (Arousal), see Figure 12 at page 79.	Positive for pre-gamble;
Intention to gamble in the future	Negative for pre-gamble;
Use of Logos 1 Figure 12, page 80	Positive for both
Use of logos 2 Figure 12, page 80	Positive for both
Use of logos 3 Figure 12, page 80	Negative for both
Cognitive processing (think about risks)	Positive for both
Advocacy (speak to others about risks)	Positive for both
Noticeability (for specific treatments)	Positive
Willingness to continue (for specific treatments)	Negative

In the ONLINE there are only two additional self-reported variables that were not used in the LAB: noticeability of specific treatments (question posed differently depending on the treatment); willingness to continue the experiment. In the first case subjects were asked about how noticeable were the treatment to which they were exposed and, important to stress, here the comparison is not with the control group (individuals in the control were not exposed to any treatment) but rather with the subjects who had been shown the small logo. In this case a positive sign indicating that other treatments were more noticeable than small logo would demonstrate effectiveness. For willingness to continue, if the treatments worked in raising doubts and awareness about risks, then one would expect a negative sign (less willingness compared to control group), but this might also be a result in need of interpretation.

3.3.2.1 ONLINE: Focus on 'Opt-out' choice

In the online experiment the subjects, after being exposed to the treatment, were given the choice to opt-out, meaning they would not gamble, would do a filler task, and then proceed to the final post-treatment questionnaire. This is treated as a consumer choice rather than as a treatment. The reason will become clear after commenting the table below with the result of the regression analysis and the following descriptive tables that shed light on which subjects decided to opt out.

Table 34 ONLINE synoptic table, Opt out choice

Treatments	Coefficients
Pictorial Warning	-.19 (.08)**
Textual Warning	-.18 (.08)**
Overconfidence	○
Logo	○
Wide Banners	○
Terms and Conditions	○
Helpline	○
Std. Registration Form	1.27 (.07)***
Ext Registration Form	1.90 (.08)***

Source: Table 66, page 155

In the case of the opt-out choice the table above reports the white circles for all treatments with not significant effects, but for those with statistically significant effects it shows instead

the value of the coefficient and the indication of the level of significance (** at 5 %; *** at 1% of confidence level).

For pictorial and textual warning the effect is significant but negative meaning those exposed to these two treatments opted out on average less than subjects in the control group. On the contrary the effect is positive, very significant, and the coefficient is very large for the standard registration form and, especially, for the extended registration form. The results of the regression mean that many more people opted out after being exposed to these two treatments (and markedly more for the extended form). This difference occurs not only in comparison with the subjects in the control group but also with the subjects exposed to the other treatments. How can this finding be interpreted?

First, one could argue that given the lack of the performance related incentive in the ONLINE, the opt-out choice was just a shortcut to finish the experiment earlier and get anyway the basic participation fee. While this might have happened, this interpretation is clearly contradicted by the fact that opt out occurred overwhelmingly more in presence of the two registration forms than with respect to other treatments or the control condition.

Second, one could interpret the choice of opting out as an effective measure that discourages the respondent from gambling by hinting that there will be traces of such activity.

Third, another interpretation is that, as shown earlier (§ 2.1.2), online users do not like registration forms. The potential corollary of this hypothesis is that, if cumbersome or lengthy registration forms are introduced only by a subset of the regulated operators, this may push the consumers of online gambling services (regardless of whether they are regular or occasional gamblers) toward other non regulated (and possibly illegal websites) not asking for extended forms of registration. This potential counterproductive effect should be taken into account. This aspect can be further explored by looking at the contingency table below and at the two graphs reported in next pages.

Table 35 ONLINE contingency table opt out by treatment

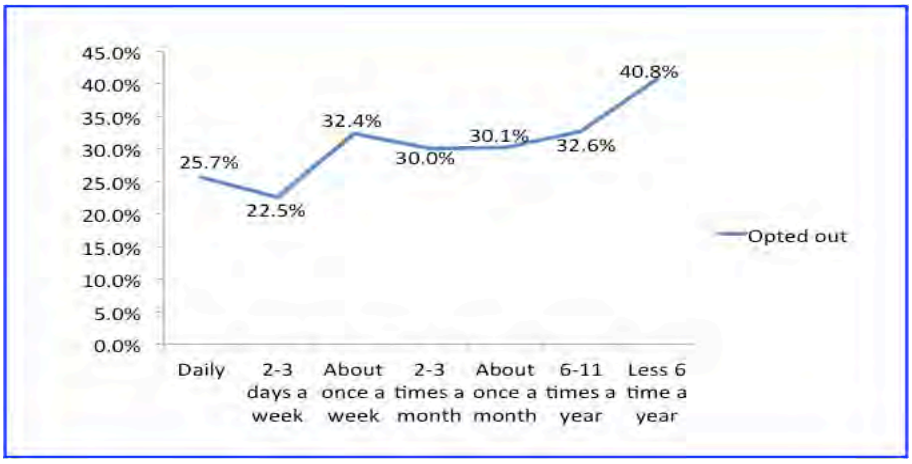
	Opted out	Continued	Total by row
Pictorial Warning	108	466	574
Textual Warning	110	463	573
Overconfidence	164	453	617
Logo	148	472	620
Wide Banners	141	453	594
Terms & Conditions	135	470	605
Helpline	156	472	628
Std. Registration	424	167	591
Ext Registration	514	70	584
Total by column	2051	3946	5997

Note: The Pearson chi2 is 1400, pvalue 0.000, there is a clear relationship among variables

The contingency table above (with chi-square statistically significant) clearly shows the marked difference in the opt-out choices of those exposed to registration forms. Taken together the two treatments account for 45% of those who opted out. Looking at the table by row it descends that: of those exposed to standard registration form as much as 71.7% opted out,

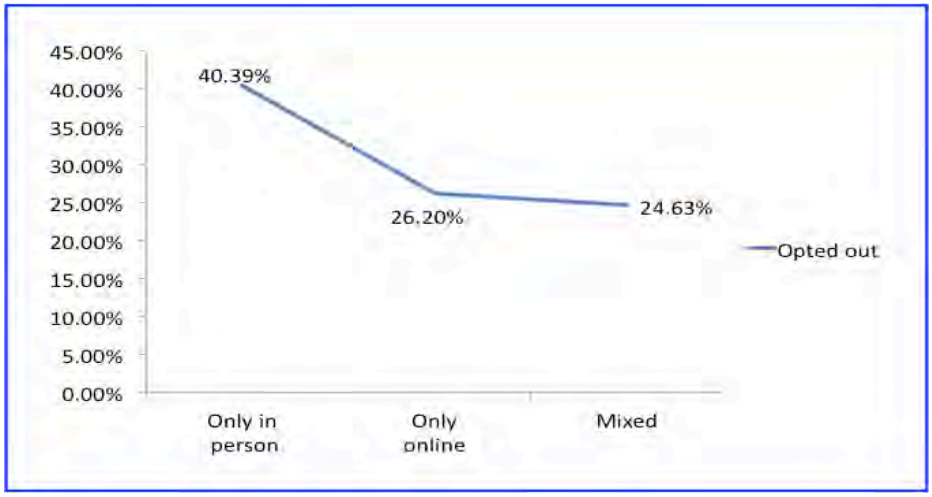
and for extended registration the share is 88%. Next opt-out rate in general (so regardless of treatment) is crossed by frequency of gambling and by preferred channel. The results are shown in the two graphs below, whose underlying contingency tables confirm that there is a statistically significant relation between the opt out rate and frequency / preferred channel of gambling.

Figure 16 Opt-out by frequency of gambling



Note: The Pearson chi2 is 81.70, pvalue 0.000, there is a clear relationship among variables

Figure 17 Opt-out by preferred channel



Note: The Pearson chi2 is =145.34, pvalue 0.000, there is a clear relationship among variables

These graphs show that opt-out is higher among the occasional gamblers and those who gambles mostly in-person and never used online gambling. Since the two tend to coincide, from the two graphs above it could be concluded that the less experienced users who have never gambled online avoid registration forms. This would be a somehow counter-intuitive but still interesting finding. Yet, the two graphs do not consider the treatments, and it is known that opt out is higher in statistically significant fashion among those subjects that are exposed to the registration forms. So, the last step is to look at the same kind of relations above but controlling for treatments, or more explicitly at how the graphs look like if considering only those subjects exposed to standard and extended registration forms. First an analysis of variance (ANOVA) was run using the three variables 'frequency of gambling', 'preferred channel', and 'opt out' controlling for treatments but no statistically significant interaction effect emerged. So, only the next two figures can be plotted that, however, are not supported

by a contingency table and the related chi-square test and are only descriptive. The tables are shown only for extended registration because the line of standard registration is specular and when plotted it was almost exactly above the one for extended registration.

Figure 18 Opt-out by frequency of gambling and extended registration

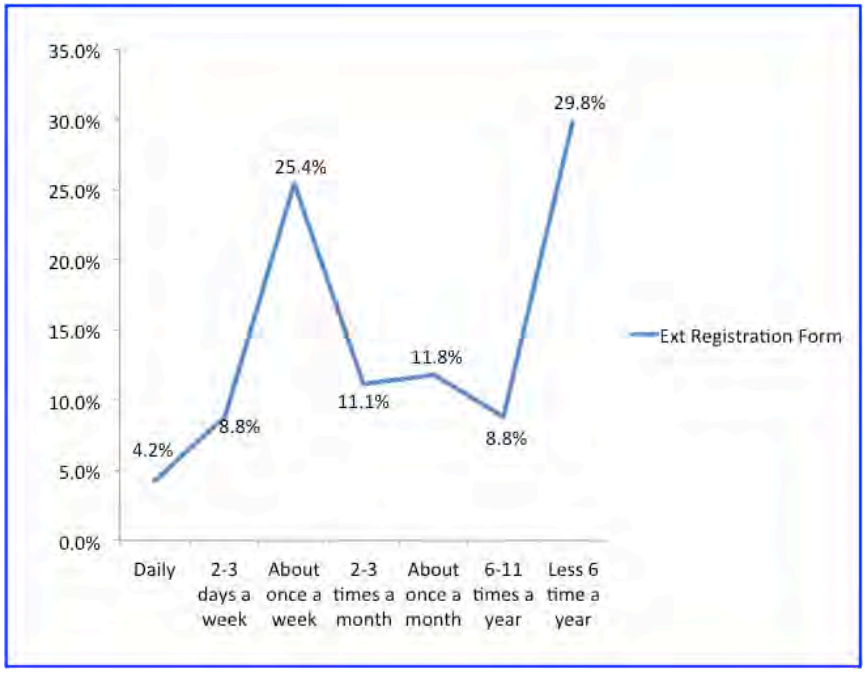
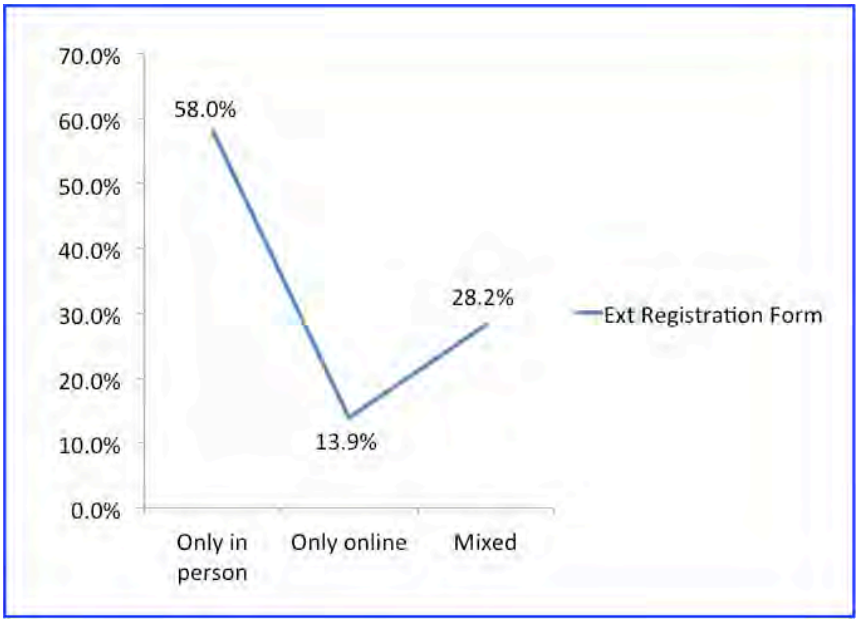


Figure 19 Opt-out by preferred channel and extended registration



The relation is not so univocal as in the previous graphs where all opt-out observations were plotted regardless of treatment. Nonetheless also in this case those who opted out the most when exposed to the registration forms treatments are again the more occasional gamblers who have not gambled online, although a pick in opting out can be noticed also among those gambling once a week and those who used mixed channel.

Hence, the conclusion may be hazarded that introducing the extended registration form may be discounted by the regular gamblers already familiar with online gambling, but it may rather alienate the beginners or occasional consumers of online gambling services with the possible counterproductive effect of sending them off to non licensed and even illegal website.

3.3.2.2 ONLINE: amount and time per spin

As in the case of the LAB, all of the treatments used in the ONLINE (that as in the LAB are of the same pre-gamble type and the first four are the same as in the LAB) do not seem to be effective in a systematic way in reducing the amount bet per spin and in slowing down spinning. There are only three isolated cases where they slow down betting (pictorial warning, overconfidence, and standard registration form). The subjects exposed to the standard registration form actually bet more per spin than the control group and this is probably due to the fact documented earlier that many of them are regular gamblers used to the online channel.

Table 36 ONLINE synoptic table, all treatments: amount and time per bet

	Average bet per spin	Average time per spin
Pictorial Warning	○	●
Textual Warning	○	○
Overconfidence	○	●
Logo	○	○
Wide Banners	○	○
Terms and Conditions	○	○
Helpline	○	○
Std. Registration Form	●	●
Ext Registration Form	○	○

Source: Table 66, page 155

3.3.2.3 ONLINE: Self-reported variable

On the PANAS scale most results are not statistically significant, only the textual warning seems to induce less positive feelings but it is a very marginal effect (coefficient -0.1, significant only at 10%, R2 very low= 0.03). On the other hand, those exposed to the extended registration form (who did not opt out) report more positive feelings than the control group.

Table 37 ONLINE synoptic table, all treatments: PANAS scale, average response

	Positive Affect	Negative Affect
Pictorial Warning	○	○
Textual Warning	●	○
Overconfidence	○	○
Logo	○	○
Wide Banners	○	○
Terms and Conditions	○	○
Helpline	○	○
Std. Registration Form	○	○
Ext Registration Form	◆	○

Source: Table 67, page 156

Also on the SAM scale (see next table) mostly statistically not significant results are found, with the exceptions concerning pictorial warning and again extended registration form. The result for pictorial warning, however, has little meaning since it shows that the intensity of feeling is higher than for control but valence is not different in statistically significant way from the control. On the other hand, subjects exposed to the extended registration form report more positive and more positively intensive emotions than control. This is a result possibly due to the fact that the majority of those exposed to the registration who did not opt out are more regular gamblers and users of the online channel. It may be interpreted in the following way: they discounted the registration and just enjoyed another round.

On the intention to gamble in the future the majority of the treatments (5) are ineffective since treated subjects report higher intentions to gamble in the future than the control group. For other four treatments the results are not statistically significant. Again positive emotions

for those exposed to the extended registration form emerge, confirming the interpretation advanced previously.

Table 38 ONLINE synoptic table, all treatments: SAM scale

	Valence	Arousal
Pictorial Warning	○	●
Textual Warning	○	○
Overconfidence	○	○
Logo	○	○
Wide Banners	○	○
Terms and Conditions	○	○
Helpline	○	○
Std. Registration Form	○	○
Ext Registration Form	◆	◆

Source: Table 68, page 157

Table 39 ONLINE synoptic table, all treatments: intention to gamble in the future

	Intention to gamble in the future
Pictorial Warning	○
Textual Warning	○
Overconfidence	●
Logo	○
Wide Banners	●
Terms and Conditions	●
Helpline	○
Std. Registration Form	●
Ext Registration Form	●

Source: Table 69, page 158

On the usage of informational logos and labels the results of the ONLINE present somehow more effective results compared to the LAB, which may be explained by the different age structure of the two samples (younger that of the LAB). At any rate the picture is not systematic and is very fragmented.

Table 40 ONLINE synoptic table, all treatments: usage of logo

	Always (USE1)	Only 1st time (USE2)	Never (USE3)
Pictorial Warning	●	○	○
Textual Warning	●	●	●
Overconfidence	●	○	○
Logo	●	○	○
Wide Banners	○	○	○
Terms and conditions	●	●	○
Helpline	○	●	○
Std. Registration Form	●	○	○
Ext Registration Form	●	○	●

Source: Table 70, page 159

Table 41 ONLINE synoptic table, all treatments: noticeability and willingness to continue

	Noticeability	Willingness to continue
Pictorial Warning	●	●
Textual Warning	●	●
Overconfidence	●	●
Wide Banners	●	●
Terms and Conditions	●	●
Helpline	●	●
Std. Registration Form	●	●
Ext Registration Form	●	●

Source: Table 71, page 160

The previous table shows the results of comparing the subjects exposed to the eight treatments with those exposed to the small logo with respect to the 'noticeability' and 'willingness to continue gambling'. In this case, since control group was not exposed to any treatment, the treatment effect was calculated using the subjects exposed to logo as control condition. The eight treatments appear to be considered more noticeable than the logo. On the other hand, all subjects regardless of treatment reported a higher willingness to continue the experiment. This can be interpreted as indicating the treatments have not induced any anxiety about gambling.

Table 42 ONLINE synoptic table, all treatments: depth of processing

	Cognitive processing	Advocacy
Pictorial Warning	●	○
Textual Warning	●	○
Overconfidence	●	○
Logo	○	○
Wide Banners	○	●
Terms and Conditions	○	○
Helpline	○	○
Std. Registration Form	●	●
Ext Registration Form	○	○

Source: Table 72, page 161

Finally, in terms of depth of processing results are a bit better than in the LAB, but still not systematic. Worth noting is that pictorial and textual warning plus the overconfidence task seem to lead subjects exposed to them to be willing to think more about the risk of gambling compared to the control group.

3.3.3 Summing up ONLINE FINDINGS

In the ONLINE experiment four treatments were tested that had also been previously tested in the LAB: (1) pictorial warning; (2) textual warning; (3) overconfidence; and (4) small logo. In addition the following were tested: (5) Wide/contrast logo; (6) only helpline; (7) terms and conditions; (8) standard registration form; (9) extended registration form.

First, to a large extent the ONLINE confirms the findings of the LAB for the first four treatments: no systematic effects on behavioural variables and self-reported variables, with

isolated exceptions. Small logo seems to perform just a bit better due to the different age structure of the two samples, but it is deemed the least noticeable of all treatments.

Second, among the additional five treatments tested in the ONLINE, it can be stated that 'terms & conditions', 'wide logo', and 'only helpline' do not have any noteworthy effect apart from being more noticeable than small logo.

Third, many of the subjects exposed to the registration forms chose to opt out, and they did so much more than the control group and than all other subjects exposed to different treatments. The regression analysis and the descriptive and contingency tables presented support the interpretation that these are ineffective measures. They may push especially new and occasional consumers of online gambling services toward operators' websites not requesting such registration (and especially the extended form), possibly including non regulated and illegal ones.

Fourth, those who despite having to fill the registration form did not opt out and continued playing, show positive feelings and emotions. This is explained by the fact that these individuals are in their majority more regular gamblers with online gambling experience so they discount the registration form and enjoy another gaming round.

4 Discussion and conclusions

Before discussing the findings and presenting a few considerations on their policy implications, it must be first recalled that in this experimental behavioural study the key and most important response variables were those that recorded subjects actual behaviour when playing the two gambles: time and amount of money per bet. Other self-reported response variables were also measured through post-treatment questionnaire, but these have well-known limitations and were considered of secondary importance (see explanation provided in § 3.1.2). Hence, the discussion of the findings, judgements, interpretations, and the policy implications derived from them are informed by this order of importance in the measure of effectiveness (i.e. response variables) used to test the various treatments.

4.1 Pre-gamble treatments

In general the pre-gamble treatments, both the four tested in the LAB (pictorial warning, textual warning, overconfidence, small logo) and the nine tested in the ONLINE (pictorial warning, textual warning, overconfidence, small logo, wide/contrast logo, only helpline, terms and conditions, standard registration form, extended registration form) can be deemed to be systematically not effective especially for behavioural measures and to a large extent also for the self-reported measures. In this respect no systematic evidence is found that pre-gamble treatments reduce the amount bet or slow down the rhythm of betting, which can be interpreted in three ways.

First, in designing the experiment and, especially the treatments, at least three of the pre-gamble treatments were expected to be more effective than what our findings shows. Effectiveness was expected for the pictorial warnings, the textual warnings, and the overconfidence tasks. The expectation was based on previous experience in experimental studies where warnings (and especially pictorial ones) had worked but also on the fact that these three treatments were solidly grounded in the consolidated theoretical and empirical knowledge existing on heuristics and biases reviewed in section 2.1. On the other hand, also in chapter 2 it was envisaged the possibility that in the specific context of gambling, heavily influenced by the dynamic of 'human-machine' interaction, treatments merely aimed at de-biasing individuals may not be sufficient, because of the emotionally confounding effect of such interaction. Indirect confirmation of this is in the fact that when pictorial and textual warnings were tested as pop-up during the in-gamble phase and required subjects to check

the box 'I understand' they were effective in reducing at least the spinning rhythm if not the amount bet. Furthermore, apparently the online medium compounds self-serving biases such as: overconfidence, illusion of control, illusion of knowledge, and self-attribution. These may also explain why warnings and overconfidence tasks did not work on subjects who on average tend to be regular Internet users (see *infra*).

Second, for the most traditional and mostly existing measures (logos in different forms, helpline, and terms & conditions) the results obtained were a clear and expectable possibility, namely no impact in reducing amount bet and slowing down spinning and little and non systematic effect on emotional, cognitive, and intentional reactions. The analysis presented in sections 2.1 and 2.3 of chapter 2 could foreshadow such results. It must be recalled that the sample of the LAB included younger subjects who are on average heavy Internet users (digital natives) and that the sample of the ONLINE, though capturing the more general population, was recruited from a panel of regular Internet users. So, with younger individuals and/or more regular Internet users is not surprising that the effectiveness of some treatments is neutralised by biases that are typical of online behaviour. The 'non-use of information' and 'rational ignorance' heuristics typical of the online medium can well explain the ineffectiveness of 'logos', 'helpline', and 'terms & conditions'. In the LAB, thus with younger potential consumers, the logo is ineffective and subjects exposed to the treatment report more than the control group that they never look at informational labels and logos when they enter a website. The logo scores just a bit better in the ONLINE where respondents include a larger number of individuals from 36 years till 65 years of age (in LAB the majority is 18-35). Reading the terms and conditions has a cost that is clearly higher than the short term perceived benefits for the consumers. Subject in the experiments have probably barely noticed it and a small minority clicked on the link, so that the lack of effectiveness is easily explained.

Third, a separate mention is needed for the interpretation of the findings concerning the standard and extended registration form. The reciprocity and inequity aversion heuristics hold that in exchanges individuals do not like to give something before having received something else in return. Hence, it has been explained that online users do not like to register or answering a survey before having given the bonus or at least having been directly admitted to the online service or entertainment they want to use. On the other hand they think it fair to leave traces of their data and behaviour on social media such as Facebook that provide them with something for free. Applying this logic to a website of an hypothetical gambling operator one would expect that consumers may be reluctant to fill in a longer registration form before having at least been admitted to the trial face. In the online experiment the subjects exposed to the two registration forms and especially to the extended one opted out in much greater numbers than the control group and than all other subjects exposed to different treatments. This cannot be interpreted as an 'experimenter' effect due to the lack of performance related incentive inducing subjects to finish the experiment quicker and get away with their participation incentive. Opt-out, in fact, occurred in statistically significant larger dimension only for the two registration forms. Neither could be accepted the interpretation that is an effective treatment discouraging online gambling. The combined reading of the regression

analysis and of the bivariate analysis supports the interpretation that the registration forms are potentially counterproductive measures that may lead especially new and occasional consumers of online gambling services not willing to register to flock to those websites not requesting registration (especially the extended one). On the other hand, those who despite having to fill the registration form did not opt out and continued playing show positive feelings and emotions. This is explained by the fact that these individuals are in their majority more regular gamblers with online gambling experience so they discount the registration form and enjoy another gaming round.

4.2 In-gamble treatments

First, it is important to recall that monetary limits (two forms) and alerts (three forms) were tested during the LAB IN GAMBLE 1 sub-step in a full factorial design enabling to measure the effectiveness of the six possible resulting combinations. On the other hand, in the IN GAMBLE 2 sub-step the pictorial and textual warnings (with the additional framing that subjects must check the box 'I understand' and then click the button 'proceed') were re-tested.

Second, it is important to stress that the in-gamble step is arguably the most internally and ecologically valid part of the two experiments. Subjects play exactly as in a real website, longer than in the LAB pre-gamble step and than in the ONLINE, and they can win more than the basic participation fee or even bet this fee when they consume their virtual wallet and walk out of the LAB with no money after having invested one hour of their time.

Third, and in view of the previous point, it is absolutely noteworthy that money limits combined with alerts have fairly systematic effects in slowing down the spinning and in reducing the amount subjects choose to bet per spin. In addition, 'Self defined limits with pull feedback' also reduce the number of subjects that decided to play another session when they are given the possibility to proceed to the next sub-step of the in-gamble step. Considering these six measures with respect to the discussion of heuristics and biases and of ways to de-biasing them then in-gamble treatments are quite theoretically and empirically grounded. Fixed monetary limits leverage the power of the default option and the inertia effect this may have on betting decisions[49]. This is important also in view of the fact that in the online context there is a demonstrated 'status quo' bias and people stick to default settings. Self-defined limits leverage mental accounting: individuals construct dedicated 'budgets' for specific activities keeping under control spending (Thaler 1985). All variants of alerts (push, pull, or push with 'you lose') are a practical realisation of the solutions the relevant literature suggests as ways to activate slow but accurate reasoning (Strack et al 2006; Streff & Geller 1988; Petty at al. 1986).

[49] On the general concept of how default options can produce policy desirable out comes see Johnson & Goldstein (2003).

Fourth, the effectiveness of these measures (money limits & alerts) resides also in the fact that they alter the 'human-machine' interaction. When the wallet is empty, even if refill is automatic, the subject needs to stop playing and think about how much they have bet both with fixed and with self-defined limits. The push pop up with information about time and amount spent also disturb the 'flow in the zone' to use an expression presented in section 2.2 of chapter 2. The prompt to activate the pull pop up, even if the subjects do not activate it, is also a source of disturbance to the spinning rhythm. In general, it can be said that these measures go to the core of the problem, the 'human-machine' interaction, and alter/disturb/interrupt this interaction. Recalling the analogy with the 1960s and 1970s, when with mechanical slot machines gamblers who won more than a certain sum had to stop playing and wait until the attendant verified their win and paid it of (that was a sort of invitation to stop the game), these measures appear as a sort of attempt to stop the 'expediting' strategy inscribed in the machine's design and force the gambler to a pause that may lead to stop playing earlier. Considering that online slot machines tend to be faster than their land-based but still electronic counterparts and that in the online context certain biases may be magnified (illusion of control, illusion of knowledge, overconfidence, self-attribution, etc.), altering the 'human-machine' interaction with measures such as these and others it is probably the most effective way to protect consumers. Naturally, one may ask to what extent the effectiveness of these measures is due to the de-biasing strategy inspired by classic analysis of heuristics and biases or rather simply to the fact that they alter 'human-machine' interaction. To some extent this question is not so relevant from a policy perspective since what matters is that monetary limits and alerts work. Nonetheless this issue is tackled further below when discussing in-gamble treatments with regard to self-reported measures.

Fifth, the re-framed warning messages tested in the IN GAMBLE 2 of the LAB showed effectiveness only in slowing down spinning but not in reducing the amount bet. Here, one can only speculate that the need to check the box 'I understand' is the main source of this effectiveness and that otherwise the warning about risks do not seem to work in a gambling context because of the 'emotionally confounding effect' of doing what in the last instance should be considered a gaming activity.

Sixth, for all in-gamble treatments the self-reported measures either show results that are not statistically significant or that are somehow counter-intuitive and would require interpretation. The first consideration that come to mind is that, if there are no sign of emotional and cognitive meaningful reactions, then one may conclude that in-gamble treatments worked mostly due to the fact that they alter 'human-machine' interaction. If nudges activated slow and accurate thinking then one should see sign of this in the emotional and cognitive reactions. This may be, however, an interpretation not fully warranted given the limits of self-reported measures (see § 3.1.2). So, one should proceed by steps looking at depth of cognitive processing first and then at emotional reactions (and also at intention to gamble in the future). On both dimensions of depth of processing – cognitive processing (willingness to think in the future about the risks of gambling) and advocacy (willingness to talk to other people in the future about the risks of gambling) – no statistically significant effects

have been found. On the one hand, this may corroborate the hypothesis that there was no activation of slow and accurate thinking and so the effectiveness of the measures is mostly due to the altering of the 'human-machine' interaction. On the other hand, it is also possible that the activation of slow and accurate thinking occurred at a subconscious level of which subjects were unaware whence their not fully reliable answers to the depth of processing questions. When moving to emotional reactions, for some treatments more positive emotions and feelings than the control group are reported. The assumption behind the nudges is also that by inducing emotional uneasiness (i.e. risks, loosing money, etc.) cool cognition is activated. So, according to this line of reasoning one would have expected the treated to show more unsettling feeling and emotions than the control group, rather than more positive ones. In the same vein one would have expected less intention to gamble in the future, but instead in some cases more intention to gamble in the future than the control group is observed. There are two possible interpretations of these results here: a) the confounding effect of gambling make subjects enjoy the experience (so this interpretation takes at face value the results that come from self-reported answers with all their limitation); b) some treatments are reassuring (limits are fixed, I am reminded how I am doing) and neutralise any possible worry or anxiety (also this interpretation takes the answers at face value). Whereas the first interpretation seems more reasonable, it must be stressed that these results are not systematic across scales and treatments. At any rate what matters most is that the treatments work in reducing amount bet per spin and in slowing down the spinning process. There might also be at work a sort of "post-purchase rationalization bias": *we played the gamble, it was ok, I like it, so I may play again in the future*. Actually, this post-activity rationalisation bias could also explain the intention of gambling in the future where statistically significant results both in the ONLINE and in the in-gamble step of the laboratory experiment are found. This sort of effects does not weaken the overall behavioural effectiveness of the in-gamble treatments.

Finally, a more general consideration is presented that go beyond what is strictly related to our findings on the treatment effects but rather triangulates them with the more general discussion conducted in chapter 2. In the spring of 2013 a very important change was introduced by the American Psychiatric Association (APA, 2013) when it released the last edition of its Diagnosis and Statistical Manual (DSM V): gambling disorder was placed alongside substance-related addictions in a renamed group called "Addiction and Related Disorders". Until pathological gambling was consider a 'impulse disorder' it was more difficult to claim that the problem is also in the object of the addiction and not only in the mind of individuals. Now, even from a medical perspective is more difficult and less legitimate to continue in considering pathological gambling only as a matter of individuals' personality traits and weakness. Both pathological and non-pathological gambling (to be seen in a continuum and not as a clear-cut dichotomy) are as much a matter of individual behaviour as it is a matter of the machines been designed with scripts that invite certain behaviours and avoid others. Gambling is about above all 'human-machine' interaction, and the more so in the online context where the gambles are faster and gamblers can play in more isolated, accessible, and convenient ways. The findings of this study about the effectiveness of the in-gamble

treatments that touch upon this interaction and the ineffectiveness of pre-gamble treatments addressing only the individuals add a further solid piece of evidence in this direction. Any consumer may experience when gambling a loss on control and time, just as a pathological gambler, and to counter this the protective measures to be effective must target 'human-machine' interaction. It was also shown that there is a clear relation between being a regular gambler and using the online channel (see Figure 7, page 70). A vast body of literatures was cited warning about the risks for children and adolescent ('screen-ager) of the convergence between digital media and video games with gambling. In the view of this the study team, clearly stating that this is not the official position of the Commission, calls for a more integrated approach to consumer protective measures that go beyond provision of information and other nudges targeting only the individuals and tackle both side of the problems: the individual and the electronic machines.

4.3 Policy implications

As put it in the ALICE RAP policy brief on gambling *"… any proposal for regulation is faced with the challenge of balancing opportunities for legal gambling on one side, and effective Public Health measures to prevent gambling-related harm on the other side. There is no fair, scientific or "objective", universal solution for such a balance…"* (Bühringer et al. 2013, p. 1). Indeed the challenge consists in providing legal and safe opportunities treating gambling as a recreational activity while minimising the risks that gambling-related problems emerge. Since such problems may gradually emerge from what starts just as a recreational activity, there is a need to keep gambling within a safe and controlled environment.

It was beyond the mandate of this study to formulate any specific and formal policy recommendations as to which protective measures should be introduced and which should not be introduce among those that were tested. The aim of the study was to test the effectiveness of a set of consumer protective measures from a strictly experimental behavioural perspective. Effectiveness was measured above all by the extent to which the tested measures led the participants to the experiments to bet less money and more slowly. A secondary measure of effectiveness was the extent to which the protective measures tested generated in the subjects some concern about gambling, made them more aware about the risks, and influenced their intention to gamble in the future. From the findings of the two experiments carried out it can only be inferred whether or not these effects were produced by the tested protective measures. If such effects were not produced, then the measures were deemed ineffective. Ineffectiveness does not mean, however, that the tested protective measures are harmful and does not imply they should not be used. As long as they provide consumers with some source of information it cannot be ruled out that they can be useful. It is a matter of consideration for the Commission to assess the costs and benefits of proposing or not some of these measures in light of the results of this study. Hence, only some preliminary policy implications are presented here that do not go beyond what the findings strictly show. Only in the case of the registration forms some interpretative considerations on their possible consequences are added. These interpretative considerations spring from the observation that consumers' protection can decrease if an operator website is not regulated or controlled. The risks for consumers stem in particular from operators or websites operating outside any form of control, or under lax control. Hence, consumers' protective measures may be counter-

productive if due to unintended forms of over-regulation they push consumers to use the service of unregulated and non-controlled operators' sites.

Three policy implications are, thus, presented below for: a) all pre-gamble measures except standard and extended registration forms; b) standard and extended registration forms; and c) in gamble measures.

Pre-gamble measures. Pictorial warnings, textual warnings, overconfidence task, logos (in their different variants), helpline, terms and conditions were not effective in terms of reducing cognitive biases, of making consumers more aware about the risks of gambling, and of altering their behaviour (did not reduce amount bet or the speed of betting). It must be added that these findings come both from the laboratory experiment and the online experiment, which means that they warrant generalizability. These pre-gamble protective measures may nonetheless serve the purpose of providing consumers with information about the operator they are playing with, about the conditions they are signing up to (e.g. pay backs of winnings, use of data provided, information about the games/bets), a well as for enabling consumers to compare sites/prices. They are not effective from an experimental behavioural perspective, but they could still be used as a non-invasive form of consumer information, which is not harmful and for sure cannot be considered as over-regulation. Consumers may not bother to read terms and conditions or to look at logos at helpline numbers, or they may not be impressed by warnings, yet it is safe to state that these measures are not invasive for consumers can start right away to play and simply ignore them. Hence, it is part of the mandate of this study to signal their ineffectiveness from a behavioural perspective but the study provides no grounds for advising against their usage.

Registration forms. Besides being ineffective exactly as the other pre-gamble measures with regard to all the response variables, the registration forms (and in particular the extended registration form) may represent an instance of overregulation that may push consumers toward website or operators not requiring such registrations. This is the interpretation given to the findings that only the registration forms (and more so the extended one) cause a large majority of the subjects to early opt out from the experiment. If the early opt out, which occurs in systematic fashion only for this measure, is seen as a reaction of discomfort (if not of clear aversion), then it is not unreasonable to expect that consumers encountering the request of an extended registration in a regulation compliant operating website would abandon it and turn to another operating website (possibly non regulation compliant if not fully illegal). This is more important also considering that the extended registration form seems to be refused more by new and occasional consumers than by regular gamblers with experience in using the Internet channel to gamble. The latter seem not to be affected by the need to register and report positive feelings and emotions after gambling. However, the former may be inadvertently pushed to non-regulated and possibly illegal website and this is even less desirable considering these are not regular gamblers. These results come from the sample of the online experiment, which is a representative multi-country sample and warrants generalisation.

In-gamble measures. Last but certainly not least, it can be safely stated that the monetary limits and the alerts are by far the most effective consumer measures among those tested. It is, thus, advisable that the Commission work on them, if not for the short term, certainly for future recommendations and/or communications. The reasons why these measures are suggested not for the short term is that the findings come only from one laboratory experiment in one country. Given the high internal validity and realism of this experiment it could be expected that the findings would be replicated if tested in other countries, but

naturally in a EU28 context this statement would hardly be acceptable. Hence, it is proposed shortly here how these findings should be re-tested. It would not be feasible to replicate the level realism obtained in the in-gamble part of the laboratory experiment within the context of an online experiment. It is, therefore, suggested a mix of laboratory experiments and smaller explorations in a total of 10 countries. It would recommendable to test only the monetary limits and alerts in a full factorial design. With six conditions plus control this would require a sample of about 210 individuals. Five laboratory experiments could be conducted in the largest markets: France, Germany, Italy, Spain, and the United Kingdom. In other five countries opportunely selected to cover the EU cultural and geographical areas (probably 2 Nordic countries, 2 Eastern countries, and 1 additional southern country) exploratory experimental focus groups and interviews could be conducted, having the participants interact with the programme website and gambles, register their behaviour by observing and making questions to them as they gamble.

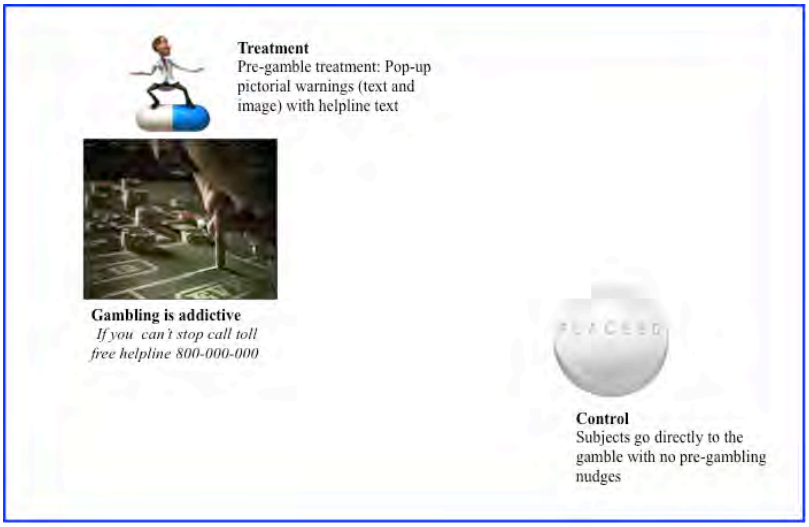
5 Technical Appendix

5.1 Key design choices

5.1.1 Randomised control trial design

Both the laboratory and the online experiments were designed as randomised control trials where the subjects are always randomly allocated to either treatment or to a control condition (placebo) as exemplified in the figure below. For instance, among the various pre-gamble treatments there was one with a pop-up pictorial warning (image plus text) and reference to helpline (image used is just exemplificative).

Figure 20 Treatment and control: exemplification

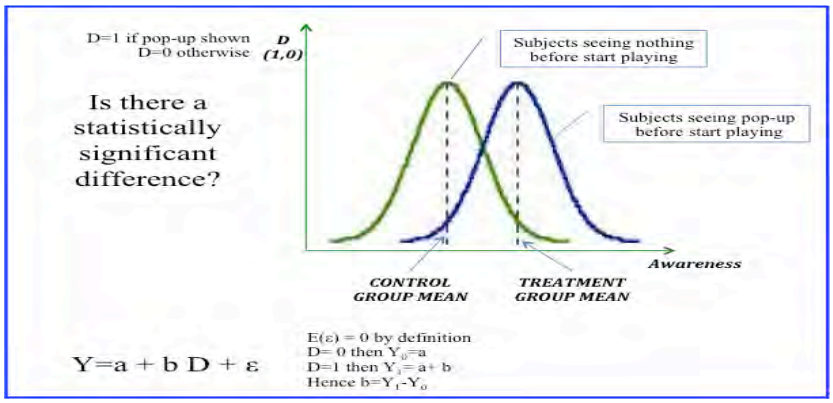


Subjects were randomly allocated to either see this treatment (or other ones) before start gambling or to start gambling directly without any pre-gamble warning. This second case is the placebo or control condition.

A between subject design with in some cases partial repetition of measures was used, meaning that subjects could be exposed to more than one experimental condition. In order to avoid order effects and other technical problems, not only the subjects were randomly allocated to

conditions but also the order by which they were exposed to condition X and condition Y was randomised[50]. The characteristics of the design guarantees internal validity (see *infra*) and enables to recover the causal effects of the tested measures on the response variables (or outcome variables) estimating a difference in mean outcomes using regression analysis[51].

Figure 21 Treatment effect: a statistically significant difference in means



[50] In technical parlance this amount to perform 'counterbalancing' for which there are a number of very complex techniques that is beyond our scope and space to explain here. It suffices to explain why these are implemented. If all subjects goes through treatment A,B,C in this exact order three things are possible: a) going through A before B may influence the reaction to B, which means one can no longer assume that the effect of B on the response variable X is due just to B; b) when subjects arrive to C they may be tired and their reactions reflect more they mental state than the effect of treatment C; c) it is possible that going through A,B, C in this order enable the subjects to understand what the researcher is trying to prove. They can, thus, engage in hypothesis guessing and answer either as to please the researchers or as to refute his/her hypothesis. In all three cases internal validity is weakened and the causal effect measured may be the result of biases rather than of the treatments. Randomisation of the order by which subjects take the three treatments A,B, C wash out the three problems identified.

[51] Let "y" be, for instance, "awareness to gambling risks" measured with respect to whether subjects saw a pop-up (D=1) or not (D=0). Hence, the general formula for the y is:

$y=a + b\ D_1 + \boldsymbol{\varepsilon}$

The term **ε** includes all the observable and unobservable variables that impact on the awareness variable. What is important is that under randomization the expected value of **ε** under treatment (in technical notation $E[\boldsymbol{\varepsilon}|\ D_1]$) is equal to zero (orthogonality condition). A simple Ordinary Least Square (OLS) regression is capable of identifying "b", since the exogeneity condition is met. The coefficient "b" is precisely the treatment effect. In fact, for those that did not receive the treatment the expected value for y is:

$E[y \mid D_1=0] = y_0 = a$

While for the treated group we have:

$E[y \mid D_1=1] = y_1 = a + b$

So by definition,

$b = y_1 - y_0$

This corresponds to the difference in the mean outcome between treated and untreated group, i.e. the treatment effect. The coefficient "b" is also what we can consistently estimate with OLS.

In other words this means that, assuming for the sake of exemplification the effect of the pictorial warning placed in Figure 20 on the level of 'awareness of gambling risk' (measured through psychometric scale) is being assessed, if the mean level of awareness about gambling risks for the subjects seeing the pictorial warning is 4 (on a psychometric 5 points scale) and that for the subjects not seeing it is 3 (and if difference prove to be statistically significant), then it is possible conclude that this policy measure (pictorial warning) has the effect of increasing awareness on risk of gambling on average by 20%.

5.1.2 Validity

The ***overall validity*** of an experiment can be assessed according to three related but independent criteria: internal validity, ecological validity, and external validity. The ***internal validity*** is the extent to which a causal conclusion based on the experiment is warranted. The internal validity of the two study experiments is ensured by the fact that they were designed as Randomised Control Trial with double randomisation and counterbalancing. The ***ecological validity*** is the extent to which the experiment materials, processes, and settings are realistic and approximate the real-word situations that aim to examine and test. Though ecological and external validity are independent there is evidence that improvement of the ecological validity of the experiment leads to improvement in the generalizability of the obtained effects (Shadish et al., 2002). Ecological validity is often a source of weakness for laboratory experiments as conditions are tested in aseptic settings and under controlled conditions. In the study experiments ecological validity was maximised: a) by programming and reproducing the interface of a typical gambling operator's online portal for a particular choice of an online gambles for both experiments; b) by providing in the LAB real monetary incentives to subjects (they got more money if they won by gambling). Finally, **external validity** refers to the extent to which the results of an experiment can be generalised to other situations and/or to other people. In our case, it is evident that the external validity of the online experiment is higher than that of the laboratory experiment, both because subject are recruited from seven countries and because they are drawn from a sample fully representative of the overall population. In general our experiments followed the consensus existing on optimal design rules (Hertwig & Ortmann, 2001): a) a detailed script (protocol) with all the "framework" details to ensure comparability and replicability was used; b) performance pay is used in order to induce cognitive effort and reduce variability of outcomes; c) warm up phase to allow subjects learning about the lab environment.

5.1.3 Statistical power

In technical terms statistical power is the probability that given the number of available observations one can reject the null hypothesis when this is false. In simpler terms it means having enough observations to estimate parameters with a sufficiently reduced variability and reliability. Suppose that the X variable "logo" has the effect of increasing the Y variable "consumer awareness" by 20%. The null hypothesis would state that this change of 20% in the response variable Y might result by chance and not because of the effect of X. With a limited

number of observations it may not be possible to reject the null hypothesis even if it were false. In this case the so called "Type II error" would be made, which means discarding the conclusion that X has a 20% impact on Y when in reality it does have this effect. So, simplifying to the basics, with more observations the probability of committing Type II error decreases, which in other even simpler words means that the larger is the sample size the higher are the probability of demonstrating statistically significant effects that do not emerge by chance but can be considered the true causal effect of X on Y. In order to avoid Type II error one has to consider how many experimental conditions need to be tested and derive the sample size required using the formula for the so-called Minimum Detectable Treatment Effect (MDE). Fixing a MDE is equivalent to deciding a lower bound threshold, below which one is not interested to recover a causal effect. In the case of the study experiments MDE was fixed at 20%, which implied that for the laboratory experiment (given the maximum number of experimental conditions) a sample size of at least 420 subjects was needed[52]. With this sample size per treatment and control one can detect statistically significant effect equal to, or greater, than a 20% change in the response variable. This means Type II errors cannot be ruled our for effects smaller than 20%, since for smaller effects a sample size that is hardly feasible in laboratory settings would be required. Sample size requirements determined by the MDE formula also increase as the number of conditions to be tested increase. The selection of a 20% MDE is based both on previous experiences and on cost-effectiveness[53].

[52] The formula for just one treatment and one control condition is reported and explained below, in order to understand the basic logic.

$$\left(z^{*}_{1-\alpha/2} + z^{*}_{1-\beta}\right)^2 \sigma^2(n) = \left(\mu^A - \mu_0\right)^2$$

Where alpha represents significance, one minus beta the power, zeta is the well known standardized normal variable, sigma is the standard deviation, n is the sample size and the right hand size is the minimum detectable treatment effect (MDE). Having Alfa and Beta fixed at 0.05 and sigma at 0.4 we then need to decide the MDE that we want to capture, input the value in the equation and extract the required sample size. If we fix MDE at 20%, we obtain a sample size of 52 subjects that we round to 60 (30 treated group and 30 control group). Multiplying 30 by the number of treatments and adding 30 for control group yield the required sample size.

[53] To fix the MDE threshold ideally one should look at previous studies that tested exactly the same treatments. Unfortunately in the literature this sort of reference point to fix the target MDE is not available. Lacking such direct reference point one can use by analogy results from other studies although not directly concerning online gambling. In this respect insights from the two behavioural studies conducted within this framework contract were used. One should also consider the cost-effectiveness in terms of money spent for the study and the kind of policy effect one can demonstrate in relation to the potential pool of affected consumers. In the case of this study considering policy measures addressed to a very small percentage of the European population, it would not be policy relevant to demonstrate an effect lower than a 20% change in the response variables. Hence, on the basis of insights from previous studies and of cost-effectiveness considerations, MDE was fixed at 20%.

The online experiment, of course, given its larger sample size does not impose constraints in terms of MDE but it does in terms of time[54]. Online experiments have higher external validity than laboratory experiments and are more ecologically valid but if they last too long then subjects may complete some part of them with less care and providing top of the head answers. A good rule of thumb is to minimise fatigue and boredom as to avoid such top of mind answers that cause noise and systematic errors and biases in the results.

5.1.4 Selection of gambles

The types and number of gambles on which subjects were tested was decided taking into consideration both validity and statistical power issues for the experiments.

It was decided to test two gambles in the laboratory experiments and one in the online experiment. In the case of the laboratory experiment testing three or more gambles would have implied multiplying the experimental conditions in such a way that even with only three gambles a sample size of more than 1000 subjects would be needed, which was beyond feasibility in laboratory settings. In the case of the online experiment the limitation to one gamble (randomly chosen from the same two gambles selected for the laboratory experiment) is justified by the need of keeping the experiment within 20 minutes.

In order to maintain internal validity of experimental protocol, generalizability of obtained results, and, importantly, feasibility of implementation within laboratory settings, the following set of requirements for the selection of two gambles were identified:

- **Gamble of pure chance.** It was decided that gambles of pure chance (e.g. roulette, scratch cards, virtual slot-machine or similar) with no element of skills involved should be tested. Therefore, sports, races, other betting gambles as well as poker or other card gambles had to be excluded. The knowledge and skills for certain gambles could bias the sample both within and across countries;
- **Multi-round gamble.** It should be a game with a multi-round gamble, so as to allow for the testing of the proposed measures (e.g. monetary limits). Therefore, lottery draws and other similar gambles were excluded;
- **Familiar gamble.** It should be familiar to participants of the experiment in terms of the general gambling principles in order to avoid prolonged learning periods and non representative results. Therefore, the selected gambles were to be simple, intuitive and with an appropriate level of realism;

[54] It is a well-established benchmark in the field that an online experiment cannot last more than 20 minutes. It was experimentally demonstrated that length of survey instrument (30 minutes versus 10 minutes in length) is negatively related to subject's cooperation rate and positively related to provision of higher uniformity of responses to the questions positioned later in the survey (Galesic & Bosnjak, 2009) In addition, questions positions later in the long surveys may be processed differently compared to the questions located at the beginning (Helgeson & Ursic, 1994)and may lead to higher rate of "don't knows" (Krosnick et al., 2002).

- **Quick repeatition of rounds/spins gamble.** It was to be a game that has a sufficient number of rounds/spins within limited timeframes in consideration of the general time limitation of the laboratory and online experiments.

Taking into account the results of the British Gambling Prevalence Survey 2010 (NatCen, 2011) and the identified requirements, there were several gambles identified as potential choices to be used for the laboratory experiment. The laboratory experiment was based in London, which explains why the data of the British survey were used as a starting point.

The table below compares the 3 most popular online gambles of chance. Roulette and slot machine were selected for three reasons. First, the effects should be sufficiently generalizable across other types of gambles if we choose 2 opposite gambles such as roulette (cognitive choice of the bet amount) and slot-machine (high automaticity of the decisions, e.g. "hit & play"). Second, according to British Gambling Prevalence Survey 2010, roulette (casino-type gamble) and slot-machines are familiar and popular choice of online gambling activity in United Kingdom where this laboratory experiment will take place. Third, they are both pretty simple and quite familiar worldwide and so can be replicated in the online experiment without incurring into problems of familiarity depending on the different countries.

Table 43 Potential candidates for selection of gambles

Characteristics*	Roulette	Slot-Machine	Scratch Cards
Warm-up time	~ 10-15 seconds	~ 5-10 seconds	~ 10-15 seconds
Spins/rounds per minute	4-5 spins	9-10 spins	9-10 rounds
Auto-play option	No	Yes	Yes
Setting amount of bet per spin/round	Manual**	Automatic/manual	Automatic/manual
Degree of automaticity of gambler's actions	Low	High	Low

Note: * characteristics were obtained empirically by engaging into real gambles. ** In manual mode, gambler has to make a cognitive effort in assigning amount per bet per spin/round

5.1.5 Target sample in the context of gambling research

Sampling issues in gambling behaviour studies are notoriously difficult and before entering into the concrete choices made by other scholars and in this study a digression is in order on the concept of 'pathological' and 'problem' gamblers.

The introduction of pathological gambling among the mental disorder catalogues by the American Psychiatric Association it its DSM-III (APA, 1980) represented a watershed, after which most discussion of gambling, of how to study it, and of its prevalence had to deal with the dichotomy of what is and what is not pathological gambling. Also the World Health Organisation (WHO) International Classification of Diseases (ICD) includes pathological gambling among mental disorders.

Pathological gambling is an urge to continuously gamble despite harmful negative consequences or a desire to stop. Until very recently pathological gambling was considered in the DSM-IV the American Psychiatric Association (APA, 1994) to be an impulse control disorder rather than an addiction. According to this earlier classification, in order to be diagnosed, an individual must have had at least five of the symptoms reported in the following box.

Box 3 DSM-IV Conditions for pathological gambling

1. **Preoccupation**. The subject has frequent thoughts about gambling experiences, whether past, future, or fantasy.
2. **Tolerance**. As with drug tolerance, the subject requires larger or more frequent wagers to experience the same "rush".
3. **Withdrawal**. Restlessness or irritability associated with attempts to cease or reduce gambling.
4. **Escape**. The subject gambles to improve mood or escape problems.
5. **Chasing**. The subject tries to win back gambling losses with more gambling.
6. **Lying**. The subject tries to hide the extent of his or her gambling by lying to family, friends, or therapists.
7. **Loss of control**. The person has unsuccessfully attempted to reduce gambling.
8. **Illegal acts**. The person has broken the law in order to obtain gambling money or recover gambling losses. This may include acts of theft, embezzlement, fraud, or forgery.
9. **Risked significant relationship**. The person gambles despite risking or losing a relationship, job, or other significant opportunity.
10. **Bailout**. The person turns to family, friends, or another third party for financial assistance as a result of gambling.

Source: (APA, 1994)

The new DSM-V released in 2013 by the American Psychiatric Association (APA, 2013) introduced an important change: it reclassified the new term “gambling disorder” under “Substance-related and Addictive Disorders” (Petry et al., 2013). The number of conditions to be diagnosed with pathological gambling has decreased from at least five to at least four and the ‘‘illegal acts’’ criterion was removed from the list.

“Problem gambling” on the other hand, is a frequently used generic term that covers early signs of gambling-related problems, with increased risk of transition into a gambling disorder. Definitions of problem gambling vary widely and the clinical relevance of this category is disputed (Blaszczynski & Nower, 2002).

As a result there are serious challenges and problems in measuring the prevalence of pathological and problematic gambling and in distinguishing it from normal or regular gambling (Abbott, 2006; Doughney, 2007; Dowling, et al., 2005; Reith, 2003; Shaffer, 1996; Shaffer & Kidman, 2003; Smith et al., 2007; Volberg, 2004). From clinical studies the prevalence of pathological gambling is estimated between 0.5% and 2.2% of the general population and that of pre-pathological but problematic gambling between 1.3% and 3.8% (Esposito, 2013; Schull, 2012). For what concerns more specifically European MS, according to Sassen et al (2011):

- 0,1-0,8% of the general adult population fulfil the criteria of a gambling disorder
- An additional percentage of 0,1-2,2% demonstrate potentially problematic gambling involvement;

On the other hand, taking the total population as a base is misleading, for the percentage of problematic gamblers over the total population of regular gamblers is estimated to reach up to 20% (Abbott & Volberg, 2000; MacNeil, 2009; Productivity Commission, 2009, 2010). Some scholars have argued, in fact, that prevalence measures should follow a continuum approach (Dickerson, 2003; Volberg, 2004).

Most importantly, from the perspective of drawing a sample, there are neither consolidated scales to distinguish different typologies of gamblers (i.e. pathological, at risk, regular but not at risk, occasional, etc.) nor reliable estimates within and across countries of how large are these categories of individuals in the general population. When it comes to online gambling, given its relative novelty, the situation is even less consolidated and clear.

A further complicating factor is the tendency for researchers to simply compare online gamblers with non-online gamblers (Wardle & Griffiths, 2011). This approach makes the implicit assumption that these are mutually exclusive groups with little overlap in behaviour. Ladd and Petry (2002) were arguably the first to use this approach. They reported that 8.1% of their sample used the Internet to gamble and that rates of disordered gambling were higher among the Internet gambling group than among non-Internet gamblers. Almost all other researchers who have used survey data for their analysis have replicated this analytical technique. For example, examination of online gamblers identified in the 2007 British Gambling Prevalence Survey (BGPS) demonstrated that rates of problem gambling were higher among those who used the Internet to gamble (5%) than among those who did not (0.5%) (Griffiths, et al., 2009). Similar results have been replicated in other jurisdictions (Olason, et al., 2011; Wood & Williams, 2009). However, this is a simplistic method of defining the online gambler (i.e. anyone who has used the Internet to gamble in a given period). Little consideration has been given to how online gambling behaviour may be integrated more broadly with offline behaviour (Wardle & Griffiths, 2011). For instance, Ladd and Petry (2002) noted that 89.2% of respondents had experience of playing the lottery, 81.7% had experience of playing slot machines and 78.7% had experience of buying scratch cards, whilst 8.1% had experience of using the Internet to gamble. It is likely, therefore, that a high proportion of the lifetime Internet gamblers in their sample also engaged in some form of offline activity. This is supported by evidence from the 2007 BGPS showing that although the overall prevalence of online gambling was 5%, the prevalence of those who gamble exclusively online was 0.1% (Wardle & Griffiths, 2011), demonstrating that most online gamblers are also offline gamblers. Likewise, the California Problem Gambling Prevalence Survey showed that most Internet gamblers also gambled offline and were more likely to be engaged gamblers (Volberg et al., 2006). Perhaps the most recent and detailed large-scale study on gambling diffusion in a country is the 2010 version of the British Gambling Prevalence Survey 2010 (NatCen, 2011). The sample was drawn at random from the Postcode Address File and stratified according to

age, occupational status and ethnic group. It shows that 73% of participants had gambled in the past year and that the prevalence of online gambling on any activity was 14%. Of past year gamblers, only 2% reported that they had only gambled online**.** The survey adopted a detailed classification dividing users in four groups: in person only gamblers, online only, mixed mode – different activities, mixed mode-same activities. The largest subgroup was in-person only gamblers (80.5%). The next largest group was mixed mode gamblers who gambled in-person and online on the same activity (10.6%) followed by mixed mode gamblers who gamble in-person and online on different activities (6.8%; hereafter referred to as mixed mode same activity and mixed mode different activity gamblers). Only 2.1% of past year gamblers were online only gamblers. The online only subgroup is overwhelmingly comprised of those who only used the Internet to purchase National Lottery tickets online (84.3%). This also means that there was a smaller subgroup of online only gamblers who participated in some other activity online, either taking part in this activity alone or in combination with the National Lottery.

Summing up there are at least five considerations to be made. First, there is probably a more nuanced continuum from the most pathological gambler to the occasional one and also occasional gamblers can face the same lack of control problems of pathological gamblers. Second, lacking a clear definition of the universe of reference it is basically impossible to draw a random sample of a well-defined category of gamblers and even more so of online gamblers. Not surprisingly around 40 studies of Internet gambling been conducted so far have resorted to self-selected samples (International Gaming Research Unit, 2007; Ladd & Petry, 2002; Lloyd, et al., 2010; Matthews, et al., 2009; Wood, et al., 2007). Third, it is almost impossible to identify a clearly distinct category of online gamblers only and seemingly it is a marginal phenomenon compared to the reality of gamblers using both traditional land-based and online forms of gambling. Fourth, participation in online gambling is increasing and sizeable but still relatively low compared to gambling in general, with international data indicating that between 5% and 30% of adults gamble online (Gainsbury, 2010; Petry, 2006; Wardle, et al., 2011; Wood & Williams, 2009). Fifth, estimates of online gambling are in any case limited, given that few national prevalence studies have been dedicated just to online gambling.

Hence, there was no systematic way of sampling online gamblers and it would have been simply not feasible, neither in the laboratory experiment nor in the online experiment, to recruit a sample of strictly defined online gamblers, which was not done. For the laboratory experiment, which was based on a convenience (hence self-selected) sample the decision was to recruit participants making sure they have had in the past some broadly defined gambling experience (see questions used in Box 2, page 66), which resulted in a sample split 80:20 between those who had such experience and those who had never gambled even once in their life. In the online experiment a simple random sample was drawn from the general online population and ex post it was registered found a sample split 90:10 between those who had such experience and those who had never gambled even once in their life.

5.2 Online versus laboratory experiment

Before the advent of the Internet, experiments in behavioural economics and other behavioural disciplines were carried out in laboratories mostly using university students as participants. Table 44 provides a synthetic overview of the pros and cons of the online experiment as new experimental method, where the laboratory experiment is the implicit benchmark against which pros and cons are identified.

Table 44 Pros and Cons of Online experiments

Pros	Cons
Wider sampling access. Ease of access to a large number of demographically and culturally diverse participants	**Multiple submissions**. They can be avoided or controlled by collecting personal identification items (evidence is that multiple submission, however, is rare).
Generalizability /quality of data. Better basis for generalising the findings to the general population and to more settings and situations (because of high external validity).	**Less experimental control**. Variability of environments (lighting, noise, technical features of equipment used, i.e. browser type, connection speed). In absence of Lab assistants' controls participants may provide 'noisy' answers (provided without paying attention). These problems are less of an issue with between-subjects designs with random distribution of participants to experimental conditions
Better efficiency and logistics. Experimental procedures automation reduces costs and increases the uniformity of the procedure across participants.	**Realism and incentives**. It is more difficult to use very realistic stimuli with many possible different options to be chosen, given lack of control on subjects. The possibility of using a performance based incentive system is limited in large multi-country random samples. These tow aspects decrease the ecological validity of online experiments compared to laboratory ones.
Detectability of motivational confounding. See opposite cell about dropout.	**Dropouts**. This is always an issue in Web experiments. However, dropout can be turned into a detection device for motivational confounding.
Reduction of experimenter effects and demand characteristics[55]**.**	**Lack of interaction**. This may cause misunderstanding among participants, but can be avoided with pre-test and pilot testing

Source: extracted in condensed fashion from, among others, key reference sources (Batinic et al., 2002; Birnbaum, 2000; Birnbaum, 2004; Dandurand et al., 2008; Gosling & Johnson, 2010; Reips, 2000; Reips, 2002a, 2002b, 2002c; Reips & Krantz, 2010).

The main strategic advantage of an online experiment compared to a laboratory one is the increasing possibility for generalisation (external validity). Web studies, by having larger samples, usually have greater statistical power and possibility to generalise than lab studies. Data quality can be defined by variable error, constant error, reliability, or validity. Comparisons of power and of certain measures of quality have found cases where Web data

[55] Demand characteristic is a subtle cue that makes participants aware of what the experimenter expects to find or how participants are expected to behave. Demand characteristics can change the outcome of an experiment because participants will often alter their behaviour to conform to the experimenters expectations

are higher in quality by one or another of these dimensions than are comparable lab data, though not always (Birnbaum, 2004). Many Web researchers are convinced that data obtained via the Web can be "better" than those obtained from students (Reips, 2000), despite the obvious advantage that the lab offers for control.

The main drawback of an online experiment compared to a laboratory one is the lack of full environmental control. Participants in online experiments may answer questions and accomplish behavioural tasks in very different settings (a room with light and silence, versus one's desk at work in less light and a lot of noise) and with different equipment (a participant may use a browser that does not correctly show a visual stimuli or may have a slow connection delaying the completion of the tasks and increasing fatigue, frustration, and 'noisy' answers). Most importantly, since lab assistants do not control participants, there are more chances that they engage in automatic answering and completion of tasks, which introduce noise in the data.

There are other technical/tactical issues that can be controlled for in the online experiment, but the main trade-off between online and lab experiment is that of exchanging greater generalizability and data power for less experimental control and realism for what concerns stimuli and incentives.

In view of the discussion above both the pragmatic and substantive reasons behind our choice of testing both pre-gambles and in-gambles treatment in the laboratory experiment with subjects playing two gambles, and only pre-gambles treatment with subjects playing only one gamble in the online experiment can be provided.

First, using two gambles and testing both pre-gambles and in-gambles treatments first of all required an amount of time beyond the standard maximum 20 minutes length prescribed for online experiments before too much noise kicks in (unreliable answers).

Second, the in-gamble treatments required a sophisticated performance based incentive scheme (see § 5.3.1) to make the choices realistic and valid that could have not been implemented for logistic reasons in the online experiment. Third, the in-gamble treatments refer mostly to possible new measures that required a first more internally valid and realistic test sacrificing external validity, since further research will probably be needed before they can be become the object of policy proposals.

On the other hand, in the online experiment only pre-gamble treatments were tested but a larger set compared to the laboratory experiment. For this reason the larger sample lent itself potentially to more generalisation. Moreover, in the online experiment also choices that subjects make after being confronted with peculiar treatments such as the registration form were tested. Subjects were given the option of opting out after being exposed to a treatment, which enabled us to see if a particular measure could have unintended effects. While the opt out option was also included in the lab, its results are more reliable in the online experiment since in the lab the incentives scheme neutralised the possibility that subjects chose to opt out.

5.3 Laboratory experiment

5.3.1 Incentives scheme

Subjects were allocated with 3 types of participation and performance-related monetary incentives: *experiment participation endowment (B1); "bonus" for gambling (B2);* and *opt-out participation endowment (B3)*. The 'bonus' for gambling had to be used for gambling activity, was then exchanged for real money at the end of the experiment. This type of incentive is realistic and is used by most online gambling operators - when a gambler enters of the operator's sites s/he is usually awarded with free bonus that could be used for gambling after a gambler puts into the gambling bank certain amount of his own money. (B1) Endowment for participation is the basic incentives subjects receive when they participate to any experiment. It could be used for gambling purposes only during the optional gambling time, while (B2) gambling bonus had to be used during sub-treatments 1 and 2 of the in-gamble phase and could not be exchanged for monetary payoff unless participants complete all the experimental treatments.

Subjects were also offered an opportunity to opt-out from the experiment with reduced experiment participation pay-out.

(B1) As stated, Endowment for participation was a monetary reward for participation in the experiment, which depended on experiment duration. Existing participants of LSE's BLR panel are usually paid 5 British pound sterling for a 30 minutes experiment and 10 British pound sterling for a 1 hour experiment.

(B2) "Bonus" for gambling was allocated to each participant at the start of Step 2 and became gambler's "virtual wallet". Participants were allocated with an initial 100 Virtual Dollars of gambling endowment. "Bonus" 100 Virtual Dollars were split in 2 parts of 80 and 20 Virtual dollars between sub-treatment 1 and sub-treatment 2 to secure minimum playable balance for participants and ensure participants complete both sub-treatments.

At the end of the experiment, participants were able to exchange their "virtual wallet" for real money using the following scale:

1 Virtual wallet: 0.5 - 15$ -> Pay-out: £1[56]

2 Virtual wallet: 16 - 45$ -> Pay-out: £3

3 Virtual wallet: 46 - 75$ -> Pay-out: £5

[56] This is a pay-out structure for the laboratory experiment conducted in United Kingdom at LSE's Behavioural Research Lab.

4 Virtual wallet: 76 - 120$ -> Pay-out: £8

5 Virtual wallet: 121 - 150$ -> Pay-out: £10

6 Virtual wallet: 151 - 220$ -> Pay-out: £13

7 Virtual wallet: 221 - 300$ -> Pay-out: £15

8 Virtual wallet: 301 - 450$ -> Pay-out: £17

9 Virtual wallet: >450$ -> Pay-out: £20

(B3) Was the Payoff for participation in the experiment, but completing the opt-out task was reduced by 50% depending on the length of their participation.

At any point of Step 2, participants were offered option to use his/her (B1) payment for making additional rounds/spins of gamble during the experiment. If participants were to lose all his/her money during sub-treatment 1, they were able to exchange (B1) for (B2) with an exchange rate 1 Pounds Sterling = 15 Virtual Dollars. Participants could use either entire (B1) monetary reward or its part for additional bets.

During roulette and slot-machine gambles, participants could bet the following amount per spin:

1. Roulette: 25 ¢, 50¢, 1$, and 2$. Maximum cap on bet per spin to be equal to 5$.
2. Slot-machine: 25¢. Maximum 3 'coins' of face value 25¢ can be used per spin (75¢ in total)

Participants were provided with an option to play additional time (10 more minutes) straight after sub-treatment 1 was over using their virtual wallets. So, if participants were interested to continue gambling and keep betting using their bonus (B2) or their participation fees (B1), they were offered this option on the screen.

Participants' final payoff, thus, depended on the outcome of their gambling activity. However, they could choose not to use their participation fees (B1) and to play additional rounds after sub-treatment 1 in order to obtain the entire (B1) reward and remainder of (B2) after completing minimum required number of rounds/spins in sub-treatment 1 and sub-treatment 2.

5.3.2 Response variables

The following two tables report all the variables measured during the laboratory experiment, the first table contains the key response variables used to measure treatment effectiveness, whereas the following contains additional contextual variables (socio-demographics, gambling experience profile, ICT profile, etc.).

Table 45 Response variables (LAB)

Behavioural	
Average bet per spin (pre-gamble)	"*Average amount each subject bet in each spin of either slot machine or roulette during pre-gamble step*". Variable is positive and continuous.
Average time per Spin (pre-gamble)	"*Average time required for making a bet and a spin by each subject in either slot machine or roulette during pre-gamble step*". Variable is positive and continuous.
Average Bet per Spin	"*Average amount each subject bet in the sessions of In-Gamble 1* ". Variable is positive and continuous.
Keep gambling	"*Subject decision to keep gambling when the option to stop is available in In-Gamble 1*". Dummy (0= stop; 1= keep gambling)
Change in average Bet per Spin, post warning	"*Difference between the average bet post and pre-exposition to the pop up with treatment in In Gamble 2*". Continuous.
Change in average Time per Spin, post warning	"*Difference between the average time required for making a bet and a spin by each subject for the post and pre-exposition to the pop up with treatment in In Gamble 2*". Continuous.
Emotional (self-reported)	
Positive affect scale	"*Average response on the first group of ten positive adjectives of the PANAS scale (see* Figure 10*"*). Continuous on the range one to ten
Negative affect scale	"*Average response on the second group of ten negative adjectives of the PANAS scale (see* Figure 10*"*). Continuous on the range one to ten
SAM Valence	"*Response to the part of the SAM scale measuring Valence (see* Figure 11*, top panel)*". Discrete on the range one to nine
SAM Arousal	"*Response to the part of the SAM scale measuring Arousal (see* Figure 11*, bottom panel)*". Discrete on the range one to nine.
Intentional/Cognitive (self-reported)	
Intention to gamble	*"Thinking about the game you have just played, please indicate to what extent are you willing to engage in gabling activity in the future".* Discrete, one to 5 (1 "not at all"--- 5 "Extremely")
Logos & Labels Usage	See Figure 12. All discrete one to five 1 "completely disagree"--- 5 "completely agree") • "*When I enter websites, I always check informational labels and logos*". • "*Only when I enter for the first time, I check information on information labels and logos* • "*I never check the information on information labels and logos*". Discrete, one to 5
Cognitive processing	"*Thinking about the game you have just played, please indicate to what extent when encountering information regarding gambling you would be willing to stop and think about it*". Discrete, one to 5 (1 "not at all"--- 5 "Extremely")
Advocacy	"*Please indicate to what extent when encountering information regarding gambling you would be willing to talk with other people about dangers associated with gambling*". Discrete, one to 5 (1 "not at all"--- 5 "Extremely")

Table 46 Other variables (LAB)

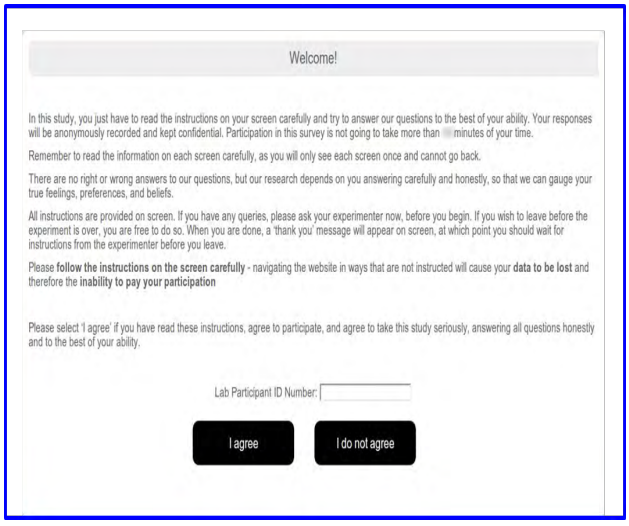
Socio-demographic	
Gender	Annex I, Q1.
Age	Annex I, Q2.
Educational level	Annex I, Q3.
Marital status	Annex I, Q4.
Children	Annex I, Q5.
Annual income	Annex I, Q6.
Gambling profile	
Have you ever spent money on any of the following?	Annex I, Q7.
In the last 12 months Have you spent money on any of the following?	Annex I, Q8.
Frequency of gambling	Annex I, Q9.
Preferred channel of gambling	Annex I, Q10.
Gambling Relate Cognition Scale (GRCS)[57]	Annex I, Q24-Q26.
ICT Profile	
ICT Profiling	Annex I, Q47-Q65.

5.3.3 Procedure

The following procedure was followed for the Laboratory experiment:

1) Participants entered the lab and signed-in in the participation sheet;

Figure 22 LAB screenshots: instructions for participants

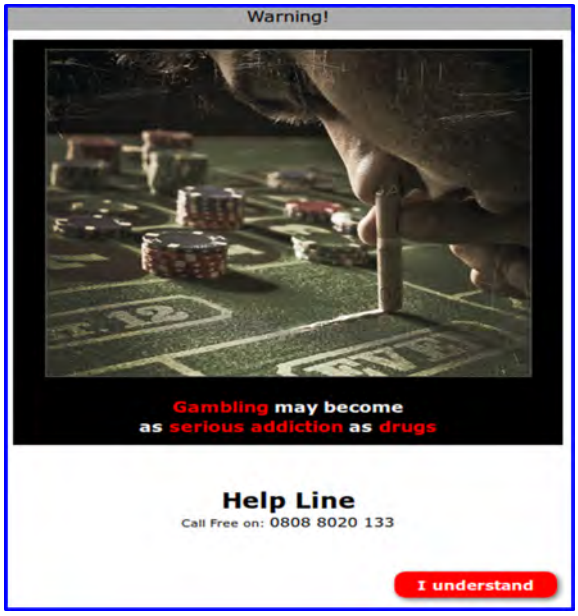


2) Read instructions (see figure above) and do pre-experimental warm-up;

[57] See (Raylu & Oei, 2004).

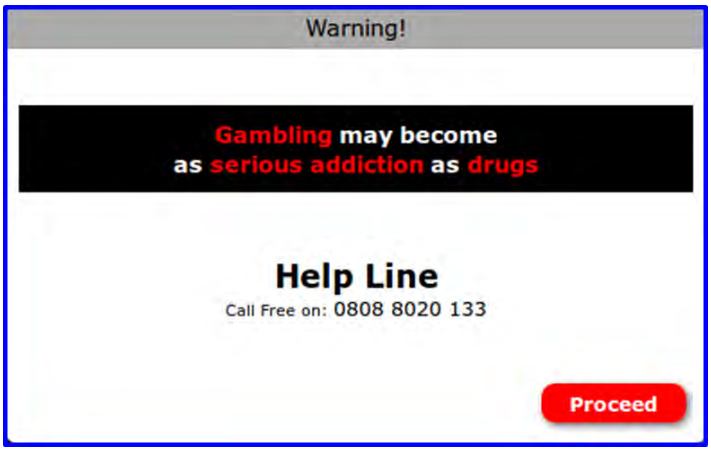
3) Complete a first set of socio-demographic profile and short offline/online gambling attitude question:
    a. Annex I: Q1-Q6 (socio-demographic profile)
    b. Annex I: Q7-Q10 (gambling profile);
4) Proceed to Step 1 (pre-gamble) and they are first randomly allocated to one of the following pre-gamble treatments:
    a. PT1: pop-up pictorial warning

Figure 23 LAB screenshots: pictorial warning



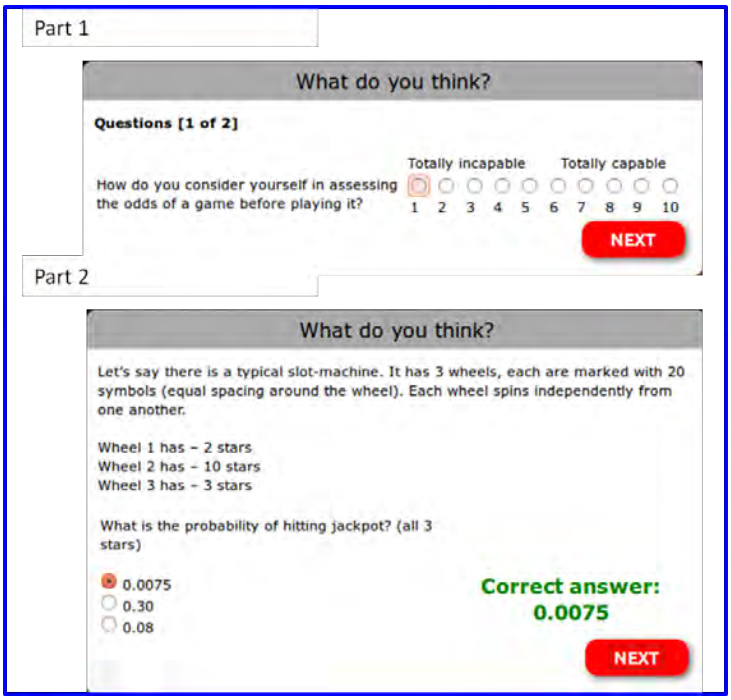
    b. PT2: pop-up textual only warning

Figure 24 LAB screenshots: textual warning



c. PT3: over-confidence task

Figure 25 LAB screenshots: overconfidence task



d. PT4: Logo of national gambling information provider

Figure 26 LAB screenshots: logo

e. Control condition (these subjects go directly to pre-gamble playing sessions, without being exposed to any measure)

5) After being exposed to one of the treatment above, the treated subjects could decide to opt out immediately from the gamble. Those who decided to early opt-out were allocated to a filler task and when this was completed they were paid only the basic 5 GBP incentive;

6) All the others (overwhelming majority) proceeded to the pre-gamble warm up sessions and they were randomly allocated to one of the two gambles (for example, roulette). They gambled for a maximum of 10 rounds/spins

Figure 27 LAB screenshots: roulette

7) Behavioural measures were collected: time per bet, amount per bet/spin, etc..

8) At the end of the pre-gamble (step 1) subjects answered the following questions:

   a. Annex II: Q11 (PANAS positive and negative affect scale);

   b. Annex II: Q12 (SAM, Valence)

   c. Annex II: Q12 (SAM, Arousal)

   d. Annex II: Q14 (Intention to gamble in the future)

   e. Annex II: Q15, Q16, Q17 (Logos and labels usage)

9) After answering the above questions, subject moved to in-gamble (Step 2)

   a. They played a gamble they did not play in pre-gamble (i.e. slot-machine, since before roulette was assumed);

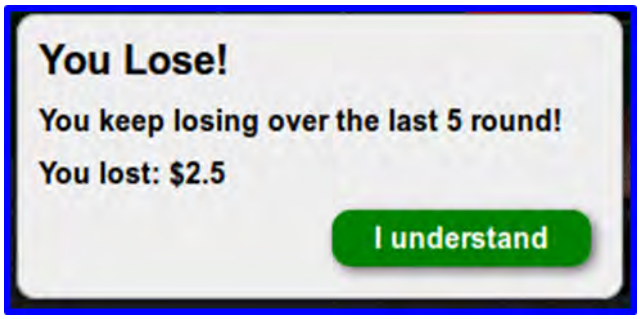
Figure 28 LAB screenshots: slot-machine

b. They are given the "bonus" wallet they could gamble and provided with all instruction of how the wallet will correspond to real money that they could win or lose;

c. They were randomly allocated to either In Gamble 1 or In Gamble 2. To continue the illustration let us assume they are allocated to In Gamble 1. Naturally if they are first allocated to In Gamble 2 they do that and then move to In Gamble 1;

10) So, they are randomly allocated to the following treatments that are part of the In Gamble 1:

Figure 29 LAB screenshots: example of pop up alerts



a. Monetary limits:

i. IS1.1.1 Fixed limits with automatic refills possibility

ii. IS1.1.2 Self-defined limits with automatic refills possibility

b. Feedback on winnings and losses

i. IS1.2.1 Push pop up clock with length of play, cumulative winnings and losses (30 spins/rounds)

ii. IS1.2.2 Pull pop up clock with length of play, winnings and losses

iii. IS1.2.3 Push pop up "You lose" message similarly based on participant's performance (performance related measure)

Please note that as a combination of the above and because a full factorial design was used (allowing to test the effect of the interaction between the different treatments), subjects while gambling, could either be exposed to:

Fixed limits, push feedback

Fixed limits, pull feedback

Fixed limits, push "You lose"

Self-defined limits, push feedback

Self-defined limits, pull feedback

Self defined limits, push "You lose"

c. IS1.3 Control: no monetary limits and no feed-back on winning and losses.

11) Behavioural measures were collected: time per bet, amount per bet/spin.

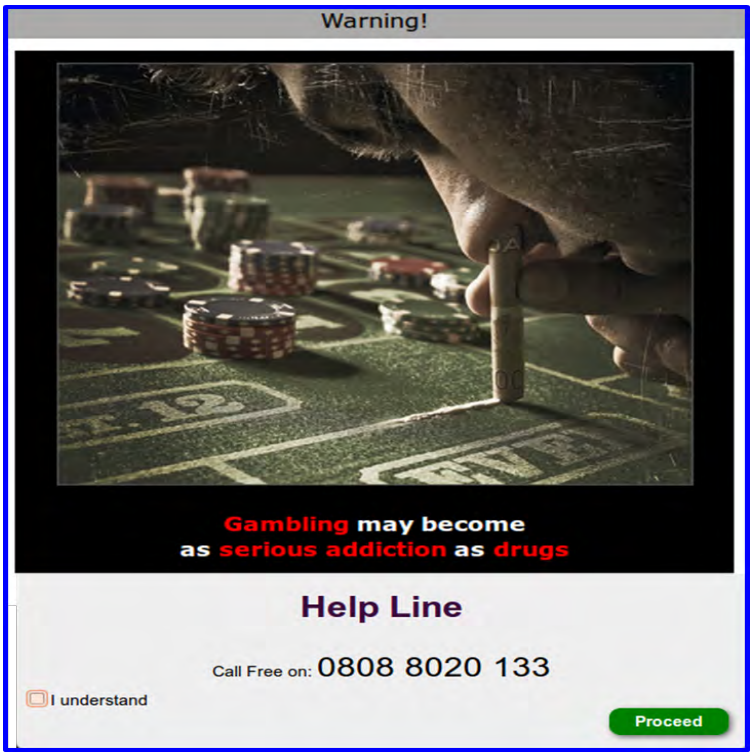
Please note. During In Gamble 1 subjects included in the control groups played 100 rounds/spin in a row, whereas treated subjects played 100 rounds/spins broken down into 5 trials (because, given monetary limits, wallet may have to be refilled). These five trials are not optional, meaning subjects must play all of them before moving to the next step. Therefore, for the between subject comparison to be valid, the behavioural measures for the treated are calculated summing all the 5 trials.

12) After completing 100 rounds/spins (or reaching 20 minutes of playtime), subjects were offered to proceed to the next step of the experiment or to continue gambling, including possibility to use for betting and lose the basic incentive of GBP 5. This choice is a behavioural one and is registered and used as a behavioural variable in the analysis. In case they continue, these are optional trials to be distinguished from the non-optional ones mentioned earlier.

13) When subjects completed In Gamble 1 they were provided with instructions for In Gamble 2 and they are randomly allocated to the three treatments foreseen:

    a. IS2.1.1 Pop-up pictorial warning message with checking-box "I understand" and button "Proceed". See figure below.

Figure 30 LAB screenshots: pictorial warning with check box



b. IS2.1.2 Pop-up textual only warning message with checking-box "I understand" and button "Proceed". Similarly, to T2.1 this warning message will appear on the subject's screen, but will contain no graphical image.

Figure 31 LAB screenshots: textual warning with check box

c. IS2.2 Control: no message

14) Behavioural measures are collected: time per bet, amount per bet/spin, etc.

15) After completion of 30 rounds/spins (or reaching 5 minutes of playtime), subject proceed to answer post-treatment questions:

   a. Annex II: Q18 (PANAS positive and negative affect scale);
   b. Annex II: Q19 (SAM, Valence)
   c. Annex II: Q20 (SAM, Arousal)
   d. Annex II: Q21 (Intention to gamble in the future)
   e. Annex II: Q22 (cognitive processing);
   f. Annex II: Q23 (advocacy)

16) All subjects regardless of order of allocation to treatments complete the final part of the questionnaire:

   a. Annex II: Q24-Q46 (Gambling Related Cognition Scale, GRCS Scale)
   b. Annex II: Q47-Q65 (ICT Profiling)

17) Experiment is completed.

5.3.4 Statistical results tables (LAB)

Table 47 Pre gamble measures: bet and time per spin (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Average Bet per Spin	Average Bet per Spin	Average Time per Spin	Average Time per Spin
Pictorial Warning	-.18 (.14)	-.08 (.16)	-1.08 (.80)	-.70 (.92)
Textual Warning	-.09 (.13)	-.10 (15)	-1.72 (.67)**	-1.42 (.77)*
Overconfidence	.15 (.13)	-.12 (.15)	-1.58 (.71)**	-1.29 (.82)
Logo	-.06 (.13)	.04 (.15)	.49 (.75)	-.10 (.85)
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Constant	2.94 (.12)***	2.95 (.13)***	19.64 (.70)***	19.48 (.76)
No Obs.	522	420	522	420
R2	.54	.56	.40	.39
F	108.07***	111.47***	60.35***	57.29***

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 48 Pre gamble measures: PANAS scale, average response (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Positive Affect	Positive Affect	Negative Affect	Negative Affect
Pictorial Warning	.10 (.10)	.12 (.13)	.00 (.08)	.05 (.09)
Textual Warning	-.04 (.10)	-.08 (.11)	-.01 (.08)	-.03 (.08)
Overconfidence	-.00 (.11)	.01 (.12)	.01 (.71)**	.05 (.09)
Logo	-.06 (.10)	-.10 (.11)	-.09 (.07)	-.10 (.08)
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes
Constant	2.08 (.23)***	2.22 (.24)	2.21 (.18)***	2.28 (.17)***
No Obs.	522	420	522	420
R2	.54	.07	.40	.05
F	6.55***	5.63***	2.71***	4.04***

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 49 Pre gamble measures: SAM scale (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	SAM Valence	SAM Valence	SAM Arousal	SAM Valence
Pictorial Warning	.07 (.23)	.08 (.26)	.02 (.23)	.16 (.27)
Textual Warning	-.03 (.22)	-.03 (.26)	-.07 (.22)	-.02 (.26)
Overconfidence	.03 (.23)	-.11 (.25)	-.02 (.23)	.11 (.25)
Logo	-.03 (.23)	-.16 (.25)	-.01 (.24)	-.05 (.26)
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes
No Obs.	522	420	522	420
Pseudo R2	.03	.03	.01	.01
Wald	46.32***	39.13***	28.56***	21.66***

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 50 Pre gamble measures: intention to gamble in the future (LAB)

	Full Sample	Gamblers
Pictorial Warning	.18 (.26)	.31 (.29)
Textual Warning	-.04 (.25)	-.18 (.27)
Overconfidence	.11 (.25)	.16 (.26)
Logo	-.09 (.26)	-.07 (.29)
Dummy Slot	Yes	Yes
Dummy No Experience	Yes	
Final balance of the game	Yes	Yes
No Obs.	522	420
Pseudo R2	.03	.01
Wald	40.89***	8.98

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 51 Pre gamble measures: usage of logos (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers	Full Sample	Gamblers
	Always check (USE1)	Always check (USE1)	Only first time (USE2)	Only first time (USE2)	Never (USE3)	Never (USE3)
Pictorial Warning	-.27 (.25)	-.31 (.29)	-.21 (.24)	-.28 (.27)	.29 (.25)	.35 (28)
Textual Warning	-.39 (.23)*	-.48 (.25)*	-.06 (.25)	-.10 (.27)	.37 (.23)	.41 (25)
Overconfidence	-.45 (.22)**	-.45 (.24)*	-.25 (.24)	-.15 (.26)	.17 (.24)	.08 (26)
Logo	-.62 (.23)***	-.58 (.25)**	-.31 (.24)	-.36 (.25)	.45 (.24)*	.33 (.27)
Dummy Slot	Yes	Yes	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes	Yes	Yes
No Obs.	522	420	522	420	522	420
Pseudo R2	.01	.01	.01	.00	.01	.00
Wald	10.41	8.09	3.35	2.87	5.81	5.07

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 52 In gamble measures: limits and alerts, session 1, bet and time (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Average Bet per Spin	Average Bet per Spin (	Average Time per Spin	Average Time per Spin
Fixed limits, push feedback	-.45 (.16)***	-.59 (.18)***	1.13 (.50)**	1.28 (.58)***
Fixed limits, pull feedback	-.26 (.17)	-.33 (.19)*	.68 (.45)	.74 (.49)
Fixed limits, lose feedback	-.43 (.16)***	-.42 (.19)**	2.15 (.48)***	2.53 (.58)***
Self defined limits, push feedback	-.35 (.14)**	-.36 (.16)**	2.10 (.45)***	2.16 (.52)***
Self defined limits, pull feedback	-.53 (.15)***	-.58 (.18)***	.52 (.44)	.45 (.48)
Self defined limits, lose feedback	-.34 (.14)**	-.43 (.16)***	1.88 (.47)***	1.45 (.43)***
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot Machine	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
Constant	2.03 (.16)***	2.06 (.18)***	12.73 (.45)***	12.33 (.47)***
No Obs.	522	420	522	420
R2	.38	.40	.34	.36
F	24.42***	22.10***	18.55***	18.52***

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 53 In gamble: limits & alerts, non-optional sessions, bet per spin (LAB)

	Full Sample	Gamblers
	Average Bet per Spin	Average Bet per Spin
Fixed limits, push feedback	-.32 (.16)**	-.46 (.18)**
Fixed limits, pull feedback	-.15 (.16)	-.24 (.18)
Fixed limits, lose feedback	-.28 (.15)*	-.27 (.19)
Self defined limits, push feedback	-.26 (.14)*	-.29 (.16)*
Self defined limits, pull feedback	-.32 (.15)**	-.34 (.18)*
Self defined limits, lose feedback	-.15 (.14)	-.25 (.16)
Dummies for pre gamble treatments	Yes	Yes
Dummy Slot	Yes	Yes
Dummy No Experience	Yes	
Dummy for In gamble treatments order	Yes	Yes
Constant	2.08 (.16)***	2.12 (.18)***
No Obs.	522	420
R2	.44	.44
F	32.08***	27.18***

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 54 In gamble: limits & alerts, non-optional sessions, time per spin (LAB)

	Full Sample	Gamblers
	Average Time per Spin	Average Time per Spin
Fixed limits, push feedback	.71 (.42)*	.75 (.49)
Fixed limits, pull feedback	.24 (.37)	.30 (.41)
Fixed limits, lose feedback	1.43 (.42)***	1.70 (.52)***
Self defined limits, push feedback	1.25 (.41)***	1.44 (.49)***
Self defined limits, pull feedback	-.33 (.33)	-.35 (.38)
Self defined limits, lose feedback	1.05 (.32)***	.90 (.36)**
Dummies for pre gamble treatments	Yes	Yes
Dummy Slot	Yes	Yes
Dummy No Experience	Yes	
Dummy for In gamble treatments order	Yes	Yes
Constant	12.88 (.38)***	12.64 (.42)***
No Obs.	522	420
R2	.39	.38
F	28.17***	22.68***

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 55 In gamble measures: limits and alerts, keep playing (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Keep playing (Probit)	Keep playing (Probit)	Keep playing (Logit)	Keep playing (Logit)
Fixed limits, push feedback	.26 (.21)	.33 (.23)	.43 (.34)	.54 (.38)
Fixed limits, pull feedback	.00 (.21)	.09 (.24)	.00 (.35)	.15 (.39)
Fixed limits, lose feedback	-.02 (.20)	-.21 (.24)	-.03 (.33)	-.36 (.40)
Self defined limits, push feedback	.02 (.19)	.06 (.22)	.05 (.32)	.11 (.36)
Self defined limits, pull feedback	-.38 (.22)*	-.61 (.27)**	-.61 (.38)*	-1.03 (.46)**
Self defined limits, lose feedback	-.12 (.21)	.02 (.23)	-.20 (.34)	.05 (.38)
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot Machine	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
Constant	-.36 (.20)*	-.24 (.22)	-.58 (.33)*	-.39 (.37)
No Obs.	522	420	522	420
Pseudo R2	.03	.05	.03	.05
Wald	26.50**	26.42***	25.51**	25.54***

Note: Non linear regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 56 In gamble measures: warnings, (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Change in average bet post warning	Change in average bet post warning	Change in average time post warning	Change in average time post warning
Pictorial Warning	-.07 (.05)	-.06 (.06)	1.39 (.20)***	1.55 (.25)***
Textual Warning	-.08 (.06)	-.07 (.06)	.81 (.24)***	.85 (.27)***
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
Constant	-.03 (.08)	-.04 (.09)	-.70 (.31)**	-1.77 (.40)***
No Obs.	522	407	506	407
R2	.01	.01	.02	.13
F	1.02	1.02	10.43***	9.93***

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 57 In gamble measures, limits and alerts: PANAS scale, average response (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Positive Affect	Positive Affect	Negative Affect	Negative Affect
Fixed limits, push feedback	.46 (.13)***	.47 (.15)***	.05 (.12)	.01 (.13)
Fixed limits, pull feedback	.32 (.13)**	.40 (.14)***	.00 (.12)	-.04 (.13)
Fixed limits, lose feedback	.18 (.12)	.22 (.14)	.05 (.12)	-.04 (.14)
Self defined limits, push feedback	.21 (.12)*	.21 (.13)	-.04 (.11)	-.07 (.12)
Self defined limits, pull feedback	.09 (.13)	.06 (.13)	-.15 (.12)	-.22 (.13)*
Self defined limits, lose feedback	.18 (.12)	.27 (.14)**	.16 (.13)	.13 (.14)
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
Constant	1.83 (.14)***	1.78 (.19)***	2.21 (.18)***	1.79 (.16)***
No Obs.	522	420	522	420
R2	.09	.10	.03	.03
F	3.52***	3.30***	1.28	1.06

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 58 In gamble measures, warnings: PANAS scale, average response (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Positive Affect	Positive Affect	Negative Affect	Negative Affect
Pictorial Warning	-.02 (.09)	.03 (.10)	-.05 (.07)	-.06 (.08)
Textual Warning	-.09 (.09)	-.00 (.10)	.02 (.07)	.00 (.08)
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
Constant	2.46 (.11)***	2.43 (.12)***	2.21 (.18)***	1.70 (.10)***
No Obs.	522	420	522	420
R2	.06	.08	.01	.02
F	3.86***	4.67***	1.09	.88

Note: OLS regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 59 In gamble measures: limits and alerts: SAM scale (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	SAM Valence	SAM Valence	SAM Arousal	SAM Valence
Fixed limits, push feedback	.64 (.27)**	.77 (.28)***	.68 (.27)**	.47 (.30)
Fixed limits, pull feedback	.66 (.25)**	.89 (.29)***	.35 (.27)	.38 (.29)
Fixed limits, lose feedback	-.06 (.28)	.16 (.30)	.40 (.30)	.10 (.33)
Self defined limits, push feedback	.23 (.24)	.36 (.26)	.20 (.27)	.06 (.29)
Self defined limits, pull feedback	.61 (.26)**	.61 (.29)**	-.01 (.29)	-.38 (.31)
Self defined limits, lose feedback	.17 (.28)	.42 (.31)	.33 (.30)	.21 (.35)
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
No Obs.	522	420	522	420
Pseudo R2	.02	.03	.01	.01
Wald	42.18***	43.32***	32.14***	36.10***

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 60 In gamble measures: warnings, SAM scale (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	SAM Valence	SAM Valence	SAM Arousal	SAM Valence
Pictorial Warning	.22 (.19)	.27 (.21)	-.04 (.18)	.01 (.20)
Textual Warning	-.17 (.20)	-.08 (.23)	-.04 (.19)	.04 (.22)
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
No Obs.	522	420	522	420
Pseudo R2	.02	.03	.01	.01
Wald	51.02***	41.21***	17.52*	22.65***

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 61 In gamble measures: limits and alerts, intention to gamble in the future (LAB)

	Full Sample	Gamblers
Fixed limits, push feedback	.84 (.32)	.81 (.35)**
Fixed limits, pull feedback	.47 (.33)	.53 (.37)
Fixed limits, lose feedback	.16 (.35)	.00 (.39)
Self defined limits, push feedback	.38 (.31)	.37 (.35)
Self defined limits, pull feedback	.57 (.36)	.38 (.39)
Self defined limits, lose feedback	.74 (.32)**	.93 (.35)***
Dummies for pre gamble treatments	Yes	Yes
Dummy Slot Machine	Yes	Yes
Dummy No Experience	Yes	
Final balance of the game	Yes	Yes
Dummy for In gamble treatments order (	Yes	Yes
No Obs.	522	420
Pseudo R2	.05	.04
Wald	56.46***	41.04***

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 62 In gamble measures: warnings, intention to gamble in the future (LAB)

	Full Sample	Gamblers
Pictorial Warning	.10 (.21)	.14 (.23)
Textual Warning	.17 (.22)	.19 (.24)
Dummies for pre gamble treatments	Yes	Yes
Dummy Slot Machine	Yes	Yes
Dummy No Gambling Experience	Yes	
Final balance of the game	Yes	Yes
Dummy for In gamble treatments order (Limits and Feedback first)	Yes	Yes
No Obs.	522	420
Pseudo R2	.05	.03
Wald	51.72***	36.18***

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 63 In gamble measures: limits & alerts, & Warnings, depth of processing (LAB)

	Full Sample	Gamblers	Full Sample	Gamblers
	Cognitive processing	Cognitive processing	Advocacy	Advocacy
Fixed limits, push feedback	-.10 (.32)	-.01 (.34)	.17 (.29)	.29 (.32)
Fixed limits, pull feedback	-.15 (.35)	.06 (.39)	.16 (.31)	.41 (.35)
Fixed limits, lose feedback	-.05 (.31)	.03 (.35)	-.02 (.30)	-.04 (.32)
Self defined limits, push feedback	-.38 (30)	-.17 (.32)	-.07 (.28)	.13 (.31)
Self defined limits, pull feedback	-.37 (.34)	-.26 (.38)	-.14 (.32)	.18 (.37)
Self defined limits, lose feedback	.17 (.30)	.27 (.33)	.09 (.29)	.38 (.32)
Pictorial Warning	-.09 (.19)	-.15 (.21)	-.16 (.19)	-.20 (.22)
Textual Warning	.08 (.20)	.07 (.23)	-.11 (.19)	-.28 (.21)
Dummies for pre gamble treatments	Yes	Yes	Yes	Yes
Dummy Slot	Yes	Yes	Yes	Yes
Dummy No Experience	Yes		Yes	
Final balance of the game	Yes	Yes	Yes	Yes
Dummy for In gamble treatments order	Yes	Yes	Yes	Yes
No Obs.	522	420	522	420
Pseudo R2	.01	.00	.01	.01
Wald	8.84	8.50	14.62	11.92

Note: Ordered Logit regressions, robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

5.4 Online experiment

5.4.1 Response variables

The following two tables report all the variables measured during the laboratory experiment, the first table contains the key response variables used to measure treatment effectiveness, whereas the following contains additional contextual variables (socio-demographics, gambling experience profile, ICT profile, etc.).

Table 64 Response Variable (ONLINE)

Behavioural	
Average bet per spin	"*Average amount each subject bet in each spin roulette*". Variable is positive and continuous.
Average time per Spin (pre-gamble)	"*Average time required for making a bet and a spin by each subject*". Variable is positive and continuous.
Change in average Time per Spin, post warning	"*Difference between the average time required for making a bet and a spin by each subject for the post and pre-exposition to the pop up with treatment in In Gamble 2*". Dummy (1-opt out, 0-otherwise)
Emotional (self-reported)	
Positive affect scale	"*Average response on the group of ten positive adjectives of the PANAS scale*". Continuous on the range one to ten
Negative affect scale	"*Average response on the group of ten negative adjectives of the PANAS scale*". Continuous on the range one to ten
SAM Valence	"*Response to the part of the SAM scale measuring Valence*". Discrete on the range one to nine
SAM Arousal	"*Response to the part of the SAM scale measuring Arousal*". Discrete on the range one to nine.
Intentional/Cognitive (self-reported)	
Intention to gamble	*"Thinking about the game you have just played, please indicate to what extent are you willing to engage in gambling activity in the future".* Discrete, one to 5 (1 "not at all"--- 5 "Extremely")
Logos & Labels Usage	All discrete one to five 1 "completely disagree"--- 5 "completely agree") • "*When I enter websites, I always check informational labels and logos*" (USE 1). • "*Only when I enter for the first time, I check information on information labels and logos (USE 2)* • "*I never check the information on information labels and logos*". Discrete, one to 5 (USE 3)
Noticeability	*"Now think about (SPECIFIC TREATMENT) that you have seen on the webpage of a hypothetical gambling operator.* *How much do you agree with each of the following statements regarding this SPECIFIC TREATMENT? Please use a scale from 1 to 5 in which 1 means you completely disagree and 5 you completely agree with that statement:* *This SPECIFIC TREATMENT is noticeable."* Caveat: Not asked after control condition
Willingness to Continue	*"Now think about (SPECIFIC TREATMENT) that you have seen on the*

	webpage of a hypothetical gambling operator. *How much do you agree with each of the following statements regarding this SPECIFIC TREATMENT? Please use a scale from 1 to 5 in which 1 means you completely disagree and 5 you completely agree with that statement:* *After seeing this SPECIFIC TREATMENT I was willing to continue."* Caveat: Not asked after control condition
Cognitive processing	"*Thinking about the game you have just played, please indicate to what extent when encountering information regarding gambling you would be willing to stop and think about it*". Discrete, one to 5 (1 "not at all"--- 5 "Extremely")
Advocacy	"*Please indicate to what extent when encountering information regarding gambling you would be willing to talk with other people about dangers associated with gambling*". Discrete, one to 5 (1 "not at all"--- 5 "Extremely")

Table 65 Other variables measured (ONLINE)

Socio-demographic	
Gender	Annex II, Q1.
Age	Annex II, Q2.
Educational level	Annex II, Q3.
Marital status	Annex II, Q4.
Children	Annex II, Q5.
Annual income	Annex II, Q6.
Gambling profile	
Have you ever spent money on any of the following?	Annex II, Q7.
In the last 12 months Have you spent money on any of the following?	Annex II, Q8.
Frequency of gambling	Annex II, Q9.
Preferred channel of gambling	Annex II, Q10.
Gambling Relate Cognition Scale (GRCS)	Annex II, Q20-Q42.
ICT Profile	
ICT Profiling	Annex II, Q43-Q57.
Personality Profile	
REI Scale	Annex II, Q66-Q76.

5.4.2 Procedure

In this case screenshots only for the additional five treatments not already tested in the LAB are added, since for the other four they are the same and were presented earlier. Also note that all examples are from the English version, but the experimental platform, the treatments, and the questions were all translated into all required languages (Estonian, French, German, Italian, Spanish, and Swedish).

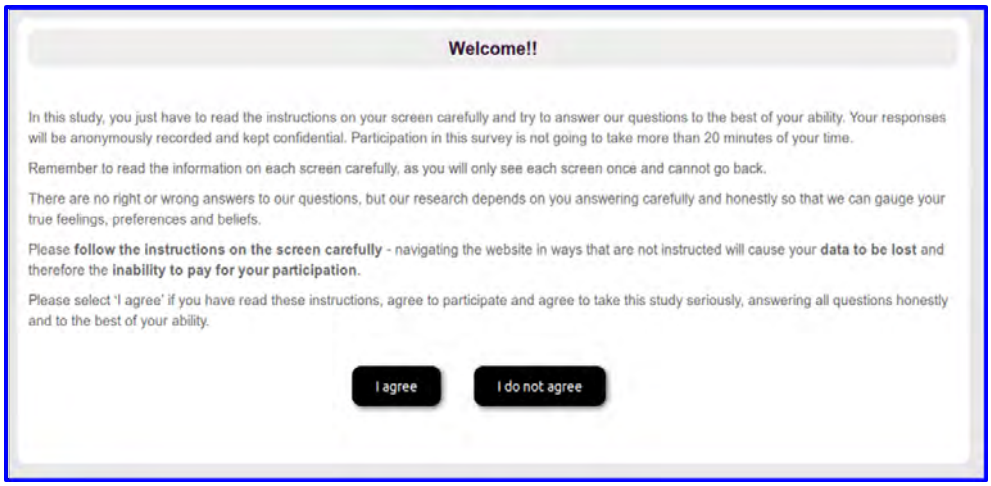
The following procedure was followed for the online experiment:

1) Mail invitations are sent to a randomly drawn subset of the online panel used for this experiment. Several randomly drawn mailing are sent until the sample quota is reached.

   Please note that the online experiment included control and filter question to spot whether subjects are just randomly answering the question, in which case they are discarded and not paid the basic incentive.

2) Read instructions;

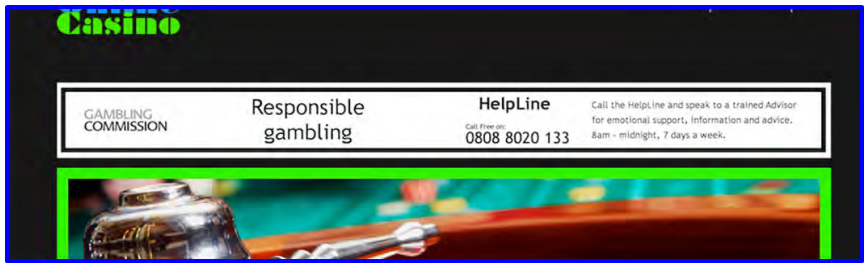
Figure 32 ONLINE screenshots: instructions for participants



3) Complete a first set of socio-demographic profile and short offline/online gambling attitude question:
   a. Annex II: Q1-Q6 (socio-demographic profile)
   b. Annex I: Q7-Q10 (gambling profile);
4) They are randomly allocated to the various treatments and they proceed playing roulette. Gamble with a reduced length (20 rounds/spins, max 20 minutes):
   a. OT1: pop-up pictorial warning (same in LAB, see screenshot in § 5.3.3)
   b. OT2: pop-up textual only warning (same in LAB, see screenshot in § 5.3.3)
   c. OT3: over-confidence task (same in LAB, see screenshot in § 5.3.3)
   d. OT4: Small logo/banner (same in LAB, see screenshot in § 5.3.3, but different in each of the seven countries);

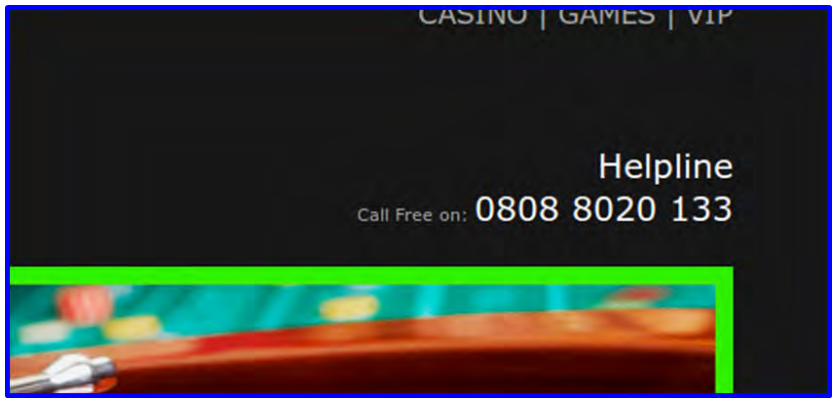
e. OT5: Larger contrast logo/banner (below example for England, but different in each country)

Figure 33 ONLINE screenshots: larger and contrast logo/banner



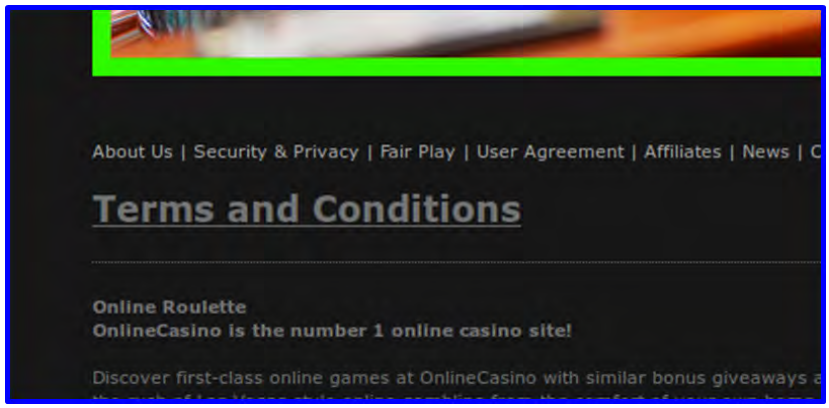
f. OT6: only helpline number (below example for England, but different in each country)

Figure 34 ONLINE screenshots: helpline only



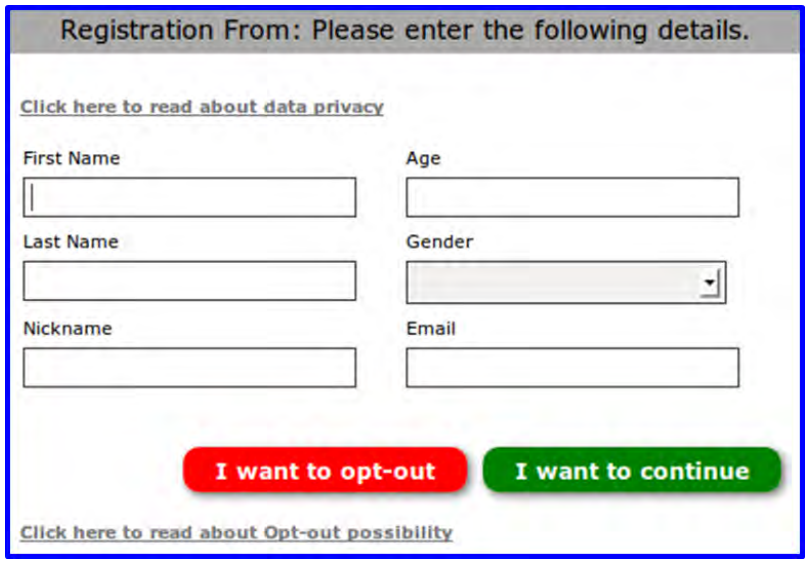
g. OT7: TerMember States and conditions (below example for England, but different in each country)

Figure 35 ONLINE screenshots: terMember States and conditions



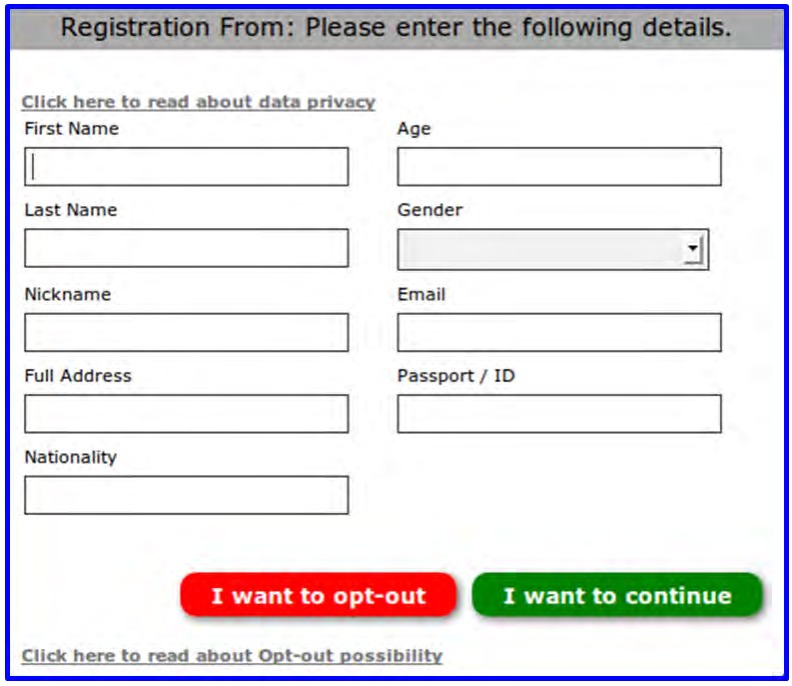
h. OT8: registration form (below example for England, but different in each country)

Figure 36 ONLINE screenshots: standard registration form



i. OT9: extended registration form (below example for England, but different in each country):

Figure 37 ONLINE screenshots: extended registration form



j. OT10: Control condition (subjects go directly to playing sessions, without being exposed to any measure)

5) Behavioural measures are automatically recorded (time per bet, amount per bet, and also opt-out, see below)

6) Please note that, after being exposed to one of the treatment above, subjects could immediately opt-out and move directly to steps x and x below.

7) All the others (overwhelming majority) proceeded to the pre-gamble warm up sessions and they were allocated to roulette. They gambled for a maximum of 20 rounds/spins
8) Subjects complete a post-treatment questionnaire with two additional iteMember States
    a. Noticeability of treatments to which they have been exposed
    b. Willingness to continue the experiment after seeing the treatments
9) All subjects regardless of order of allocation to treatments complete the final part of the questionnaire:
    a. Annex II: Q24-Q46 (Gambling Related Cognition Scale, GRCS Scale)
    b. Annex II: Q47-Q65 (ICT Profiling)
10) Experiment is completed.

5.4.3 Statistical results table (ONLINE)

Table 66 All treatments: Bet per spin, time per spin, & opt out (ONLINE)

	Opt Out	Average Bet per Spin	Average Time per Bet
Pictorial Warning	-.19 (.08)**	.08 (.08)	1.17 (.65)*
Textual Warning	-.18 (.08)**	-.02 (.08)	.30 (.59)
Overconfidence	.07 (.07)	-.01 (.08)	1.31 (.78)*
Logo	-.03 (.07)	.05 (.08)	.49 (.65)
Wide Banners	-.02 (.07)	-.00 (.08)	1.04 (1.18)
Terms and Conditions	-.06 (.07)	-.02 (.08)	.33 (.63)
Helpline	-.01 (.07)	-.07 (.08)	.43 (.62)
Std. Registration Form	1.27 (.07)***	.21 (.11)*	.77 (.84)
Ext Registration Form	1.90 (.08)***	-.02 (.18)	1.96 (1.55)
Gambler	Yes	Yes	Yes
Attention Filter	Yes	Yes	Yes
Constant	-.81 (.05)***	3.40 (.06)***	17.16 (.36)***
F test		2.58***	.84*
Wald test	1197.92***		
R2		.01	.01
Pseudo R2	.19		
N Obs	5997	3946	3946

Note: for Opt out is a probit regression, for the other two variables are OLS regression. Robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 67 All treatments: PANAS scale, average response (ONLINE)

	Positive Affect	Negative Affect
Pictorial Warning	-.03 (.05)	-.03 (.04)
Textual Warning	-.10 (.05)*	-.05 (.04)
Overconfidence	.01 (.05)	-.00 (.04)
Logo	-.00 (.05)	.03 (.04)
Wide Banners	-.02 (.05)	-.05 (.04)
Terms and Conditions	-.04 (.05)	.02 (.04)
Helpline	-.06 (.05)	-.04 (.04)
Standard Reg Form	.02 (.07)	.07 (.07)
Ext Registration Form	.38 (.13)***	.01 (.08)
Gambler	Yes	Yes
Attention Filter	Yes	Yes
Final balance	Yes	Yes
Constant	1.96 (.05)***	1.50 (.03)***
F test	13.45***	9.78***
R2	.03	.03
N Obs	3946	3946

Note: OLS regression. Robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 68 All treatments: SAM scale (ONLINE)

	SAM valence	SAM Arousal
Pictorial Warning	-.02 (.11)	-.25 (.11)**
Textual Warning	-.08 (.11)	-.15 (.11)
Overconfidence	.05 (.12)	-.06 (.11)
Logo	.00 (.12)	-.04 (.11)
Wide Banners	-.02 (.12)	-.20 (.12)*
Terms and Conditions	-.02 (.12)	-.01 (.11)
Helpline	.01 (.12)	-.07 (.11)
Standard Reg Form	.02 (.17)	.04 (.15)
Ext Registration Form	.77 (.26)***	.46 (.25)*
Gambler	Yes	Yes
Attention Filter	Yes	Yes
Final balance	Yes	Yes
Wald test	151.69***	46.21***
Pseudo R2	.01	.00
N Obs	3946	3946

Note: Ordered Logit regression. Robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 69 All treatments: intention to gamble in the future (ONLINE)

Pictorial Warning	**-.00** **(.12)**
Textual Warning	.16 (.12)
Overconfidence	.21 (.12)*
Logo	.15 (.12)
Wide Banners	.20 (.12)*
Terms and Conditions	.23 (.12)*
Helpline	.15 (.12)
Standard Reg Form	.31 (.17)*
Ext Registration Form	.93 (.23)***
Gambler	Yes
Attention Filter	Yes
Final balance	Yes
Wald test	211.85***
Pseudo R2	.02
N Obs	3946

Note: Ordered Logit regression. Robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 70 All treatments: usage of logo (ONLINE)

	Always check (USE1)	Always check (USE1)	Always check (USE1)
Pictorial Warning	.20 (.11)*	.12 (.11)	-.16 (.12)
Textual Warning	.35 (.11)***	.25 (.11)**	-.22 (.12)*
Overconfidence	.19 (.12)*	.16 (.12)	-.00 (.12)
Logo	.21 (.11)*	.18 (.11)	-.11 (.12)
Wide Banners	.12 (.11)	.18 (.18)	-.09 (.12)
Terms and Conditions	.21 (.11)*	.19 (.11)*	-.08 (.11)
Helpline	.11 (.11)	.19 (.11)*	.09 (.11)
Standard Reg Form	.44 (.15)***	.23 (.16)	-.06 (.18)
Ext Registration Form	.45 (.25)*	.19 (.23)	-.21 (.29)
Gambler	Yes	Yes	Yes
Attention Filter	Yes	Yes	Yes
Final balance	Yes	Yes	Yes
Wald test	25.18**	17.88	37.20***
Pseudo R2	.00	.00	.00
N Obs	3946	3946	3946

Note: Ordered Logit regression. Robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 71 All treatments: noticeability and continue (ONLINE)

	(1) Noticeability	(2) Willing to continue
Pictorial Warning	2.23 (.11)***	1.58 (.11)***
Textual Warning	1.96 (.11)***	1.47 (.11)***
Overconfidence	1.30 (.10)***	.84 (.11)***
Wide Banners	.45 (.11)***	.48 (.11)***
Terms and Conditions	.50 (.11)***	.48 (.11)***
Helpline	1.03 (.12)***	.23 (.12)*
Standard Reg Form	2.18 (.17)***	.84 (.18)***
Ext Registration Form	2.56 (.23)***	.53 (.25)**
Gambler	Yes	Yes
Attention Filter	Yes	Yes
Final balance	Yes	Yes
Wald test	665.41***	347.84***
Pseudo R2	.06	.03
N Obs	3486	3486

Note: Ordered Logit regression. In this case the counterfactual is represented by the standard Logo since these questions are not asked after control condition. Robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

Table 72 All treatments: depth of processing (ONLINE)

	Cognitive processing	Advocacy
Pictorial Warning	.20 (.12)*	-.08 (.11)
Textual Warning	.26 (.12)**	.06 (.11)
Overconfidence	.25 (.12**)	.18 (.11)
Logo	.07 (.12)	-.01 (.11)
Wide Banners	-.03 (.12)	-.21 (.12)*
Terms and Conditions	.15 (.12)	.00 (.11)
Helpline	-.05 (.12)	-.12 (.11)
Standard Reg Form	.38 (.16)**	.27 (.16)*
Ext Registration Form	.18 (.21)	-.15 (.21)
Gambler	Yes	Yes
Attention Filter	Yes	Yes
Final balance	Yes	Yes
Wald test	33.94***	33.85***
Pseudo R2	.00	.00
N Obs	3946	3946

Note: Ordered Logit regression. Robust standard errors in parenthesis, one, two, three stars stand for significance at 10, 5 and 1 per cent.

5.5 Other summary graphs for LAB and ONLINE samples

5.5.1 LAB: socio-demographics

Figure 38 LAB: Gender

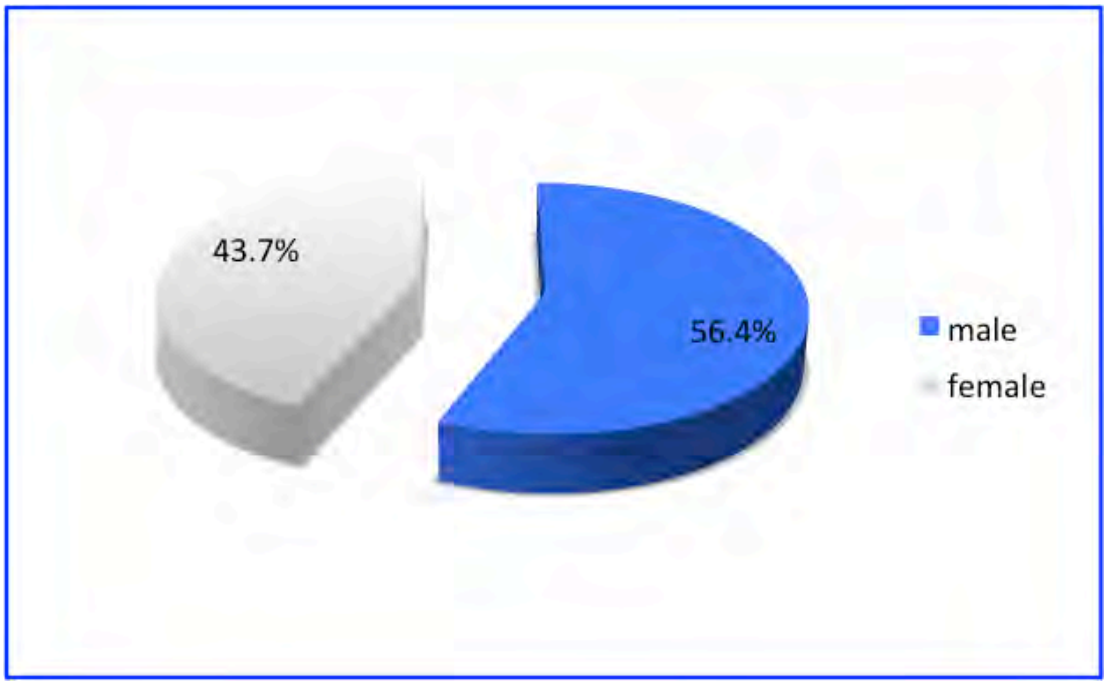


Figure 39 LAB: Age

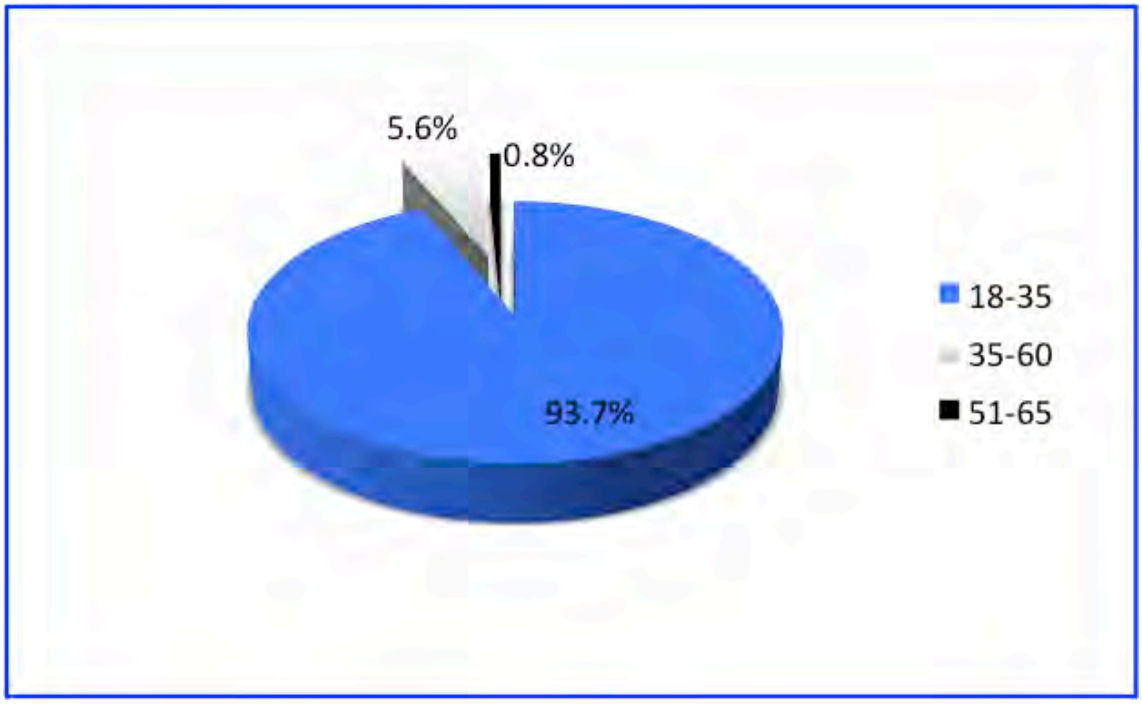
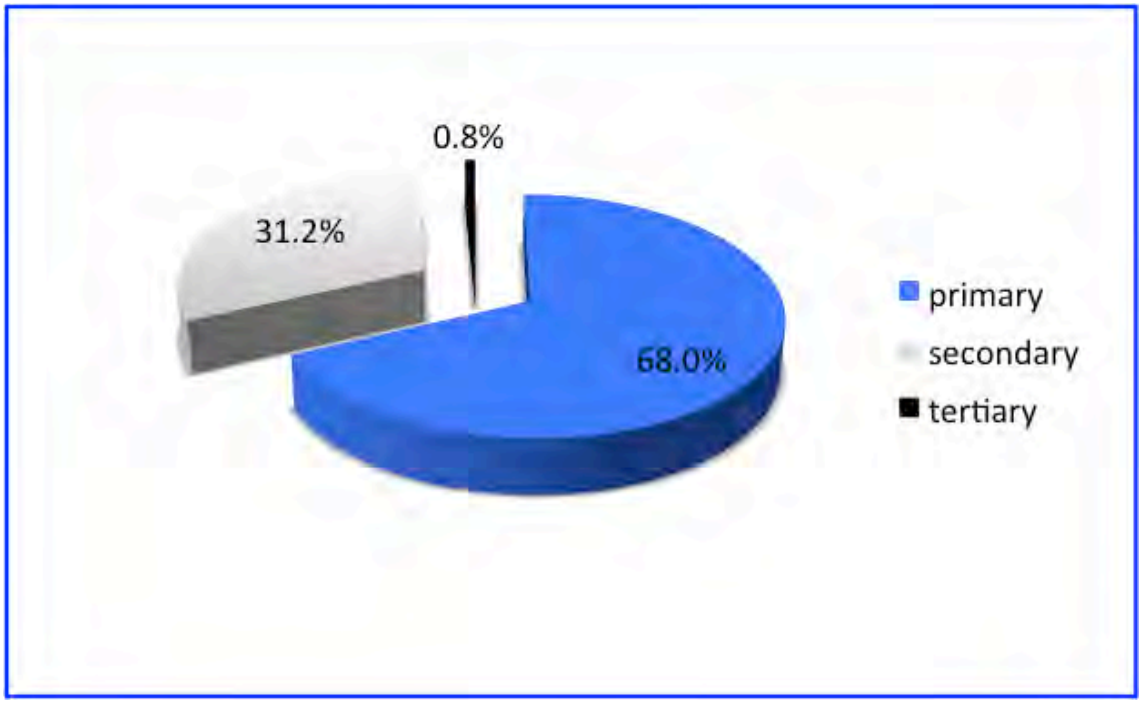


Figure 40 LAB: Educational level



5.5.2 ONLINE: socio-demographics (all of sample)

Figure 41 ONLINE: Gender (all sample)

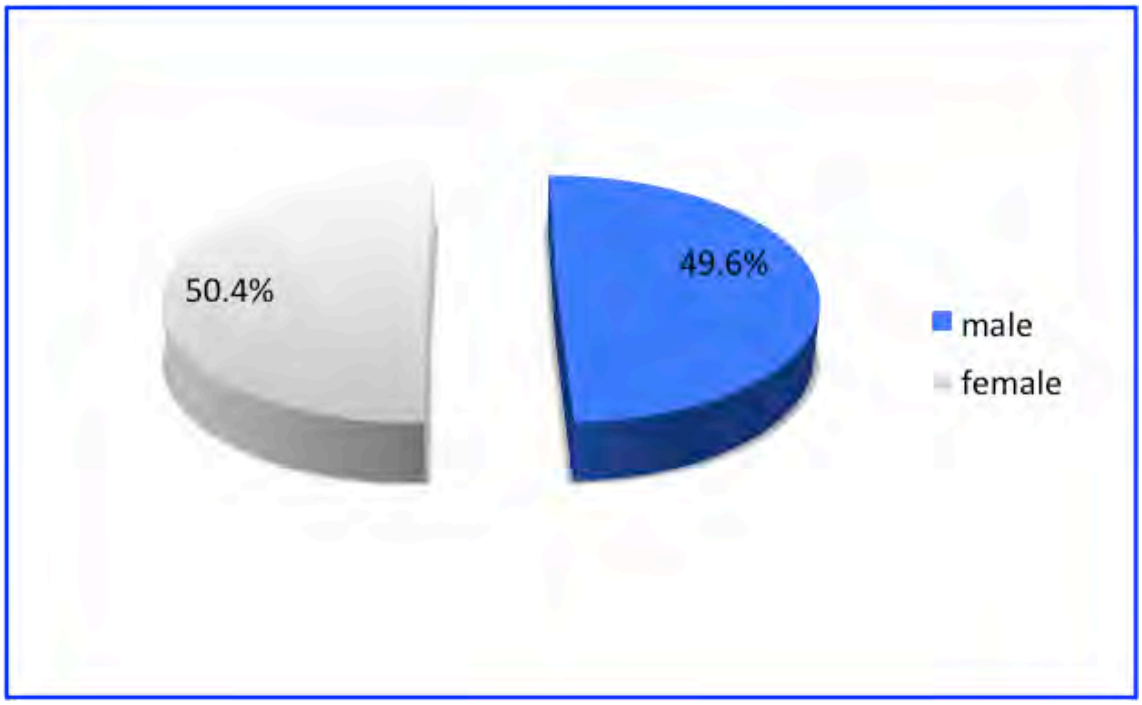


Figure 42 ONLINE: Age (all sample)

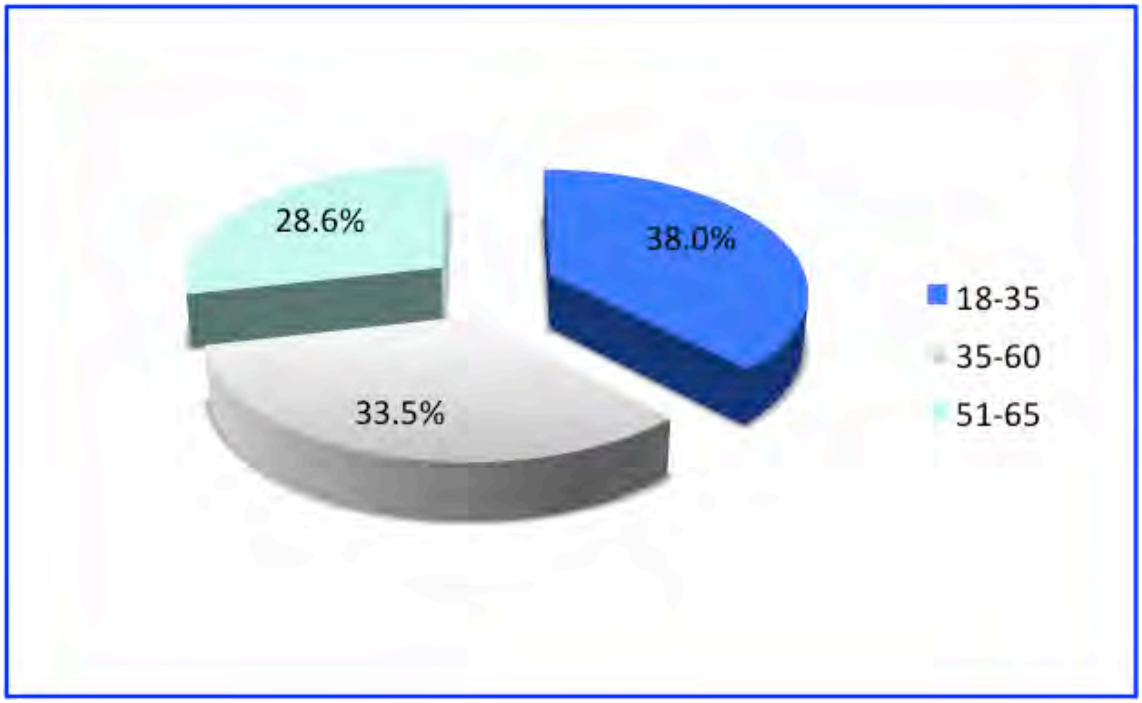
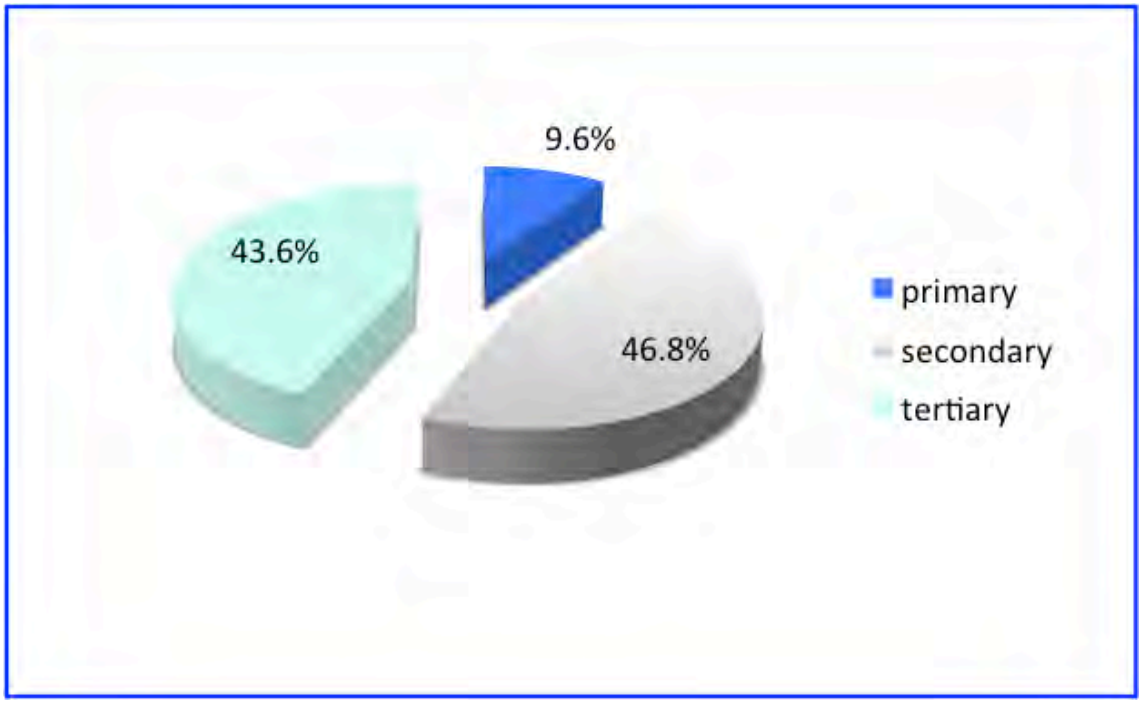


Figure 43 ONLINE: Educational level (all sample)



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