Breaking Ban: Belgium's ineffective gambling law regulation of video game loot boxes

Leon Y. Xiao*†‡ [0000-0003-0709-0777] <lexi@itu.dk>

*: Center for Digital Play, IT University of Copenhagen, Rued Langgaards Vej 7, 2300 København, Denmark

†: School of Law, Queen Mary University of London, Mile End Road, London E1 4NS, United Kingdom

‡: The Honourable Society of Lincoln's Inn, Lincoln's Inn, London WC2A 3TL, United Kingdom

14 **Abstract**

15 Loot boxes in video games are gambling-like mechanics that players buy to obtain

16 randomised rewards of varying value. Loot boxes are conceptually and

17 psychologically similar to gambling, and loot box expenditure is positively

18 correlated with self-reported problem gambling severity. Citing consumer protection

19 concerns, the Belgian Gaming Commission opined that such mechanics constitute

20 gambling under existing law and effectively 'banned' loot boxes by threatening

21 criminal prosecution of non-compliant companies implementing paid loot boxes

22 without a gambling licence. The effectiveness of this ban at influencing the

23 compliance behaviour of video game companies (and, by implication, consumers',

24 including children's, exposure to and consumer protection from loot boxes) was

25 assessed. Paid loot boxes remained widely available amongst the 100 highest-

26 grossing iPhone games in Belgium: 82.0% continued to generate revenue through a

27 randomised monetisation method, as did 80.2% of games rated suitable for young

28 people aged 12+. The Belgian 'ban' on loot boxes has not been effectively enforced.

29 Although the initial imposition of this measure promoted public discussion and

30 debate about loot box regulation (both domestically and internationally) and likely

31 provided better consumer protection in relation to specific games operated by well-

32 known companies, an unenforced 'ban' has many negative consequences, including

33 (i) giving consumers, parents, and policymakers a false sense of security and (ii)

34 allowing non-compliant games to replace games that have been removed from the

35 national market by more socially responsible companies. Indeed, even an effectively

36 enforced ban has potential disadvantages. Finally, technical measures taken by

37 companies to comply with the ban were easily circumvented, and some highly

38 dedicated players (who are likely to be the highest spending and most vulnerable)

39 could reasonably be expected to do so. Therefore, the complete elimination of the

40 loot box mechanic from a country may not be practically achievable. Belgium should

41 re-evaluate its regulatory position. A blanket ban approach to loot box regulation

42 cannot be recommended to other countries. Other less restrictive approaches to loot

43 box regulation should be considered. Preregistered Stage 1 protocol:

44 https://doi.org/10.17605/OSF.IO/5MXP6 (date of in-principle acceptance: 7 April

45 2022).

46

47 **Keywords (10 Max):**

48 Loot boxes; Gambling law; Video gaming regulation; Consumer protection; Belgium

1. Introduction

Paid loot boxes are randomised monetisation methods in video games that are purchased by players to obtain randomised rewards of varying value [1]. Loot boxes are prevalent in video games internationally and across different hardware platforms [2–5]. The loot box purchasing process hides what rewards the player will actually receive (and their value) until after the purchase decision and payment have already been made, which is why paid loot boxes have been identified as being structurally similar to gambling [6–8] and why they have been considered 'predatory' and potentially abusive of consumers [7,9–11]. Loot boxes have also been identified as sharing certain psychological similarities with gambling [12,13]. Indeed, loot box purchasing has been found to be positively correlated with problem gambling severity in 16 studies in various countries [14,15], including the US [16,17], Canada [18], the UK [19,20], Spain [21], Germany [22], Denmark [23], Australia [16,24] and Aotearoa New Zealand [16], and internationally in general [25–31]. Specifically, players that self-reported higher scores on problem gambling severity scales tend to buy more loot boxes, the theorised implication of which is that video game companies are likely disproportionally profiting from such potentially at-risk players [32]. The same correlation has also been found within samples of underage players, and it has been suggested that young people might be a group that is particularly vulnerable to potential harms [20]. Many countries have considered, or are considering, whether to regulate loot boxes because of their potentially harmful link to problem gambling, and because of consumer protection concerns, particularly in relation to vulnerable groups, such as children [11,33–40].

The predominant regulatory approach, adopted by gambling regulators [41–45] and policymakers [46–50] in many countries, has been to consider whether to regulate paid loot boxes as gambling: particularly, whether different types of loot boxes that have already been implemented in various video games fall afoul of existing gambling law [10,11,38]. If paid loot boxes constitute gambling, then video game companies would be prohibited from offering loot boxes for sale unless they possess a gambling licence (and therefore be regulated under gambling laws, and would be prohibited from selling them to underage players in most countries even with a licence). Regulators in different countries have come to divergent conclusions on this particular legal point because the definitions for gambling in law varies from

3

83   jurisdiction to jurisdiction depending on the drafting language of the law in each

84   country [10,11,38].

85

86   To summarise, paid loot boxes (*i.e.*, those that require players to pay real-world

87   money to buy) can be divided into two types: firstly, those containing rewards

88   which can be transferred to other players (and therefore possess real-world

89   monetary value) and, secondly, those containing rewards which *cannot* be

90   transferred to other players (and therefore does *not* possess direct real-world

91   monetary value) [1,7,10]. The first type constitutes gambling under existing law in

92   many countries, as recognised by various European national gambling regulators,

93   including in the UK, Denmark, and Belgium[41–44], although only the Belgian

94   regulator has actively enforced the law[11]. In contrast, the Dutch gambling regulator

95   also previously opined that the first type constitutes gambling [45] and has enforced

96   the law by imposing a financial penalty on Electronic Arts for allegedly illegal loot

97   box implementation in its *FIFA* games [51,52]; however, that interpretation has since

98   been successfully appealed and was overruled by the highest Dutch administrative

99   court. Therefore, the Netherlands is the first country where the first type of loot box

100   has been confirmed not to constitute gambling.

101

102   However, as far as can be discerned, the second type constitutes gambling only

103   under existing Belgian law [44] and Manx law [53,54] and not in other jurisdictions [11,38].

104   Belgium has been popularly referred to as a country that has 'banned' both types of

105   loot boxes [55]: this is technically incorrect because the law did not change and the

106   Belgian gambling regulator merely announced its interpretation of the law and

107   declared an intention to enforce it by criminally prosecuting non-compliant video

108   game companies for contravening existing gambling law [44]. Offering either type of

109   paid loot box would be illegal under the gambling law of the Isle of Man unless

110   licensed because the definition of 'money's worth' differs between Manx and UK

111   law [53,54]. However, this paper does not focus on Manx law because it is effectively

112   identical to the Belgian position but practically it appears that video game

113   companies simply treat the Isle of Man as the UK and have not taken dedicated

114   Manx compliance action, in contrast to taking exclusive compliance action in

115   Belgium, as discussed in detail below.

116

117   In order to comply with Belgian gambling law (the Gambling Act of 7 May 1999),[1] as

118   interpreted by the Belgian gambling regulator (which the academic literature

119   recognises as the correct legal interpretation [10,11,38], even though video game

120   companies have expressed their disagreement with this interpretation [56–58] but have

121   not attempted to appeal it), a number of prominent video games companies have

122   reported either disabling players' ability to purchase both types of loot boxes in

123   Belgium [56–58] or even removing their games from the jurisdiction outright and

124   having stopped providing the video gaming service (including the sale of loot boxes)

125   to Belgian players [59]. These are demonstrations of how enforcement of Belgian

126   gambling law has caused at least some video game companies to behave differently

127   in Belgium as they do in other countries. Therefore, Belgian players will likely find it

128   more difficult to purchase loot boxes (if they are able to do so at all) than players

129   from other countries who continue to have unrestricted access. Belgian consumers

130   are thereby likely better protected from the potential harms of loot boxes: players

131   who cannot spend any money at all on loot boxes could not 'overspend' and would

132   not suffer potential financial harms.

133

134   However, the restrictive course of action taken by Belgian policy is potentially

135   overregulation because not all consumers will be harmed by loot boxes, yet now all

136   Belgian players, both children and adults alike, cannot buy loot boxes. Loot boxes

137   and other newer monetisation methods, compared to the old model of selling the

138   software, allow for many players (including some who might not be able to afford

139   purchasing the software) to gain access to entertainment and play certain games for

140   free [11]. The Belgian ban has arguably infringed upon the freedom and right to

141   choose of players who would never have been harmed [60]. Indeed, in contrast to this

142   prohibiting approach, other alternative regulatory approaches that better ensure

143   consumer choice (although potentially providing less consumer protection) are

144   available. For example, China legally requires video game companies to disclose the

145   probabilities of obtaining randomised loot box rewards, thus providing a degree of

146   transparency and consumer protection, whilst not restricting the player's freedom to

147   purchase loot boxes, nor the video game companies' commercial interests in selling

148   loot boxes [3,61]. Researchers have also suggested restricting loot box sales only to a

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[1] Wet van 7 mei 1999 op de kansspelen, de weddenschappen, de kansspelinrichtingen en de bescherming van de spelers [Act of 7 May 1999 on games of chance, betting, gaming establishments and the protection of players].

149 certain extent by limiting players' spending on loot boxes to a 'reasonable' amount,
150 *e.g.*, US$50 [62,63], and designing more 'ethical' loot boxes that players are less likely to
151 overspend on [61,64,65].
152
153 Despite a loot box 'ban' being (arguably overly) paternalistic, two UK parliamentary
154 committees have recommended that the second type of loot boxes (currently only
155 illegal in Belgium) should also be regulated in the UK through an amendment of its
156 gambling law by expanding the definition of what constitutes gambling [47,49], and
157 this is presently being considered by the UK Government [66]. Other countries are
158 also considering adopting a similar prohibition of the second type of loot boxes that
159 would mirror the current restrictive position in Belgium: as demonstrated by Bills
160 proposed in the US that have since failed [67] and by a Bill that an Australian Member
161 of Parliament intended to propose [68] that would restrict loot box sales to underage
162 players.
163
164 Given that there is significant interest in emulating this regulatory approach, it is
165 important to assess whether this Belgian 'ban' on loot boxes has been effective. One
166 objective measure is to assess whether loot boxes have been effectively removed
167 from games marketed in Belgium. A preliminary examination of the top-grossing
168 iPhone games list in Belgium (more than three years after the ban was confirmed by
169 the Belgian Gaming Commission [44]) revealed that a number of games occupying
170 prominent positions on the top-grossing list were found to contain loot boxes in the
171 UK [4,5] and in the People's Republic of China [3] and whose revenue likely mostly
172 derived from loot box sales,. It is not known whether these games are monetising
173 using methods which do not involve loot boxes in Belgium, or whether these games
174 are continuing to sell loot boxes in Belgium. If the latter is true, then these video
175 game companies are either operating contrary to Belgian gambling law and liable for
176 criminal prosecution or operating under a gambling licence (which appears unlikely
177 as none are known to have been granted to video game companies at the time of
178 writing).
179
180 Belgium is the appropriate jurisdiction to study in this context because the other two
181 candidate jurisdictions (the Isle of Man and the Netherlands) are less suitable.
182 Firstly, in relation to the Isle of Man, the jurisdiction is a Crown Dependency of the
183 UK that, although it has its own laws, is not necessarily recognised as a separate

184   jurisdiction in practice by video game companies. The jurisdiction's small

185   population of approximately only 80,000 residents and geopolitical status potentially

186   give rise to certain idiosyncrasies [69]. It is unlikely that video game companies would

187   actively seek to comply with Manx law by making a special 'national' version of

188   their software. Indeed, there is no Manx Apple App Store (where such an adapted

189   'national' version of the game could potentially be published) based on which a

190   highest-grossing list might be captured for research purposes. This is in contrast to

191   Belgium which has a much larger population of more than 11.5 million legal

192   inhabitants [70] and where video game companies have reportedly taken dedicated,

193   national compliance action [56–59].

194

195   Secondly, the legal position in relation to loot boxes in the Netherlands changed in

196   March 2022 [71]. Previously, the Dutch gambling regulator *incorrectly* interpreted the

197   law and has actively enforced existing gambling law to regulate the first type of loot

198   boxes by sanctioning allegedly non-compliant companies (specifically, imposing a

199   financial penalty on Electronic Arts for allegedly illegal loot box implementations in

200   its *FIFA* games[51,52]). This is unlike other countries (*e.g.*, the UK) whose regulators

201   came to the same interpretation of their gambling laws but have not sought to take

202   enforcement actions against potential contraventions. The present Dutch position is

203   that the first type of loot box is confirmed to be generally lawful [71]. The Dutch

204   Apple App Store would therefore likely be experiencing change to reflect that new

205   regulatory position, which would render it inappropriate to study for answering the

206   present research question. Even assuming that the regulatory change did not take

207   place, it would not have been appropriate to study the Netherlands because the

208   previously enforced Dutch regulation focused on the presence of the ability for

209   players to transfer loot box rewards to other players in exchange for real-world

210   money [10,11,38]. A previous loot box prevalence study attempted to assess the presence

211   and prevalence of this so-called 'cashing out' process: however, Zendle *et al.* (2020)

212   importantly failed to reliably do so [4], possibly due to video game companies

213   actively preventing this from happening such that the availability of third-party

214   cashing out platforms is extremely transient. Even if the presence of cashing out

215   features could have been reliably assessed, the previous Dutch regulatory position

216   meant that only a reduction in the prevalence of 'cashing out' features would have

217   been observable and that a reduction in paid loot box prevalence was not necessarily

218   observable and, indeed, highly unlikely to have been true because the removal of

paid loot boxes was not legally required. This is contrasted with Belgium, where a reduction in paid loot box prevalence should be observable as an outright removal of the feature is required to comply with the law, as compared to only amendments to a certain aspect of some loot boxes' implementation that Dutch law previously required. This is demonstrated by how the same video game company removed paid loot boxes entirely from a game in Belgium [56], but did not remove paid loot boxes from the same game in the Netherlands and only changed them such that cashing out is no longer possible [72].

Therefore, a survey replicating the methodology of previous loot box prevalence studies [3–5] was conducted in Belgium to assess: (i) the effectiveness of the Belgian Gaming Commission's threat to criminally prosecute video game companies for implementing paid loot boxes without a gambling licence (*i.e.*, the Belgian 'ban') [44] and (ii) whether the loot box prevalence rate in Belgium is consequently lower than in other Western countries where no loot box regulation has been enforced, *e.g.*, the UK. Doing so sheds light on whether the Belgian ban has effectively changed video gaming companies' behaviour. In addition, potential circumventions of the Belgian ban on paid loot boxes were attempted: specifically, the UK version of certain games that are known to contain paid loot boxes was downloaded and loot box purchasing using those games within geographical and jurisdictional Belgium was attempted.

The following research questions were addressed.

> Research Question 1: Has the Belgian ban succeeded in eliminating paid loot boxes from mobile games?

> Research Question 2: Has the Belgian ban on paid loot boxes been effective?

> Research Question 3: Is it possible for a player to circumvent the Belgian ban on paid loot boxes and purchase them from within the country?

Because loot boxes have been effectively banned by the Belgian Gaming Commission's public pronouncement of its interpretation of Belgian gambling law[44], no loot boxes should be found amongst video games available in Belgium:

254   Hypothesis 1: None of the 100 highest-grossing iPhone games in Belgium will
255   contain paid loot boxes.

256

257   Hypothesis 2: None of the games within the 100 highest-grossing iPhone
258   games in Belgium that received an Apple Age Rating of 4+, 9+, or 12+ (*i.e.*, *not*
259   17+) will contain paid loot boxes.

260

261 Notably, the results of Hypothesis 1 cannot be conclusive proof that any of those
262 games that were found to contain paid loot boxes infringed Belgian gambling law
263 and were operating illegally, because the companies operating those games might
264 possess a gambling licence granted by the Belgian Gaming Commission. The list of
265 games and their operating companies was sent to the Belgian Gaming Commission
266 to request that the Commission confirm whether any of those companies were duly
267 licensed. Permission to publish the Commission's response, if any is received, was
268 sought and, it was planned for a summary to be made available at the data deposit
269 link (<https://doi.org/10.17605/OSF.IO/7KJS9>). However, departing from the
270 registered study protocol, the Commission's response is instead described in the
271 Results section. The Commission's response is described in the Results section.
272 Hypothesis 2 is included in case the Commission did not respond (although it in fact
273 did): the offering of gambling services to young people under the age of 18 or 21 is
274 illegal depending on the type of gambling, per Article 54 of the Belgian Gambling
275 Act of 7 May 1999. Therefore, the offering of paid loot boxes in any game that is
276 rated to be suitable for children aged 4+, 9+ and 12+ (*i.e.*, not rated 17+) should be
277 illegal and a stronger case of suspected criminality can be put against any such
278 games found to contain paid loot boxes.

279

280 Assuming that the Belgian ban on loot boxes has been effective to some perceivable
281 degree, then the availability of loot boxes in Belgium should be lower than
282 previously observed in other countries that have not actively regulated this
283 mechanic (*e.g.*, the UK):

284

285   Hypothesis 3: Of the highest-grossing iPhone games, fewer will contain paid
286   loot boxes in Belgium than in countries that have not banned loot boxes.

287

288 The 100 highest-grossing games were chosen to form the sample for Hypotheses 1–3,
289 following the methodology of previous studies [3–5], because these are the most
290 popular games that generate the most amount of revenue for video game companies.
291 Globally, the 100 highest-grossing mobile games reportedly accounted for 53.5% of
292 all player spending on those platforms in 2020 [73]. Generally, players are most likely
293 to encounter and engage with these games, and the Belgian Gaming Commission
294 should be most heavily scrutinising these games when undertaking compliance
295 actions. Relevant stakeholders, including players, parents and regulators, would be
296 most interested in the compliance situation amongst these best commercially
297 performing games. Previous studies have noted that the highest-grossing games
298 should be the most compliant and therefore do not necessarily reflect the compliance
299 situation with lower grossing games (and this limitation is recognised in the
300 Discussion section); however, the 100 highest-grossing games do represent the most
301 objective and reasonably practicable sample[3,5]. For Hypothesis 3 in particular, a
302 sample size of 100 games allowed for the present study to be directly comparable to
303 the Zendle *et al.* (2020) [4], the Xiao *et al.* (2021) [3], and the Xiao *et al.* (2021) [5] samples
304 of the 100 highest-grossing iPhone games and remove any potential biases that
305 might arise from choosing a differently justified and constituted sample of a
306 potentially different size.
307
308 For the Belgian ban on loot boxes to be deemed fully effective, it must not only
309 reduce loot box availability through the usual domestic channel of downloading
310 iPhone games from the *Belgian* Apple App Store but also prevent potential technical
311 circumventions (*e.g.*, downloading the games from the UK Apple App Store from
312 within Belgium and purchasing loot boxes in that version of the game). Preventing
313 such circumventions appears technically difficult and is therefore unlikely to have
314 been accomplished:
315
316   Hypothesis 4: UK iPhone games known to contain paid loot boxes will
317   continue to offer them for sale even when the phone is within geographical
318   and jurisdictional Belgium.
319
320 The contribution from the present study also has wider implications for other
321 regulatory domains because it empirically examines and assesses companies'
322 compliance with criminal law, specifically in relation to the challenging regulation of

323   novel technologies and new media: have companies changed their corporate

324   behaviours because of a specific legal development? Such an exercise is nearly

325   impossible to do objectively in most other contexts. However, the highest-grossing

326   list of video games provides for an impartial way to assess compliance with

327   gambling law amongst the best commercially performing companies that would be

328   far more difficult, if not impossible, to do in relation to, *e.g.*, physical, traditional

329   gambling venues or online (including cryptocurrency) gambling websites (whose

330   relative popularity and financial performance are more difficult to measure and

331   compare).

332

333   **2. Method**

334   Replicating the established methodology of Xiao *et al.* (2021) [3] and aiming to collect

335   data from a relatively diverse range of video games, the 100 highest-grossing iPhone

336   games on the Belgian Apple App Store on 28 May 2022 as reported by App Annie

337   (since rebranded to data.ai), an authoritative independent analytics company, were

338   selected to form the sample. If a game on the captured list is (i) no longer available

339   for download by the data collection period or (ii) a duplicate of a higher-ranked

340   game whose data was already collected (two exclusion criteria applied in Xiao *et al.*

341   (2021) [3]), then it was excluded from the sample and replaced with the next highest-

342   ranking game, *e.g.*, the 101th highest-grossing game in the first instance. In total, 100

343   games were coded.

344

345   The Country/Region setting of the Apple ID that was used on the coder's iPhone

346   was set to Belgium to ensure that the Apple App Store that loads is the Belgian

347   Apple App Store. This guarantees that the game that was downloaded from then on

348   was the Belgian version of the game specifically uploaded to and made available on

349   the Belgian Apple App Store (whether or not the video game company actually

350   made it different from the version(s) uploaded to other country's Apple App Stores).

351   In addition, the coder physically travelled to Belgium to ensure that he was within

352   the Belgian geographical and legal jurisdiction when conducting the data collection.

353   This was preferable to, for example, using a VPN (Virtual Private Network) to spoof

354   the coder's IP (Internet Protocol) address to be in Belgium even though the coder has

355   remained physically in a non-Belgian jurisdiction, because such a coder would

356   technically not be under the jurisdiction of Belgian gambling law (as he is not

357   physically within the country), even if he is playing the Belgian version of the game

358   downloaded from the Belgian Apple App Store.

359

360   The following variables were measured:

361

362   *Apple age rating*

363   This variable was coded using the relevant age rating information displayed on the

364   game's Belgian Apple App Store page.

365

366   *Presence of paid loot boxes*

367   A 'paid loot box' was defined as being either an Embedded-Isolated random reward

368   mechanism (which are video game mechanics that players must pay real-world

369   money to activate and which provide randomised rewards that do *not* possess direct

370   real-world monetary value) or an Embedded-Embedded random reward mechanism

371   (whose activation also must be paid for by players with real-world money but which

372   *do* provide randomised rewards that possess direct real-world monetary value), as

373   defined by Nielsen & Grabarczyk (2019) [7]. An amendment must be made to the

374   methodology of Xiao *et al.* (2021) [3], which assessed this variable based firstly on 40

375   minutes of gameplay and, if no such mechanic was found within that time, then

376   based on up to 2 hours of internet browsing of video streams and screenshots. This is

377   because it is not possible to rely upon internet browsing at all for the present study

378   as the coder cannot know whether the video streams or the screenshots that he

379   observes were captured from a Belgian version of the game. Only by playing a

380   Belgian version of the game can the coder be confident that he is coding the correct,

381   national version of the game that was possibly amended to comply with the law.

382   Therefore, to avoid video streams and screenshots of non-Belgian versions of the

383   games from biasing the results, the coder spent up to an hour playing the video

384   game instead. If a paid loot box cannot be identified within that timeframe, then the

385   game was coded as not containing paid loot boxes.

386

387   This design decision may cause the Belgian loot box prevalence rate that was found

388   by the present study to be lower than the true value. However, this is unavoidable

389   and justifiable. Firstly, the present study is more concerned with finding a non-zero

390   value rather than the true value: the presence of paid loot boxes in even one high-

391   grossing game severely challenges the effectiveness of the Belgian ban. Secondly, in

392 the most recent loot box prevalence research of Xiao *et al.* (2021), of the 77 games
393 amongst the 100 highest-grossing UK games that were found to contain loot boxes,
394 73 games' loot boxes were identified through gameplay (94.8%), whilst only 4
395 games' were determined through internet browsing (5.2%), so the potential bias
396 caused by coding games that must be coded through internet browsing as not
397 containing loot boxes would be very minor [5]. Thirdly, it was always potentially
398 possible for a game to have been thusly inaccurately coded as not containing paid
399 loot boxes even when it did because the coder could always have been unable to
400 identify such a mechanic even during the combined 40 minutes of gameplay and 2
401 hours of internet browsing. This was accepted as a justifiable inaccuracy because this
402 meant that a new player engaging with the game (whose experience the previous
403 literature attempted to replicate [3,5]) would highly likely have not encountered a paid
404 loot box either. Fourthly, this approach is also 'fairer' towards the video game
405 industry in the sense that if games whose paid loot box presence could not be
406 determined would instead be excluded from the sample and replaced with the next
407 highest-grossing game until a game whose loot boxes could be found is assessed,
408 then the loot box prevalence rate would be artificially inflated to be higher than the
409 true value.
410
411 Further, if a so-called 'sand box' game, such as *Minecraft* (Mojang, 2011) or *Roblox*
412 (Roblox Corporation, 2012), that contains a significant amount of third-party user-
413 generated content was included in the sample, then that game was assumed by the
414 coder to contain paid loot boxes without the need for the coder to identify and
415 screenshot such a mechanic (because choosing to base the coding on which specific
416 third-party content would be subjective). However, the game was deemed compliant
417 with the law and coded as not containing paid loot boxes if an official online post
418 can be found where the developer or publisher of that game specifically states that
419 user-generated content that is paid loot boxes should not be offered in Belgium,
420 similar, for example, to the guidelines requiring loot box probability disclosures that
421 Roblox Corporation published [74].
422
423 Finally, it is noted that the coder only accessed and screenshotted the loot box
424 purchase screen and the Apple App Store payment pop-up screen for the paid loot
425 box. The coder did not go through with the transaction by paying real-world money
426 in exchange for paid loot boxes and confirm that the sale would indeed process. This

427   is because doing so would be illegal under Belgian gambling law. Article 4(2) of the

428   Belgian Gambling Act of 7 May 1999 states that: 'It is prohibited for anyone to

429   participate in a game of chance … when the person involved knows that it concerns

430   the operation of a game of chance or a gaming establishment which is not licensed in

431   accordance with this Act.' The coder, being an academic researcher of loot box

432   regulation, possessed the knowledge that the relevant video game company likely

433   did not have a gambling licence and therefore would arguably have been

434   committing a crime if he completed the loot box purchasing transaction.

435

436   *Date and time of data collection*

437   The date and time, based on Central European Summer Time (or Central European

438   Time, depending on which was used by Belgium at the data collection period), on

439   and at which paid loot boxes were searched for was recorded.

440

441   Two previous studies, whose methodology the present study is replicating,

442   calculated for inter-rater reliability by dual-coding 15.0% of the sample [3,5]. The

443   methodology has therefore been previously refined and been found to be reliable

444   (near-perfect or perfect agreement was achieved). Therefore, the present study did

445   not calculate for inter-rater reliability. The raw data and a full library of screenshots

446   showing, *inter alia*, the Apple App Store age rating and in-game loot box purchase

447   pages for each game is available via <https://doi.org/10.17605/OSF.IO/7KJS9> for

448   public scrutiny.

449

450   An alpha level of .05 was used for all statistical tests.

451

452   Hypothesis 1 would have been accepted if had zero, one, or two of the 100 highest-

453   grossing games that was were coded contained paid loot boxes.

454

455   Hypothesis 2 would have been accepted if had zero, one, or two of the games, within

456   the 100 highest-grossing games that was were coded, that received an Apple Age

457   Rating of 4+, 9+, or 12+ (*i.e.*, *not* 17+) contained paid loot boxes.

458

459   A Belgian loot box prevalence rate of 0.0% should be found amongst all games

460   studied and amongst those games studied that were deemed suitable for underage

461   players. However, considering that one previous loot box prevalence study

462   identified an 1.0% false positive rate through its data collection process [4], to provide

463   for type 1 error control, Hypotheses 1 and 2 would have been accepted even ~~if~~ had

464   up to two Belgian games studied are identified as containing paid loot boxes (*i.e.*, a

465   prevalence rate of up to 2.0% would have been deemed as effective elimination of

466   loot boxes from the Belgian market). Considering that some video games might

467   contain loot boxes which are duly licensed by the Belgian Gaming Commission

468   (whose confirmation was sought by the present study, as explained below), any

469   games that were so licensed would have been excluded from the sample for the

470   purposes disconfirming Hypotheses 1 and 2.

471

472   Hypothesis 3 was tested using a binomial test (two-sided test, ~~$p = .05$~~) to identify

473   whether the percentage of the 100 highest-grossing iPhone games containing loot

474   boxes in Belgium that was found by the present study was significantly different

475   from a hypothetical loot box prevalence rate of 65.0%, which a Western country that

476   has not restricted loot box sales is assumed to have.

477

478   The hypothetical 65.0% figure is derived from a holistic consideration of historical

479   loot box prevalence rates in other countries found by the prior literature. Zendle *et*

480   *al.* (2020) found the UK iPhone loot box prevalence rate amongst the 100 highest-

481   grossing games in February 2019 to be 59.0%[4]; Rockloff *et al.* (2020) found the

482   Australia loot box prevalence rate amongst the 82 'best selling' games on various

483   platforms (*e.g.*, PC, console, and mobile) between August and October 2019 to be

484   62.0%[2]; Xiao *et al.* (2021) found the Chinese iPhone loot box prevalence rate amongst

485   the 100 highest-grossing games in June 2020 to be 91.0% [3]; and Xiao et al. (2021)

486   found the UK iPhone loot box prevalence rate amongst the 100 highest-grossing

487   games in June 2021 to be 77.0% [5]. The comparatively high Chinese 91.0% prevalence

488   rate appears to be an outlier that has been influenced by Far East Asian cultural

489   factors that would not affect a hypothetical Western country that has not regulated

490   paid loot boxes; therefore, little reliance is placed on that datum. The Rockloff *et al.*

491   Australian 62.0% is derived from games on various consoles, whilst it is known that

492   games on mobile platforms (*e.g.*, the iPhone platform which the present study

493   assessed) tend to contain more loot boxes[4]; therefore, the 62.0% value might not

494   reflect the contemporaneous Australian loot box prevalence rate amongst mobile

495   games specifically, which likely would have been higher. A comparison of Zendle et

496   al.'s 2019 UK data with Xiao et al.'s 2021 UK data suggest that the loot box

prevalence rate have increased due to a variety of reasons, including that the 2019 59.0% datum might have been an underestimation, due to certain paid loot box implementations not having been recorded [75]. Xiao et al.'s 2021 77.0% figure is the closest comparator for the present study, in terms of data collection time; however, in context, it is comparatively higher than other values previously observed in Western countries. Accordingly, a hypothetical value of 65.0%, which is slightly higher than the previously observed Zendle et al. UK 59.0% and Rockloff et al. Australian 62.0% values (which were likely slight underestimations), but which is lower than the comparatively high Xiao et al. UK 77.0% value, was used. This 65.0% value errs on the side of caution and avoid potentially overestimating the reduction effect of the Belgian ban, although unavoidably it is possible that the effect might consequently be underestimated.

In the absence of any prior guidance on what effect size would constitute a 'legally meaningful' and 'socially beneficial' regulatory measure, a smallest effect size of interest of Hedges' $g = -.15$ is proposed based on the potential usefulness of the results to the end users [76]. The intended end users would be the policymakers in other countries who might be considering taking the same regulatory action that Belgium has already taken: importantly, besides the Belgian Gaming Commission having issued its interpretation of Belgian gambling law and thereby threatened criminal prosecution of non-compliant companies implementing paid loot boxes, little else appears to have been done by the Belgian Gaming Commission in terms of enforcement; therefore, thus far, the costs that have been incurred by Belgium in its attempt to regulate loot boxes have been relatively low. Accordingly, realistic policymakers seeking to expend a similarly low amount of resources to regulate loot boxes would likely not expect a particularly high reduction to loot box prevalence in Belgium (*e.g.*, for the loot box prevalence rate to be reduced by at least 50 percentage points, *i.e.*, to 15.0% or lower). Nonetheless, these policymakers would likely still expect some perceivable reduction (*e.g.*, for the loot box prevalence rate to be reduced by at least 10 percentage points, *i.e.*, to 55.0% or lower) before being persuaded to emulate the Belgian ban, considering that some regulatory costs have been incurred by Belgium and that Belgian consumers have been given the (potentially incorrect) impression that loot boxes have been effectively eliminated from the market. Recognising that some policymakers might be more hesitant to restrict players' freedom to purchase loot boxes and video game companies'

532   commercial interests and therefore be more cautious when relying on the results
533   (*e.g.*, they might view a reduction of 10 percentage points or less as being
534   insufficiently persuasive), it is proposed, conservatively, that the vast majority of
535   policymakers would likely consider a reduction of at least 15 percentage points (*i.e.*,
536   for the loot box prevalence rate to be 50.0% or lower) as demonstrating the
537   effectiveness of Belgium's loot box ban (as implemented in its relatively low-cost
538   manner) and be persuaded to potentially emulate the Belgian regulatory actions in
539   their own countries. Accordingly, setting the Hedges' *g* at −.15, a priori power
540   analysis using G*Power has determined, given an *α* value of .05: the present sample
541   of 100 games would achieve .86 power in a two-sided test for finding a statistically
542   significant difference between the Belgian and the hypothetical 65.0% prevalence
543   rates (see Fig. A1)[77].

544

545   As to interpretation, ~~if~~ had the Belgian value ~~was~~ been significantly lower than
546   65.0%, then Hypothesis 3 would have been accepted and the present study would
547   have concluded that it is *possible* that the Belgian 'ban' may have been effective at
548   reducing paid loot box prevalence in Belgium and that this measure could be
549   considered for adoption in other countries, although it must also be recognised that
550   national differences between Belgium and the previously assessed Western countries
551   (*i.e.*, the UK and Australia), and the passage of time between the data collection
552   points, may also have contributed to the results. The present study would have then
553   recommended other countries' policymakers and regulators to consider adopting a
554   similar measure if they desire to reduce paid loot box prevalence rates in their
555   country: how strongly this recommendation would have been put by the present
556   study in the Discussion section would have depended on the Belgian loot box
557   prevalence rate that would have been identified (a reduction to below 50.0% would
558   have been deemed as effective, whilst a reduction to below 25.0% would have been
559   deemed as very effective). In contrast, ~~if~~ had the Belgian value ~~is~~ been significantly
560   higher than 65.0%, then Hypothesis 3 would have been rejected and the present
561   study would have concluded that the Belgian ban has been ineffective, noting the
562   same abovementioned limitations. The present study would have then cautioned
563   against other countries' policymakers and regulators from making the assumption
564   that a loot box ban will necessarily be effective, and concluded that the Belgian
565   measure should not be adopted by other countries unless effective enforcement can
566   be guaranteed or some other improvements are made. Further, reasoned criticism of

the apparent lack of enforcement actions by the Belgian Gaming Commission would also have been made. However, if had no significant difference is been found, then the present study would have stated that no sufficient evidence that the Belgian ban affected paid loot box prevalence in Belgium has been found, thus Hypothesis 3 can be neither confirmed nor disconfirmed. Alternative research methodologies for future studies would have been discussed.

For Hypothesis 4, firstly, the coder arrived in geographical and jurisdictional Belgium with an iPhone pre-installed with UK versions of the following three popular and high-grossing games (known to contain paid loot boxes in the UK) that reflect operating companies from various regions of the world: *Hearthstone* by the US company Blizzard Entertainment, *Brawl Stars* by the European, Finnish company Supercell Oy, and *Genshin Impact* by the Chinese company miHoYo Co., Ltd.. The sample size was limited to three highly popular games due to practical constraints on research resources. These three popular games were chosen because they have been widely published across the world (including in both the UK and China) and have consistently performed well financially. Importantly, engagement with loot boxes is a fundamental and arguably unavoidable and inalienable aspect of all three games' gameplay and monetisation because the vast majority of in-game content (*e.g.*, playable characters) *requires* engagement with loot boxes to unlock (at least in the UK version of the games). These three games also represent how companies from three different regions of the world might have taken technological steps to comply with Belgian law and prevent potential circumvention. In the unlikely event that any of these three games becomes unavailable for download and online gameplay (*e.g.*, removed from the Apple App Store), another popular game developed by a company from the same region as the unavailable game; known to contain paid loot boxes in the UK; and in which paid loot boxes represent a fundamental aspect of the game's gameplay and monetisation would be chosen to replace that game. With the Country/Region setting of the Apple ID initially set to the UK, the coder then attempted to access the paid loot box purchase screen and the Apple App Store payment pop-up screen and record their experience from within Belgium. Then, the Country/Region setting of the Apple ID was changed from the UK to Belgium, and the coding process was repeated. Thusly, the two potential possibilities of setting the phone's geographic location to either Belgium or a non-Belgian country were tested. Subsequently, the three games were deleted from the iPhone. Secondly, whilst

602 within geographical and jurisdictional Belgium, the coder changed the
603 Country/Region setting of the Apple ID to the UK and attempt to access the UK
604 Apple App Store to download the UK versions of those three games within Belgium.
605 Then, the coder attempted to access the loot box purchase paid loot box purchase
606 screen and the Apple App Store payment pop-up screen and record their experience
607 again. Therefore, two potential ways to circumvent the Belgian ban were tested:
608 firstly, by bringing non-Belgian version of the games into the country and using
609 them to purchase loot boxes, and, secondly, by downloading non-Belgian version of
610 the games from within Belgium and using them to purchase loot boxes. Hypothesis
611 4 would have been accepted, ~~if~~ had loot box purchase ~~was~~ been possible within one
612 or more of the games using any of the abovementioned methods. The interpretation
613 would have been that the law can be easily circumvented by dedicated players; the
614 Belgian Gaming Commission should therefore consider ways to force video game
615 companies to better enforce compliance with the law. However, ~~if~~ had loot box
616 purchase been ~~is~~ not possible within one or more of the games using any of the
617 abovementioned methods, then the interpretation would have been that the law
618 could not be circumvented in the simple ways that have been attempted, although
619 other potential circumventions remain untested and possible. The present study
620 would have concluded that companies might have taken *some* technological
621 measures to prevent circumventions of the Belgian ban, although further evidence
622 would be required to confirm this (*e.g.*, contacting the relevant company to request
623 for confirmation of the compliance actions that have been taken).
624
625 In accordance with the *Danish Code of Conduct for Research Integrity*[78], as adopted by
626 the IT University of Copenhagen, the present study did not require research ethics
627 assessment and approval because no human participants or personal data were
628 involved and only publicly available information was examined and recorded.
629
630 The Stage 1 Registered Report for the present study was granted in-principle
631 acceptance by Peer Community in Registered Reports on 7 April 2022 and is openly
632 available in the Open Science Framework at
633 https://doi.org/10.17605/OSF.IO/5MXP6.
634
635

3. Results

Statistical analysis was conducted using Stata, version 15.1, except for the 95% confidence intervals, which were calculated using R, version 4.2.1.

3.1. Confirmatory analysis

3.1.1. Paid loot box prevalence in Belgium and effectiveness of the 'ban'

Of the 100 highest-grossing Belgian iPhone games on 28 May 2021, 82 games contained loot boxes (82.0%). Their Apple App Store age ratings are summarised in Table 1.

Table 1

Apple App Store age rating of games containing loot boxes (cumulative; N = *100)*

Apple App Store Age Rating	Total number of games (cumulative)	Number of games that contain loot boxes (cumulative)	Percentage containing loot boxes [95% CI]
4+	24	13	54.2% [34.3%, 74.1%]
9+	42	29	69.0% [55.0%, 83.0%]
12+	86	69	80.2% [71.8%, 88.6%]
17+	100	82	82.0% [74.5%, 89.5%]

Game 36 (*The Lord of the Rings: War* (NetEase, 2021)) could no longer be downloaded by the time of data collection and was therefore replaced with the next highest-grossing game, Game 101 (*Bingo Frenzy-Live Bingo Games* (Gluon Interactive, 2020)), as preregistered. Further discussion of how the commencement of the present study may have caused the removal of Game 36 is set out in Appendix 3.

Game 8 (*Roblox*) was duly coded as containing loot boxes as preregistered because, although loot boxes were not encountered through gameplay, it is known that loot boxes are implemented by third parties as user-generated content in this game and the developer and publisher of Roblox did not explicitly require that such user-generated loot boxes be blocked from purchase in Belgium.

Game 50 (*Governor of Poker 3 – Friends* (Youda Games & Azerion, 2016)) and Game 78 (*DRAGON BALL Z DOKKAN BATTLE* (Akatsuki & Bandai Namco Entertainment, 2015)) implemented Isolated-Isolated random reward mechanisms, as defined by Nielsen & Grabarczyk (2019), that provided randomised rewards, but the player did not have to pay real-world money to engage with them. These mechanics would

666   have been capable of constituting a paid loot box (specifically, an Embedded-

667   Isolated random rewards mechanism); however, both games took technical

668   measures to prevent loot box purchase from within Belgium using real-world

669   money. Specifically, the coder was prevented from spending real-world money to

670   purchase the 'premium' virtual currency that would then be used to purchase loot

671   boxes. The Apple App Store payment pop-up screen was rendered inaccessible. In

672   Game 50, a pop-up window appeared indicating that 'Buying virtual items is no

673   longer possible in Belgium,' as shown in Figure 1. In Game 78, the in-game shop

674   simply did not display any premium currency as being purchasable without

675   providing any explanation, as shown in the left pane of Figure 2. These two games

676   were therefore compliant with Belgian law (due to the inability of the coder to

677   purchase loot boxes using real-world money) and accordingly coded as not

678   containing paid loot boxes. Exploratory analysis was conducted to attempt to

679   circumvent the technical measures implemented in both games, as detailed below.

680
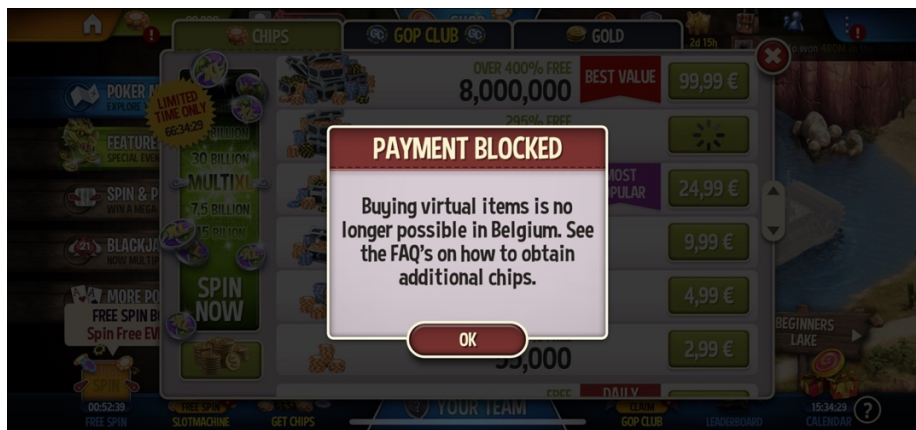
682   **Figure 1. A pop-up window appeared to prevent any in-game purchase in Game 50 (*Governor of***
683   ***Poker 3 – Friends*) when this was attempted in geographical and jurisdictional Belgium without**
684   **attempting any circumvention. © 2022 Youda Games & Azerion.**

685

686   Hypothesis 1 was rejected because 82 (which is more than two) of the 100 highest-

687   grossing Belgian iPhone games contained paid loot boxes.

688

689   Hypothesis 2 was rejected because 69 (which is more than two) of the 86 highest-

690   grossing Belgian iPhone games that received an Apple Age Rating of 4+, 9+, or 12+

691   (*i.e.*, *not* 17+) contained paid loot boxes.

692

693   In response to the author asking for the Belgian Gaming Commission to confirm

694   whether any of the games found to contain loot boxes were duly licensed in an email

695 dated 20 June 2022, the Commission did not provide a written response to that
696 inquiry (and therefore none could be made available at the data deposit link as
697 stated in the registered protocol). Instead, the Commission met with the author on 24
698 June 2022 and stated ~~stated in a meeting with the author on 24 June 2022~~ that this
699 could be manually checked by the author and referred the author to public resources
700 provided by the Belgian Gaming Commission (specifically, an exhaustive list of
701 companies that are licensed to provide gambling services in Belgium[79]). Using that
702 list, it was determined that none of the 82 games found to be offering loot boxes for
703 sale in Belgium (0.0%) were duly licensed. *Identity V*, the game operated by the same
704 company as the removed Game 36, was also not licensed. Indeed, under the current
705 gambling law regulatory regime in Belgium, the Belgian Gaming Commission is not
706 legally empowered to be able to approve and license the provision of loot boxes or
707 any randomised monetisation methods in video games as gambling (given that these
708 cannot fit under any recognised licence categories), so no video game company can
709 even apply for a licence, let alone successfully obtain one. The Belgian Gaming
710 Commission has confirmed this legal point in the same meeting with the author on
711 24 June 2022.
712
713 Hypothesis 3 was rejected using a binomial test (two-sided test, ~~$p = .05$~~), which
714 revealed that the Belgian loot box prevalence rate of 82.0% was significantly higher
715 ($p < .001$) than the hypothetical 65.0% prevalence rate.
716
717
718 **3.1.2. Potential circumvention of the ban**
719 Hypothesis 4 was accepted because all three preregistered potential circumventions
720 of the Belgian ban in the three examined games were successful. Pre-downloaded
721 UK versions of the games worked without any hindrance and allowed loot box
722 purchase within geographical and jurisdictional Belgium, regardless of the Apple
723 ID's Country/Region settings being set to the UK or Belgium. The coder was also
724 able to download the UK versions of the games from within Belgium and access the
725 in-game loot box purchase pages and Apple App Store payment pop-up screens.
726
727
728 **3.2. Exploratory analysis**
729 **3.2.1. Another game operated by the same operator as the removed Game 36**

730 NetEase, the company operating Game 36, also operated another relatively popular
731 game, *Identity V* (NetEase, 2018), that was not within the highest-grossing list
732 studied. *Identity V* was known to contain loot boxes in the UK and in the PRC but
733 has not been removed from any countries' Apple App Store as of 7 June 2022.
734 Exploratory analysis revealed that the Belgian version of *Identity V* continued to
735 contain paid loot boxes in Belgium.
736
737 **3.2.2. Excluding ~~social~~ simulated casino games from the analysis for Hypothesis 3**
738 In relation to Hypothesis 3, to err on the side of caution, an exploratory test was
739 conducted to address the potential concern that the considerable prevalence of
740 'social casino games' or 'simulated casino games' (which are video games in which
741 'players can spend real-world money to buy more stakes to continue participating in
742 simulated gambling'[75]) amongst the sample may have overly exaggerated the
743 prevalence of 'loot boxes' (widely defined) in Belgium. The Belgian Gaming
744 Commission has confirmed in the same meeting with the author on 24 June 2022 that
745 it does recognise the randomised monetisation methods in 'simulated casino games'
746 games as legally constituting 'gambling' (*i.e.*, there is *no* distinction between the two
747 concepts in Belgium in contrast to in most other countries where the two are treated
748 differently in law as 'simulated casino games' are not seen as gambling and not
749 recognised as legally constituting 'gambling' elsewhere). However, there is debate
750 within the academic literature as to whether 'simulated casino games' should, by
751 definition, be deemed as 'containing loot boxes' or an Embedded-Isolated random
752 reward mechanism[75,80]. The coder deemed 15 of the 100 games to be 'simulated
753 casino games' (15.0%). This was defined as any games that allowed the player to
754 spend real-world money to participate in simulated traditional gambling activities,
755 *i.e.*, 'games of chance' or 'mixed games of chance and skill,' such as slot machines,
756 poker, bingo, belote, and craps. Particular attention is drawn to Game 77 (*UNO!*™
757 (Mattel163, 2018)), which was coded as a ~~social~~ simulated casino game because it
758 involved players competing against each other to win or lose premium virtual
759 currency (similarly to ~~social~~ simulated casino games involving poker) whilst playing
760 a simulated version of the tabletop game *UNO* (1971, Robbins), which itself is a
761 mixed game of chance and skill that has reportedly been played physically as a form
762 of gambling[81]. Amongst the other 85 non-'simulated casino games,' 68 contained
763 loot boxes (80.0%; 95% CI: [71.5%, 88.5%]). A binomial test (two-sided test, ~~p = .05~~)
764 revealed that the Belgian loot box prevalence rate amongst non-'simulated casino

765 games' of 80.0% was still significantly higher ($p = .003$) than the hypothetical 65.0%

766 prevalence rate. For clarity, this 80.0% prevalence rate is not comparable to the 59.0%

767 derived from Zendle *et al.*'s UK data collected in 2019[4] because in that study

768 simulated casino games were generally coded as not containing loot boxes[75,80],

769 whilst this exploratory analysis instead excluded simulated casino games.

770

771 **3.2.3. Circumvention of the removal of games from the Belgian market**

772 One further potential circumvention was attempted successfully through

773 exploratory analysis. The three games that were preregistered to be examined all

774 continued to be available on the Belgian national Apple App Store. Some games (*e.g.,*

775 *Fire Emblem Heroes* (Nintendo, 2017) and *Animal Crossing: Pocket Camp* (Nintendo,

776 2017)) were known to have been removed from the Belgian store entirely. It was not

777 known whether such games could still be downloaded from within geographical

778 and jurisdictional Belgium by setting the Apple ID's Country/Region settings to a

779 country where those games remain available, *e.g.,* the UK. During the data collection

780 period, Blizzard Entertainment decided not to publish *Diablo Immortal* (Blizzard

781 Entertainment & NetEase, 2022) in Belgium and the Netherlands, citing 'the current

782 operating environment for games in those countries,'[82] which can reasonably be

783 inferred to mean these two countries' loot box regulation[83].2 The coder was indeed

784 unable to find or download *Diablo Immortal* from the Belgian Apple App Store.

785 However, the coder was able to do so by setting the Apple ID's Country/Region

786 settings to the UK and downloading the game from the UK Apple App Store whilst

787 within geographical and jurisdictional Belgium. The premium currency used to

788 purchase the loot boxes implemented in *Diablo Immortal* was also purchasable using

789 real-world money from within Belgium. This shows that any corporate actions to

790 remove or not publish a certain game containing loot boxes in Belgium specifically

791 can be easily circumvented if that game continues to be available on another

792 country's Apple App Store.

793

794 **3.2.4. Games that actively prevented loot box purchase**

795 Of the 84 games that were potentially capable of selling loot boxes in exchange for

796 real-world money (the 82 games containing paid loot boxes plus Games 50 and 78),

797 only two games (2.4%) took technical measures to prevent loot box purchase with

798 fiat currency.

---

2 For the Dutch law position on loot boxes in video games, see Xiao & Declerck (2022)[84].

24

799

800   Game 50 prevented *all* in-game purchases: cosmetic items that were entirely

801   unrelated with any randomised monetisation methods were also not purchasable

802   with real-world money. Attempts to make *any* in-game purchases in Game 50 failed.

803   This state-of-affairs was illogical, because if all in-game purchases were blocked,

804   then this game could not therefore gross *any* money at all and so surely should not

805   be capable of being the 50th high-grossing game on the Belgian Apple App Store.

806   The present study could not determine what exact technical measures were taken to

807   block in-game purchase from within Belgium. However, two methods to circumvent

808   the technical measures were attempted to make an educated guess. Firstly, using a

809   VPN from within Belgium to spoof one's IP address to be non-Belgian, and secondly,

810   taking the Belgian version of the game outside of the country. Whilst within

811   geographical and jurisdictional Belgium, Proton VPN was used to change the

812   coder's IP address to Japan. Purchases for the premium currency were then

813   attempted on the same Belgian Apple ID and user account, and these were not

814   blocked (as the pop-up window shown in Figure 1 did not appear) and were instead

815   allowed to advance to the Apple App Store payment pop-up screen. Turning off the

816   VPN promptly made virtual items unpurchasable again. Secondly, the phone

817   containing the Belgian version of the game and with Belgian Apple App Store

818   settings was physically brought outside of geographical and jurisdictional Belgium.

819   When the coder was in Warsaw, Poland, in-game purchasing was possible similar to

820   when a VPN was turned on. Game 50 did not ask for, and did not have, permission

821   to access the coder's phone's geographical location. Therefore, it is likely that the

822   technical measure that has been taken was a simple IP address check to confirm

823   whether the player is within Belgium. This block on in-game purchase being easily

824   circumventable may partially explain why Game 50 still managed to gross money

825   through the Belgian Apple App Store, despite Belgian players being (in theory)

826   prevented from purchasing anything. The fact that Game 50 remains a high-grossing

827   game suggests that a considerable number of Belgian players are likely

828   circumventing this technical measure. Regardless of its imperfect efficacy, Game 50

829   should still be commended for at least attempting to implement a technical block on

830   loot box purchase from within Belgium because it might have successfully prevented

831   some players from spending money: analysing user reviews of the game, which is

832   beyond the ambit of the present study, may shed further light on that point. Turning

833   on a Japanese VPN and being physically in Poland similarly allowed the coder to

834   purchase the premium currency required to buy loot boxes in Game 78, as shown in

835   the right pane of Figure 2.

836

837   Immediately prior to the coder's physical departure from geographical and

838   jurisdictional Belgium on 2 July 2022, in-game purchasing was attempted again in

839   both Games 50 and 78 whilst at Brussels International Airport. For reasons

840   unknown, in-game purchase was possible in Game 50 temporarily without any

841   attempted circumventions (*e.g.*, no VPN was switched on). The pop-up window

842   shown in Figure 1 did not appear, and the coder was able to access the Apple App

843   Store payment pop-up screen. Relevant screenshots are available at the data deposit

844   link. This again demonstrates that the technical measures taken might fail at times.

845   In-game purchasing was again rendered not possible in Game 50 when attempted 10

846   and 40 minutes after the initial successful attempt at Brussels International Airport.

847   In-game purchasing remained not possible in Game 78 when no circumvention was

848   attempted. Temporary failures of the technical measures, without the player

849   intentionally trying to circumvent them, represent another potential reason why

850   these two games have continued to nonetheless generate revenue from Belgium.

851

852

Figure 2. Left pane: The premium currency used to purchase loot boxes did not appear in the in-game shop and could not be bought using real-world money in Game 78 (*DRAGON BALL Z DOKKAN BATTLE*) when the coder was physically in geographical and jurisdictional Belgium with a Belgian IP (Internet Protocol) address. Right pane: The premium currency appeared in the in-game shop and became purchasable when a Japanese VPN (virtual private network) was used to spoof the coder's IP address to be non-Belgian. © 2022 Akatsuki Inc. & Bandai Namco Entertainment

3.2.5. Comparability with previous studies in other countries

Peer review comments of the present study's stage 1 registered report manuscript suggested that context should be provided as to how comparable the present results are to those of previous studies[85]. The 100 highest-grossing iPhone games in the UK on 28 May 2022 was compared with the Belgian list (including Game 36, which was, however, excluded from the present study's sample): 70 games (70.0%) appeared on

both lists. Amongst the 50 highest-grossing games, the overlap of 42 games (84.0%) was even more apparent. This demonstrates that there is a substantial degree of similarity between the two countries' highest-grossing lists, and that the results from these two countries are reasonably comparable, if done with some caution. Additionally, the 50 highest-grossing list of Android games in Belgium on 21 June 2021 (Xiao et al. (2021)'s UK data collection date[5]) and the list on 28 May 2022 were compared: 35 games (70.0%) appeared on both lists. This further supports the direct comparison of the UK results of Xiao *et al.* (2021) with that of the present study. Data for the Android platform was used because the relevant historical iPhone data were no longer accessible. Zendle *et al.* (2020) has previously found near identical loot box prevalence rates on the Android and iPhone markets in 2019. For reference, 70.0% of the 100 and 88.0% of the 50 highest-grossing games on the iPhone and Android platforms in Belgium overlapped on 28 May 2022.

4. Discussion

4.1. No reduction to Belgian loot box prevalence

As of mid-2022, 82.0% of the highest-grossing iPhone games in Belgium continued to sell loot boxes for real-world money and seemingly continued to heavily rely on such randomised mechanics to monetise and generate revenue. For the avoidance of doubt, in each of these 82 games, players were able to either directly spend real-world money, or indirectly spend premium currency that is purchasable using real-world money, to engage with a randomised monetisation method whose results are unknown at the point of purchase. The Belgian Gaming Commission has confirmed that 'loot boxes' as defined by the present study's Method section would legally be recognised as 'gambling' in Belgium according to the Commission's interpretation in a meeting with the author on 24 June 2022.

The Belgian 'ban' on loot boxes, as instituted by the Belgian Gaming Commission through the pronouncement of its interpretation of the law and its threat of criminal prosecution of non-compliant companies in April 2018[44], did not appear to have an effect on the prevalence of paid loot boxes four years after the event. Certain well-known companies have taken compliance actions by either removing the ability to purchase loot boxes with real-world money from their games or removing their games (that rely on loot boxes to generate revenue) from the Belgian market

entirely[56–59]. As recently as June 2022, Blizzard Entertainment actively complied with the ban by not publishing *Diablo Immortal* in Belgium[82]. However, these widely reported instances of compliance by well-known companies appear to be the exceptions rather than the rule. Other companies have had four years to comply with the law and evidently have yet to do so.

The mid-2022 Belgian loot box prevalence rate of 82.0% is numerically higher than the mid-2021 UK loot box prevalence rate of 77.0% (where no effective loot box regulation has been imposed or enforced)[5]. However, this could simply be due to loot boxes becoming increasingly more prevalent due to the passage of time, which is a general trend that has previously been observed amongst UK iPhone games[75]. Therefore, no point is taken in relation to this higher value in Belgium. It should *not* be suggested that loot box prevalence has somehow become higher due to, or despite, the ban. The present study provides evidence that the Belgian ban does not appear to have effectively *reduced* loot box prevalence.

In short, the Belgian 'ban,' as implemented, has not been effective at reducing the broad availability of opportunities to purchase loot boxes. The high loot box prevalence rate on the Belgian Apple App Store shows that loot boxes continue to be widely available and easily accessible to video game players, including children. Table 1 shows a trend that games are more likely to contain loot boxes as their age ratings increase; however, notably 54.2% of the games deemed suitable for children aged 4+ (the lowest available age rating) still contained loot boxes.

Importantly, although the ban may have caused some games containing loot boxes to be removed, those removed games' positions on the highest-grossing list appear to have simply been replaced by non-compliant games from other companies that continue to contain loot boxes. It is likely that some previous players of compliant games chose to 'migrate' to instead spending money on non-compliant games (although not all players would have done so). Compliant companies are making less or no revenue: assuming that the amount of money spent by players on video games did not change following the ban, the non-compliant companies have dishonestly taken a share of that revenue away from compliant companies by implementing illegal loot boxes. This represents the first negative consequence of this unenforced 'ban.' The (generally more well-known) companies that did comply

938 with the law by removing or not publishing their games likely cared more about
939 protecting their reputations and ensuring compliance with the law than lesser-
940 known companies. It would seem that the since 'vacated' positions on the highest-
941 grossing list were then replaced with games from more unscrupulous (or at least less
942 well-resourced) companies that either actively decided not to comply with the law
943 or were unaware of their legal responsibilities to comply with the ban. It is not
944 unreasonable to suggest that the since removed and unpublished games likely
945 would have been more compliant with other legal requirements (*e.g.*, data protection
946 law) and offered better consumer protection measures in relation to loot boxes than
947 the non-compliant games currently do, for example, in terms of potentially making
948 more prominent and accessible loot box probability disclosures[3] and providing
949 better customer service (*e.g.*, being more responsive to parents' refund requests for
950 unpermitted spending by children). Whether more established video game
951 companies (*e.g.*, those that have international legal, compliance, and localisation
952 teams and are more heavily scrutinised by players, policymakers, and the press)
953 might generally offer better consumer protection than smaller companies should be
954 assessed by future research.
955
956 In summary, contrary to improving the consumer protection provided to Belgian
957 players as intended, the 'ban' might have had the unintended, opposite effect of
958 creating a more dangerous environment for players. The market has shifted towards
959 higher risk illegal providers. ~~Compliant companies are making less or no revenue:~~
960 ~~assuming that the amount of money spent by players on video games did not~~
961 ~~change following the ban, the non-compliant companies have dishonestly taken a~~
962 ~~share of that revenue away from compliant companies by implementing illegal loot~~
963 ~~boxes.~~ Crime must not pay; the law should never put companies in a position
964 whereby breaking the law becomes more profitable than following it.
965
966 Other variables, such as the operators' country of origin, might also affect whether a
967 company is more or less likely to comply: for example, it is worth noting that Game
968 50 (one of two games that took technical measures to prevent loot box purchase in
969 Belgium) was developed and published by Youda Games and Azerion, both of
970 which are based in Amsterdam, the Netherlands, a neighbouring country that shares
971 close cultural and linguistic links with Belgium, and in which the potential illegality
972 of loot boxes has been recently highlighted. These two Dutch companies might have

more actively complied with the Belgian ban because they were more aware of the regulatory environment in Belgium. Note, however, that Game 78 (the other game that blocked loot box purchase in Belgium) was developed and published by Japanese companies, although the publisher, Bandai Namco Entertainment, is one of the largest multinational video game companies in the world in terms of revenue[86] and therefore likely was well-resourced and had a knowledgeable compliance team. It is worth noting here that maybe some (or even many) of the companies found to still be selling loot boxes in Belgium did not maliciously and knowingly chose not to comply with the law but simply lacked sufficient local awareness and resources to be aware of the ban. Follow-up research on the individual companies as to their compliance decisions (or lack of them) might prove fruitful at revealing what measures could be taken to ensure that they become better informed of, or better able to comply with, their legal responsibilities.

Finally, a previous study has also noted that the likelihood and effectiveness of the companies' compliance might also be affected by game 'genre' and the relative importance of loot boxes as a monetisation method when compared to other in-game microtransactions in a particular game (both financially and in relation to the 'core game loop'[87] (*i.e.*, the essential sequence of actions that are repeated by the player over and over again to engage with the game))[5]. Player communities might expect more from, and exert more pressure on, certain games. Game 50 is a simulated casino game in which using the purchased premium currency to engage with simulated gambling activities (*i.e.*, the 'loot boxes') forms the core game loop. (As an aside, besides the fact that Game 50 is still grossing a significant amount of money from Belgium despite the technical block, one reason why the game remains available in the market and was not removed despite technically not being able to generate any revenue from Belgium is that this game is a multiplayer game. The non-paying Belgian players do provide something of value to the company: these players' presence and participation allow other paying players from other countries to compete against human players (rather than bots) and potentially have more 'fun'). Game 78 is a so-called 'gacha' game in which loot boxes are the principal monetisation method and the player's gameplay progression revolves around engaging with the loot box mechanic[88]. Loot box mechanics are fundamental to these two games' designs, which might explain why the companies operating these two games were more mindful about complying with the Belgian ban. However,

1008   note also that many of the non-compliant games identified by the present study

1009   would also fall broadly within the definition of a simulated casino game or a gacha

1010   game.

1011

1012   **4.2. A toothless 'ban' that is not really a 'ban' in practice**

1013   The Belgian 'ban' on loot boxes is not, at its essence, a true 'ban' of the product. The

1014   Belgian Gaming Commission did issue a report opining that loot boxes that require

1015   payment of real-world money to purchase constitute gambling and are illegal if

1016   offered without a gambling licence[44]. However, that report was issued only on the

1017   basis of the in-depth examination of four then-popular video games[44(p. 18)]. The

1018   Belgian Gaming Commission has not reportedly taken any further action in relation

1019   to loot boxes since then, which means that the Belgian courts have not had the

1020   opportunity to confirm whether that interpretation is indeed valid. Contrast here

1021   with how the Dutch gambling regulator's previous interpretation of the law, which

1022   sought to outlaw certain implementations of loot boxes, has been applied in practice

1023   but has since been overruled by the Dutch court[84]. The Dutch regulatory position on

1024   loot boxes is therefore certain. In contrast, the Belgian Gaming Commission's

1025   interpretation has neither been enforced nor challenged in court, which means that

1026   its correctness is uncertain, despite support by the academic legal literature[10,11,38].

1027   Besides merely pronouncing its interpretation of the law and threatening criminal

1028   prosecution of non-compliant companies[89], the Belgian Gaming Commission has

1029   not attempted to *actively* enforce that interpretation in practice by actually criminally

1030   prosecuting non-compliant companies for implementing loot boxes or seeking to

1031   otherwise remove loot boxes from the national market. The Belgian Gaming

1032   Commission has only *passively* waited for companies to comply: a few did, but most

1033   did not. It is entirely unsurprising that merely stating that the sale of a product (in

1034   this case, loot boxes) is illegal under existing law, without also actively taking

1035   enforcement actions, did not lead to widespread compliance. Consider here, in

1036   contrast, how enforcement actions are actively taken by the police of many countries

1037   in relation to criminalised or otherwise controlled products and services. Indeed, the

1038   Belgian Gaming Commission does take active enforcement actions against websites

1039   offering more traditional forms of illegal gambling (*e.g.*, blackjack) by identifying

1040   them on a published list in addition to threatening a fine[90,91]. Loot boxes, however,

1041   were not subjected to similar enforcement actions.

1042

4.3. The positives: encouraging public debate and providing some protection

In terms of the benefits of the Belgian regulatory approach as it stands, the initial publication of the Belgian 'ban' on loot boxes by the Belgian Gaming Commission led to popular reporting and public discussion and debate of the loot box issue in Belgium and in other countries[92], which were of benefit to the consumers of all countries by facilitating better awareness of this issue and the potential harms of loot boxes. Indeed, policymakers,[47(pp. 33, paras 92–93)][49(p. 111, para 427)] regulators,[93(p. 6)] the media,[55] and some players[see 94] in other countries often pointed to Belgium as a good example of taking proactive action to address loot box harms and argued for their own countries to emulate the Belgian approach. Undoubtedly, the Belgian 'ban' has advanced the international debate on whether loot boxes should be regulated as gambling or otherwise, and this positive impact of the 'ban' should be duly recognised.

Further, it must be recognised that (i) loot boxes have been removed from Belgian versions of some popular games[e.g., 56] and (ii) a number of other popular games have been removed from, or were not published in, the Belgian market[e.g., 59,82,83]. Some Belgian players might therefore have been successfully prevented from being able to purchase loot boxes from these games and potential opportunities to be exposed to loot boxes generally (particularly in relation to children and young people) may have been reduced, despite other games containing loot boxes continuing to be available. However, what percentage of Belgian players that represents is unknown and by how much (if any) average loot box spending has reduced remains the subjects of further research. Although referred to as a 'ban,' perhaps the complete elimination of the product from the Belgian market is not necessarily a goal that the measure must achieve for it to be deemed 'successful.' Even when imperfectly enforced, a 'ban' that potentially leads to reduced exposure to loot boxes and thereby provides better protection is still arguably of benefit to many consumers.

4.4. The negative: a false sense of security

However, the manner in which the 'ban' was then subsequently enforced (or rather, not enforced at all) has a number of potential negative consequences that arguably render the ban worse than doing nothing at all. Firstly, by supposedly imposing a 'ban,' the Belgian Gaming Commission gave video game consumers (including children and parents of young players) the false impression that Belgian players are

1078 now safe from loot boxes because the mechanic has been deemed illegal under

1079 gambling law, 'banned,' and therefore eliminated from the Belgian market. In

1080 reality, loot boxes are evidently still widely available for purchase, and their

1081 potential harms have not been removed from the country and may have reduced

1082 only to a limited extent (which is due to the actions of the finite number of complaint

1083 companies). This unfortunate state of affairs is potentially harmful because

1084 consumers might have been lulled into a false sense of security because they might

1085 think that the loot box 'problem' has been completely resolved by the 'ban' imposed

1086 by the Belgian Gaming Commission. For example, a player choosing to be less

1087 careful with their in-game spending or a parent deciding not to educate their child

1088 about loot boxes because they have been falsely assured that there is no longer any

1089 risk of harm.

1090

1091 More concerningly, Belgian policymakers and the Belgian Gaming Commission itself

1092 might also have been under the same wrong impression that Belgian consumers are

1093 already adequately protected. For example, Belgian legislators might be less willing

1094 to update the country's gambling law to specifically regulate loot boxes because they

1095 might deem the situation as having already been resolved. The Belgian Gaming

1096 Commission might also have not been more active with enforcing the law because it

1097 has not monitored whether its 'ban' has been effective, potentially because of the

1098 same incorrect assumption.

1099

1100 As an aside, this regulatory approach of merely pronouncing an interpretation of the

1101 law that recognises certain loot box implementations as illegal but then not actively

1102 enforcing that interpretation against non-compliant companies (and thereby

1103 potentially creating a false impression that the law has been duly enforced) is what

1104 the relevant gambling regulators have done in the UK and Denmark (and other

1105 countries) in relation to loot boxes that require real-world money to purchase and

1106 provide rewards that can be transferred to other players in exchange for real-world

1107 monetary value.[95] This lack of enforcement action is likely why certain games, *e.g.*,

1108 *Magic: The Gathering Online* (Wizards of the Coast, 2002), containing loot boxes that

1109 arguably infringe relevant gambling laws as interpreted by the national regulators

1110 remain available and have not been forcibly removed from those markets[96].

1111

1112 **4.5. Criminalisation: the 'forbidden fruit effect' and stigmatisation**

1113   Moving beyond how the 'ban' has been practically applied in Belgium, consideration

1114   should also be given to the negative consequences of this restrictive approach on a

1115   theoretical level, even if the ban is perfectly enforced. The very act of prohibiting a

1116   product potentially leads to a number of adverse effects. The so-called 'forbidden

1117   fruit effect' has been identified in relation to media content[97,98], including video

1118   games specifically[99]. Products that are prohibited becomes more appealing to young

1119   people precisely because they are deemed 'forbidden.' This might apply to loot

1120   boxes in the sense that some Belgian children might now be more interested in

1121   purchasing loot boxes because these products have been deemed 'illegal' or

1122   'banned.' The same might even be true in relation to adults because no video game

1123   loot boxes have been duly licensed as regulated gambling by the Belgian Gaming

1124   Commission (as the regulator is not legally empowered to approve and license any

1125   randomised monetisation methods in video games, specifically) and therefore all

1126   video game loot boxes remain unlicensed and technically 'illegal,' even when

1127   engaged with only by adults.

1128

1129   Indeed, the criminalisation of the purchasing of loot boxes is problematic. It must be

1130   recalled that Article 4(2) of the Belgian Gambling Act of 7 May 1999 states that: 'It is

1131   prohibited for anyone to participate in a game of chance … when the person

1132   involved knows that it concerns the operation of a game of chance or a gaming

1133   establishment which is not licensed in accordance with this Act.' In relation to

1134   unlicensed websites offering more traditional forms of illegal gambling, the Belgian

1135   Gaming Commission warns would-be punters that 'Gambling on an illegal

1136   gambling site is even punishable by law! Players can be fined between €26 and

1137   €25,000 (multiplied by a multiplication factor) if they knowingly played on an illegal

1138   gambling site[90].' Most Belgian loot box purchasers can likely escape liability by

1139   arguing that they were not aware of the video game company not having been duly

1140   licensed to provide gambling services, and it would appear highly unlikely for any

1141   Belgian loot box purchaser to be criminally prosecuted simply for fairness reasons

1142   (due to the unclarity and uncertainty of the Belgian legal position on loot boxes,

1143   given that the law does not explicitly say that loot boxes constitute illegal gambling

1144   and that the Belgian Gaming Commission merely provided its, as yet unchallenged,

1145   interpretation of the law that has not been confirmed by the court). However, given

1146   that any and all loot box purchasing is technically criminalised, players experiencing

1147   excessive loot box engagement and suffering harms from overspending might be

1148 less willing to seek help and treatment. This stigmatisation of loot box purchasing
1149 potentially increases the severity of the harms that at-risk players might experience.
1150 How gambling behaviours will now potentially develop differently in Belgian
1151 young people and emerging adults especially, as compared to those of other
1152 countries, due to Belgium's unique regulatory position, should be studied. Other
1153 potential disadvantages of an effectively enforced ban should be subject to future
1154 studies (*e.g.*, the potential loss and unfair distribution of economic opportunities for
1155 companies and negative impacts on players' gameplay experience, including
1156 rendering Belgian players uncompetitive particularly in relation to esports games
1157 that require loot box purchasing to gain gameplay advantages).
1158
1159 **4.6. How can the Belgian Gaming Commission do better?**
1160 Belgium might wish to double down on this restrictive approach (as it does
1161 presently appear to have popular support, although that might dissipate when the
1162 approach's various disadvantages and the heavy financial costs of fully enforcing
1163 the law are brought to the electorate's attention).
1164
1165 Recognising that some companies might have failed to comply only due to not
1166 knowing about their responsibilities (rather than maliciously), it has to be
1167 questioned whether the Belgian Gaming Commission has promoted the fact that a
1168 loot box ban is in effect in the country sufficiently widely, especially to video game
1169 companies in distant countries, *e.g.*, China. A promotional campaign, where the
1170 Belgian Gaming Commission collaborates with major hardware and platform
1171 providers (*e.g.*, Nintendo, Microsoft, Sony, Apple, and Google), could attempt to
1172 highlight the ban prominently (*e.g.*, a pop-up warning as part of the process for
1173 submitting a game to the Apple App Store, if the company chooses Belgium as a
1174 national store where the game should be published). Apple, for example, already
1175 asks companies to self-declare how frequently certain content appears in a game in
1176 order to provide an Apple Age Rating. As part of that process, specifically in
1177 Belgium, Apple could ask the question of whether loot boxes are sold in a game. If
1178 the company responds positively, Apple should inform the company about
1179 Belgium's ban on loot boxes and reject the game from the submission process. Apple
1180 already requires loot box probability disclosures[100], so evidently it is concerned by
1181 and willing to address the issue to some extent (albeit that Apple has seemingly not
1182 enforced its own self-regulation to ensure games do make probability disclosures[5]).

1183

1184 Regardless, to achieve a better compliance rate, the Belgian Gaming Commission

1185 must then need to carry out its threat of criminal prosecution of non-compliant

1186 companies. Doing so would likely forcibly remove many loot boxes from the market.

1187 Note that actually enforcing the law here is likely to lead to a legal challenge of the

1188 Belgian Gaming Commission's interpretation of the law by one of the prosecuted

1189 companies. That legal challenge might be decided either way. The court might

1190 approve the Commission's position or reject it. If the former happens, then the

1191 Belgian Gaming Commission can continue to enforce its interpretation. However,

1192 even if the latter happens, this will resolve the current confusion as to what the

1193 Belgian regulatory position on loot boxes truly is. If existing Belgian law cannot be

1194 interpreted as outlawing all paid loot boxes, then the Belgian Gaming Commission

1195 cannot be allowed to purport to take enforcement actions *ultra vires* or beyond its

1196 powers and without legal authority. An amendment of gambling law by the

1197 legislature to criminalise paid loot boxes should then follow if the ban is to truly be

1198 imposed. Indeed, even if the ban can no longer be maintained, this would provide

1199 legal certainty and likely lead to the more compliant companies re-entering the

1200 market and thereby providing players with more game options and likely better

1201 consumer protection as compared to what is currently being offered by non-

1202 compliant companies.

1203

1204 The main problem with enforcing the law is, however, whether it would be practical

1205 or cost effective to do so. This undertaking requires significant financial resources,

1206 manpower, and technical expertise, which the Belgian Gaming Commission

1207 arguably does not sufficiently possess, particularly in relation to non-traditional

1208 forms of gambling like video game loot boxes. This is evident in the lack of

1209 enforcement action, despite obvious loot box contraventions being widely available

1210 and highly popular. The recovery of any costs incurred by the Commission's

1211 enforcement actions through fines is likely difficult in relation to international

1212 companies with little to no corporate presence in Belgium. Further, it does not seem

1213 realistic to expect the Belgian Gaming Commission to examine every single video

1214 game on every platform (and every subsequent update to those games) and then to

1215 criminally prosecute each non-compliant case. As of June 2022, there are already

1216 over 1,000,000 individual games on the Apple App Store alone[101]. Note, however,

1217 that direct criminal prosecution of *all* illegal loot box implementations is only one

1218 (very costly) potential approach to enforcement. Less direct and cheaper approaches,

1219 such as issuing correspondence addressed to individual companies prior to litigation

1220 requesting changes to game design and threatening prosecution might be sufficient

1221 at ensuring compliance and be more cost effective.

1222

1223 The regulator could perhaps work in closer collaboration with academic researchers:

1224 the present study's results have been shared with, and were indeed of great interest

1225 to, the Belgian Gaming Commission and was ironically funded by 'regulatory

1226 settlements applied for socially responsible purposes' received by the UK Gambling

1227 Commission. Enforcement could also potentially be 'crowdsourced' in the sense that

1228 players are provided with a channel to report non-compliant games, thus reducing

1229 the Commission's workload. What the Belgian Gaming Commission could

1230 alternatively consider is an *ex ante*, whitelist, licensing system, rather than an *ex post*,

1231 blacklist, enforcement system, similar to the regulatory approach taken by China in

1232 relation to the publication of video games. Instead of allowing any games to be

1233 published on these app stores or hardware platforms and then seeking to remove

1234 and prosecute non-compliant games afterwards, only games on a pre-approved list

1235 are allowed to be published in the first place. The relevant Chinese regulator, the

1236 National Press and Publication Administration (国家新闻出版署), therefore has the

1237 opportunity to review any video games, both domestic and international, before

1238 they are published and allowed potentially to cause harm to players[102,103]. Indeed,

1239 charging a fee for this pre-approval process and for maintaining a licence would

1240 allow the regulator to recoup the costs associated with reviewing the game and

1241 taking enforcement action. Such a system would also provide opportunities to assess

1242 companies' compliance with other obligations (*e.g.*, whether probability disclosures

1243 were made).

1244

1245 Another manner by which the Belgian Gaming Commission could seek to enforce

1246 the law is to place the burden on ensuring compliance on platform providers, such

1247 as Apple, rather than going after individual video game companies. Apple, for

1248 example, is arguably facilitating the sale of illegal loot boxes by providing a platform

1249 for this to happen on a large scale. Indeed, loot box sales would not generally be

1250 possible through Apple's propriety iOS platforms, unless Apple allows it. Further,

1251 Apple generally receives a 30% commission on most in-app purchase made

1252 (although this is lower in some limited cases)[104]. In Belgium, Apple is therefore

1253   profiting on the illegal sale of loot boxes whenever a purchase is made. This could

1254   arguably be recognised as Apple aiding and abetting the commission of a criminal

1255   offence and its receiving and handling of criminal proceeds, which may fall within

1256   the ambits of money laundering regulation. The Belgian Gaming Commission could

1257   consider enforcing the law against Apple (as an accessory to the crime, arguably), or

1258   if that is not yet legally possible, impose new laws to require Apple and other

1259   platform providers to ensure that only games without loot boxes can be published.

1260   There are even precedents on this point. When put under regulatory pressure, Apple

1261   removed all unlicensed and non-whitelisted games from China at the end of 2020:

1262   reportedly, only 0.5% of the top paid games were duly licensed and 'survived the

1263   purge'[105]. Apple also specifically implements the national video game age rating

1264   system in Brazil, in addition to its own age rating[106]. Evidently, Apple is capable of

1265   and willing to take national compliance actions when required.

1266

1267   Seeking to regulate more strictly or asking the platform providers to assist in

1268   regulating might work in most cases to prevent players from unknowingly

1269   encountering loot boxes and being potentially harmed (although it should be

1270   queried what percentage of these players could actually potentially be harmed and

1271   whether a vast majority of them can enjoy loot boxes 'safely'[107]). However, on other

1272   more open platforms, such as PC and Android, an installation file that does not need

1273   to be downloaded from 'official' app stores and can be easily obtained by potential

1274   players through any online channels, such as an .apk (Android Package) file, could

1275   be used to play games. These games would be even more difficult to monitor and

1276   enforce against, as platform-based regulation would not be possible.

1277

1278   Therefore, besides identifying and prosecuting non-compliant companies still

1279   offering loot boxes in Belgium, consideration should also be given to the separate

1280   issue of how to deal with players that knowingly try to circumvent the ban. The

1281   negative stigma-related consequences of individually prosecuting players for

1282   purchasing loot boxes have already been addressed. Indeed, even if the Belgian

1283   national versions of the platforms, such as the Apple App Store, are hypothetically

1284   scrubbed clean of any games containing loot boxes, either through the Commission's

1285   actions or the platforms' actions, players who wish to do so would still be able to

1286   easily circumvent these technical measures using extremely basic and free methods

1287   (*e.g.*, changing the Apple App Store's country setting to another country or

activating a VPN), as the present study has shown. For context, research on underage online pornography use has found that 46% of 16- and 17-year-olds use VPNs and similar age-verification circumvention tools[108]. When a Belgian player seeking to actively circumvent the ban has managed to download, play, and pay for loot boxes in a video game that the company has purposefully chosen not to publish in Belgium due to the country's loot box ban, it cannot becomesbe said difficult to argue that the company or platform provider should still be deemed culpable in such cases, provided that reasonably strong technical measures have been implemented to prevent such circumvention. The Google Play Store, for example, only allows users to change their country settings once per year[109], and is therefore arguably doing better at preventing potential circumvention than the Apple App Store, which places no restrictions on changing country settings (although Google is also arguably constraining consumer rights more by more strictly restricting what users can do, which governments might not wish to further encourage). Belgium should therefore consider requiring companies and platform providers to implement sufficiently difficult-to-circumvent technical measures. However, this might be difficult to enforce in practice: the IP address checks implemented by Games 50 and 78 should not be deemed as satisfactory, and it might be the case that no such technical measures are yet available or that requiring the implementation of such a measure and the active development of ways to thwart new circumventions is not economically feasible. Indeed, in a related context, digital rights management (DRM) technology for video games is used only to provide temporary intellectual property right protection against piracy during the initial sales window and is not designed to be permanently uncrackable (given that the development of which is likely impossible)[110]. The development of an impervious loot box purchase-blocking technical measure might similarly not be possible. Any regulation should also be cautious as to not mistakenly identify a player against whom the technical measures have failed without said player intending to attempt circumvention (*e.g.*, the author's experience at Brussels International Airport in relation to Game 50 detailed in the Method section) as a player who has *intentionally* tried to circumvent the technical measures.

Importantly, the most dedicated and highest-spending loot box purchasers, who are arguably most at risk of harm and therefore most in need of consumer protection, would likely choose to circumvent any 'ban.' Therefore, it must be duly noted that

1323 any approach that seeks to forcibly remove loot boxes may be unlikely to be of
1324 assistance to the most vulnerable players. This is similar to how technical bans of
1325 online gambling in many countries can be easily circumvented by dedicated
1326 gamblers and how an effective blanket ban is not feasible[111]. Further research
1327 should consider the perspectives of high-spending Belgian players and, in particular,
1328 their views on circumvention and whether they have attempted to do this.
1329
1330 **4.78. Some reflections for the Belgian public and Belgian policymakers**
1331 The Belgian Gaming Commission instituted the ban through applying pre-existing
1332 gambling law that did not envisage technological developments, such as video game
1333 loot boxes. This means that, technically, the Belgian 'ban' on loot boxes was applied
1334 executively by the regulator (albeit based on duly passed legislation). Therefore, it
1335 cannot be said that the ban itself was truly approved through a democratic process.
1336 Neither the Belgian electorate nor their representatives specifically voted on this
1337 policy question. It is not known whether the ban has popular support, especially if
1338 the present evidence on the ineffectiveness of the ban as currently applied is made
1339 known. Importantly, Belgian policymakers should not consider the loot box issue as
1340 having been 'solved' and should not be dissuaded from updating existing gambling
1341 law to address current and developing issues. Indeed, other gambling-like products
1342 are being actively invented, including video game loot boxes that contain NFTs
1343 (non-fungible tokens) that can be freely bought and sold between players for real-
1344 world monetary value in *Gods Unchained* (Immutable, 2021)[112] and virtual packs of
1345 NFTs that do not even relate to a video game, such as NBA Top Shot[113]. Some
1346 consideration should also similarly be given to older gambling-like products that
1347 have seemingly escaped regulatory scrutiny despite literally contravening gambling
1348 law, *e.g.*, booster packs of randomised collectible and trading cards[113,114]. The uneven
1349 manner by which loot boxes have been targeted with a ban and physical card packs
1350 (real-life loot boxes) have not been addressed at all is arguably discriminatory
1351 against the video game industry[107].
1352
1353 Indeed, the Belgian public should not assume that their consumer protection is now
1354 guaranteed: it is not. Belgian consumers should continue to demand policy change
1355 in relation to loot boxes, other gambling-like products and gambling regulation in
1356 general, if they deem these appropriate and necessary. Finally, note that Belgian
1357 policymakers and consumers should consider the economic benefits of providing

duly licensed video game loot boxes to adults (*e.g.*, tax revenue), given that duly licensed traditional gambling is permitted. Presently, Belgian gambling law does not allow loot boxes to be licensed at all; the Belgian Gaming Commission is not empowered to do offer such licenses. There is therefore discrimination against the video game industry as compared to the traditional gambling industry, which is allowed to provide products and services costing real-world money and involving 'randomisation.' If video game companies are willing and technologically able to provide verifiably 'fair'—in the sense of being transparent and reliable, and not necessarily in the sense of ethical loot box design[61,64,65]—loot boxes (and this does appear to be the case), then Belgium should consider legalising licensed loot boxes (at least for sale to adults) as long as traditional gambling remains lawful.

4.89. Should other countries emulate Belgium's 'ban' on loot boxes?

Many stakeholders[47(pp. 33, paras 92–93)][49(p. 111, para 427)][93(p. 6)][55][see 94] have argued that other countries should also follow Belgium's lead and ban loot boxes. However, doing so might not work as well as intended. Notably, as the present study has proven, the Belgian 'ban' on loot boxes has not been actively enforced. Another country emulating the Belgian regulatory position as it currently stands is unlikely to achieve a significantly better result. The present study cannot provide empirical evidence on whether an actively enforced ban could be effective at reducing loot box prevalence. However, any country considering also banning loot boxes should consider whether its gambling regulator (or relevant enforcer of the law) is capable of ensuring that the ban is actually effectively enforced. Unless another country has a regulator that is much better resourced than the Belgian Gaming Commission, it also does not appear likely that a loot box ban would work in that country. Further, regardless of whether a ban works in that country, potential circumventions would be similarly difficult to prevent, and the negative consequences of this restrictive approach and the economic benefits of legalising loot boxes detailed above must be duly considered (particularly in territories where traditional gambling is legal).

4.89.1. Alternative harm-reduction approaches to a 'ban'

Given that a ban is costly to enforce; may not work effectively against the most dedicated and highest-spending players who will likely circumvent it; and leads to a number of potential negative consequences for all stakeholders, other countries should consider adopting a less restrictive approach to loot box regulation[107]. Loot

1393   boxes cannot easily be banned, and they are likely to remain an important aspect of
1394   video game monetisation for years to come. Citing the 'significant limitations'
1395   (including financial strains on the gambling regulator and the need to amend other
1396   laws) of a restrictive approach to loot box regulation[115(paras 34–36)], the UK Government
1397   has, for example, decided against regulating loot boxes as gambling (and outlawing
1398   their sale to children) and is instead exploring a non-restrictive, industry self-
1399   regulatory approach (whose success remains to be assessed)[115(paras 232, 241–243)]. Some
1400   stakeholders might find this to be unsatisfactory and difficult to accept, but one
1401   ought to consider how to regulate loot boxes in light of this. A public health
1402   approach to the issue allows for a whole range of other potential approaches of
1403   varying levels of restriction to be considered[95]. The adoption of 'ethical game
1404   design' has been one suggested approach: specifically, (i) particularly harmful
1405   aspects of loot box design could be removed (as Japan has done in relation to the so-
1406   called 'kompu gacha,' which required players to collect a complete set of loot box
1407   rewards to then obtain a further reward[116(pp. 311–312)]) and (ii) other loot box designs
1408   that appear less likely to be harmful could be trialled (as some companies have done,
1409   albeit perhaps more for commercial reasons, rather than to provide better consumer
1410   protection)[61,64,65]. However, such an approach that seeks to mandate ethical game
1411   design by law or industry self-regulation still faces the same enforcement issues as
1412   attempting to implement a ban[65]. Crowdsourcing (*e.g.*, player activism) and
1413   obtaining support from academic researchers, as previously recommended to the
1414   Belgian Gaming Commission for enforcing the ban, might help.
1415

1416   Further or alternatively, recognising the enforcement limitations of any consumer
1417   protection measure, countries should consider dedicating resources to educational
1418   campaigns and other preventative programmes that would better inform consumers
1419   to be mindful of the potential harms of loot boxes, *e.g.*, classes in school (not only for
1420   young people, but also for their parents and guardians) dedicated to enhancing
1421   'ludoliteracy' (or knowledge about video games). Previous experience from other
1422   industries providing potentially harmful products, *e.g.*, alcohol, tobacco, and
1423   traditional gambling, has suggested that these educational programmes might be at
1424   risk of being 'hijacked' by industry interests and thereby fail to promote an unbiased
1425   narrative, *e.g.*, normalising alcohol use[117]. Therefore, when designing and
1426   implementing such programmes, countries ought to be mindful of potential industry
1427   influences and ensure that the relevant audience is not potentially misled. For

example, how much and what kind of (potentially valuable) input the video game industry should be allowed to provide to such programmes should be carefully considered.

4.~~10~~9. Limitations

The present study interpreted 'loot boxes' broadly as including any in-game transaction involving randomised elements. For example, in relation to Game 100, *League of Legends: Wild Rift* (Riot Games, 2020), a loot box was positively identified because the player was able to spend real-world money to purchase a 'season pass,'[118] which allowed the player to obtain additional rewards through gameplay[119], and some of the rewards obtained through the paid season pass allowed to player to engage with a loot box mechanic. There is debate within the academic literature as to how broadly the term 'loot boxes' should be interpreted[75,cf 80]. Had a more restrictive definition for 'loot boxes' been applied, a lower prevalence rate would have been observed.

Inversely, similarly to previous loot box prevalence studies adopting the same methodology, the present study might have observed a loot box prevalence rate that was lower than the true value because some games might have implemented loot boxes that could only be encountered after a significant length of gameplay, beyond the time limit (*i.e.*, one hour) that the present study's methodology allowed for. It is highly likely, for example, that Game 96, *DomiNations* (Nexon & Big Huge Games, 2015), contained loot boxes (specifically, the Council Recruitment system) that were accessible only after a few dozen hours of gameplay given that suspected loot box probability disclosures were found in said game.

In addition, as with previous loot box prevalence studies, the present study examined the highest-grossing video games and so the results might differ if the sample was selected randomly amongst all available iPhone games. On one hand, it is possible that the highest-grossing games are more likely to comply because they are the most popular and frequently scrutinised by players, fellow companies and the regulator. On the other hand, it is possible that more compliant games that removed loot boxes are now performing worse financially and not appearing in the highest-grossing list. The present results should be treated as a snapshot of the

1462 situation as it stands with the most popular games and not as a reflection of the
1463 whole situation on the Belgian Apple App Store.
1464
1465 In addition, the present study and previous loot box prevalence studies have treated
1466 the country that the specific Apple App Store belongs to as reflecting the national
1467 situation. However, the present study has shown that it is easy to switch to a
1468 different country's store and also to spend money in a country different from the
1469 store's national identity (and still have the revenue count towards the national
1470 store's total revenue). Therefore, a due amount of caution must be exercised when
1471 interpreting the present results as perfectly reflecting the Belgian national situation
1472 because it is possible that many Belgian players are spending money in other
1473 countries' Apple App Store (*e.g.*, the Dutch or French Apple App Stores) and that
1474 Belgian players, when abroad, might also be contributing towards the Belgian Apple
1475 App Store's revenue even though they are in a different country. The national store
1476 cannot be used to determine the actual location of players but merely what
1477 Country/Region settings were used by the player at the relevant time. Finally, the
1478 present study examined only iPhone games. The situation on other platforms might
1479 be different: the 'big three' home console providers (Nintendo, Microsoft, and Sony),
1480 as platform providers, likely exercise stricter control on the availability of loot boxes
1481 in the limited number of console games published in Belgium, as compared to
1482 Apple, which cannot realistically individually assess the more than 1,000,000 games
1483 available on its market.
1484

1485 **5. Conclusion**
1486 Many video game companies are 'breaking the ban' in Belgium (maliciously or
1487 unknowingly) by continuing to offer loot boxes for sale in exchange for real-world
1488 money. Players in Belgium are able to 'break the ban' by easily circumventing any
1489 technical measures put into place to prevent loot box purchase (*e.g.*, IP address
1490 checks and removal of games from the Belgian national market). Belgian's loot box
1491 'ban' is 'breaking' because it has not been effective at reducing the prevalence of loot
1492 boxes in the country as the national gambling regulator has not actively enforced the
1493 law and merely passively waited for companies to comply. Finally, a blanket 'ban'
1494 approach to loot box regulation may be inherently 'broken' as it has many
1495 disadvantages that arguably outweigh its one advantage of providing better
1496 consumer protection.

1497

1498 The Belgian ban on loot boxes is not working at present due to its poor

1499 implementation. With better enforcement, this approach could potentially be more

1500 effective and reduce loot box prevalence, thus enhancing consumer protection from

1501 potential harms. However, even had the ban been perfectly enforced domestically, it

1502 likely would not have blocked some highly dedicated players, who are arguably

1503 most at risk of potential harms and in need of consumer protection, from easily

1504 circumventing the ban. Belgium should re-evaluate its current regulatory position:

1505 either enforce the law as promised or repeal this in-name-only 'ban' and pursue

1506 alternative regulatory options. Put simply, either 'buff' enforcement or 'nerf' the ban.

1507 Other countries are recommended to consider adopting other less restrictive

1508 approaches to loot box regulation that more effectively balance the potential harms

1509 and benefits of loot boxes.

1510

1511 **6. Postscript**

1512 For context, since the publication of the preprint version of the present study on 28

1513 July 2022, several media websites have reported the findings. A Flemish piece

1514 published in both *Het Nieuwsblad*[120] and *Gazet van Antwerpen*[121] on 13 August 2022

1515 included an official response from the Belgian Minister of Justice, Vincent Van

1516 Quickenborne. A relevant translated excerpt of that piece is provided below for

1517 context:

1518

1519   The Gaming Commission admits that there is a problem, but says it has too

1520   few resources. "It is not possible to control for all small-scale games of

1521   chance." Furthermore, the [compliance checking procedure] was said to be

1522   too slow.

1523

1524   …Van Quickenborne … emphasizes that … strict action [was taken] in the

1525   past… FIFA18 had to get on its knees and remove loot boxes. "But taking

1526   action against disguised games of chance such as these is not obvious. We

1527   want to better arm the Gaming Commission by reforming the law." […]

1528

1529 In addition, since publishing the preprint, in relation to Game 8, 'a Roblox-led

1530 program to comply with laws in The Netherlands and Belgium,' has reportedly

1531   caused the removal of user-generated content involving loot boxes from *Roblox* in

1532   Belgium[122].

Data Availability Statement

The raw data, a full library of video game screenshots showing, *inter alia*, any identified loot boxes, and the data analysis script and output are openly available in the Open Science Framework at https://doi.org/10.17605/OSF.IO/7KJS9.

Positionality Statement

When drafting and revising the stage 1 registered report and when conducting fieldwork in Belgium, the author was open to the idea that a 'ban' approach to loot box regulation might potentially be effective and worth pursuing, although he was slightly sceptical. However, after the results have been analysed and the disadvantages of a 'ban' were considered and after meeting with the Belgian Gaming Commission to discuss the (im)practicalities of enforcing a ban, in drafting and revising the stage 2 registered report, he wrote with the perspective that a 'ban' approach to loot box regulation is unlikely to be worth pursuing economically. As he subsequently wrote in a guest post on GamesIndustry.biz on 20 September 2022: 'As to exactly how loot boxes should be regulated more broadly, I personally advocate for a more middle-ground approach to loot box regulation. Doing nothing fails to adequately recognise and address the potential harms, but banning the mechanic is likely going too far and removing the economic benefits of loot boxes (for both companies and players)'[123]. In terms of the author's personal engagement with loot boxes, he plays video games containing loot boxes but he has never purchased any loot boxes with real-world money.

perspectives from other disciplines that informed this manuscript. Thanks to Sarah Saines, Moriom Khan and others at Queen Mary University of London for helping with the funding grant application and expense claims. Finally, thanks to Jonathan Van Damme at the Belgian Gaming Commission for meeting with the author to discuss the present findings and share the regulator's perspective. The title of this paper is inspired by the television series *Breaking Bad* (2008–2013) and refers to how the author has gone to Belgium to 'break the law' to prove that the Belgian 'ban' on loot boxes is 'breaking' because the regulatory system is being 'broken' by both companies and players and how a 'ban' approach to loot box regulation is arguably inherently 'broken.'

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Appendix 1: A priori Power Analysis

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Fig. A1: A priori power analysis for Hypothesis 3 using G*Power, given an α value of .05 and assuming an effect size of Hedges' $g = -.15$. A sample size of 100 games achieves .86 power.

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Appendix 3: Discussion of the Removal of Game 36

2070 The commencement of the present study's data collection may have caused Game

2071 36's removal from the Belgian Apple App Store. For full disclosure and context, the

2072 stage 1 registered report for the present study setting out the methodology was

2073 published on 7 April 2022, and the author did publish various online content about

2074 this then upcoming study, including publishing one Twitter post on 30 June 2022

2075 implying that data collection has begun[124]. Game 36 appears to have been removed

2076 from the Belgian Apple App Store between 31 May 2022 and 1 June 2022 as the game

2077 appeared on the highest-grossing list on 31 May 2022 but did not do so on 1 June

2078 2022. It is also curious that the game has been removed *only* from the Belgian store

2079 and remained available (and high-grossing) in all other countries checked,

2080 specifically, Denmark, France, the Netherlands, the UK, and the US, according to

2081 data.ai, as shown in Figure S1.
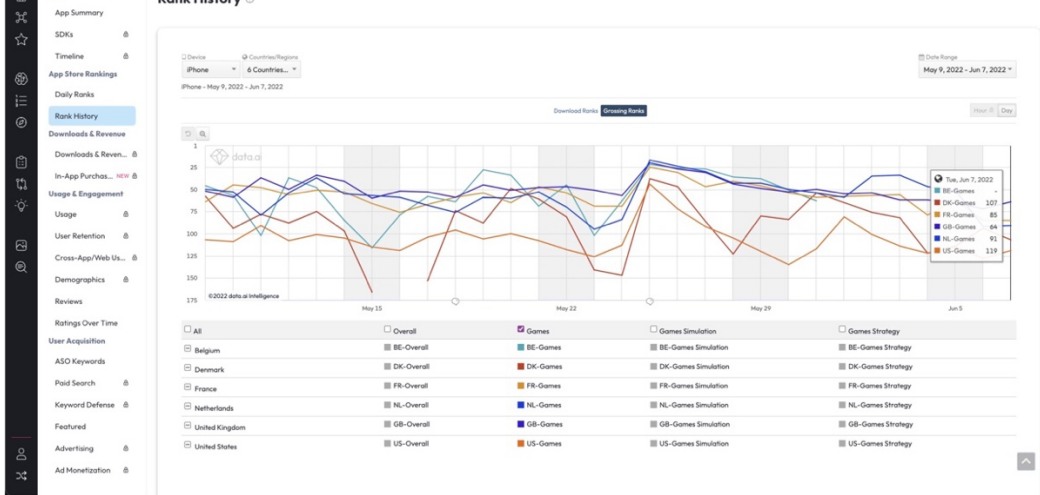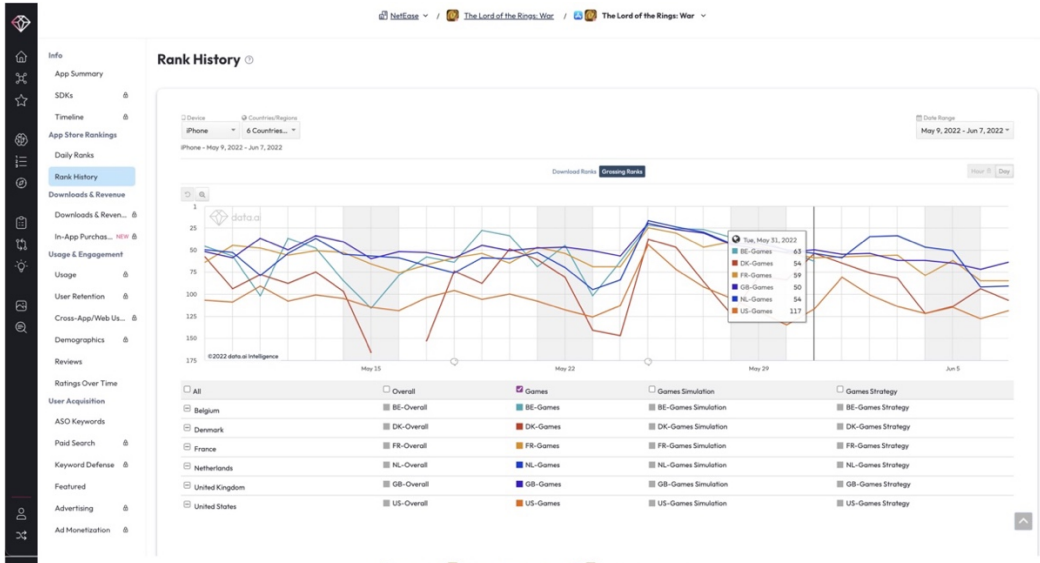
Figure S1. A series of screenshots of the grossing rank of Game 36 (*The Lord of the Rings: War*) in various countries demonstrating the removal date of said game from the Belgian Apple App Store (between 31 May and 1 June 2022) and how said game was curiously not removed from the Apple App Stores of Denmark, France, the Netherlands, the UK, and the US. © 2022 data.ai.