Explaining Gambling Behaviour among the Youth in Kenya

By

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DECLARATION

The originality of this research report is uncontested, and; I do declare that this research is neither copied/stolen from the research of others nor a misrepresentation of the works of others. Lastly, I confirm that an excerpt of this research has been submitted to an essay competition convened jointly by the Massachusetts Institute of Technology (MIT) and the Central Bank of Kenya (CBK). Competition conveners were duly informed about this development. The aforementioned submission was made following a common understanding with, and the approval of, my research advisor. Any responsibilities, however, that may emerge shall be borne entirely by me.

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October 20th, 2022

This examinable research report has been submitted to the University of Nairobi with my consent as the designated University Supervisor.

Signature

Dickson Wandeda, PhD

Date ……31/10/2022…….

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God's Providence has been the pillar upon which I leant, and it is from Him that I drew the strength to work on this research as well as the much-needed sanity. If it were not God's hand coming into play, nothing much would have materialized. I understand that all knowledge and understanding comes from God. Foremost, therefore, I acknowledge the Almighty God for everything, including that which I am yet to comprehend. To God alone be the glory!

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DEDICATION

This report is dedicated to my grandmother, Mary Sibuchi, and to my mother, Lily Anne Wanja, for always being there for me. This research is further dedicated to Mr. Daniel Wanjala, Mr. Robert Namunguba, my aunt Mildred Sibuchi, and to my future family.

In loving memory of Rosemary Naswa, Francis Wafula, and Margaret Sibuchi. May the vision and dreams of grandma, dad, and mum, respectively, be actualized in my days.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

In the face of the negative publicity which gaming has attracted recently, this research sought to unearth drivers of gambling behaviour among the youth in Kenya. To this end, indebtedness was introduced as an undesirable outcome and three gaming dimensions examined. These dimensions were: gaming propensity, intensity, and efficiency. Utilizing the Financial Access Survey 2021 dataset on 22024 households, and employing both the Cragg hurdle model and stochastic frontier analysis, this research documents that age cohort is not a significant predictor of gaming although a youth is a more efficient gamer. Second, this research provides evidence for gaming expenditures significantly declining in rural employment. The effect of indebtedness on gaming is, however, varied. On one hand, indebtedness moderates the effect of other factors on gaming. On the other hand, this research established that indebtedness, on its own, had three-fold effects: savings-backed loan repayment raised gaming propensity, expenditure efficiency, and technical inefficiency, and; food expense reduction-backed repayments enhanced gaming efficiency while reliance on more work to repay loans was associated with higher technical inefficiency and higher expenditure efficiency. Third, within the income/ poverty context, individuals were less likely to gamble as incomes rose but among those opting to gamble, gaming expenditures rose in income. Food secure individuals also spent more on gaming than food insecure individuals whereas gaming and energy poverty had no association. This research, therefore, recommends, among other things, improvements in rural employment and financial prudence such that individuals and debtors do not have to rely upon the gaming market.

Key words: financial access, gambling behaviour, undesirable outcomes, youth

1. INTRODUCTION

1.0 Study Background

Although gaming is beneficial to profit-oriented betting firms[1], the government through tax revenues and licences[2], telco[3], and the lucky gamers through winnings revenues, the associated economic costs to the society as well as to an individual's health are not insignificant (Booth et al [14]). These costs are, however, not considered by the individual gamer and could effectively be borne by the gambler's close relations (Latvala et al [59]). Besides, gaming effects are rarely domiciled to the individual or their close ties. Through the endowment effect, for instance, gaming affects participation on the labour market. Gaming externalities including bankruptcy bailout and housing individuals rendered homeless through 'irresponsible' gaming, on the other hand, is a burden borne by the society (Latvala et al [59]). Booth et al [14] revealed rising tendencies to shift away from gaming as an entertainment to pathological gambling. Johnstone & Regan [46] associated pathological gambling to individual depression. Providing healthcare to depressed individuals is an additional burden to the society (Howe et al [43]). Moreover, poor mental health hinders worker productivity, and thus affects labour market outcomes negatively. This suggests that pathological gambling is both a 'public health problem' and a precursor to the gambling crisis, globally (Seal et al [90]).

[1] UK Gambling Commission 2020 estimates wagers amounting to $130billion and gambling net revenues equal to $2.8billion in the United Kingdom in 2019.

[2] Gambling generated close to $50 billion in revenues in 2019 around the world (Dhandhania & O'Hoggins [25]).

[3] In the 6month period to November 2021, for example, wagers amounting to KSH 83billion were staked via MPesa. https://www.businessdailyafrica.com/bd/economy/kenyans-place-sh83-2bn-m-pesa-bets-six-months-3614814. Between March 2021 and March 2022, MPesa wagers amounted to KSH 169.1billion. https://nation.africa/kenya/business/kenyans-spend-sh169bn-on-gambling-via-m-pesa-3813534.

Calado & Griffiths [16] give a 0.1-3.4% pathological gambling prevalence rate globally, with Churchill & Farrell [6] attributing the gambling crisis to social capital depravity. According to Churchill & Farrell [6], poor social networks render it difficult for individuals to secure formal jobs. The estimates could be much higher, however. Howe et al [43], for example, indicate gambling disorder in some countries averaging 5.8-7.6% in 2019. Kaggwa et al [47] revealed that, globally, 1 in every 4 persons[4] gambled in 2021. Overall, gaming prevalence has increased globally, alongside a remarkable increase in gaming availability, and gambling-related spending (Abbott [1]). Various governments have formulated and implemented policies intended to tame the gambling crisis although government positions with regard to gaming are jurisdiction-specific (Diaz [25]). These regulations include the Gambling Act of 2003 in New Zealand, the 2005 United Kingdom (UK) Gambling Act, the Interactive Gambling Act of 2001 in Australia, and Japan's 2018 Integrated Resorts Implementation Bill (Watanapongvanich et al [103]). While regulations seek to protect gamers, anti-ban lobbyists rally behind the need to generate more revenue in taxes[5] (Humphreys [41]). In some instances, anti-ban lobbyists justify the existence of gambling with an increase in betting firms' corporate social responsibility (CSR) as a 'responsible gambling[6] agenda'. Instead of dissuading individuals, this agenda nudges them towards higher gaming frequencies and higher levels of gaming expenditures. With more resources being directed towards gaming, less is available for consumption of non-gaming related commodities and investment elsewhere.

[4] The actual figure was 26% (Doğan [47]).

[5] A repeal of the 1992 Professional and Amateur Sports Protection Act in 2018 in the United States was followed by an additional $2.6million from betting on sports (Chow et al [41]).

[6] In Spain, for instance, this agenda is pursued under the 'Responsible Gambling Strategy' (Dhandhania & O'Hoggins [24]).

Various reasons have been fronted to explain gaming behaviour, which in the broadest sense fall under two paradigms[7], namely; the theory of prospects, and the theory of expected utility. Winning a wager, for instance, implies higher incomes which in turn raises an individual's purchasing power [9]). This, in turn, brings about higher levels of satisfaction (Nyman [79]). Besides, higher incomes necessarily coerce individuals to spend more both on wagers and other commodities. That is, as incomes rise, individuals become more impatient, and hence raise their current levels of consumption. A plausible suggestion is that winning a wager nudges a gamer towards staking more money in the hope of winning more. As a result, gaming is reinforced. Losing a wager, on the other hand, makes an individual worse off, and probably sad. Thus, a loser would try wagering more in anticipation of winning for the sake of happiness or feeling good (Baskin et al [9]). Nyman [79], however, hypothecated that an individual bettor does wager to take advantage of the gap between winnings and wager costs. In wagering, the bettor anticipates a higher pay-out. Thus, a bettor stakes money on the betting market as a way of transferring income at the lowest cost.

Empirics demonstrate that the gaming environment is both risky[8] and uncertain. Nyman [79], for instance, indicated that gamers preferred holding a portfolio of different wagers of uncertain returns in order to hedge against losses. Thus, gaming is grounded upon distaste for certainty, even though gamers are loss aversive in practice[9]. At times, gamers overestimate their chances of winning. This consequently pushes them towards wagering. Understanding gaming behaviour, however, is complex, and hence requires a multi-

[7] The two paradigms fall within decision theory [79]).

[8] Risky in the sense that the money wagered could be lost. Following Dr. Ernest Akelo, a gamer has no control over the outcome of any given wager, and; hence, wagering is risky. Uncertainty arises from failure to know with precision what will happen in future with regard to the wager.

[9] This is a violation of the theory of prospects. That is, a loss aversive individual would either gamble when the returns are certain or not game at all when faced with uncertainty.

disciplinary approach. Diaz [25] and Nyman [79] documented that pathological gamblers, for example, form an offshoot of individuals attempting to turn their financial/ life's situation around through gaming. Besides, as Diaz [25] indicated, 4 out of 5 pathological gamblers are not naïve to their situation.

Gaming, especially sports gambling, has expanded rapidly in Kenya (Kaggwa et al [47]) with some people drawing a livelihood from the industry (Amutabi [5]). This expansion has been evidenced by an increase in the number of both licensed and unlicensed betting firms and bookmakers, while being fuelled by mobile money uptake (Schmidt [89]). At the same time, self-reported problem gambling has risen (CBK et al [17]) as more gamblers seek psychiatric treatment (Miriti [71]). While gambling is legal in Kenya, existing regulations seek to restrict gaming to adults and licensed bookmakers. The regulations articulated in the Gambling Act 2020, however, do not cover online gambling, and thereby providing fertile grounds for minors to bet.

1.1 Gaming in Kenya

In Kenya, gaming remains problematic, with an estimated 57% and 76% of Kenyans having gambled in 2017 and 2018, respectively (Kaggwa et al [47]; Elliott [28]). In 2021, 13.9% of Kenyans were active bettors with 11.4% and 18.4% being from rural and urban areas, respectively (CBK et al [17]). The proportion of active bettors in 2021 was highest among individuals in the age cohort 18-25years (CBK et al [17]). This proportion declined up the age cohorts with only 3.4% of those older than 55years being active bettors. According to CBK et al [17], Kenyans bet for various reasons, including income generation and entertainment. The income motive, for instance, attracted 15% of Kenyans in the cohort 18-25years although this motive weakened in higher cohorts with only 3.3% of individuals above 55years of age considering incomes from gaming (CBK et al [17]).

Although the betting frequency declined from 22.6% and 51.7% daily and weekly, respectively, in 2019 to a daily frequency of 15.9% and 41.4% weekly in 2021, occasional and monthly betting frequency rose between 2019 and 2021 (CBK et al [17]). Similarly, the spending on betting declined remarkably with bettors' 2021 spending being 37% of the 2019 record, on average (CBK et al [17]). Three strands of thought could be fronted in the light of these developments. First, the proportion of individuals considering having a meal as a key priority increased by 3.3 points from 28.5% in 2019 to 31.8% in 2021 (CBK et al [17]). Besides, the 2020 coronavirus-19 pandemic made more Kenyans food insecure (Kansiime et al [49]). Suggestive in this is that individuals diverted spending away from betting to meeting their food intake requirements. Second, the re-introduction of 20% withholding tax on winnings in 2021 prior to a downward revision to 7.5% reduced the profitability of gaming from the gamers' perspective. Besides, various revisions to the gaming tax as well as banning and re-licensing some betting firms in Kenya between 2018 and 2021 increased uncertainty over the gaming policy's credibility. Under this environment, therefore, risk-averse gamers chose to wager less and fewer times as much as possible. Last, negative shocks to income following coronavirus-19 pandemic forced individuals and households to reduce spending on non-essential commodities (Kansiime et al [49]). Except for pathological gamblers, gaming is not a necessity.

1.2 Statement of the Problem

Gaming threatens to hold back Kenya government's effort in combating poverty and inequality (Amutabi [5]). Prior to the 2018 crackdown on gaming, the country witnessed a rise in illegal gambling activities. These activities not only moved in tandem with increased indebtedness among young Kenyans (Amutabi [5]), but also denied the government revenues due to the existence of unlicensed betting firms and bookmakers (The Standard, [96]). Among the licensed bookmakers, delayed tax remissions and evasion was evident.

Thus, despite growing gaming penetration and welfare losses among gamers [18]), the government could not collect sufficient gaming revenues to offset the emergent negative social imbalances. Besides, CSR by betting firms has remained low (Dhandhania & O'Higgins [24]). Where CSR is present, however, the initiatives have focused on driving the 'responsible gambling' agenda (Gitau [36]). Such an agenda has, nevertheless, only benefitted betting firms at the expense of bettors.

Undesirable outcomes of gaming cannot be ignored (Lind & Kääriäinen [63]). Kaggwa et al [47], for instance, documented 18 cases of gambling-related suicides among university students across the East Africa region in 2021. 10 of the incidences were reported in Kenya. According to Kaggwa et al [47], depression following the loss of gambled school fees, and absence of immediate medical care pushed the 'unlucky' victims into suicide. While the reported cases may appear negligible, loss of a life reduces the stock of human capital (Kirigia & Muthuri [54]). A grimier portrayal is presented in (Decerf et al [22]) whereby reduction in life years is equated to extra poverty years. Poverty, however, is in itself not desirable, and hence must be confronted head on. At the household level, loss of family savings through gambling has had threefold effect. Firstly, since savings form a household's capital stock, its depletion negatively affects production of home goods and services as well as lowering the investment level by the household (Ofosu & Kotey [81]). These include the provision of quality childcare, housing, and food as well as funding children's education. Among adults, financial health has more than halved from 39.4% in 2016 to 17.1% in 2021 [17]). Secondly, some families have been reported to separate as a result of savings loss and other gambling-related problems (Benson et al [12]). Thirdly, gaming-induced indebtedness threatens to hold back welfare improvement (Chamboko & Guvuriro [18]).

While the government's intervention on the betting market in 2018 was partly welcome, (CBK et al [17]) report that the gambling menace remains largely unsolved. In 2021, for instance, the government revoked licences for some bookmakers before giving in to the demands of the anti-ban lobbyists. The central anti-ban argument was negative coronavirus-19 pandemic shocks to revenues which explained the decline in CSR as well as the delays in servicing tax debts. In addition, withholding tax on winnings was raised to 20% before downscaling to 7.5%, on the understanding that betting tax was regressive. Despite these initiatives, gaming remains common in the country although the 2021 weekly and daily betting frequencies declined in comparison to the 2019 levels (CBK et al [17]). The decline cannot, however, be authoritatively attributed to government intervention alone. Coronavirus-19 pandemic, for instance, might have impacted negatively on the bettors, and thereby explaining the decline in the betting frequencies. Against these developments, and in line with the socially undesirable outcomes, this study seeks to explain gambling behaviour among the youth in Kenya.

1.3 Research Questions

Through this research, answers were sought for the following questions:

i. How do individual-specific characteristics affect gambling behaviour among the youth in Kenya?
ii. How is this effect altered when undesirable outcomes are considered?

1.4 Objectives of the Research

This research's main goal was explaining gambling behaviour among the youth in Kenya. Towards the realization of this goal, the research narrowed down to the following objectives in specificity:

i. To interrogate how individual-specific characteristics affect gambling behaviour among the youth.
ii. To interrogate how the effect is modified when undesirable outcomes are considered.
iii. To suggest recommendations for policy based on the study's findings.

1.5 Significance of the Research

There have been many studies explaining gambling in Kenya. Most of these studies, nevertheless, failed to utilize households' survey data as well as failed to account for undesirable outcomes of gaming. Besides, the studies were conducted at a subnational level, and thereby failed to be nationally-representative. Nyamongo et al [78], Njogu [77], Machoka [66], on one hand, focused on the sub-counties of Nyamira South and Ruiru, and Nairobi County. Chamboko & Guvuriro [18], on the other hand, utilized a household-level survey, with betting as the explanatory variable, and thus failed to explain gambling itself. The current research, consequently, laid the groundwork for a holistic debate on gambling through the utilization of Fin Access 2021 survey data. Hitherto, no other rigorous study on gambling had been done with the employment of Fin Access 2021 survey data. This research, however, does not consider absence of prior rigorous work on the same subject as something worthy being proud of. Hence, any attempts to abrogate superiority was entirely refused in this research.

The findings of this research were intended to inform policies geared towards addressing the gambling problem in Kenya. While this research did not promise to solve all the problems inherent in gambling, it attempted to establish the factors behind gambling behaviour observed among the youth. Accordingly, this research serves as an eye opener while simultaneously paving the way for evidence-based interventions on the betting market.

To summarize, this study's contributions are three-fold: firstly, this research offered an update on gaming utilizing a nationwide survey. This was in sharp contrast to Njogu [77],

Chamboko & Sevias [18], and Machoka [66]. Secondly, this research explained gaming intensity, propensity, and efficiency in the presence of socially undesirable outcomes. In particular, savings-backed loan repayment raised gaming propensity, expenditure efficiency, and technical inefficiency. Food expense reduction-backed repayments enhanced gaming efficiency while reliance on more work to repay loans was associated with higher technical inefficiency and higher expenditure efficiency. Thirdly, a contextualization of gaming within income (poverty) and food security dynamics was made. To this end, this research found out that individuals were less likely to gamble as incomes rose but among those opting to gamble, gaming expenditures rose in income. Food secure individuals also spent more on gaming than food insecure individuals whereas gaming and energy poverty had no association. Lastly, this research documented a significant decline in gaming expenditures as rural employment rose.

2. LITERATURE REVIEW

2.0 Introduction

Explanation of gambling from theoretical constructs and previous studies is outlined in this section. In the theoretical narrations, attention is shifted from stand-alone theories to an emphasis on the factors underlying the theories. Evident in this prose is that two broad perspectives are captured without particular reference to them, namely; (a.) benefits-oriented motive to gambling, and (b.) changes in the financial position drive to gambling. Empirical evidence is shaped around a bias towards studies that adopted either large-scale field surveys or households survey data. Last, a summary of the literature is presented.

2.1 The Theory

Studies demonstrate that gaming cuts across all ages, from late childhood to old age, as well as gender, marital status, income levels, region, and employment status (Frisone et al [33]). Observed levels of gaming, however, differ across socio-demographic groups and geographical regions [90]). Despite the differences, gamers interact within the environment. Thus, it is plausible to think of the environment as shaping individual decision to bet or not. Hilbrecht et al [40] contextualized the gaming environment as a reflection of influences of the community and established institutions on the individual.

The role of the environmental set up in shaping individual gaming behaviour cannot be underestimated. Presence of gaming activities, for example, nudge an individual to game while absence of such activities disincentivize an individual (Hilbrecht et al [40]). Laws and regulations that govern gaming determine the extent to which gaming prevails as well as the availability of such activities (Diaz [25]). Booth et al [14], for instance, argued that gaming flourishes in highly liberalized societies. Prohibition of certain gaming activities as well as overregulation of the gaming industry stifles gaming. Gaming has, however, been shown to

flourish even in environments where restrictions appear excessive[10] (Jobim [45]). Betting firms, for instance, do turn around the corporate social responsibility (CSR) requirements into profitable brand marketing. Through using advertisements such as 'responsible gambling' and failing to forthrightly condemn gaming, individuals are nudged towards gaming. At the moment, no betting firm has ever emancipated the masses on the negative effects of betting.

With the gaming industry flourishing, betting firms are investing heavily in strategic advertising. The power of advertising in preference alteration cannot be underestimated. Mateo-Flor et al [69] argued that advertising could potentially influence an individual's gaming behaviour. Besides, advertisement, or its absence, shapes attitudes that people form about gambling (Tsururmi et al [97]). Through packaging messages suggestive of easy winnings, viewers of such texts could be stimulated towards trying their luck in gaming, either for fun's sake, as 'Devil's advocates[11]', or to reap big (Lole et al [65]).

Ignoring the influence of gender on gaming would be futile. According to Diaz [25], female gamers start wagering later than their male counterparts as well as spending less time gaming. Gender differences are in turn linked to religious beliefs which discourage investing in risky or uncertain activities. Ayifah et al [7] argued that women are more likely to be religious than men. It thus follows naturally that fewer women are likely to game than men. Besides, the gambling prevalence rate among women tends to be outstripped by that among men (Schmidt [89]). Moreover, women tend to spend less than men on gambling, on average (Salonen et al [87]). This could be explained by a higher proclivity to risk-taking among men than observable in females.

[10]Brazil's experience reveals exploitation of legal lacuna by betting firms in countering regulation (Jobim [45]).

[11] Individuals who go out of their way to disprove popular opinions.

Gambling requires spending financial resources. Diaz [25] hypothecated that an individual gambles only when their decision to bet is matched by a positive spending on the wager. Implicit in this is that resource availability constrains an individual's gambling behaviour. Gamers need not necessarily, however, rely upon their own financial endowment. A gamer can, for instance, borrow from other individuals or financial institutions, staking the proceeds on wagers while using expected gamble winnings as collateral. While this alternative is feasible, its sustainability is questionable. Kaggwa et al [47] reported an upward trend in gambling-related indebtedness whereby gamers failed to repay debts owed to them.

Gaming proportion among low-income individuals tends to outstrip that among the rich. With a higher proportion of the poor consuming gaming products, a tax on gaming tends to disproportionately overburden the poor (Diaz [25]). Such a tax, however, may not reduce gaming availability. Garret et al [35], for instance, demonstrated that gaming availability rises whenever a neutral tax is imposed. Implicitly, any attempts to raise gaming tax will merely leave the poor worse off without reducing the availability of gaming so long as the bookmaker's net margin does not shrink.

Seal et al [90] and Frisone et al [33] argued that young adults were more likely to bet than older individuals. As an individual grows older, less time is available for gaming. Besides, older individuals allocate more time forging networks on the labour market and in studies as well as focusing on home production and child upbringing than counting upon luck in betting markets (Harris [42]). Tulloch et al [100] associated the negative correlation between age and gaming with a growing interest in genuine concern for others, a phenomenon which the authors considered a product of age and maturity. For instance, since children learn from the actions of, and at times imitate, adults, it is natural to expect parents not gambling in the presence of children as a way of cushioning children against gambling-

related problems. This, then, suggests that adults would naturally not anticipate children to gamble.

Price et al [84] hypothecated that financial wellbeing bestows confidence upon an individual. According to Price et al [84], individuals do constantly evaluate their asset position against a reference point. Thus, individuals tend to be happier the better off they are in comparison to a previous situation, their neighbours, or certain other individuals deployed as reference points. Wealth accumulation through savings and labour incomes, however, takes time (Nyman [79]). Besides, labour wages require exerting effort. Effort or work, on one hand, is undesirable to workers. Gamble winnings income, on the other hand, might be effortless although such winnings could raise the same incomes as those raised otherwise through working (Nyman [79]). This suggests that those lazy individuals and those in hot pursuit for 'quick money' are more likely to game than individuals who are highly-motivated at the workplace.

Price et al [84] and Vinberg et al [101] argued that gamblers are driven by the possibility of gaining financially on the betting market. That is, gamers stake money in anticipation for more. At the same time, gamers increase the gaming frequency as well as diversify their bet portfolio in anticipation for bigger returns. Tabri et al [95] hypothecated that if individuals knew with certainty that would lose money, then they wouldn't wager. Non-satiation and materialistic tendencies of individuals thus coerce them into wagering (Eyzop et al [29]). Eyzop et al [29], furthermore, argued that higher payoffs necessarily made gamers happier while financial loses ruined an individual's self-esteem. Money gains are, nevertheless, not desired for their own sake. Individuals seek money in order to purchase consumable commodities.

The quality of parental care shapes a child's health, nutritional, and educational outcomes (Tulloch et al [100]). Existing developmental literature suggests that children look

up to older individuals for care and guidance. Thus, the behaviour of adults determines, to a large extent, the nature of childhood experience among children (Nakamura et al [75]). Children brought up in violent households, for instance, tend to be violent either in their childhood or later on life (Cheung & Chien-Chung [20]). Drawing a parallel, children brought up in neighbourhoods or households where people gamble tend to gamble in their lifetime (Mateo-Flor et al [69]).

Tulloch et al [100] argued that gambling declines with parenthood. During the initial years of parenting, financial strains push 'young' parents into gambling in the hope of obtaining finances. Any revenues earned on the betting market is, in turn, channelled towards meeting the household's consumption needs with a share of the proceeds being reinvested back on the betting market. With time, however, parents diversify income sources, and hence their reliance on bet earnings declines (Tulloch et al [100]).

2.2 Previous Studies

2.2.1 Age and Marital Status

As an individual bettor grows older, they bet less often on sports but more on non-sports[12] (Seal et al [90]). Utilizing the Cragg Hurdle model on a dataset of 15000 sports fanatics in Australia, Seal et al [90] demonstrated that bet frequency is affected significantly by age and being in a civil union. The choice of the hurdle model was informed by the presence of many zeroes arising from 35% of the respondents being non-bettors, and thus the model corrected for selection problem. The authors found no significant effect of other marital status (being widowed, divorced, 'defacto live together', or 'defacto live apart' on the bet frequency. Seal et al [90] argued that married individuals overweighed the negative effect gaming may have on their families. According to Langham et al [58], less gambling

[12] Minors are not allowed to bet in some jurisdictions (Kristiansen & Severin-Nielsen [55]).

implies more family time. Thus, it was natural to expect married individuals betting less often. It is possible, however, that a person's marital status depends on age. For some individuals, for instance, only upon attaining a certain age can they consider marrying. A shortcoming in Seal et al [90], therefore, is that the authors failed to instrument marital status on age even though they controlled for endogeneity in explaining gambling behaviour. A plausible alternative could have been interacting marital status with age.

Utilizing a sample of 1209 women from rural Ghana, and adopting the ordered Probit model, Ayifah et al [7] concluded that a woman derived significantly more satisfaction in taking high risk as her age increased from 18 years to 19 years. 18 years was the lowest reported age in the survey. For women older than 19 years, satisfaction significantly declined. The findings, furthermore, suggested that it takes a Ghanaian woman, two to three years for their satisfaction from taking high risk to turn around. This observation, while potentially insightful, conflicts conventional wisdom which suggests that women generally lean towards taking risk in their 30s, not early 20s.

Ayifah et al [7] categorized marital status into not married, loose union, and married. Amongst women in rural Ghana, the authors documented negative, though insignificant, effects of being either in a loose union or married on the bet amount for both Tobit and Heckman models. The theoretical basis for employing Tobit and Heckman was, nevertheless, absent. Moreover, the authors reported their data having very few zeroes. A natural choice would, therefore, have been either logit or probit model. Since the authors reported probit results[13], it was not necessary for them to present censored data results as well. A major shortcoming in Ayifah et al [7] relates to the marital status reference group. It was not clear whether the reference group comprised of domestic partnership, live-in

[13]Ayifah et al [7] probit estimates suggested that women in loose unions or married derived lower utility from forming positive attitudes towards risk.

arrangements, spinsters (single women), divorced, or widowed. Besides, some women would self-select into any of the groups. This possibility was not corrected for.

A generalization of age to discrete time is presented in Diaz [25] survival analysis on the inclination to start betting in Spain. In utilizing survival analysis, the author assumed that an individual's tendency to gamble depends on time. The findings suggested that the inclination to start betting significantly declined for older age cohorts. Diaz [25], nevertheless, utilized a pooled cross-section. Age cohort and time effects could best have been captured using longitudinal data. The basis for this observation is anchored on the assumption that an age cohort's gaming behaviour could be affected by time. That is, as members of a given cohort grow older, their inclination to bet could be potentially affected.

Watanapongvanich et al [103] documented that marital status and age did not significantly affect gambling frequency in Japan. Upon instrumenting financial literacy on father's education, age significantly affected gambling at 5% significance level. The probit model specification defined marital status as either single, married, or divorced, with 'single' being the benchmark group. This definition is, nevertheless, not exhaustive since widowed could be a probable status. In addition, an individual could have been co-opted into another marriage following divorce. Last, 'being single' cannot be a credible benchmark for 'divorced'. Besides, a failure to interact age with marital status presupposed that the two are stand-alone variables.

2.2.2 Parenting and Parental Responsibilities

Tulloch et al [100] indicated a negative effect of pathological parental gambling on children's wellbeing. According to Tulloch et al [100], a 'don't care' attitude among parents and a 'lack of responsibility towards their children' incentivize parents towards 'irresponsible' gambling. In explaining child health utility, Tulloch et al [100] established that parental problem gambling severity index (PGSI), parent's educational attainment, and

age as well as income of the household were not significant predictors. A child's gender, on the other hand, significantly affected the child's well-being. Whereas the sample size was large enough (3695 children), the authors provided logistic estimates without specifying the analytical form of the model. Moreover, the regression results presented by the authors failed to capture the demographic characteristics purported to have been controlled for. Besides, it is not clear how such characteristics were controlled considering that the authors shunned away from rigorous construction of the analytical model.

2.2.3 Gender

Gender affects gaming in three ways, namely (1.) the time of entry into gaming, (2.) frequency of betting, and (3.) spending on bets[14]. Utilizing a dataset drawn from a longitudinal study in Sweden, for instance, [94] reported that men commenced gambling three years, on average, before women. Schmidt [89] indicated a gambling prevalence rate of 20% and 50% among women and men, respectively, in Western Kenya. In a randomized-control trial in Kenya, Maroma et al [67] showed that pathological gambling was more likely among male students than their female counterparts. The treatment employed in Maroma et al [67] was however never made known with the authors making reference to 'novel intervention'. Besides, although Maroma et al [67] conducted both pre-treatment and post-treatment surveys, the study adopted paired t test. This failed to account for the changes attributable to the treatment alone. A plausible estimation would have adopted the difference-in-difference estimator. Probit estimates given in Watanapongvanich et al [103] demonstrated that men in Japan were significantly more likely to gamble than women.

[14] These are, however, not the only ways.

2.2.4 Advertisement

Through carefully-packaged visualizations, advertisements could potentially stimulate individual biases towards gaming. Lole et al [65] exposed 10 non-gamblers and 49 regular sports bettors in Australia to repeated advertisements on responsible sports betting. Variance analysis suggested significant interaction between the type of advertisement and the type of message. Lole et al [65], however, indicated that 'responsible gambling' messages were kept at the bottom of the screen, while remaining static throughout. Consequently, the authors were not able to report on what would have happened had the messages covered the entire screen, appeared at the top/ centre, been kept moving, or been accompanied by audio.

2.2.5 Religious Beliefs

Religious views reflect an individual's socialization which consequently shapes their attitude towards risk and gaming (Ayifah et al [7]). In Ghana, Ayifah et al [7] established that religious women were significantly less likely to take risk than non-affiliated persons in a binary probit model. The Heckman selection results were, however, insignificant. Although the models employed in Ayifah et al [7] passed the specification test, the authors used inappropriate selection variable. The Heckman model presented by the authors suggested that for an individual inclined towards risk-taking, the level of risk is observed. While such a specification may seem plausible, it falls short of econometric rigor[15]. Besides, the authors purport to have employed individual and household-specific characteristics as control variables without identifying first-stage regressions. Last, it is possible for religious views to be a function of age, degree of household democracy, and marital status. Children, live-in sons and daughters-in law, and young adult dependents are likely to subscribe to the

[15] Parallel this to the labour market, it is misleading to declare that if one is employed, hours worked is observed. Naturally, one is employed because there is some work being done with time. Perhaps, a presentable formulation would be that wage is observed for an employed individual.

views of their parents and providers. Religious affiliation should, thus, have been interacted with each of the aforementioned variables.

2.2.6 Educational Attainment

Higher levels of educational attainment have been shown to correlate positively with strategic gaming (Lind & Kääriäinen [63]), and higher abilities in evaluating risk (Watanapongvanich et al [103]). That is, educated individuals are best informed in analysing the betting market. Market analysis, nevertheless, takes time. It is, thus, expected that educated/ intelligent people bet less as well as spend less on gaming often than their counterparts with lower educational attainment (Watanapongvanich et al [103]). In a Finnish study involving 3555 adults, Salonen et al [87] showed that holders of a Master's degree spent significantly less on gambling than individuals holding lower qualifications, on average. It is, however, probable that individuals with higher educational attainment underreported their spending on wagers. Besides, the authors failed to follow up on the respondents in authenticating the expenditures declared. In Japan, Watanapongvanich et al [103] established that university graduates were significantly less likely to gamble than those without university training. It is, however, possible that a financially literate individual but without university training could bet less than a degree holder. The authors overlooked this possibility. Moreover, Watanapongvanich et al [103] failed to report first-stage estimates, which rendered it impossible to develop a better appreciation of the findings.

In a Japanese study involving 3687 individuals, Watanapongvanich et al [103] instrumented financial literacy on father's education level. Educational attainment of the father significantly strengthened the negative effect of financial literacy on gambling frequency. It is, however, not clear what the results would have been had the authors employed mother's educational level as an instrument. Mustapha & Enilolobo [74], nevertheless, established insignificant association between education and gambling among

Nigerian youth. Mustapha & Enilolobo [74] failed to clarify what 'education status' stood for.

2.2.7 Income, Neighbourhood, and Unemployment

The type of gaming taken up depends on an individual's income level. Contrasted with the poor who are drawn towards betting, the rich prefer lotteries (Resce et al [86]). This suggests that lottery machines are more likely to be found in richer neighbourhoods while gambling machines are associated with poorer neighbourhoods. While income affects the type of gaming activity, gaming could, in turn, affect income outcomes. Farrell & Fry [30], utilizing both random effects model and pooled ordinary least squares, reported negative insignificant associations between energy poverty and gambling in Australia. Even then, individual incomes have been shown to correlate positively with national incomes in more equal societies (Belucio et al [11]). Utilizing a United States dataset spanning the period 1965-2016, and employing lag-distributed auto-regressions, Belucio et al [11] indicated gambling spending being affected in the long- and the short-run by national income positively. The inclusion of population size might, however, have tampered with aggregate gambling spending. Khanthavit [50] adopted 'vector auto-regressive model' on a monthly dataset in Thailand spanning the period 2004-2021. The findings suggested that causality originated from gambling towards unemployment, and not from joblessness to gambling. Khanthavit [50], however, used only gambling and unemployment alongside their lags. It is possible that unemployment and gambling are simultaneously affected by other factors. A culture of hard work and non-reliance on luck could, for instance, potentially discourage gambling while simultaneously encouraging job-seeking tendencies and job creation. Utilizing a cross-country dataset covering 30 countries in 2015, Spångberg & Svensson [92] established positive correlations between unemployment and gambling among 16-year-olds, while gambling reduced with an increase in income per individual.

A shortcoming of time series and cross-country models which utilize aggregated data is that such models fail to capture individual-specific attributes which are made evident through household-level data. Besides, aggregation presupposes that behaviour is uniform across individuals. This assumption is, nevertheless, untenable. For policy-relevant evidence, therefore, macro-level analysis is rejected in the current study in preference for micro-level evaluation.

Mustapha & Enilolobo [74] utilized survey data covering 237 households in Nigeria to explain gambling and welfare. Probit estimates suggested that joblessness reduced the likelihood of gambling among the youth. According to Matama et al [68], job flexibility allows individuals to find time for gambling whereas discouraged and unemployed individuals could be dissuaded from gambling as a precautionary initiative. Neighbourhood effects were captured by proximity to an outlet for gambling. The authors documented positive insignificant correlations between outlet nearness and gambling tendency. In a Finnish study, [85] demonstrated that gambling machines' availability significantly reduced with an increase in median income. Availability, nevertheless, increased with absence of primary education and being unemployed. Upon controlling for job availability, unemployment had an insignificant effect on machines' availability. Job vacancies, on the other hand, significantly increased gambling machines' availability (Raisamo et al [85]). It appears that as more jobs became available, profitability of gambling to bookmakers increased. Thus, bookmakers increased gambling machines in areas with relative job abundance.

2.2.8 Other Factors

No exhaustive explanation of gaming in general, or gambling in particular, can be advanced. Ethnicity was, for instance, considered in Ayifah et al [7] whereas Farrell & Fry [30] and Mustapha & Enilolobo [74] incorporated nationality and cohabiting among the

youth, respectively, in explaining gambling behaviour. Other factors used in predicting gambling behaviour include drug and substance abuse (Hellberg et al [39]), labour force participation (Steinmetz et al [93]), household's income (Steinmetz et al [93]), game time (Steinmetz et al [93]), policy (Johnstone & Regan [46]), household's size, number of dependants, financial inclusion (Farrell & Fry [30]), technology (Liu et al [64]), residence, population density (Raisamo et al [85]), and peer pressure (Botella-Guijarro et al [15]).

2.3 Overview of the Literature

From the literature, it was evident that various factors have been used to explain gambling behaviour. These factors included individual-specific factors alongside other socio-demographic characteristics. An individual's age as well as status related to marriage, educational attainment, employment, and gender indicated mixed effects on gambling behaviour. Micro-level evidence suggested that gaming behaviour among males differs from that among females with regard to frequency, spending, and game type. Not all studies, however, showed significant correlations between gambling and gender. While nearly all studies considered age as a predictor of gambling, some studies assumed that the effect of age must eventually turn around. In other studies, this effect was assumed to be purely linear. The overarching motive for gambling documented in these studies was that gaming is perceived to be beneficial among the gamers. A variety of analytical frameworks was adopted with some studies utilizing OLS while others adopted random effects, logistic regression, instrumental variable, and the hurdle models. Micro-level evidence was supported by household-level data as well as done on individuals, mainly drawn via either experimentation or field surveys. Although previous works remained as close as possible to the predictors of gambling, modelling undesirable effects of gambling was largely unexplored. Where such effects were captured, the focus was on the moderating effect that such outcomes had on gambling behaviour. In Kenya, gambling research utilized datasets

of hundreds of respondents or fewer. It was, thus, doubtful that previous research was robust. In light of these developments, the current research will utilize the largest dataset in Kenya drawn via the 2021 Fin Access Survey.

3. METHODOLOGY

3.1 Introduction

Conceptualization and theorization as well as the specification of the analytical model are outlined in this section, together with the description of the variables. Last, a discussion of econometric issues that were addressed during the research is captured.

3.2 Conceptual Framework

The basic idea behind gaming is that an individual either gambles or does not. The option chosen by an individual then depends solely on the perceived benefits. These benefits are, nevertheless, enjoyed indirectly. Explaining gaming behaviour, therefore, requires making assumptions about either the nature of an individual's utility function (Nyman [79]) or assuming that the decision is anchored on an individual's relative financial position (Lin et al [62]). In either case, an individual who is out to maximize payoffs or minimize costs will pick an alternative that yields better payoffs or lower costs, respectively (Glenk et al [37]). The decision to gamble or not, therefore, is binary, with an individual settling for an option with higher payoffs.

Gambling presents a decision maker with two options, either gambling or refraining (Petri [83]). Models with binary dependent variables are better[16] analysed under random utility models (RUM) than being linearly specified (Olschewski et al [82]). RUM presupposes non-deterministic choices while simultaneously maintaining the consistency restriction in decision making (Olschewski et al [82]). That is, an individual might choose to gamble today and tomorrow, refrain from gambling today but gamble tomorrow, gamble today but not tomorrow,

[16] RUM in practice narrows the choice set by invoking the 'independence of irrelevant alternatives (IIA)' assumption (Aguiar et al [2]). A starving individual might be simultaneously faced with two considerations, either buying a meal or gambling. In choosing a meal over gambling consideration, the individual hasn't done anything different from were he to opt for gambling over the meal. IIA assumption, however, treats buying a meal as an irrelevant consideration within the context of gambling. Thus, RUM may fail to explain the behaviour of a population (Aguiar et al [2]).

or refrain from gambling in both days. Thus, an individual's gambling behaviour cannot be mastered with certainty across time periods. Similarly, an individual might choose to gamble while out of town or refrain while at home.

For a gamer, spending on wagers is observed (Seal et al [90]). Theoretically, a gamer's optimization requires strictly positive spending on the wager. Here, betting frequency is assumed to be given, although this assumption will be relaxed later. Spending is, in turn, explained by characteristics that are specific to the individual alongside socio-demographics. From the literature, it was evident that these factors include age, education, residence, gender, religious beliefs, advertisements, marital status, household's size, number of dependants, employment, labour force participation, gaming machines' availability, poverty, the income motive, financial inclusion, and parental behaviour. It is, nevertheless, possible that while the gamer tries to maximize payoffs through winnings and gamble earnings, undesirable outcomes emerge. Drug and substance abuse as well as indebtedness, financial stress, and reduced food intake, for instance, are potentially undesirable outcomes. These outcomes may be counterproductive, and consequently affect an individual's efficiency in gaming. Diagrammatically, these relationships are captured in the figure.

Figure 1: Conceptual Framework

Explanatory factors:		**Explained factors**:	**Undesirable outcomes**:
Individual-specific factors and socio-demographics: • Age • Household income • Unemployment status • Marital status • Residence • Gender • Religion • Individual's education • Parent's education • Financial literacy • Loan access • Having a meal • Asset ownership	→	• Gambling • Spending on wagers • Betting frequency	• Indebtedness • Financial strain • Pathological gambling

3.2 The Theoretical Model

In making a decision, an individual picks an alternative which makes them better off (O'Donoghue & Somerville [80]). Thus, betting is preferred to not betting if it bestows upon an individual higher benefits than had the decision maker chosen otherwise. The demand for gambling then reflects the indirect benefits perceived by an individual (Kim & Choong-Ki [51]). For simplicity, the decision maker on the betting market is assumed to be an individual although such decisions could be also made by firms, the government, households, or other economic agents. Furthermore, without unnecessary sophistication, the individual is stripped off all motives other than gambling being beneficial to them.

Invoking the 'independence of irrelevant alternatives (IIA)' assumption, a choice between gambling and not gambling does not depend on consumption of other commodities. Put differently, suppose an individual is faced with choosing between gambling and refraining, what he/ she ends up picking will not be affected by, say, an individual considering buying a movie ticket, paying bus fare, attending school, paying school fees, one's feelings towards others and the decision of whom to marry or date, taking a lover on a date, smoking, going on a picnic, or even abiding by the law. This restriction makes it possible to assume that the kth individual gambles or desists depending purely on his/ her own value judgment of gambling. Decisions are then made on the extensive margin. That is, an individual either shifts from not gambling to gambling, and vice versa, or maintains the status quo. Based on the extensive margin, the kth individual gambles with certainty if the net benefits of gambling outweigh the net benefits of not gambling.

Gambling is, however, produced by a technology, which is assumed to be fixed (Nikkinen & Marionneau [76]). Production of gambling necessarily implies that gambling has

a cost (Nikkinen & Marionneau [76]). Accordingly, in choosing to gamble, an individual makes a sacrifice. This is the price of gambling, and is best captured as spending on wagers by an individual. For non-gamblers, this price is non-existent, by assumption. Depending on individual value judgments of the gambles, wager spending varies. Individuals, on the other hand, are heterogeneous. Wager spending is thus a function of individual and socio-demographic characteristics, namely; age, education, asset ownership, gender, financial literacy, financial inclusion, parent's education, alternative income sources, income, marital status, employment status, labour force participation, advertisement[17], residence, loan access, and religion. These characteristics are collectively listed as a row vector, T.

Theoretically, the characteristics in the vector T are related to wager spending, W, via the relation:

$$W_k = W_k(T_k), W_k \geq 0, \& \; T_k \geq 0$$

(1)

Where k denotes the individual. Suggestive in (1) is that it is possible to link a characteristic, for example age or financial literacy, with wager spending. The restrictions imposed eliminate negative wager spending, which would have otherwise suggested that individuals are actually paid to bet. These restrictions also omit the possibility of betting firms dishing out 'handouts' to potential gamers. Thus, any wager spending reflects an individual's true valuation of gaming's net benefits.

Spending on a wager is assumed to bestow benefits upon an individual (Seal et al [90]). Similarly, not gambling is also assumed to be beneficial (Hoffmann & Risse [44]) such that the decision to gamble or refrain follows the option with higher benefits. The odds of gambling are then non-negative since the worst an individual can do is to refrain from gambling, of which

[17]Advertisement were to be left out since Financial Access Survey 2021 (CBK et al [57]) captured data on television and radio ownership without explicitly inquiring about advertisement viewership.

the odds will be zero. This allows for a formulation of the ratio of odds (O) of gambling to those of not gambling as:

$$O = \frac{p}{p'}$$

Where the probabilities of not gambling and gambling are given by p' and p, respectively.

For an individual with a zero chance of gambling, O=0 whereas O→∞ if an individual gambles with certainty. Gambling probability is, on the other hand, a function of the perceived benefits, B. A linear specification of this function might, however, result into degeneracy. A natural choice is then an exponential specification such that $p = e^B$ instead of $p = cB$, where c is a constant. Given perceived benefits, B, it can be shown that sufficiently small B leads to e^Bbeing zero if the non-negativity restriction is lifted. Similarly, $e^B \to \infty$for sufficiently large B. The ratio of odds, O, depicts similar characteristics. Thus, an alternative formulation of this ratio would be:$O = \frac{p}{p'} = e^B$.Since $p + p' = 1$ (unit sum of probabilities), then$p' = 1 - p$. A substitution of p'=1-p in $\frac{p}{p'} = e^B$yields

$$p = \frac{e^B}{1 + e^B}$$

(2)

Where the right-hand side (RHS) expresses the benefits,e^B from gambling as a share of the total benefits, $1 + e^B$. The probability of gambling is, thus, a share of the total benefits enjoyed by an individual. The total benefits an individual enjoys are, nevertheless, the sum of benefits accrued from gambling (G) and from refraining (N). This implies that $1 + e^B$is equivalent to:$e_G^{B'} + e_N^{B'}$.The difference in benefits expected from gambling and refraining isB'. This difference is zero if for a given individual, personal attributes are identical to attributes of

the option. Benefits from alternative j are captured by $e_j^{B'}$ where j=G and j=N if the individual gambles or refrains, respectively.

Letting G=1 and G=0 if the kth individual gambles or refrains, respectively, then the probability of gambling is given by the function:

$$P(G = 1|B) = \frac{e^{B}}{e_G^{B'} + e_N^{B'}}$$

(3)

The benefits are, however, perceived, and hence an individual derives the benefits indirectly. Since wager spending is observed if an individual gambles (Seal et al [90]), this spending will consequently be treated as a function of the decision to gamble. The aforementioned, notwithstanding, an individual's decision to gamble or refrain is separate from how much to spend on a wager as well as the frequency for gambling (Seal et al [90]). Combining (1) and (3) gives the theoretical framework for this research, which is defined by:

$$W_k = W_k(G_k, T_k), W_k \geq 0, \& \, T_k \geq 0$$

(4)

In (4) gambling behaviour is captured by wager spending, W, and an individual's status as a gambler, G. Thus, a non-gamer spends KSH 0 on betting whereas a gambler spends non-negative amount on wagers. How wager spending, W, and gambling participation, G, respond to individual and socio-demographic characteristics, T, is subject to empirical investigation.

3.3 The Empirical Model

The framework adopted for analysis builds upon (4) through parameterization and the incorporation of a term capturing completely 'unobserved' characteristics. Since Fin Access (2021) (CBK et al [17]) revealed that 86.1% of Kenyans were non-active bettors, betting frequency and wager spending data is characterized by many zeros, and hence necessitate the

adoption of the 1971 hurdle model developed by Cragg. The justification follows from the need to address the selection problem. The hurdle model is a two-part approach requiring the selection model for gambling decision, followed by an estimation of wager spending or (betting frequency)[18]. The selection model is given by:

$$G_k = G_k(T_k b_k) = \begin{cases} 1 \text{ if } T_k b_k + e_k > 0 \\ 0 \text{ otherwise} \end{cases}$$

(5)

Where G_k is 0 if an individual decides to refrain, or 1 if the individual gambles. T_k are control variables capturing individual characteristics and socio-demographics. Parameters are captured by vector 'b', and these reflect the effect of each individual characteristic on the gambling decision. 'b' is, nevertheless, not interpreted in isolation. The innovation term 'e' is a white noise, by assumption. In the second part, wager spending is estimated for the kth individual, and this is given by:

$$W_k = G_k * e^{T_k a_k + v_k}$$

(6)

Where the hurdle model[19] is exponentially-specified with W_k being the kth individual's average spending on wagers, parameters are captured by vector 'a', while the disturbance term 'v' is a white noise. Together, 'a' and 'b' explain the average spending on a wager if the kth individual opts to gamble. 'b', on its own, shapes the refrain decision, and therefore informs the zero-bet decision. The vector T contains the following factors: age, age squared, parental status, education, asset ownership, gender, financial literacy, financial inclusion, parent's education, alternative income sources, income, marital status, employment status, labour force participation, residence, loan access, and religion. In the literature, it was suggested that

[18] Fin Access (2021), however, captured betting frequency as a categorical variable.
[19] Hurdles that have to be overcome by an individual prior to gaming include being healthy and having a meal.

interaction terms be included. Interaction terms include age*marital status, marital status*alternative income sources, religion*marital status, gender*marital status, asset ownership*financial literacy, gender*financial literacy, gender*residence, and employment status*residence. Exponential specification of the hurdle model restricts wager spending to non-negative values[20]. To capture undesirable outcomes of gambling and wager spending, the hurdle model will be modified into a model permitting for cross-sectional stochastic frontier analysis (SFA). SFA will be based on the specification advanced by Malmquist and Luenberger.

Under SFA, it is assumed that a gamer seeks to minimize spending on a game. The individual gamer is, nevertheless, inefficient such that his/ her actual wager spending (W) deviates from the optimal wager. The cost frontier is thus given by the targeted level of wager spending. Exogenous factors are all the other factors in vector T above. Deviations are assumed to arise from exogenous shocks (v) and from the gamer's technical inefficiency (u). The analytical SFA model is then given by:

$$W_k = W_k(T_k; a)e^{v+u}, v + u = \varepsilon$$

(7)

Where v is white noise whereas u follows the truncated normal distribution. The parameter 'a' in (7) is retrieved through the employment of maximum likelihood estimation (MLE) technique. Here, endogeneity is corrected for using instrumental variables[21] while individual gamer's inefficiency is given by the JLMS estimator.

[20] Corner solutions are, however, possible. The Heckman model assumes that a gamer has strictly positive spending on games. Hurdle models, however, allow for the possibility of a gamer having zero game expenditure. Double hurdle is employed where the participation decision and the expenditure amount are correlated (i.e., both decisions made simultaneously); otherwise, the Cragg model is employed (i.e., decisions are made sequentially). Where decisions are sequential but independent, two-part models are employed. See https://www.youtube.com/watch?v=q2NRQBcihQY&t=635s.

[21] Dr. Daniel Abala wondered what these instrumental variables were.

3.4 Definition and Measurement of Variables

The variables under consideration are captured in *Table 1*. An elaborate discussion on the variables' wording in the questionnaire is presented in APPENDICES.

Table 1: Variables' description		
Variable	Description	Measurement
T_1	Age	The number of whole years an individual had lived up to the time of the survey.
T_1^2	Age squared	The square of years lived by an individual up to the time of the survey.
T_{1Y}	Young person	Assigned 1 for an individual in the age cohort 18-35years, and 0 if not.
T_{2A}	Mobile phone ownership	Assigned 1 for an individual owning a mobile, and zero if not. This variable will be used as an indicator of information access.
T_{2B}	Television ownership	Assigned 1for a TV-owning individual, and 0 for a non-owner.
T_{2C}	Radio ownership	Assigned 1 for a radio owner and 0 for a non-owner.
T_{3U}	University education	Assigned 1 for a university student or graduate, and 0 otherwise.
T_{3D}	Secondary school graduate and post-secondary education than university.	Assigned 1 for a person with some post-primary school training but not university, and 0 if not.
T_{3P}	Primary school education or none	Assigned 1 for a person that has at most primary school education, and 0 if not.
T_4	Gender	A male is assigned 0, and a female is assigned 1.
T_5	Financial inclusion	A mobile money account holder is assigned 1, and 0 if non-owner.
T_6	Financial literacy	A person that can solve simple financial numeracy questions is assigned 1, and 0 if unable.
T_{7U}	University education- parent	Assigned 1 if an individual's parent has some university education, and 0 if not.
T_{7D}	Post-primary school other training- parent	Assigned 1 for a person whose parent has some secondary school/ non-university college training, and 0 if not.
T_{7P}	Primary school education or none for parent	Assigned 1 if an individual's parent has at most primary school education, and 0 if not.
T_8	Alternative income sources	Assigned 1 for a person that does not consider gaming as the main income source, and 0 if not.
T_{9S}	Single	Assigned 1 for a person that has never been married, and 0 if not.
T_{9D}	Divorced/ lost partner	Assigned 1 for an individual whose partner died or divorced, and 0 if not.

T_{9M}	Married (including live-in, live together, and live apart arrangements)	Assigned 1 for a married person, and 0 if unmarried.
T_{10}	Employment status	Assigned 1 for a person drawing livelihood from formal employment, and 0 if not.
T_{11}	Residence	Assigned 0 for an urban resident and 1 for a rural resident.
T_{12C}	Christianity	A Non-Christian is assigned 0, and a Christian is assigned 1.
T_{12I}	Islam	A Muslim is assigned 1, and a non-Muslim is assigned 0.
T_{12H}	Hindu	A Sikh/ Hindu are assigned 1, and a non-Sikh/ Hindu is assigned 0.
T_{12O}	Other religion	Assigned 1 for a non-Sikh/ Hindu, non-Muslim, or non-Christian, and 0 if not.
T_{12N}	Non-religious	Assigned 1 for a person with no religion, and 0 if otherwise.
T_{13}	Loan access	Assigned 1 for a person that has accessed Fuliza loan or any other mobile loan, and 0 if otherwise.
U_{14P}	Indebtedness	Assigned 1 for a person that has had problems in repaying a loan, and 0 if otherwise.
U_{15}	Financial strain	Assigned 1 for a person that often experiences financial-related problems, and 0 if otherwise.
T_{16}	Parental status	Assigned 1 for a parent/ guardian, and 0 if non-parent/ non-guardian.
G_1	Gamer	Assigned 1 for a person that has ever participated in lotteries or betting, and 0 if otherwise.
G_{2D}	Betting frequency- daily	Assigned 1 for a person that bets on a day-to-day basis, and 0 if not.
G_{2W}	Betting frequency- weekly	Assigned 1 for a person that bets on a week-to-week basis, and 0 if not.
G_{2M}	Betting frequency- monthly	Assigned 1 for a person that bets on a month-to-month basis, and 0 if not.
G_{2O}	Betting frequency- while	Assigned 1 for a person that bets once in a while, and 0 if not.
W	Wager spending	The typical amount, in Kenya Shilling, that an individual wagers on a bet.

3.5 Expected Outcome

From previous studies, it was expected beforehand that individual-specific characteristics and other socio-demographics affect gambling behaviour among the youth as well as wager spending. It was, for instance, expected that the average spending on wagers in the rural areas

differs from that observed in urban areas. Similarly, the observed gambling behaviour among rural youth was expected to differ from that among urban youth. Moreover, gambling behaviour among female youth was expected to differ from that among male youth. The same was expected among the financially literate versus the financially illiterate.

3.6 Econometric Issues

3.6.1 Normal Data

This issue relates to the distribution of residuals (Monnat [73]), which then determines the RUM to be utilized. In utilizing the Probit model, it is assumed that the distribution of the residuals is approximately normal. Logistic and logit models, on the other hand, assume that the residuals are approximately logistically- or extreme value- distributed, respectively. Although violation of the normal data assumption leaves the estimates unbiased (Knief & Forstmeier [53]), the corresponding standard errors tend to be incorrect in small samples. Wrong assumptions, however, stifle the plausibility of the results (Amore & Murtinu [4]).

Normal data tests are many including the Kolmogorov-Smirnoff procedure, and the Shapiro-Wilk procedure. Since both tests are commonly the most used (Mishra et al [72]), the latter was, accordingly, was utilized in this research. The claim tested was that the residuals are approximately normal. Corresponding probability values for each variable were compared with the significance level. The claim of normal data failed to hold for probability values less than significance level. For convenience, this research adopted 5% significance level. The normal data test was, however, not necessary in this research since the sample (given by Fin Access (2021) Survey) was large enough.

3.6.2 Selection Problem

This research was informed by the possibility of individuals belonging to any of the following categories: (1.) those who would gamble regardless of the odds and their endowment

level, (2.) those who would gamble only when the odds are favourably high and they have additional cash balances, (3.) those who would gamble only when the odds are unfavourably low and they have no additional cash balances, and (4.) those who never gamble regardless of odds or cash balances. Fin Access (2021) Survey, however, did not capture data on odds or additional cash balances. A natural option would then be categorizing individuals based on wager spending and betting frequency. For instance, if an individual games, then wager spending is observed (Seal et al [90]). Following a model proposed by Heckman, an individual first opts to bet or refrain. Thereafter, an individual spends on a wager if he/ she chooses betting. There is, nevertheless, the possibility of individuals with certain characteristics self-selecting into gaming or refraining (Kruse-Diehr et al [56]). The financially literate, for example, could be having other shared characteristics (including alternative income sources and time use schedules) that affect their gambling behaviour.

Fin Access (2021) Survey showed that 86.1% of Kenyans were non-active bettors. Suggestive in the survey was that the data on bettors will have many zeroes. Attempts to utilize such data in least squares parameterizing would thus be unfruitful. A natural way to go about it would be the employment of selection models. One such a model is the Heckman model while the other is the hurdle model. Non-concavity might, however, limit the plausibility of the Heckman model. Besides, Heckman estimates might be erroneous in the event that the restriction on exclusion is violated (Galimard et al [34]). Moreover, endogeneity is poorly accounted for in the Heckman model when the available instruments are not valid (Wolfolds & Siegel [106]). Thus, addressing the selection problem required the utilization of the hurdle model as fronted by Cragg. In the hurdle model, a distinction was made between non-zero and zero values, and thereby allowing for zero-values' probability to fit within the standard count distribution (Kang et al [48]).

3.6.3 Homoscedasticity

Given a vector of explanatory variables, homoscedasticity refers to a situation whereby the disturbances have a constant variable (Babashova [8]). In the event that this fails to hold, the problem of heteroscedasticity arises. Heteroscedasticity is undesirable since it leads to incorrect standard errors, which in turn affect inferences (Alaba et al [3]). In this research, therefore, the claim of homoscedastic errors will be investigated against the alternative of non-constant error variance. The procedure adopted follows the White test. The claim of homoscedastic errors will fail to hold in the event that Chi-square probability value is smaller than the 5% significance level. In such a case, robust standard errors will be adopted.

3.7 Data Source

The data to be utilized is cross-sectional in nature, and will be sourced from the Fin Access (2021) survey conducted jointly by the Central Bank of Kenya (CBK), Financial Sector Deepening (fsd-) Kenya, and Kenya National Bureau of Statistics (KNBS).

4. EMPIRICAL FINDINGS AND DISCUSSION

4.1 Introduction

Two key analyses are captured in this chapter. The first part of the analyses focused on the demographics with a particular interest in describing the data using the measure of dispersion, central tendency, and range. The second part of the analyses addressed the first two objectives of the research, and made use of regression models and diagnostics earlier presented in the previous chapter. Lastly, a discussion of this research's key findings was presented at the end of this chapter.

4.2 Demographics

Descriptive statistics are captured in Table 2 in the APPENDICES. This section, however, narrows down on describing the data based on the mean. 1.36% of Kenyans gamed with an estimated 11.4% of Kenyans knowing/ being closer to a gamer. This figure is slightly lower than the 13.9% reported in the methodology, with the difference being attributed to changes arising from data cleaning. The average Kenyan gamer wagered Kenya Shillings 1007 while approximately 3-fifths of individuals had a spending plan and another 3-fifths were either food insecure or couldn't access medical care when need arose. Kenyans own different assets regardless of their incomes/ livelihood sources. In 2021, approximately 9.04% and 9.79% of Kenyans owned a motorcycle and bicycle, respectively, with radio ownership being more than twice digital TV ownership. Age hints at the possibility of demographic transition. 47.3% of Kenyans were in the age cohort 18-35years while 65.6% of Kenyans were rural residents. Although youths constituted 47.3% of Kenyans, the average individual was 38 to 39 years.

Meeting day-to-day needs requires a livelihood source. Fin Access 2021 survey suggested that casual workers almost trebled those in formal employment, who were in turn less than half the number of individuals drawing a livelihood from the agricultural sector. Disturbing, however, was that dependents were second only to casual laborers. These statistics may require careful scrutiny considering that the average household had 4 to 5 members with

only 16.4% of Kenyans being healthy financially. At times, individuals tap on financial resources such as credit facilities, either for consumption or investment purposes. Whereas 24.5% of Kenyans accessed a loan via mobile phone (majority of whom used Fuliza), approximately 1 in every 10 Kenyans was denied a loan.

Despite the average Kenyan being non-poor income-wise (from a simple comparison of means without testing for significance difference), over 4-fifths of Kenyans were not healthy financially. Besides, 1 in 2 Kenyans never repaid their debts while 23.6% of Kenyans repaid their loans late. Monetary depravity was evidenced in 29.3% of Kenyans while most of indebted individuals repaid loans using savings. Finding a job (regardless of whether it is gainful or degrading) is not always an agenda for everyone. Worrisome is that in 2021, more Kenyans considered gaming as a good income source than individuals focusing on finding a job.

4.3 Model Estimation

4.3.1 Interpretation Overview

In interpreting the hurdle estimates, this research was cognisant of the fact that gaming propensity was strictly defined within the interval [0,1] and explained in a probit model whereas wager amount was strictly non-negative among gamers and explained in a Tobit model[22]. Gaming propensity was consequently interpreted as a probability while wager amount was measured in Kenya Shillings except in situations whereby an explanatory variable was in logarithm. In such a case, the interpretation is one of semi-elasticity. Equations (*5*) and (*6*) were, however, probit and Tobit models, respectively. For simplicity, the 'ceteris paribus dictum' was invoked in the interpretation to avoid unnecessary repetition. Consequently, reported coefficients in column (2) Table 3 (in the APPENDICES) capture probabilities, and

[22] Prof. Richard Mulwa has indicated that Tobit model is a generalization of hurdle models.

not indirect benefits. As an example, consider the two estimated models with coefficients in columns (1) and (2) of Table 3. The two estimated models are, thus, (8) and (9), respectively:

$$\widehat{G_k} = G_k(-2.197 + 0.2\text{youth} - 0.425\text{female} - 0.0992 \ln \text{income} - \cdots + 0.082\text{radio}) \quad (8)$$

$$\widehat{W_k} = 4.675 - 0.0506\text{youth} - 0.815\text{female} + 0.147 \ln \text{income} + \cdots - 0.122\text{loan denied} \quad (9)$$

To interpret the kth coefficient in (*8*), a redefinition of marginal effect is warranted. This effect is defined by the relation: $\frac{\partial p(\widehat{G_k=1}|T_k)}{\partial T_k} = g(T_k) = \frac{1}{2\pi} e^{-\frac{1}{2}n^2}, n = T_k b_k$. A quick approximation of n can be established by setting each of the explanatory variables to be 1 (essentially implying that income is measured at the natural base, KSH e). Thus, n is the sum of the coefficients. For columns (2) and (5), this computation yields n=-0.26856 and n=-0.18352, respectively. Suppose, one wishes to interpret the coefficient of female and ln income. Since 'female' was assigned 1 for a female individual and 0 for a man, the coefficient of 'female' in (8) suggests that a female is 16.35% less likely to game than a male counterpart. In (9), this coefficient suggests that a female gamer wagers, on average, Kenya cents 82 less than a male gamer. Similarly, a 1% income increment led to additional Kenya cents 14.70 being wagered while reducing the gaming probability by 3.817%.

Attention is now shifted towards interpreting SFA estimates. The frontier in columns (7) and (11) of Table 3 captures technical efficiency. In column (7) Table 3, for example, the optimum wager spending is KSH 53.18 which is way far below the average wager amounting to KSH 1006.92 in Table 2. Consider the coefficient of ln income (i.e., 5.659 in Table 3) which suggests that an individual's efficiency in gaming rises by 0.00562% for a 1% income

increment[23]. Similarly, the coefficient for the university dummy is 62.73 suggesting that an average beneficiary of university training is 0.2772% more efficient gamer than a non-university-trained counterpart. During the analyses, however, it was suspected that the realization of a minimum wager spending was hampered by some factors which contributed towards technical inefficiency. These factors included loan repayment status and the repayment enabler. In particular, loan repayment by either using one's savings or working extra hours increased the technical inefficiency (column (8), Table 3). Last, the efficiency scores were estimated using the JLMS procedure, whose summary is presented in Table 4. In order to compute the efficiency scores, the analyses narrowed down to only gamers, and subsequently transformed the dependent variable into ln wager amount, rather than just wager amount. This research's findings suggested that the average gamer was 90.22% efficient in the absence of undesirable outcomes. When accounting for undesirable outcomes, it was noticed that the average gamer was only 86.95% efficient (Table 4 in the APPENDICES). Suggestive in this is that undesirable outcomes increased inefficiency among gamers.

4.3.2 Model Estimation and the Discussion

This research adopted 5% significance level, and captured the findings in Table 3 in the APPENDICES. It was suspected that heterogeneity in the SFA would arise from undesirable outcomes (loan repayment and repayment enablers). In choosing the two undesirable outcomes, previous evidence for gaming-induced indebtedness was followed, which then meant that debtors had to repay their loans when due. This also meant that the repayment modality was important. Diaz [25] and Seal et al [90] had suggested that gaming propensities decline up the age cohort and as individuals grow old, respectively. This research documented that age cohort is not a sufficient predictor of gaming (propensity and intensity) in Kenya, and hence disagreed

[23] Since the target was to minimize wager amount instead of ln wager amount, the wager spending frontier is not of the Cobb-Douglas form. Thus, $\frac{\partial \widehat{W_k}}{\partial Income} = 5.659 \rightarrow \frac{\partial \widehat{W_k}}{\partial Income} * \frac{E(Income)}{\widehat{W_k}} = \frac{5.659}{\widehat{W_k}} = \frac{5.659}{1006.917} = 0.005620129.$

with Diaz [25] and Seal et al [90]. Young people are, however, found to have higher gaming efficiency than older individuals although undesirable outcomes slightly erode the efficiency. That is, a youth, on average, was 7.696% more likely to game, wagered Kenya Cents 5.06 less, and was 1.031% more efficient gamer than an adult. Undesirable outcomes, nevertheless, meant that relative efficiency of youth gamers dropped by 0.1381 points. Neither location nor location interacted with age cohort affected gaming propensity, intensity, or efficiency.

In the absence (presence) of undesirable outcomes, a typical[24] female gamed 16.35% (15.73%) less often and wagered Kenya Cents 81.5 (87.9) less than a male counterpart. The average female was just as efficient in spending on wagers as a male counterpart. Schmidt [89] suggested higher gaming propensities among males than females in Western Kenya while Salonen et al [87] showed that the average female gamer spent less than a male counterpart. This research, therefore, corroborated Salonen et al [87] and Schmidt [89], while showing further that gaming intensities and propensities among females dwindle in consideration of undesirable outcomes. Age effect, however, suggested that undesirable outcomes enhanced efficiency among female youth although they were less efficient than non-youth males. It was noticed that although wager spending and gaming likelihood was not statistically different between a female youth and an adult male, a female youth was 0.595489% less efficient in reducing wager spending than a male adult.

Undesirable outcomes (or their absence) meant that a university-trained individual, on average, was 12.24% (11.93%) more likely to game, spent Kenya Cents 36.90 (35.80) more, and 0.2899% (0.2772%) more efficient gamer than a non-university counterpart. Salonen et al [87] and Watanapongvanich et al [103] established gaming expenditures and inclination, respectively, declining in educational level whereas Mustapha & Enilolobo [74] suggested no significant associations between gambling and education among the youth. This research, thus,

[24] Average

disagrees with Salonen et al [87], Watanapongvanich et al [103], and Mustapha & Enilolobo [74]. It was established that university-trained (current and graduates) had significantly high gaming propensities and tended to be more efficient gamers than non-university individuals. Besides, presence (absence) of undesirable outcomes meant that university females were 0.0368% (0.01576%) more efficient gamers than non-university males. The findings, furthermore, suggested that a rural university individual was 0.0826% (0.0414%) more efficient gamer than a non-university urbane, without (with) undesirable outcomes. While educational attainment is informative, it need not necessarily imply financial literacy. An observation was made to the effect that financial literacy reduced gaming propensities whereby the average financially literate individual gamed 7.31% less often than a financially illiterate counterpart.

While sharing a home with a gamer left wager spending unaffected, it was realized that neighbourhood effects mattered. In particular, absence (presence) of undesirable outcomes meant that an individual was 67.27% (69.39%) more likely to game when someone else in the household gamed than when no other household member did so. Imitation effect implied that children and young people pick up some behaviours from adults. Closeness to a gamer, furthermore, coerces an individual towards gaming (Hilbrecht et al [40]). Following Mateo-Flor et al [69] and Hilbrecht et al [40], thus, an individual is likely to game if those around them are actively engaged in it. This research's findings suggested that proximity to a gamer increased both the propensity to game and the efficiency of gaming, and hence agree with Mateo-Flor et al [69] and Hilbrecht et al [40].

Income stability has a bearing, on one hand, on an individual's life goals, food security, and access to medication. In addition, stable incomes imply that an individual is able to cater for various other needs, including asset ownership and energy utilization. Farrell & Fry [30] suggested that gambling has nothing to do with energy poverty. This research documents that

clean fuel adoption has nothing to do with gaming. Belucio et al [11] and Spangberg & Svensson [92] suggested significant increments and decrements, respectively, in gambling expenditures (Belucio et al [11]) and gambling propensity (Spangberg & Svensson [92]) as income rose. As incomes rose, gaming inclination declined suggesting that gaming is consumed infrequently or it is an inferior good[25]. Among food secure gamers, significantly higher spending on wagers than among food insecure gamers was noticeable. In accounting for undesirable outcomes, food secure individuals staked Kenya Cents 46.10 in gaming more than individuals who couldn't afford a meal on a day-to-day basis. This figure was slightly higher than Kenya Cents 35.80 reported when undesirable outcomes were ignored. Individuals who considered gaming as a good source of income were 9.083% more likely to game, spend Kenya Cents 25.40 more, and 0.3387% more efficient than those thinking otherwise. This effect actually rose in the presence of undesirable outcomes. Following O'Donoghue & Somerville [80] and Kim & Lee [51], it is likely that higher perceived net benefits induced such individuals towards gaming. Besides, these individuals could have been incentivized by financial gains (Price et al [84]; Vinberg et al [101]). Having food, education, or health as the main life goals reduced expenditures on gaming. Meeting one's need for food, education, or health meant that an individual wagered less Kenya Cents 35.10, Kenya Cents 38.40, and Kenya Cents 70.60, respectively, than one who didn't consider any of these as a priority. Except for education, whose effect on wager amount remained unchanged, gaming expenditures given food goal declined while wager amount given health goal rose slightly when moderating for undesirable outcomes although the goals had no effect on efficiency.

[25] The coefficient of ln income in the wager amount and gaming propensity equations captured under columns (1) and (2), Table 3 is extracted. Now, $\frac{\partial \widehat{W_k}}{\partial \ln Income} = 0.147 \rightarrow \frac{\partial \widehat{W_k}}{\partial Income} * \frac{E(Income)}{\widehat{W_k}} = \frac{0.147}{\widehat{W_k}} < 1$. This suggests that wager expenditure is inelastic in income. Similarly, $\frac{\partial \widehat{G_k}}{\partial Income} = -\frac{0.0992}{Incom} \rightarrow \frac{\partial \widehat{G_k}}{\partial Income} * \frac{E(Income)}{\widehat{G_k}} = -\frac{0.0992}{\widehat{G_k}}$. Since, 13.9% of individuals are active gamers, on average, the last derivation suggests that gaming is a necessity (absolute elasticity less than 1) but an inferior good (elasticity is negative).

On the other hand, dwelling tenure (purchased, constructed, inherited, or rented home) and relocation decision could be affected by income. For instance, a dweller can relocate to a more fulfilling house/ neighbourhood as incomes rise or relocate to low-cost residence during periods of financial turmoil. Through this research, it was evident that relocation increased gaming expenditures significantly but not propensity. An individual who had relocated wagered Kenya Cents 30.80 (32.20) more than one who had not relocated with (without) considerations of undesirable outcomes. Dwelling tenure suggested that individuals who had built their own homes tended to spend Kenya Cents 41.50 more on gaming and had 0.9875% higher gaming efficiency than rental tenants. Gaming intensity actually rose when undesirable outcomes are considered with a typical gamer who had constructed a home wagering Kenya Cents 47.00 more than a rental tenant counterpart. Owning phones on credit is a much recent phenomenon in Kenya. Within the gaming context, mobile loan access was found to enhance gaming propensity without affecting efficiency with a typical debtor being 9.412% more likely to game than a counterpart who had no access to mobile loans. Aggressive campaigns by gaming firms have evidenced advertisements on radio and TV. This research established that gaming expenditures declined significantly among digital TV owners such that a digital TV owner wagered Kenya Cents 48.70 less than a non-owner. Last, this report documents a significant gaming expenditure decline as rural employment rises in the presence of undesirable outcomes. Compared to an urban jobless individual, a rural employee wagered Kenya Cents 48.29 less.

So far, undesirable outcomes have been considered as moderating factors. From the survey, however, it was evident that some households used credit facilities in meeting their income needs. While credit eases consumption, by assumption, it carries with it the burden of honouring loan repayment obligation that has three-fold effect. First, reliance on savings to repay mature loans potentially depletes savings. Second, where savings are inadequate,

expenditure cuts on food and non-food items is common. Third, where shortfalls persist, an individual may have to work longer periods in order to secure more income. These consequences have far-reaching ramifications on gaming behaviour. Loan repayment using savings, for instance, raised gaming propensities by 7.61% as well as implied 0.9446% higher gaming efficiency and higher technical inefficiency relative to a typical individual who did not use savings to repay their debts. Loan repayment using food expense reductions improved gaming efficiency by 0.5224% while longer work durations not only enhanced gaming efficiency (such that an individual working more hours was 0.5138% more efficient in gaming than one who didn't work extra time) but also increased technical inefficiency. Other than credit dynamics, it was also noted that weekly bread consumption[26] was associated with higher gaming propensity such that a bread consumer was 7.966% (7.532%) more likely to game than one who didn't consume bread on a week-to-week basis, without (with) undesirable outcomes.

4.4 Changes Made in the Analysis

At the conceptual stage, gambling propensity and intensity as well as betting frequency had been identified as explained variables. Fin Access 2021 Survey data, however, captured betting frequency duration-wise; that is, whether an individual gamed daily, on a week-to-week basis, monthly or occasionally. The anticipated frequency at the conceptual stage was the number of times an individual gamed. As a result, the analyses omitted betting frequency. Similarly, gambling disorder had been identified as an undesirable output at the conceptual stage. At the analytical stage, gambling disorder was found not to have been captured in the data. Lastly, parent's education was carefully left out as a matter of convenience while some variables identified under the analytical model and subsequently under the operationalization of the study failed the variable selection test. Hence, they were dropped. Variable selection involved executing forward selection on the probit and Tobit models in the hope that qualifying

[26] Dr. Maureen Were has noted that the inclusion of bread in the analysis appears to have been from panacea. However, its inclusion was deliberate, and was intended to form the basis for further inquiry.

variables could lead to the Cragg hurdle model being estimable[27]. Some of the variables which were left out in the analyses captured in the subsection above include marital status and religion while education level was reclassified into university versus non-university.

The analyses presented and discussed so far have considered age among the explanatory factors. Being faithful to this research's spirit, however, required a narrowing down of the analyses to focus on the youth with a presentation of the relevant estimation and discussion captured in APPENDIX IV which focuses on gaming efficiency.

In analysing gaming efficiency, three cases were considered, being; (I.) without undesirable outcomes, (II.) with loan repayment status as an undesirable output, and (III.) with loan repayment status, repayment enabler, and amount repaid as undesirable output. Loan repayment enablers could not be considered on their own since the estimates could only be backed up without converging. Table 5 in APPENDIX IV for instance suggested that working as a casual labourer, constructing a home, perception, ownership of radio or digital TV, and financial health significantly affect gaming efficiency among the youth. This effect is, however, not across all the factors but depends on the case being considered. Age, location, and income, on their own, have no significant effect on gaming efficiency, on the other hand. Under the three cases, the average gamer was 60.5%, 60.3%, and 99.1% efficient in minimizing wager amounts. The statistics reported in cases I and II for the youth alone appear to be much lower than that reported in the entire sample of gamers.

4.5 DIAGNOSTICS

The Cragg hurdle estimates indicated no change in the signs of the coefficients with (or without) undesirable outcomes. Thus, the Cragg hurdle estimates could be effectively considered robust. Attention was then directed towards the SFA. The truncated normal model was chosen due to its relatively high flexibility. It was, however, necessary that this research

[27] Prof. Damiano Kulundu suggested the employment of Heckit model instead of the Cragg Hurdle model.

interrogates the claim of technical inefficiency being absent as well as that on the truncated normal distribution being appropriate[28]. This was equivalent to testing the null of all coefficients in the technical inefficiency model being jointly not different from zero in the former case. The constant term was significant indicating the presence of technical inefficiency (column (7) Table 3 in the APPENDICES). In the latter case, the null was the claim of all slopes in the technical inefficiency model being zero. Noticeable was that the differential slopes for loan repayment using either savings' withdrawal or working additional time were statistically significant. The null of truncated normal was subsequently rejected.

[28] Sigma u was insignificant statistically, and; hence, the contribution of technical inefficiency to observed deviations was considered not statistically different from zero.

5. SUMMARY, CONCLUSIONS, AND DIRECTIONS FOR POLICY ACTION

5.1 Introduction

An overview of the entire research is presented in this final chapter as well as a summary of the findings and insights drawn from those findings. Lastly, suggestions for policy action are indicated followed by a concession of the limitations in this research alongside suggestions/ directions for future research.

5.2 Overview of the Research

Given the existing gaps in methodology, population, and evidence, this research sought to investigate gaming behaviour among the youth in Kenya on three dimensions, namely; propensity, intensity, and efficiency. The first two dimensions were explained through the employment of the Cragg hurdle model whereas the third dimension was captured under Batesse & Coelli (1995) SFA. Calibration was adopted in the analysis and made use of as many parameters as possible while ensuring robustness of the results. Cognisant with the fact that the more the parameters, the fewer the degrees of freedom, and the lesser the parsimony, forward selection procedure was utilized. The adoption of forward selection was anchored on the understanding that candidate variables for the two constituent models in the Cragg Hurdle model, namely; probit and Tobit, could be chosen using step-wise estimation. It was anticipated that selected variables in the step-wise estimation would raise the chances of convergence in both the Cragg hurdle model and SFA.

The investigation made a distinction between gaming determinants with and without undesirable outcomes. The undesirable outcomes incorporated in the analyses were: an individual's loan repayment status and an enabler towards the repayment, although the amount of loan repaid was also included when narrowing down to gaming efficiency among the youth explicitly. Descriptive analysis did shed light on variables which could not be used in the regressions. For instance, the sample had no Hindu whose marital status was single although in the model estimations, religion dummies were dropped. The descriptive statistics also

indicated that the proportion of individuals who knew/were closer to someone who games was higher than the proportion of individuals who revealed having gamed. Without unnecessary repetition, food and medical insecurity were alarmingly high, to the tune of three-fifths of Kenyans struggling with either. In terms of this research's focal points, the youth were approximately 47.3% of those sampled and wagered between Kenya Shillings 20 and Kenya Shillings 10000, although the average wager by an individual in the age cohort 18-35years was less than the average wager in the entire sample. The burden of debt cannot be ignored since this research's findings suggested that savings' withdrawal and reduction in both food and non-food expenses constituted over two-thirds of loan repayment means while more than half of indebted individuals never repaid their loans. Lastly, it was found that the proportion of financially literate Kenyans was almost 9times higher than the proportion of Kenyans with university training, either as students or graduates.

At this point, it is important to highlight the key findings from model estimation. Although age cohort was not a sufficient predictor of gaming propensity and intensity, young people had higher gaming efficiencies than older individuals. This efficiency was slightly eroded by undesirable outcomes. While there was no significant difference in gaming efficiency between females and males, a female gamer wagered less often as well as staked less than a male counterpart. Undesirable outcomes, however, evidenced an improvement in gaming efficiency among female youth although falling short of the efficiency seen in non-youth males. Relative to non-university persons, university-trained individuals recorded high gaming propensity, intensity, and efficiency, although undesirable output slightly reduced the magnitudes. Attending university also meant that females were more efficient gamers than non-university males. The effect of university training on gaming was also evident residence-wise high gaming efficiencies being observed in rural university individuals relative to non-

university urbane. Contrasted to university education, financial literacy reduced gaming propensities.

Neighbourhood effects led to enhanced gaming propensities with undesirable outcomes further increasing the chances that an individual would game if someone close to them does. In terms of energy poverty, the findings suggested that clean fuel adoption was not a significant predictor of gaming. An analysis of income elasticity suggested that gaming was consumed infrequently and, at the same time, was an inferior good. Among other contributors to reductions in gaming intensities was food insecurity. When accounting for undesirable outcomes, food secure individuals actually wagered more than food insecure counterparts. Gaming propensity, intensity, and efficiency was enhanced by perception of gaming as a good income source. Having food, education, or health as the main life goals reduced expenditures on gaming. Relocation increased gaming expenditures significantly but not propensity.

Relative to a rental tenant, an individual who had constructed his/ her home recorded high gaming intensity and high gaming efficiency with the intensity rising in the presence of undesirable output. Mobile loan access was found to enhance gaming propensity without affecting efficiency. Gaming expenditures declined significantly among digital TV owners. Employment, on the other hand, suggested that as rural employment rose, gaming expenditures significantly declined. An examination of undesirable outputs suggested the following: drawing on savings to repay loans raised gaming propensities, gaming efficiency, and technical inefficiency; cutdowns on food expenses raised gaming efficiency, and; longer work durations raised both gaming efficiency and technical inefficiency.

Reporting different regression models enabled a quick assessment of robustness of the results. As a rule of thumb, the results were considered robust if none of the coefficients changed signs across related regressions. The findings suggested that the estimates were robust. In the SFA, robustness checks suggested that the technical inefficiency component had to be

included. In restricting to the youth alone, however, the technical inefficiency component was omitted.

5.3 Conclusions

From the analyses, it was evident that gaming propensity, intensity, and efficiency is affected by some factors, although at differing magnitudes and direction. Gaming efficiency, for instance, declined in age but rose in educational attainment, perception, residence in a constructed home, and loan repayment using either savings, food expense reduction, or longer work durations. Gaming propensity, on the other hand, declined in gender, income level, and financial literacy but rose in loan repayment using savings as well as proximity to a gamer and mobile loan access. The amount wagered declined in food insecurity, rural employment, and digital TV ownership as well as having either food, education, or health as the main life goals, but; rose in educational attainment and perception of gaming as a good income source. Although undesirable outputs did not alter the direction of correlations, they altered the magnitudes.

5.4 Suggestions for Policy Action

Since gaming efficiency and intensity rose in educational attainment, a suggestion is for the government to restrict gaming to only individuals with at least a university degree. Although this seems paternalistic, it could improve social outcomes in the long-run. This does not, however, imply that gamers be allowed to wager as much as they want. Rather, wager amounts have to be capped as well as the number of times allowable per person in a month. This suggestion follows from the evidence of undesirable outcomes, such as suicidal tendency, documented in Kaggwa et al (2021).

The indication of gaming efficiency declining in age need not necessarily suggest that young people should be encouraged to game. Attention ought to, however, be directed at perception since the findings suggested that highly efficient gamers were those considering

gaming as a good source of income. This finding has to be weighed against rural employment which led to declines in amounts wagered. Rather than shaping perception or reframing gaming as a bad income source, employment opportunities ought to be availed, especially for the rural populace.

A preoccupation with meeting one's needs for food, health, or education was occasioned by declines in wager spending. Additionally, meeting one's food requirements as well as owning digital TV meant less resources are available for gaming. Digital TV ownership reflects improvements in the standard of living of the people, at least in theory. While food insecurity cannot be encouraged, the government's actions ought to be directed towards the betterment of Kenyans such that individuals are able to provide a meal, healthcare, and education for themselves or others. In suggesting, thus, this research assumed that failing to have meeting either one's needs for food, health, or education as a life's priority need not necessarily raise expenditures on gaming.

Since gaming propensity declined in financial literacy, a suggestion is presented to the effect of pushing aggressive financial literacy campaigns without leaving any Kenyan behind. Similarly, the decline in gaming propensity with income suggested that the temptation to game was more nuanced at lower levels of income. Raising household incomes, as well as those of individuals, requires economic development. Macro-economic planners, therefore, ought to avail incentives which would raise both output and received incomes. To realize this, a three-pronged approach could be adopted. One, agricultural diversification could, for instance, raise the incomes of farmers while simultaneously raising rural employment. This would, in turn, reduce the expenditures on gaming. Additionally, safety nets could be considered. Two, as rural incomes rise, rural residents can manage sending their children to university. This, in turn, would lead to improvements in gaming efficiency. Three, with rising incomes, individuals require financial literacy training which then works to reduce gaming propensity.

Although gaming efficiency rose in loan repayment using savings, reductions in expenditures on both food and non-food items, these actions are undesirable. Reduction of savings, for instance, leads to less resources being available for investment, depletes the stock of household wealth, and may negatively affect the production of home commodities such as childcare since savings are shifted towards repaying loans. Repaying loans using savings is, in this sense, considered unproductive. Reducing expenditures on food implied a reduction in consumption levels among individuals. This negatively affects the welfare of individuals. A suggestion would be for credit rationing. This may, however, distort the credit market in the spirit of Joseph Stiglitz and Michael Rothschilds.

5.5 Limitations of the Research

Financial Access Surveys in Kenya are cross-sectional. Besides, it is only Fin Access 2021 which explicitly collected meaningful data on gaming. As a result, the Malmquist and Luenberger productivity index could not be employed in explaining undesirable outcomes since the data was not panel. Although pooling datasets enhances precision, this research did not utilize pooled cross sections. This was occasioned by the realization that Fin Access 2016 never captured gaming whereas Fin Access 2019's gaming data failed to sync with Fin Access 2021. This also meant that government interventions on the gaming market in 2018 and 2019 could not be adopted as a treatment. In 2020, COVID-19 pandemic proffered an opportunity to conduct a quasi-experimental research. It was, however, noticed that 2.259% of individuals who experienced shock during COVID-19 pandemic were gamers while 81.14% of gamers reported experiencing shock. There are, however, almost certainly spill over effects that despite some individuals not experiencing shocks, they were closer to a family member/ household that had suffered the shock. This was, nevertheless, a minor issue.

This research's central concern was that although Fin Access survey datasets are rich, their cross-sectional nature renders it impossible to investigate causality. Last, this research

didn't incorporate any treatment since the datasets were designed in such a manner that left no room for grouping households into treatment and control groups. The best that could be done, accordingly, was playing around with pure correlations while desisting from inferring causality. In summary, therefore, estimates reported in this research cannot be considered as inferring causal relationships. Instead, at best, the estimated coefficients are merely correlations.

5.6 Directions for Future Research

During the analyses, it was evident that some individuals at least knew a gamer or shared the same roof with a gamer. An identified grey area was that little, if anything, had been mentioned in terms of the utilization of such knowledge. It would be interesting, for instance, for future research to interrogate the impact of inter-household networks on gaming in Kenya. A typical case would be the utilization of such networks in forging alliances which could effectively 'beat the bookie'. Even then, knowing a gamer is not enough. A parent could be a gamer, for example, while simultaneously forbidding younger household members (e.g., youth) from gambling. Thus, networks can be modified to incorporate power dynamics and household norms in shaping gaming inclination in Kenya. Lastly, this research's findings suggested that gaming inclination declined in incomes. It was, however, not clear whether the incomes documented in Fin Access 2021 Survey included cash transfers or unexpected windfall gains. Thus, future research could interrogate the impact of cash transfer programs on gaming in Kenya. At the moment, there have been many studies on cash transfer initiatives in Kenya. Majority of them, nevertheless, focused on household welfare. Shifting attention from household welfare to gaming, therefore, would shed light on the gaming dynamics.

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APPENDICES

APPENDIX I: Financial Access 2021 Survey Questionnaire

Relevant variables considered in the current study are reported as captured in the Survey Questionnaire. The questionnaire is accessible via https://www.centralbank.go.ke/wp-content/uploads/2021/12/FinAccess-2021-English-Version-Questionnaire-Dec.-15.pdf.

APPENDIX II: DEMOGRAPHICS

Summary statistics are captured in Table 2.

Table 2: Demographics

VARIABLES	Observations	Mean	Standard deviation	Minimum	Maximum
Financial health	22,017	0.164	0.371	0	1
Youth	22,017	0.473	0.499	0	1
Bet spending	300	1,007	1,579	20	12,000
Wager amount	17,264	17.50	246.0	0	12,000
Female	22,017	0.576	0.494	0	1
Location	22,017	0.656	0.475	0	1
Bread	22,017	0.450	0.498	0	1
Banana	22,017	0.566	0.496	0	1
Motorcycle	21,946	0.0904	0.287	0	1
Bicycle	21,946	0.0979	0.297	0	1
Radio	21,946	0.616	0.486	0	1
Digital TV	21,946	0.270	0.444	0	1
Age	22,017	38.87	17.17	16	100
Neighbourhood	22,017	0.114	0.318	0	1
Loan denied	22,017	0.102	0.303	0	1
Mobile loan	22,017	0.245	0.430	0	1
Fuliza	22,017	0.198	0.398	0	1
Food security	22,017	0.416	0.493	0	1
Spending plan	22,017	0.613	0.487	0	1
Medical security	22,017	0.405	0.491	0	1
Mobile access	22,017	0.897	0.303	0	1
Household size	22,017	4.178	2.407	1	23
Livelihood source:					
Agriculture	22,017	0.211	0.408	0	1
Employed	22,017	0.0935	0.291	0	1
Casual	22,017	0.276	0.447	0	1
Own business	22,017	0.148	0.355	0	1
Dependent	22,017	0.272	0.445	0	1
Main goal in life:					
Food	22,017	0.314	0.464	0	1
Education	22,017	0.319	0.466	0	1
Health	22,017	0.101	0.301	0	1
Job	22,017	0.0746	0.263	0	1
Other	22,017	0.192	0.394	0	1
Perception	22,017	0.0923	0.290	0	1
Financial literacy	22,017	0.444	0.497	0	1
Income	19,613	8,303	12,616	100	400,000
Repayment enabler:					
Savings	22,017	0.241	0.428	0	1
Assets	22,017	0.140	0.347	0	1
Food expense reduction	22,017	0.223	0.416	0	1
Non-food expense reduction	22,017	0.228	0.420	0	1
Work hours	22,017	0.188	0.390	0	1
Loan repayment:					
Never	22,017	0.506	0.500	0	1
Late	22,017	0.236	0.425	0	1
Missed	22,017	0.0868	0.281	0	1
Less	22,017	0.0819	0.274	0	1
Exact	22,017	0.214	0.410	0	1
Savings loss	22,017	0.00223	0.0471	0	1
Money run	22,017	0.292	0.455	0	1
Relocation	22,017	0.166	0.372	0	1

Female*financial literacy	22,017	0.233	0.423	0	1
Female*financial health	22,017	0.0849	0.279	0	1
Female*location	22,017	0.378	0.485	0	1
Employed*location	22,017	0.0399	0.196	0	1
Youth*location	22,017	0.272	0.445	0	1
Home tenure:					
Purchased home	22,017	0.00590	0.0766	0	1
Constructed home	22,017	0.693	0.461	0	1
Inherited home	22,017	0.0422	0.201	0	1
Rented home	21,947	0.256	0.437	0	1
Youth*female	22,017	0.284	0.451	0	1
Household head	22,017	0.440	0.496	0	1
Clean fuel	21,947	0.176	0.380	0	1
Location*income	19,613	4,108	8,204	0	300,000
Youth*income	19,613	3,949	8,344	0	200,000
Employed*youth	22,017	0.0518	0.222	0	1
University	21,992	0.0445	0.206	0	1
University*location	21,992	0.0158	0.125	0	1
University*female	21,992	0.0206	0.142	0	1

APPENDIX III: ESTIMATION

Estimations are captured in Table 3.

Table 3: Gaming Propensity, Intensity, and Efficiency

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
VARIABLES	Wager amount	Gaming propensity	Ln sigma	Wager amount	Gaming propensity	Ln sigma	Frontier	Technical inefficiency	U sigma	V sigma	Frontier	Technical inefficiency	U sigma	V sigma
Youth	-0.0506	0.200		-0.0892	0.228*		21.95**				19.01**			
	(0.244)	(0.129)		(0.243)	(0.131)		(8.914)				(8.627)			
Female	-0.815*	-0.425**		-0.879**	-0.401**		-5.086				-1.421			
	(0.441)	(0.202)		(0.439)	(0.203)		(10.56)				(10.33)			
Ln income	0.147*	-0.0992**		0.124	-0.0912**		5.659**				2.043			
	(0.0819)	(0.0425)		(0.0841)	(0.0431)		(2.539)				(2.434)			
Location (rural)	-0.0273	-0.161		-0.0779	-0.134		-14.54*				-7.474			
	(0.297)	(0.150)		(0.296)	(0.153)		(8.290)				(8.118)			
Food security	0.358**	-0.101		0.461***	-0.0770		2.943				4.717			
	(0.167)	(0.0865)		(0.169)	(0.0876)		(5.716)				(5.538)			
Medical security	0.00660	0.0639		0.00266	0.106		4.705				3.991			
	(0.156)	(0.0840)		(0.158)	(0.0853)		(5.761)				(5.627)			
University	0.358*	0.310***		0.369*	0.312***		62.73***				65.61***			
	(0.207)	(0.115)		(0.207)	(0.116)		(16.19)				(16.22)			
Spending plan	0.0439	-0.0603		0.0519	-0.0729		-0.687				0.00842			
	(0.153)	(0.0802)		(0.154)	(0.0814)		(4.958)				(4.734)			
Mobile loan	0.225*	0.243***		0.235	0.200**		-1.142				2.962			
	(0.134)	(0.0715)		(0.153)	(0.0807)		(9.809)				(9.973)			
Mobile access	0.231	-0.0334		0.557	-0.0482									
	(1.060)	(0.520)		(1.103)	(0.519)									
Neighbourhood	-0.347	1.748***		-0.437	1.769***		89.77***				83.54***			
	(0.327)	(0.0994)		(0.331)	(0.101)		(7.301)				(7.356)			
Household size	0.0222	-0.0182		0.0186	-0.0215									
	(0.0309)	(0.0165)		(0.0321)	(0.0168)									
Livelihood source:														
Agriculture	-0.230	0.174		-0.295	0.147									

	(0.275)	(0.142)	(0.282)	(0.144)		
Employed	0.184	0.0381	0.250	0.0617		
	(0.313)	(0.161)	(0.318)	(0.162)		
Casual	0.0897	0.0529	0.0831	0.0474		
	(0.243)	(0.123)	(0.249)	(0.125)		
Own business	0.104	-0.0357	0.0629	-0.0594		
	(0.274)	(0.141)	(0.277)	(0.143)		
Dependent (rf)	-	-	-	-		
Main goal in life:						
Food	-0.351**	-0.114	-0.362**	-0.0983	-0.620	-7.704
	(0.178)	(0.0970)	(0.177)	(0.0984)	(6.499)	(6.289)
Education	-0.384**	-0.0408	-0.384**	-0.0201	-4.979	-11.52*
	(0.175)	(0.0958)	(0.175)	(0.0967)	(6.458)	(6.297)
Health	-0.706**	-0.341**	-0.614**	-0.316**	-9.660	-12.73
	(0.310)	(0.158)	(0.311)	(0.159)	(8.705)	(8.414)
Job	-0.235	-0.0942	-0.244	-0.102	-8.005	-10.55
	(0.206)	(0.116)	(0.203)	(0.117)	(9.401)	(9.293)
Other	-	-	-	-	-	-
Perception	0.254**	0.234***	0.283**	0.240***	36.95***	31.78***
	(0.126)	(0.0731)	(0.126)	(0.0739)	(7.991)	(7.932)
Financial literacy	0.206	-0.190**	0.237	-0.172*	6.641	6.469
	(0.150)	(0.0881)	(0.151)	(0.0897)	(7.181)	(7.017)
Insurance	-0.630	-0.315	-0.578	-0.317		
	(0.399)	(0.202)	(0.398)	(0.203)		
Savings loss	0.940	0.148	0.165	0.119	-23.18	-11.15
	(1.122)	(0.552)	(1.144)	(0.545)	(46.76)	(46.00)
Money run	-0.0833	0.0831	-0.0857	0.0985		
	(0.131)	(0.0729)	(0.131)	(0.0738)		
Relocation	0.322**	0.0743	0.308**	0.0603	10.63	1.146
	(0.143)	(0.0817)	(0.144)	(0.0825)	(6.634)	(6.538)
Female*financial literacy	-0.222	0.161	-0.208	0.154	-10.47	-11.57

	(0.351)	(0.165)	(0.349)	(0.166)	(9.409)		(9.153)	
Female* financial health	-0.681*	-0.0430	-0.629	-0.0379	-11.07		-13.35	
	(0.382)	(0.166)	(0.383)	(0.167)	(8.595)		(8.510)	
Female*location	0.0516	-0.242	0.164	-0.262	13.20		8.943	
	(0.353)	(0.162)	(0.359)	(0.163)	(9.563)		(9.387)	
Employed*location	-0.585*	0.208	-0.655**	0.204	-9.453		-3.748	
	(0.310)	(0.179)	(0.310)	(0.179)	(10.83)		(10.54)	
Youth*location	-0.203	0.133	-0.154	0.124				
	(0.314)	(0.157)	(0.315)	(0.159)				
Home tenure:								
Purchased home	0.451		0.539		51.35*		57.36**	
	(0.598)		(0.592)		(27.94)		(27.79)	
Constructed home	0.415**		0.470**		14.35**		4.911	
	(0.189)		(0.191)		(7.022)		(6.991)	
Inherited home	0.0626		0.0640		9.390		3.469	
	(0.264)		(0.264)		(11.86)		(11.64)	
Rented home (rf)	-		-		_		_	
Youth*female	0.626	-0.228	0.614	-0.247	-22.01**		-18.56**	
	(0.411)	(0.179)	(0.412)	(0.181)	(9.252)		(8.968)	
Clean fuel	0.298*		0.287*		0.426		6.578	
	(0.170)		(0.168)		(6.941)		(6.913)	
Digital TV	-0.487***	0.0371	-0.476***	0.0573				
	(0.149)	(0.0766)	(0.148)	(0.0774)				
Loan denied	-0.122	0.230***	-0.138	0.204**	1.665		0.998	
	(0.137)	(0.0801)	(0.136)	(0.0817)	(6.979)		(6.906)	
Loan repayment:								
Never			0.272	0.135		47.73		18.66
			(0.207)	(0.118)		(32.22)		(24.85)
Late			0.0150	0.0827		15.35		19.22
			(0.215)	(0.120)		(32.60)		(25.08)

Missed		-0.00596	-0.155		14.71		20.11	
		(0.212)	(0.118)		(32.84)		(25.89)	
Less		-0.0996	-0.0642		-14.29		-17.56	
		(0.249)	(0.132)		(34.43)		(30.04)	
Exact		0.246	-0.0827		32.58		21.49	
		(0.239)	(0.135)		(37.21)		(28.62)	
Repayment enabler:								
Savings		0.0444	0.194**	39.47***	130.2***	2.399	30.06	0.846***
		(0.151)	(0.0867)	(8.197)	(33.75)	(7.753)	(22.84)	(0.0340)
Assets		0.231	0.0198	-7.762	-22.74	-1.481	-42.77	-0.795***
		(0.178)	(0.104)	(9.364)	(36.08)	(6.963)	(31.23)	(0.0497)
Food expense reduction		0.172	-0.0420	23.59**	79.49*	0.736	30.67	1.107***
		(0.188)	(0.111)	(10.54)	(41.44)	(8.346)	(32.09)	(0.0502)
Non-food expense reduction		-0.152	0.223**	-9.593	-26.43	-4.149	-51.01	-1.101***
		(0.185)	(0.111)	(10.46)	(40.88)	(7.714)	(32.48)	(0.0494)
Work hours		0.314**	-0.0146	27.52***	90.92***	9.140	39.94*	0.628***
		(0.151)	(0.0901)	(8.706)	(33.83)	(8.568)	(23.14)	(0.0406)
Bread	0.207**		0.192**					
	(0.0807)		(0.0814)					
Banana	-0.0531		-0.0435					
	(0.0783)		(0.0792)					
Motorcycle	0.0710		0.0774					
	(0.100)		(0.101)					
Bicycle	0.00694		0.00958					
	(0.104)		(0.105)					
Radio	0.0820		0.0763					
	(0.0863)		(0.0872)					
Ln age				8.882		7.416		
				(10.06)		(9.533)		
Fuliza				13.49		6.553		

							(10.15)				(10.42)			
University*location							-19.70				-43.86**			
							(20.56)				(20.18)			
University*female							-51.42**				-49.66**			
							(20.29)				(20.07)			
Constant	4.675***	-2.179***	-0.0343	4.269***	-2.446***	-0.0526	-71.57	-337.5***	9.945***	11.22***	-44.55	-48.56	5.804***	11.11***
	(1.355)	(0.651)	(0.0425)	(1.389)	(0.667)	(0.0425)	(45.37)	(36.75)	(0.0556)	(0.0124)	(43.26)	(31.36)	(0.399)	(0.0206)
Observations	15,598	15,598	15,598	15,598	15,598	15,598	15,599	15,599	15,599	15,599	15,599	15,599	15,599	15,599

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Rf: base category

Table 4: JLMS Efficiency Scores					
Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Model 7	277	0.9021579	0.2121455	0.1593521	0.9981183
Model 11	277	0.8695364	0.2252168	0.0767637	0.9979419

APPENDIX IV

Gaming Efficiency among the Youth

In analysing gaming efficiency among the youth, only individual gamers in the age cohort 18-35years were considered. The explained variable was ln wager amount. In testing for technical inefficiency, it was to be absent for each of the frontiers captured in columns (1), (5), and (9), respectively. This was the case since the computed probability values were greater than 5% significance level. Thus, it was considered needless checking out for various factors which could affect technical inefficiency. Descriptive analyses suggested that the youth wagered between Kenya Shillings 20 and Kenya Shillings 10000. These statistics are, nevertheless, not tabulated in this report. In analysing gaming efficiency, three cases were considered, being; (I.) without undesirable outcomes, (II.) with loan repayment status as an undesirable output, and (III.) with loan repayment status, repayment enabler, and amount repaid as undesirable output. Loan repayment enablers could not be considered on their own since the estimates could only be backed up without indicating convergence.

Among the youth, those who had constructed a home were 0.594% more efficient gamers than rental tenants in case I (column (1), Table 5). In case II this figure reduced to 0.575% (column (5) whereas the figure rose to 0.754% in case III (column (9)). While gender did not matter in cases I and II; under case III, female youth were much less efficient gamers than their male counterparts (column (9)). In all the three cases, the perception of gaming as a good source of income enhanced gaming efficiency. Livelihood sources meant that, under case III, casual laborers were 0.753% more efficient gamers than dependents. Asset ownership mattered in terms of radio or digital TV. In case I, for instance, an individual owning a radio was 0.384% less efficient gamer than one owning none whereas one with a digital TV was 0.729% less efficient than a youth gamer without one. When faced with undesirable outcomes, as with case III, a financially healthy youth was 0.632% more efficient at gaming that a financially unhealthy youth although financially healthy females had lower efficiencies. Lastly,

age, location, and income, on their own, have no significant effect on gaming efficiency. An increment in age by 1%, however, evidenced a higher gaming efficiency among females than male youth.

Table 5: Gaming Efficiency among the Youth

VARIABLES	(1) Frontier	(2) Technical inefficiency	(3) U sigma	(4) V sigma	(5) Frontier	(6) Technical inefficiency	(7) U sigma	(8) V sigma	(9) Frontier	(10) Technical inefficiency	(11) U sigma	(12) V sigma
Ln age	0.324				0.315				0.0730			
	(0.505)				(0.500)				(0.744)			
Ln income	0.0328				0.0441				-0.0296			
	(0.120)				(0.121)				(0.153)			
University	0.297				0.301				0.313			
	(0.316)				(0.313)				(0.377)			
Female	-5.332				-5.062				-18.60***			
	(3.939)				(3.989)				(5.114)			
University*female	-0.635				-0.693				0.349			
	(0.554)				(0.548)				(0.753)			
Location	-0.260				-0.260				-1.579			
	(1.431)				(1.440)				(1.548)			
University*location	0.492				0.493				0.643			
	(0.456)				(0.454)				(0.589)			
Relocation	0.313*				0.292*				0.235			
	(0.160)				(0.160)				(0.197)			
Employed*location	-0.551				-0.528				-0.614			
	(0.403)				(0.399)				(0.453)			
Female*location	-0.0841				-0.0613				0.525			
	(0.474)				(0.479)				(0.546)			
Purchased	0.977				1.007				1.818*			
	(0.765)				(0.757)				(1.030)			
Constructed	0.594**				0.575**				0.754**			
	(0.231)				(0.232)				(0.293)			
Inherited	0.172				0.130				0.263			
	(0.300)				(0.304)				(0.428)			
Rented (rf)	-				-				-			
Permanent	0.484				0.488				0.200			
	(0.396)				(0.392)				(0.501)			
Semipermanent	0.166				0.181				-0.324			
	(0.364)				(0.366)				(0.456)			
Traditional	0.152				0.145				-0.177			
	(0.495)				(0.494)				(0.574)			
Temporary (rf)	-0				-0				-0			
Financial literacy	0.296*				0.273				0.0466			
	(0.171)				(0.172)				(0.214)			
Perception	0.401**				0.417**				0.585**			
	(0.148)				(0.149)				(0.172)			
Livelihood source:												
Agriculture	0.292				0.261				0.241			
	(0.345)				(0.344)				(0.387)			
Employed	0.529				0.549				0.536			
	(0.359)				(0.354)				(0.413)			
Casual	0.508*				0.525*				0.753**			
	(0.281)				(0.279)				(0.338)			
Own business	0.269				0.270				0.251			
	(0.319)				(0.319)				(0.390)			
Dependent (rf)	-				-				-			
Mobile access	0.859				1.068				1.601			
	(1.073)				(1.099)				(1.149)			
Medical security	-0.0527				-0.0642				-0.270			

	(0.191)	(0.193)	(0.283)
Spending plan	-0.207	-0.210	-0.391
	(0.195)	(0.198)	(0.250)
Food security	0.294	0.291	0.259
	(0.194)	(0.193)	(0.266)
Neighbourhood	-0.506	-0.501	0.116
	(0.409)	(0.410)	(0.550)
Mobile loan	0.166	0.207	0.298
	(0.166)	(0.186)	(0.236)
Loan denied	-0.180	-0.208	-0.204
	(0.161)	(0.165)	(0.203)
Bread	0.162	0.159	0.365
	(0.181)	(0.181)	(0.223)
Banana	0.204	0.227	0.0426
	(0.163)	(0.166)	(0.216)
Motorcycle	0.299	0.275	0.189
	(0.215)	(0.217)	(0.250)
Bicycle	0.125	0.129	0.101
	(0.226)	(0.232)	(0.230)
Radio	-0.384**	-0.378**	-0.401**
	(0.187)	(0.187)	(0.228)
Digital TV	-0.729***	-0.717***	-0.649***
	(0.182)	(0.182)	(0.226)
Financial health	0.283	0.282	0.632**
	(0.230)	(0.229)	(0.258)
Female* financial literacy	-0.485	-0.595	-0.671
	(0.441)	(0.455)	(0.540)
Female*financial health	-0.953*	-1.015*	-1.397**
	(0.530)	(0.540)	(0.641)
Location*ln income	-0.00568	-0.00554	0.154
	(0.161)	(0.163)	(0.176)
Female*ln income	-0.0237	-0.0565	0.305
	(0.299)	(0.301)	(0.320)
University*female*employed	0.769	0.953	0.182
	(1.037)	(1.044)	(1.206)
Female*ln age	1.782	1.824	4.784***
	(1.141)	(1.148)	(1.488)
Clean fuel	0.375*	0.372*	0.236
	(0.199)	(0.198)	(0.256)
Loan repayment status: Never		0.173	0.527*
		(0.251)	(0.318)
Late		0.120	-0.0930
		(0.254)	(0.297)
Missed		-0.173	-0.0579
		(0.256)	(0.265)
Less		0.200	-0.104
		(0.309)	(0.308)
Exact		0.145	0.243
		(0.286)	(0.329)
Ln amount repaid			0.0106
			(0.0934)
Repayment enabler: Savings			-0.0723
			(0.185)
Asset's sale			0.279
			(0.223)
Food expense			-0.150

reduction												
									(0.245)			
Non-food expense reduction									0.0149			
									(0.239)			
Extra work									0.250			
									(0.194)			
Constant	3.799*	-12.93	2.024	-0.424	3.366	-87.71	3.894	-0.472	3.573	-0.874	-4.869	-0.350***
	(2.096)	(76.18)	(5.139)	(0.329)	(2.089)	(718.5)	(8.025)	(0.294)	(2.757)	(91.23)	(131.8)	(0.120)
Observations	214	214	214	214	214	214	214	214	141	141	141	141

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Efficiency scores were computed for each of the aforementioned cases, and the results captured in Table 6. Under case III, surprisingly very high efficiencies were observed with the average youth gamer, who had repaid a loan, at least in part, being 99.1% efficient in minimizing expenditures on gaming. Although average efficiency was almost identical in case I and II, the least efficient gamer dropped 2.01 points while the most efficient gamer gained 0.05 points when loan repayment was considered. Suggestive is that the cost of undesirable outcomes may far outweigh the benefits of indebtedness.

Table 6: Efficiency Scores for Youth Gamers

VARIABLES	Observations	Average	Standard deviation	Minimum	Maximum
Model (1)	214	0.605	0.141	0.0768	0.837
Model (5)	214	0.603	0.148	0.0567	0.842
Model (9)	141	0.991	8.64e-05	0.991	0.992

APPENDIX V

Do File

The STATA do-file can be accessed at https://drive.google.com/file/d/1IKrHR6bdeKnnDTbM_i3tn5ACJ3SoOvHL/view?usp=sharing. A modified version is accessible via: https://drive.google.com/file/d/1kwkteXS-WcnO3DGAg_crBqJ_qf4auj7o/view?usp=sharing.