Volume 37, issue 6, December 2008 ISSN 1053-5357

ELSEVIER

The Journal of SOCIO-ECONOMICS

CONTENTS

(Contents continued on OBC)

The Journal of Socio-Economics 37 (2008) 2492–2504

Contents lists available at ScienceDirect

The Journal of Socio-Economics

journal homepage: www.elsevier.com/locate/soceco

Something for nothing: A model of gambling behavior

John A. Nyman[a,*], John W. Welte[b], Bryan E. Dowd[a]

[a] University of Minnesota, USA
[b] Research Institute on Addictions, University of Buffalo, USA

ARTICLE INFO

Article history:
Received 19 June 2007
Received in revised form 13 February 2008
Accepted 25 February 2008

JEL classification:
D81
D11

Keywords:
Gambling
Demand for gambles
Expected utility theory
Insurance-buying gambler

ABSTRACT

Gambling is an ancient economic activity, but despite its universality and importance, no single explanation for the demand for gambles has gained ascendance among economists. This paper suggests that the demand for gambles is based on the ability to obtain "something for nothing." That is, the gain from gambling is not merely additional income, but additional income for which the gambler does not need to work. Thus, to fully understand gambling behavior, it must be placed in a labor supply context. The theory is tested empirically using the Survey of Gambling in the U.S. Support for the theory is found.

Gambling is an ancient and ubiquitous economic activity, but despite its importance, economists do not have a generally accepted theoretical understanding of why people gamble (Machina, 1987, 1989; Sauer, 1998; Starmer, 2000). The theory to which many economists would subscribe is expected utility theory, with utility from money income that is increasing at an increasing rate (von Neumann and Morgenstern, 1944). This theory, however, is problematic because it implies that the gambler should not purchase insurance. Yet, in modern developed economies, the purchase of insurance is almost as common as gambling.

Indeed, explaining the behavior of the insurance-purchasing gambler has become a basic criterion for any acceptable gambling theory. A number of models have been advanced. Friedman and Savage (1948) and Markowitz (1952) suggest that the consumer's utility function is generally concave, but locally convex. Conlisk (1993) and Simon (1998) solved the problem by adding a positive consumption value to the gambling experience. Many have modeled gambling by pointing to specific market imperfections or indivisibilities that can generate local non-concavity (Dobbs, 1988; Eden, 1979; Fleming, 1969; Hakansson, 1970; Kim, 1973; Ng, 1965). These models have provided important insights and have been useful in explaining gambling under specific circumstances, but none of them has gained acceptance among economists as a basic theory of the phenomenon of gambling.[1]

The theory of the demand for gambles that is presented and tested here is based on the folk wisdom that individuals gamble to obtain "something for nothing." This motivation has a straightforward translation into economic theory because it is based on the fundamental economic premise that resources are scarce and that in order to obtain "something" – in the case of gambling, this is typically additional money income – it is usually necessary to give up something else. Because most

* Corresponding author at: 420 Delaware Street SE, Box 729, Minneapolis, MN 55455, USA. Tel.: +1 612 626 4425; fax: +1 612 624 2196.
E-mail address: nyman001@umn.edu (J.A. Nyman).

[1] Another explanation, the lack of borrowing or lending opportunities in the absence of perfect capital markets (Bailey et al., 1980), is debated (Dowell and McLauren, 1986; Hartley and Farrell, 2002).

1053-5357/$ – see front matter © 2008 Elsevier Inc. All rights reserved.
doi:10.1016/j.socec.2008.02.011

consumers must give up leisure time in the form of work to obtain income, this theory holds that the implicit evaluative context of the decision to gamble is the consumer's labor supply experience. Thus, the gambling motivation is not merely the utility gained from the winnings, but in addition the utility costs that are saved by not having to work to earn them. For example, a breakfast waitress might occasionally purchase a scratch-off lottery game for which the winnings are $1000. Her motivation for purchasing this gamble is not only the utility gained from the additional $1000 in income, but also the utility cost saved by not having to work longer hours or weekends in order to obtain it. Both these utility gains motivate the gamble.[2]

Because diminishing marginal utility of income losses is preserved, this theory allows for the simultaneous purchase of gambles and fair insurance. It does not, however, rely on the existence of local non-concavities to achieve this. Like the Conlisk (1993) model, this theory holds that there is additional utility associated with the gamble that is not captured in utility as a function of income alone. Rather than postulating an additional utility associated with the gambling experience, however, this theory suggests that gamblers derive additional utility from the utility costs that are avoided from winning the additional income rather than earning it.

It should be made clear that this theory is not intended to explain the behavior of the habitual or pathological gambler, the subject of many, if not most, gambling surveys and studies. The powerful psychological and physiological factors that motivate this behavior are likely to trump the more purely economic motives that are at issue here. Because of this, habitual or pathological gamblers are excluded from analysis at both the theoretical and empirical levels.

The theory is also not intended to explain the behavior the professional gamblers. Professional gamblers are so productive in generating income through gambling that they make their labor supply decisions jointly with their gambling decisions. For example, a professional gambler might decide to work less during a certain period because he knows he will be able to take advantage of more gambling opportunities. Professional gamblers are, however, rare and so the theory presented here is intended to explain the behavior of the more common amateur or casual gambler, one who makes their labor supply decision independently of their gambling decisions. This does not mean that an individual cannot quit her job as a result of winning the lottery, but instead that the typical gambler does not let his ex ante gambling decisions influence his labor supply decision. That is, the only connection between the individual's gambling decision and his or her supply decision that is postulated by this theory is simply that the individual uses his or her prior experience in the labor market to evaluate the winnings from the gamble.

The motivation proposed here, however, may be basic to most forms of gambling. That is, even when other factors are present – for example, a consumption value from gambling (such as the social or entertainment value from a trip to the casino with friends); or an actual or perceived unfairness that favors the gambler (such as the poker player who thinks he is more skilled than his competitors or the race-track gambler who thinks he has inside information); or some indivisibility that generates local non-convexities in his or her utility function (such as an enormous lottery prize that might place the winner on an entirely different concave utility function; see Dobbs, 1988) – the ability to gain income without having to work for it is also present and may represent at least a partial motivation. More importantly, even when no other motivation is present – for example, the $1000 scratch-off game that has little if any entertainment value for the player, that does not represent a challenge or depend on any special skill, and whose winnings are not large enough to place one on a different utility function – the potential winnings from such gambles still represent income gained without earning it and as such would motivate the purchase of the gamble. Thus, gaining "something for nothing" may be a basic motivation underlying many, if not most, forms of casual gambling, even though other motivations can be, and often are, overlaid on it.

This paper also tests whether observed gambling behavior is consistent with this theory using the Survey of Gambling in the U.S. (Welte et al., 2002). In the next section, the theory is presented and the expected relationships among variables specified. Then, the data and methods are described and the results presented. The paper concludes by summarizing the model, and discussing the findings and the implications for public policy.

1. Theory

1.1. Model

The following model of the demand for gambles was first presented in Nyman (2004). To show how gambling winnings are evaluated from a labor supply perspective, it is useful first to describe the standard labor supply model where the consumer–worker derives utility from income, y, and leisure, l. At wage rate w, he faces a constraint on his earnings based on the total amount of time available for both work and leisure. The total time available is normalized to unity, so the individual's problem can be written

$$\max u(y, l) \qquad \text{subject to}: \quad y = w(1 - l), \quad 0 \leq l \leq 1. \tag{1}$$

[2] The gambling winnings are also often referred to a "fast money" or "easy money," implying this same perspective. That is, if money is fast or easy, it is not necessary to devote the time and effort that is usually required in order to earn it. These terms communicate the same implicit labor supply context for the gambling winnings as does "something for nothing."

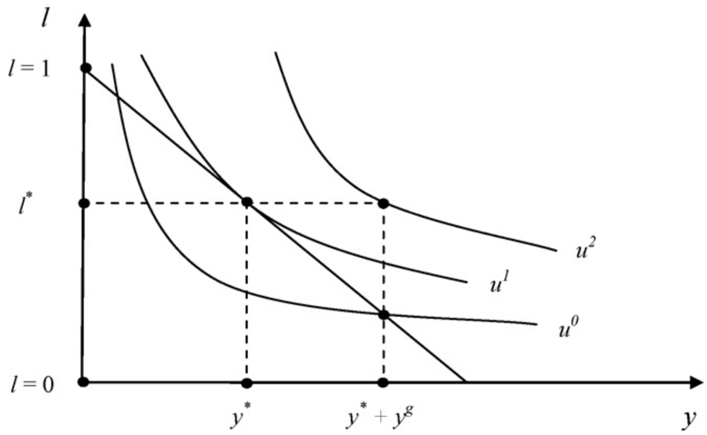

Fig. 1. Optimal labor supply.

In order to be able to present the corresponding diagrams, we add the standard structural assumptions that the utility function is continuous, twice differentiable, and strictly concave, so that, $u_l, u_y > 0, u_{ll}, u_{yy} < 0$ and $u_{ll}u_{yy} - u_{ly}^2 > 0$. For example, a standard Cobb-Douglas utility function could represent this relationship. The consumer is assumed to maximize utility at (y^*, l^*), consistent with the first-order conditions.

Fig. 1 shows the familiar indifference curve diagram of the labor supply decision. In Fig. 1, as the worker gives up leisure from $l = 1$ (that is, from point (0, 1)) along his budget constraint, utility increases up to (y^*, l^*) and (most importantly for gambling) decreases thereafter. For example, if the worker earned $(y^* + y^g)$ income instead of y^*, utility would fall from u^1 to u^0. However, if the worker were at y^* and won an additional y^g as a result of a gamble, the winnings would increase utility from u^1 to u^2. Thus, by winning y^g instead of earning it, a worker increases utility by $(u^2 - u^0)$ because of (1) the utility gained from the additional income or $(u^2 - u^1)$, and (2) the avoidance of the utility cost from having to earn the same amount of income or $(u^0 - u^1)$. This theory suggests that for a worker – that is, for most people in economies that are characterized by a scarcity of resources – the relevant and natural reference comparison for gambling winnings is not simply the absence of winnings, but having to earn them instead. In other words, for someone who is in the habit of viewing additional income as being accessible only by working for it, the utility gain from the gambling winnings is $(u^2 - u^0)$, not just $(u^2 - u^1)$.

The formal specification of the labor supply model allows us to transform this utility gain from its expression in an indifference curve diagram (Fig. 1) into the same utility gain expressed using a standard expected utility diagram (Fig. 2). The advantage of Fig. 2 is that it is able to illustrate the entire expected utility from the gamble, including both the expected gain from the winnings and the expected loss from making the wager and losing. To capture the expected gain from the winnings under the new theory, however, it is necessary to distinguish utility as a function of earned income from utility as a function of unearned income.

The relationship between utility and earned income – reflecting the worker's utility as he moves along his budget constraint in Fig. 1 from $l = 1$ to $l = 0$ – is shown in Fig. 2 as u^e and is expressed as a function of y alone. The changes in leisure required to earn this income still must occur and still affect utility, but leisure has been suppressed in u^e so as to be consistent

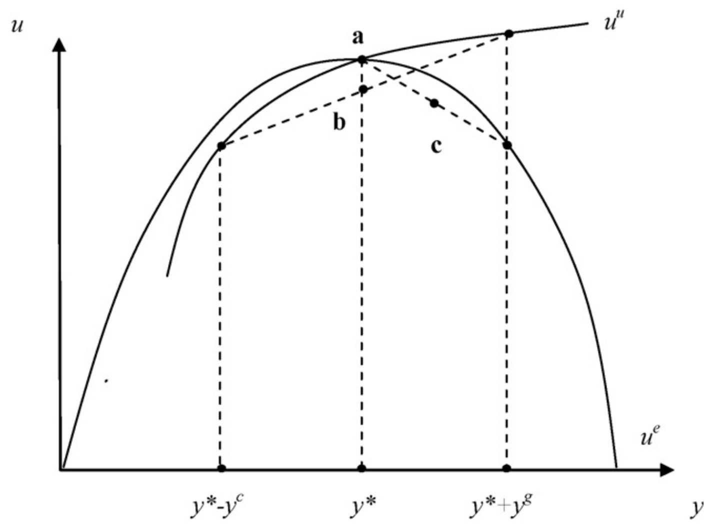

Fig. 2. Net expected utility gain from gambling.

with the two-dimensional axes of Fig. 2, just as the utility axis is typically suppressed in a two-dimensional indifference curve diagram like Fig. 1. In Fig. 2, utility reaches a maximum at the same level of earned income, y^*, as shown in Fig. 1.

If the consumer had maximized utility by working and had already obtained y^* in earnings, then it would be possible to show the utility implications of using some of these y^* in earnings to purchase a gamble. With a gamble, the gains from the winnings are unearned, so l is held constant at l^*. Similarly, the losses from paying the wager also do not change l. Therefore, the relationship between utility and the changes (gains and losses) in unearned income from y^* is represented by the function

$$u^u(y) = u(y, l)|_{l=l^*}, \tag{2}$$

and the corresponding curve is labeled as such in Fig. 2. This curve exhibits the standard concave functional form and is derived from the original utility function by holding leisure constant at l^* and allowing income to vary. For example, if $u(y, l) = y^a l^b$, then $u^u(y) = y^a l^{*b}$, where $0 < a + b <= 1$, $a > 0$, $b > 0$, and $l = l^*$ for all y.

Consider now a fair gamble such that the expected winnings equal the expected losses or

$$\pi y^g = (1 - \pi) y^c, \tag{3}$$

where π is the probability of winning, y^g is the winnings from y^*, and y^c is the losses from y^*. For example, a fair coin toss game would be represented by $y^g = y^c$ and $\pi = 0.5$. The expected utility of the income consequences of the gamble is represented by

$$E(u_g) = \pi u^u(y^* + y^g) + (1 - \pi) u^u(y^* - y^c). \tag{4}$$

Under conventional theory, this gamble would be evaluated against the utility of not gambling, but staying with certainty at an income level of y^*:[3]

$$E(u_n) = u^u(y^*) = \pi u^u(y^*) + (1 - \pi) u^u(y^*). \tag{5}$$

Given the standard specification of utility as a diminishing (positive) function of unearned income, purchasing such a gamble would result in an expected utility loss. This expected utility loss for a fair coin toss game is illustrated in Fig. 2 as the vertical distance between points a and b. Under the conventional model, those who contemplate a gamble in this way would not gamble.[4]

Under the new theory, the gamble expressed in Eq. (4) would be evaluated against a different alternative, one that takes into account the utility cost from working to earn the winnings. This alternative can be expressed as[5]

$$E(u_w) = \pi u^e(y^* + y^g) + (1 - \pi) u^u(y^*), \tag{5'}$$

where the difference between Eqs. (4) and (5′) captures the utility cost savings from not having to provide matching random work for the same earned income gain as is represented by the winnings. This represents the additional expected utility gain that is not recognized by the conventional model.

In Fig. 2, this additional expected utility gain is captured by the u^e function. Earning the additional income y^g would result in a loss of utility of from $u^e(y^*)$ to $u^e(y^* + y^g)$ since the consumer is assumed to already have maximized utility at y^*. By winning y^g in a gamble, the individual avoids this utility cost, but this only happens with a probability of π. In Fig. 2, the expected utility gain from this avoided utility cost is equal to the vertical distance between points c and a. As it is drawn in Fig. 2, this expected gain from c to a exceeds the expected loss from a to b, therefore, the net expected gain from the gamble is positive and the gamble would be taken.

At this point, it is important to point out that the function $u^u(y)$ is also the appropriate basis for evaluating the expected utility gain from purchasing fair insurance against an uncertain loss of unearned income (or wealth) from y^* because neither the loss (of income or wealth if uninsured) or the expected loss (the insurance premium paid if insured)—would generate a gain in leisure time. Given $u^u(y)$ as drawn in Fig. 2, or more generally, given any function of unearned income that exhibits diminishing marginal utility, the consumer would gain from purchasing actuarially fair insurance for feasible financial losses from y^*. Thus, such a person could both gamble and purchase fair insurance at the same time.[6]

It is also important to reiterate that we are not interested in describing the behavior of the professional gambler. Instead, we are interested in explaining the behavior of the amateur or casual gambler who allows his or her labor market experience to influence his or her ex ante gambling decision, but not visa versa. That is, the labor market experience of the casual gambler functions as a cognitive input in the gambling decision, not a financial one.

Finally, it should be cautioned that the model just described should not be taken too literally. If taken literally, it would appear as if the model is only applicable to hourly workers who earn a wage and who have the possibility of working longer hours at the same job. This model, however, is intended to generalize to any worker who applies his or her labor supply experience to the gambling decision. That is, it is intended to apply to anyone who can contemplate the disutility avoided

[3] The utility level for $u^u(y^* + y^g)$ in Fig. 2 corresponds to utility u^2 in Fig. 1.
[4] The utility level $u^u(y^*) = u^e(y^*)$ in Fig. 2 corresponds to utility u^1 in Fig. 1.
[5] The utility level for $u^e(y^* + y^g)$ in Fig. 2 corresponds to u^0 in Fig. 1.
[6] Because insurance is typically modeled as simply replacing a financial loss, there are no "winnings" in excess of y^* that might generate a utility cost avoidance gain.

from working longer hours, working overtime, working harder, taking on additional responsibilities at work, working out of the home in addition to formal employment, taking another part-time or even full-time job in order to earn the additional income represented by the gambling winnings. This model is intended to apply even to the person who, after a particularly bad day at work, stops by the convenience store to purchase a lottery ticket whose enormous payoff would allow him to avoid the utility cost from any additional work at all.[7]

1.2. Asymmetry of the model

This model points to a fundamental asymmetry in the way in which the consumer/worker views the wager and the winnings. In order to make a wager, the consumer generally must already have earned income. As a result, the consumer does not gain any leisure when making the wager, but only forgoes income. This implies that the consumer evaluates the expected utility cost of making the wager according to the utility function for unearned income alone.

In contrast, the payoff has not (yet) occurred. Therefore, it is not known whether the consumer evaluates the utility gain (to $u^u(y^* + y^g)$ in Fig. 2 or u^2 in Fig. 1) from the reference point of the initial level of utility ($u^u(y^*)$ in Fig. 2 or u^1 in Fig. 1) alone, or whether the consumer also incorporates the utility cost savings from not working for it, that is, ($u^e(y^* + y^g)$ in Fig. 2 or u^0 in Fig. 1) compared to the initial level of utility ($u^u(y^*)$ in Fig. 2 or u^1 in Fig. 1). This ambiguity suggests that one consumer might evaluate the utility gain from the payoff relative to the original level of income and choose not to gamble, while another might evaluate the utility gain from the payoff and the utility cost savings from avoiding work, and choose to gamble. Therefore, whether or not a person gambles may depend upon whether the individual is sufficiently oriented toward the labor market to evaluate the gamble from that context.

1.3. Behavioral implications of the theory

This theory suggests an empirical investigation with two parts. The first part investigates the consumer's decision whether to gamble at all and suggests that this depends upon whether or not the consumer has a labor market orientation. In Fig. 1, this difference in orientation is reflected in whether the consumer views the gain from the gambling winnings as the difference in utility from u_1 to u_2 or from u_0 to u_2, or in Fig. 2 as the expected utility change from the gamble as being a loss from points *a* to *b*, or a *net* expected utility change that also includes a larger gain from points *c* to *a*.

The second part of the empirical investigation focuses on those who gamble and suggests that the amount of gambling done and its frequency are determined at least in part by how difficult it is to earn additional income instead. In Fig. 1, this is represented by the difference between the levels of utility from u_0 to u_1, or in Fig. 2, the size of the expected utility gain from points *c* to *a*. These ideas are elaborated upon in the next two sections.

1.3.1. Decision to gamble

With regard to whether a consumer gambles at all, the theory suggests that labor market experience is the central factor. That is, those who are or have been employed understand that obtaining additional income usually requires performing additional work and, as a result, those who are or have been employed are more likely to gamble than those who have never been employed. Those who have never been employed are less likely to gamble because they simply do not recognize the advantage that acquiring unearned income through gambling represents.

As a secondary prediction, theory suggests that those who provide the optimal number of hours on the labor market are more likely to regard giving up additional leisure (in order to gain more income) as welfare decreasing and therefore, may be more likely to gamble than those who provide less than the optimal number of hours on the labor market. If those who are working full-time are more likely to be working the optimal number of hours than those working part-time, then full-time workers may be more likely to gamble than those working part-time. If those who are working at all, either full-time or part-time, are more likely to be working an optimal number of hours than those who are not working at all, then those who are working would be more likely to gamble than those (previous participants in the labor market) who are not now working. This prediction, however, may be tempered if those who are not working feel they cannot find a job, for example, because of racial or health discrimination, and are left with few options to gain income other than to gamble.

1.3.2. Amount and frequency of gambling

Among those who gamble, the theory suggests that more gambling would be done by those (a) who face lower wage rates, (b) for whom the additional work is relatively unpleasant, and (c) who would have difficulty obtaining additional work,

[7] Dobbs' (1988) model of the demand for gambles is also set in a labor supply context. Dobbs' model differs from the present one in that the winnings from his model are so large that they move the consumer from one utility function to another, where work is no longer necessary and income is derived entirely from investment earnings. In contrast, the present model can generate a demand for small-scale lotteries (such as the scratch-off game for winnings of $1000), but may also underlie, at least in part, the demand for large scale lotteries as well. Moreover, Dobbs' model derives the demand for lotteries from the local non-concavity from a hypothesized switching from one concave utility function to another. In the present model, the demand for gambles does not rely on creating a local non-concavity, but occurs because the person who gambles views the utility cost from working for the additional income as the reference for evaluating the utility gain from the gambling winnings. Finally, Dobbs' model assumes that the amount of labor that a worker can provide is fixed due to rigidities in the labor market, while the present model assumes that most workers can at least contemplate additional work and the disutility that it would generate.

either because they are discriminated against in the labor market or because the markets in which they seek employment have few jobs available. Each of these predictions will generate specific empirical tests.

First, the theory predicts that those facing lower wage rates will gamble more because for those with lower wage rates, the utility cost of obtaining a certain amount of additional income by working is greater because of the greater amount of leisure time that must be sacrificed, compared to those with higher wages. As a result, gambling would be relatively more attractive. For example, winning $1000 saves more leisure time for a person whose wage rate is $10 per hour than $20, thus the gamble is relatively more attractive for the former individual than the latter. On the other hand, those with higher wage rates have higher incomes and might purchase more gambles because a gamble is a normal good. The empirical analysis will be challenged to separate out the effects of these two factors.

Second, the theory also suggests that those whose jobs are relatively burdensome, dangerous or otherwise unpleasant will gamble more because such jobs generate greater disutility for a given amount of additional earnings. As a result, the alternative of obtaining unearned income through gambling is more attractive.

This effect can be measured by a number of variables related to work burden. Perhaps, the most important variable in determining whether a job is burdensome is education: people who have more education are likely to have relatively pleasant jobs compared with those with less education. As a result, those with more education may regard working more to obtain more income as having a smaller utility cost, and therefore, would gamble less than those with less education.

The specific type of work that is performed in order to obtain additional income may also be related to gambling. Those in occupations associated with unpleasant or dangerous working conditions or those in occupations that require relatively more physical effort may gamble more.

Third, the ease with which additional income can be obtained through working may also be related to the worker's characteristics and the market conditions that the worker faces. Certain racial characteristics or health factors might adversely affect the worker's ability to gain additional income through employment. For these people, obtaining additional income may imply working more hours in a menial job or finding a second job that is even less pleasant or more menial. Or, these characteristics may simply create a barrier to finding any additional work at all, resulting in a utility cost from earning more income that is, in effect, infinitely large. As a result, those individuals with these characteristics may become discouraged by the high utility costs of earning additional income and, as a result, gamble more than those whose job prospects are better. In the same way, those who face bleak job prospects because of the general labor market conditions are also likely to gamble more.

2. Data and methods

2.1. Data

The data come from the Survey of Gambling in the U.S., a random-digit-dial telephone survey of the U.S. population aged 18 and older (see Welte et al., 2002 for a detailed description of the data). This survey was conducted between August 1999 and October 2000, and represented an 84-page interview requesting information on the demographic and economic characteristics of the respondent, the respondent's drug and alcohol use, and the respondent's gambling history over the last 12 months. Like many other gambling surveys, the impetus for this one was primarily to gain information on gambling addictions. These data, however, were useful for our purposes because they contained information on all gamblers, both pathological and casual alike, and also the psychological information that enabled us to identify the pathological gamblers and exclude them from our analysis.

Pathological gamblers were identified using a rule derived from the Diagnostic Interview Schedule (Robins et al., 1996), which was represented by a series of 13 questions in the survey. These 13 questions map into 10 criteria for pathological gambling-criteria such as, preoccupation with gambling and the need to gamble with increasing amounts of money to generate the same level of excitement. Endorsement of 5 or more of the 10 criteria is considered the threshold for pathological gambling according to the American Psychiatric Association (1994). The Diagnostic Interview Schedule items are reliable, demonstrating a Cronbach's alpha of 0.85 in our data set (Welte et al., 2002). Of the 2631 respondents to the survey, 28 were deemed to be pathological gamblers under this rule and were thus excluded.

In the regression analysis, the observations from the Survey were weighted to reflect the gender, race, and age distribution of the 2000 census. This involved, for example, giving a Hispanic or male respondent a relatively higher weight. Observations were also weighted to reflect the number of eligible respondents in a household because if a household had additional eligible respondents (than the one who was interviewed), there was a lower likelihood that the surveyor would select a given respondent. These weights are scaled so that the weighted sample for the entire study is equal to the true unweighted sample size of 2631.

2.2. Dependent variables

The Survey of Gambling in the U.S. asked for information on (1) whether or not the respondent gambled, (2) the amount of money won and lost, and (3) the frequency with which the respondent gambled, on each of the following categories of games: (a) office pools, raffles, or charitable small stakes gambling, (b) the lottery, including instant scratch tickets, daily number or Lotto, (c) pulltabs, (d) gambling on the internet, (e) gambling at a casino, riverboat or cruise ship, (f) gambling at a racetrack, (g) any other betting on horses, dogs or other animals, (h) any other playing of slot machines, poker machines or other gambling machines or video terminals, (i) any other playing card games for money, (j) bowling, or playing pool, golf, backgammon or some game of skill, other than cards, for money, (k) any other playing of lottery video-keno games, such as Quick Draw, Quick Case or Keno, (l) any other playing of bingo, (m) any other playing of dice games, (n) any other betting on sporting events, and (o) betting money on any other gambling activity, not previously mentioned. The theory suggests that the lure of obtaining "something for nothing" would provide at least a partial motivation for all of these games. Therefore, the variable representing whether the subject gambles at all was represented by gambling with any of these games, and the amount and frequency of gambling variables were represented by the aggregated behavior across all the games that the respondent played.

2.3. Equation for the decision to gamble

Whether the respondent *gambles at all* (=1 vs. not = 0) during the previous year is hypothesized to be determined by whether the respondent is oriented toward the labor market. Thus, theory suggests that those who work are more likely to be so oriented and to gamble than non-workers. The theory further suggests that, based on a presumption that full-time workers are more likely to be working an optimal amount of hours than either those with part-time jobs or those who have worked but are not now working, full-time workers would be more likely to gamble than either of the other two types of workers.

Perhaps, the most potentially revealing prediction, however, is related to those who do not now work. Theory predicts that those who have worked at one time would be more likely to gamble than those who have never worked, even though both are not now working. This prediction is important because, while it holds constant that the individual is not now working, it changes a factor – work experience – that would logically be associated with a change in mental orientation. Thus, a confirmatory result would suggest that any difference in gambling behavior observed between these two types of individuals could be traced to a difference in the respondent's orientation, which is in turn related to the experience of working.

Accordingly, four mutually exclusive dummy variables for work status were defined: (1) working *full-time* at the time of the survey, (2) working *part-time*, (3) *not now working*, and (4) *never worked*, the last variable being excluded from the regression equation as the reference category. We expect that workers would be more likely to gamble than those who have never worked, and full-time workers may be more likely to gamble than either of the other two types of workers, if full-time workers are more likely to be optimally employed than others.

A number of control variables were included in this regression equation. Religious teachings often proscribe gambling and may limit its practice, regardless of the respondent's natural economically motivated inclinations. Four dummy variables were included representing whether the respondent indicated that he or she practiced one of the religions that is known for being strict in their opposition to gambling: *Baptist*, *Pentecostal*, *Mormon*, and *Muslim* (each = 1 vs. other religions = 0). The data also included a question regarding whether the respondent considered his or her religion to be "fundamentalist" or "evangelical," and so we included the dummy variable *fundamentalist or evangelical* (=1 vs. not = 0) in the analysis. The devoutness of the individual's religious feelings was thought to be reflected in whether or not the respondent attended religious services at least *weekly* (=1 vs. not = 0), expecting that, regardless of religion, those who practice a religion regularly would be less likely to gamble. Whether the respondent was *male* (=1 vs. female = 0) and the respondent's *age* were included as final control variables. The number of observations used in this regression equaled 2603, the number of people who were deemed not to be pathological gamblers in the sample.

2.4. Equations for amount and frequency of gambling

If a respondent gambled at all, the amount and frequency of gambling were predicted using separate regression equations. One equation captured the amount of gambling as the absolute number of *dollars won or lost* the last time the respondent played each category of gambling games, averaged over the categories of games that the respondent played. For example, if the last time the respondent played lotteries he lost \$10 and the last time he played pulltabs he won \$20, and those were the only types of gambling that he participated in, then the value for this variable was $(|-\$10| + \$20)/2 = \$15$.

A second set of regression equations uses as the dependent variable the *number of times* that the respondent estimated that he or she had gambled during the previous year. Because of skewness in this variable, the count was converted into its logarithm (base 10) and used as an alternative specification. Both the amount of and frequency of gambling regressions excluded those who did not gamble and those whose salary was zero (because they were not working at the time). As a result, the analysis of the number of gambling times was performed on 1510 respondents. The analysis of the gambling dollars won or lost was preformed on 1494 because a few more data points were missing. The independent variables were generally the same for both equations.

Theory suggests that lower wage rates would generate a greater amount and frequency of gambling, but the data did not contain a wage variable. They did, however, contain information on the respondent's individual *salary*. Specifically, in the survey, the respondent was asked to identify "how much money do you make in a year from your job" from a list of seven categories of salary ranges. Responses were converted into point estimates based, in most cases, on the midpoint of the category's range (the exceptions being the lowest and highest categories which were set at \$10,000 and \$175,000 to represent "less than \$15,000" and "greater than \$150,000", respectively) and entered in the regression as a continuous variable. Theory suggests that the higher the individual's wage (salary), the smaller the leisure cost of obtaining a certain amount of additional income through working and the less attractive would be obtaining greater income through gambling.

As was suggested above, however, if gambles are normal goods, then an income effect from higher wages might negate the wage (salary) effect to some extent. To attempt to hold constant this effect, we included a variable representing the annual *income* of the respondent's household, which in the survey represented income "from all sources, including salaries, rents, investments, social security, etc." for "you and everyone you live with." This variable was assumed to represent the resources that were generally available to spend on all consumption, including gambling. By including household income in the regression as a separate variable, it would be more likely that the salary variable would reflect the cost of leisure time faced by the individual respondent and exhibit the expected negative coefficient consistent with the theory.

According to theory, the amount and frequency of gambling should decrease with education because those with better educations have more desirable jobs. Therefore, a variable indicating the respondent's *years of schooling* was included in the equation.

The amount and frequency of gambling is predicted to be greater for those with relatively unpleasant occupations. Survey respondents were asked to categorize their usual occupation according to the 10 categories from the Bureau of Labor Statistics (BLS) Standard Occupational Classification system. We hypothesized that (1) those who engaged in "*service* (e.g., health care support, food preparation, protective services)" occupations would be more likely to gamble because their jobs are often low status, unpleasant and/or monotonous, (2) those in "farming, fishing and forestry" would be more likely to gamble because many of these jobs are notoriously dangerous, and (3) those in "construction and extraction (e.g., construction workers, miners, oil drillers)" work would be more likely to gamble because their jobs are often physically demanding, dangerous, and often performed in an unpleasant environment. Moreover, the method of payment for all these occupations is predominantly the hourly wage, and so overtime work is often an option for these workers. Therefore, not only the unpleasantness of the work but also the accessibility of additional hours of work may make it more likely that workers in these occupations would view the context of the gamble as the additional work required to make the same amount of winnings, and gamble more and more frequently than other occupations. These occupations were entered as three dummy variables, with the seven other BLS categories excluded as the reference category (that is, each of the three job categories = 1 vs. the other seven job categories, aggregated = 0).

The amount and frequency of gambling was expected to increase as the prospects fall for gaining desirable additional work. Certain demographic characteristics may be associated with lowered job prospects because of labor market imperfections. Thus, those who classify themselves as *non-white* (=1 vs. not = 0), or *disabled* (=1 vs. not = 0), or who categorize themselves with a "poor" or "fair" *health status*, rather than "excellent" or "good" (where poor or fair = 1 vs. excellent or good = 0), may have reduced job prospects and would be expected to gamble more.

The survey collected information on the respondent's height and weight. From these data, the respondent's body mass index was calculated and it was determined whether the body mass index exceeded the clinical threshold for obesity. If so, the respondent was characterized as *obese*. This variable was included and expected to be associated with increased gambling because of the difficult job prospects that obese people often experience.

Prospects for gaining desirable employment or additional employment are also related to the labor market in which the respondent competes. We defined the labor market by the census block group in which the respondent resided. A census block group is a cluster of census blocks having the first digit of the four-digit identifying numbers within a census tract and typically contains between 600 and 3000 people. The employment characteristics of residents of the census block group were aggregated and the *percent unemployed* was determined. This variable was used to characterize job prospects of those who reside in these communities. Specifically, as this variable increased, the difficulty earning additional income by working would also increase, which would increase the amount and frequency of gambling.

Two control variables were included: whether the respondent was male (=1 vs. female = 0) and the respondent's age. There were no expectations derived from theory for these variables.

2.5. Methods and specifications

A logistic regression was used to estimate the equation representing the decision to gamble at all. Ordinary least squares were used to estimate the regression coefficients for both the amount and frequency of gambling equations. If we had been estimating equations that predicted the amount or frequency of pathological or habitual gambling, however, we might have been concerned about the presence of reverse causality from some of the more "mutable" independent variables. For example, with regard to the obesity variable, we might have been concerned that habitual gambling may have created a more sedentary lifestyle in the respondent, resulting in obesity. Because we have eliminated pathological or habitual gamblers from the data set and because reverse causality is unlikely in the casual gambler, we have concluded that our independent variables are reasonably exogenous, and that we need not use an instrumental variable approach to correct for endogeneity.

As mentioned above, the dependent variable in the analysis of the frequency of gambling is specified both as a count and a logged count in alternative regression equations. Similarly, the amount of gambling equation is specified with the household income variable entered on the right-hand side as a separate independent variable and, alternatively, as the amount of gambling divided by household income in an alternative specification, with household income excluded from the right-hand side. This dependent variable can be interpreted as representing the amount of gambling as a proportion of household income. Again we expect the same hypothesized signs for this specification as for the original one.

Table 1
Descriptive statistics: all respondents excluding pathological gamblers

Variables	Percent of respondents
Proportion who gambled	
Gambled in the past year	81.9%
Ever gambled	92.7%
Employment status	
Current full-time employed	55.4%
Current part-time employed	13.2%
Not now working, but employed in past	29.7%
Never worked	1.7%
Religion	
Baptist	18.5%
Pentecostal	2.3%
Mormon	1.6%
Muslim	0.5%
Other religions	77.1%
Fundamentalist/evangelical	25.7%
Attend religious services weekly or more	34.0%
Male	48.0%
Age	
Mean	44.22
Standard deviation	17.48

$N = 2603$.

3. Results

Descriptive statistics for those respondents included in the "decision to gamble" regression equation are presented in Table 1 and the results of the logistic regression are presented in Table 2. Coefficients, odd ratios and significance levels of the regression coefficients are reported. Workers were more likely to gamble, and this was even true of those who had worked at one time but were not now working. For the latter group, the significant regression coefficient suggests that past working experience increases the probability of gambling during the past year by about 13% points at the sample mean. There did not appear to be much difference in the tendency to gamble among full-time workers, part-time workers and those who had worked but are not now working, suggesting that all three types might be "working" optimally at this time.

Regarding the control variables, if respondents were members of religious denominations that proscribed gambling, if they were fundamentalists, or if they attended religious services on a weekly basis, then they were less likely to gamble, compared with the excluded categories. Older respondents were less likely to gamble, and males were more likely, but this variable represented the only non-significant result in the equation.

Table 3 presents the descriptive statistics for the variables included in the two regression equations investigating the amount and frequency of gambling, and Table 4 shows the results (listed as the regression coefficient, the standard error in parentheses, and the significance level achieved, in that order) of the OLS regressions using (1) average dollars won or lost and (2) average dollars won or lost as a proportion of household income as alternative dependent variables. The proxy variable used for the wage rate, the individual's yearly salary, appears to capture an income effect instead of the price of earning additional income. As the years of schooling increases, the amount of gambling decreases significantly, consistent with theory. The coefficient suggests that any education beyond high school would have reduced the expected amount

Table 2
Decision to gamble equation: logistic regression results

Variable	Coefficient	Odds ratio	Significance level
Full-time	0.970	2.637	0.007
Part-time	1.000	2.719	0.009
Not now working (but having worked)	0.872	2.392	0.016
Baptist	−0.585	0.557	0.000
Pentecostal	−1.002	0.367	0.001
Mormon	−1.504	0.222	0.000
Muslim	−1.893	0.151	0.001
Fundamentalist/evangelical	−0.381	0.683	0.002
Weekly	−0.888	0.411	0.000
Male	0.157	1.170	0.170
Age	−0.024	0.976	0.000

$R^2 = 0.158$.
$N = 2603$.

Table 3
Descriptive statistics: respondents who gamble

Variable	Mean	Standard deviation
Dollars won or lost as a proportion of salary	1.27	3.19
Dollars won or lost in dollars	34.47	67.66
Number of times gambled during last year	56.40	96.27
Log number of times	1.44	0.48
Salary in thousands of dollars	38.17	28.98
Education measured by years of schooling	14.12	2.33
Health status (excellent = 4, good = 3, fair = 2, poor = 1)	3.37	0.67
Percent of the labor force that is unemployed	5.86	5.10

Qualitative variable	Percent of respondents with characteristic
Male	53.3
Disabled	4.1
Non-white race	28.6
Health status	
Poor	1.0
Fair	8.2
Good	44.0
Excellent	46.9
Bureau of labor statistics occupational code	
Service	21.4
Farming, fishing and forestry	1.2
Construction and extraction	4.3
Excluded categories	73.1
Obese as measured by body mass index	21.7

N = a maximum of 1549. Some variables were based on fewer observations because of missing data.

gambled from the sample mean of $34.47 to zero. Those engaged in service occupations gambled significantly more relative to the excluded occupations (in the second equation) and those in construction and extraction occupations gambled more than others (in the first equation), but at only the 0.052 significance level. Persons who are non-white gamble significantly more that than do white persons (by an amount equal to about 70% of the sample mean), and persons with low self-reported health status (in the second equation) gamble more than those with higher health status, both consistent with expectations. The coefficients were not significant for disabled and obese. Those respondents living in a census block group with a higher percent of the labor force that is unemployed gambled significantly more (in the second equation), consistent with expectations. Males and older people tended to gamble more.

Table 5 presents the OLS regression results for equations that use gambling frequency over the previous year – both count and logged count – as dependent variables. In both specifications, salary was not significant, but household income was. Years of schooling was negatively and significantly related to gambling frequency in both equations, per our expectation. For each year of schooling, about five gambling activities during a year are eliminated so that those with more than 10 years of education would be expected to eliminate gambling altogether according to this linear regression equation. Workers in the construction and extraction industry gambled much more often, as did non-whites, and the obese (in the count equation). It is possible, however, that these results may be influenced by the presence of outliers since they are not significant in the logged equation. As the percentage of unemployed increased in the respondent's neighborhood, the frequency of gambling by residents increased. The coefficient indicated that a 1% increase in the percentage of unemployment in an area generated one more gambling activity per year by everyone living in that area. Males and older people also gambled more often.

4. Discussion

Gambling can take many forms and may have a number of motivations, but one motivation appears to be the attraction of gaining "something for nothing." The empirical results in this paper suggest that this motivation is a factor in determining whether a person participates in a wide variety of gambling games. Specifically, working appears to increase significantly the likelihood of gambling. Furthermore, among those who are not now working, those who have worked in the past have a significantly higher likelihood of gambling than those who have never worked. These results are consistent with the theory that the working experience changes the perspective from which gambling is viewed to recognize the utility cost savings from the winnings, and that once this change in orientation takes place, it endures and continues to motivate behavior.

Our empirical results further suggest that the characteristics of the consumer's occupation and labor market prospects affect the amount and frequency of gambling, and in ways predicted by the theory. While there are likely alternative explanations for each of the empirical relationships found in this study, taken altogether, however, these results act to bind further the gambling motivation to the type of work that the individual does.

Table 4
Amount of gambling equations

Independent variables	Dependent variables	
	Dollars won or lost	Dollars won or lost/income
Salary (of individual)	0.245** (0.083) 0.003	−0.002 (0.003) 0.371
Income (of household)	0.092 (0.048) 0.058	–
Years of schooling	−2.760** (0.859) 0.001	−0.083** (0.031) 0.008
Service (occupational category)	5.154 (4.364) 0.238	0.369* (0.159) 0.021
Farming, fishing, forestry (occupational category)	−3.525 (15.808) 0.824	0.307 (0.577) 0.595
Construction, extraction (occupational category)	17.088 (8.797) 0.052	0.362 (0.321) 0.260
Non-white	24.477** (3.960) 0.000	0.549** (0.145) 0.000
Disabled	−0.601 (9.164) 0.948	−0.469 (0.335) 0.161
Poor or fair health status	0.955 (6.301) 0.114	0.632** (0.230) 0.006
Obese	−0.610 (4.227) 0.855	−0.226 (0.154) 0.144
Percent unemployed	0.409 (0.349) 0.242	0.053** (0.013) 0.000
Age	0.264 (0.142) 0.064	0.010* (0.005) 0.044
Male	12.380** (3.679) 0.001	0.130 (0.134) 0.333
Constant	28.953* (12.899) 0.025	0.975* (0.469) 0.038
N	1494	1494
R^2	0.068	0.056

* Significant at the 5% level.
** Significant at the 1% level.

Placing the gambling decision in this context distinguishes earned from unearned income and preserves intact the notion of positive but diminishing marginal utility of (unearned) income. Moreover, it predicts that consumers may gamble and purchase insurance at the same time. It suggests a reason why gambling is so common: resources are scarce and most people throughout history have been required to work for their income. And, if more Americans feel they are becoming increasingly disadvantaged in the labor market, it may even suggest a reason for the recent growth in gambling in the U.S.

The predictions from this model are consistent with the results of a number of other empirical studies of the determinants of gambling behavior. For example, some studies have found that those from low income households spend a greater proportion of their income on state lotteries than do those from middle or high income households (Clotfelter et al., 1999; Kearney, 2004). Other studies have found that successful casinos are often built in communities that are already distressed economically, which would seem counterintuitive until it is realized that this is where a disproportionate demand for gambling exists (de la Vina and Berstein, 2002). Studies like these, that document empirical relationships, are useful, but their usefulness can be further enhanced if an applicable theoretical context existed in which to place the results. A theoretical context is important because it would provide a basis for linking these specific behaviors and associating them with an underlying economic disadvantageousness in the labor market. It would also provide a basis for extrapolating to new connections between gambling behaviors and economic disadvantage.

A proven theory would be especially useful in informing public policy. For example, states use state-run lotteries to raise revenues. We might know from one empirical study that low wage workers purchase a disproportionate number of lottery tickets, or from another that obese people purchase more lottery tickets, but without the theory, we would not be able to link these behaviors and conclude that it is limited earnings potential that connects these findings. Therefore, we would not understand that state lotteries raise revenues disproportionately from those who are disadvantaged in the labor market, and that *any* individuals who are likewise disadvantaged would be predicted to provide a disproportionate share of

Table 5
Amount of gambling equation: frequency of gambling over last year (logged and not logged)

Independent variables	Dependent variables	
	Frequency	Logged frequency
Salary (of individual)	−0.081 (0.118) 0.490	0.000 (0.001) 0.695
Income (of household)	0.137* (0.069) 0.048	0.001* (0.000) 0.024
Years of schooling	−5.061** (1.213) 0.000	−0.031** (0.006) 0.000
Service (occupational category)	−1.215 (6.210) 0.845	−0.009 (0.031) 0.767
Farming, fishing, forestry (occupational category)	−2.658 (22.607) 0.906	0.008 (0.113) 0.946
Construction, extraction (occupational category)	33.638** (12.571) 0.008	0.106 (0.063) 0.090
Non-white	15.122** (5.630) 0.007	0.020 (0.028) 0.475
Disabled	−0.211 (12.843) 0.987	−0.045 (0.064) 0.485
Poor or fair health status	3.270 (8.926) 0.714	0.051 (0.045) 0.250
Obese	16.361** (6.002) 0.006	0.047 (0.030) 0.118
Percent unemployed	0.976* (0.498) 0.050	0.005* (0.002) 0.031
Age	0.463* (0.203) 0.022	0.003** (0.001) 0.001
Male	21.360** (5.239) 0.000	0.155** (0.026) 0.000
Constant	76.864 (18.273) 0.000	1.564 (0.091) 0.000
N	1510	1510
R^2	0.057	0.067

* Significant at the 5% level.
** Significant at the 1% level.

lottery revenues. This, of course, would have implications regarding equity and the desirability of using lotteries to obtain revenue.

This theory may also inform public policy with regard to gambling addictions. A number of studies of pathological gambling have observed that pathological gambling is more common among those with certain characteristics. For example, the 1998 National Opinion Research Center national survey of adults found more pathological gambling among blacks than among whites (National Opinion Research Center, 1999). The present paper suggests that these characteristics may instead stem from an increased amount or frequency of non-pathological or casual gambling among blacks. As a result, it may be the case that among those who are disadvantaged in the labor market and are therefore more frequent casual gamblers, blacks may be no more likely to become addicted than any other racial or ethnic group. This finding would have implications for determining effective policy interventions to reduce pathological gambling.

The study has a number of limitations. First, it was hypothesized that certain occupation categories are more likely to gamble because of the burdensomeness of these occupations, but were we not able to find consistent empirical support for our hypotheses. The occupation categories used, however, contain a wide array of jobs related to the occupation in question and people may vary considerably regarding whether they regard their job as burdensome. For example, we hypothesized that those in farming, fishing or forestry occupations are more likely to gamble than those in the excluded categories because of the danger associated with these occupations, but clearly a forest ranger may not consider his job as dangerous or unpleasant as, perhaps, a lumberjack would. Therefore, given the diversity of jobs in each occupational category, it is not surprising that these job category variables were often insignificant. Our analysis would have benefited from a data set that directly measured the relative disutility from each respondent's job.

Second, the use of the salary variable as a proxy for the individual's wage rate was not ideal. Moreover, it was difficult to distinguish the price effect of salary (the cost of additional income in terms of the leisure forgone) from the income effect. In our analysis, the individual's salary probably represented both, resulting in the mixed empirical results. This is an important empirical issue that will need to be addressed in future research.

Third, the measure of the amount of gambling – amount won or lost on average the last time the respondent gambled – is somewhat crude and its accuracy depends on recall. Although the frequency of gambling over the last year is more precise, it may also contain error because of inaccurate recall. Clearly, better information – data collected from diaries, for example – might provide more confidence in the results, but better data are more expensive and difficult to obtain, and at this time are simply not available. That we obtained significance in so many of the independent variables and in directions consistent with theoretical expectations attests to the usefulness of the Survey of Gambling in the U.S. data and suggests that were better data available, even better results might obtain.

Fourth, the theory is intended to identify a basic motivation for gambling and to explain the behavior of the insurance-buying gambler. It does not consider other aspects of the gambling decision, such as, repeated gambling or precisely how this theory interacts with the other motivations for gambling. A basic question here is, how important are the characteristics of the gambler's labor supply relative to the characteristics of the gambling experience (Conlisk, 1993) in generating additional utility gains and thus, motivating gambling. This question would be particularly interesting for those who want to modify gambling behavior and is again a subject for further research.

Fifth, there is finally the issue of whether the utility cost savings from avoiding labor is a generalizable phenomenon that can be applied to understanding other situations (such as, theft or government "welfare" transfers) where the demand for unearned income must be explained. This is also beyond the scope of the present study, but represents an especially enticing subject for further research.

In summary, this paper presents a theory of why people gamble that suggests that gamblers derive additional utility from the fact that gambling winnings are not earned. Using the Survey of Gambling in the U.S., we find empirical evidence that the demand for gambles is driven, at least in part, by the characteristics of the consumer's labor supply decision, which supports this theory. The theory has the advantages that it preserves in tact the notion of diminishing marginal utility of (unearned) income and can explain the insurance-buying gambler. The policy implications of this study are important and may inform decisions that range from the determination of the most effective treatments for gambling addictions to the equity issues surrounding the use of state lotteries to raise revenues. This is an important area of investigation because a proven and broadly accepted general theory of the basic demand for gambles does not now exist and its identification would represent a useful advance.

Acknowledgements

The authors would like to thank Morris Altman and an anonymous reviewer for helpful comments. Any remaining errors or oversights are solely the authors' responsibility.

References

American Psychiatric Association, 1994. Diagnostic and Statistical Manual of Mental Disorders. American Psychiatric Association, Washington, DC.
Bailey, M.J., Mancur, O., Paul, W., 1980. The marginal utility of wealth does not increase: borrowing, lending, and Friedman–Savage gambles. American Economic Review 70, 372–379.
Clotfelter, C., Cook, P.J., Edell, J.A., Moore, M., 1999. State Lotteries at the Turn of the Century: Report to the National Gambling Impact Study Commission. Duke University, Durham, NC.
Conlisk, J., 1993. The utility of gambling. Journal of Risk and Uncertainty 6, 255–275.
de la Vina, L., Berstein, D., 2002. The impact of gambling on personal bankruptcy rates. Journal of Socio-Economics 31, 503–509.
Dobbs, I.M., 1988. Risk aversion, gambling and the labour-leisure choice. Scottish Journal of Political Economy 35, 171–175.
Dowell, R.S., McLauren, K.R., 1986. An intertemporal analysis of the interdependence between risk preference, retirement, and work rate decisions. Journal of Political Economy 94, 667–682.
Eden, B., 1979. An expected utility function for the insurance buying gambler. Review of Economic Studies 46, 741–742.
Fleming, J.S., 1969. The utility of wealth and the utility of windfalls. Review of Economic Studies 36, 55–66.
Friedman, M., Savage, L.J., 1948. The utility analysis of choices involving risk. Journal of Political Economy 56, 279–304.
Hakansson, N.H., 1970. Friedman–Savage utility functions consistent with risk aversion. Quarterly Journal of Economics 84, 472–487.
Hartley, R., Farrell, L., 2002. Can expected utility theory explain gambling? American Economic Review 92, 613–624.
Kearney, M.S., 2004. State Lotteries and Consumer Behavior. NBER Working Paper 9330. National Bureau of Economic Research, Cambridge, MA.
Kim, Y.C., 1973. Choice in the lottery-insurance situation augmented-income approach. Quarterly Journal of Economics 87, 148–156.
Machina, M., 1987. Choice under uncertainty: problems solved and unsolved. Journal of Economics Perspectives 1, 121–154.
Machina, M., 1989. Dynamic consistency and non-expected utility models of choice under uncertainty. Journal of Economic Literature 27, 1622–1668.
Markowitz, H., 1952. The utility of wealth. Journal of Political Economy 56, 151–158.
Ng, Y.-K., 1965. Why do people buy lottery tickets? Choices involving risk and the indivisibility of expenditure. Journal of Political Economy 73, 530–535.
Nyman, J.A., 2004. A Theory of Demand for Gambles, Department of Economics Working Paper #322. University of Minnesota, Minneapolis.
Robins, L., Marcus, L., Reich, W., Cunningham, R., Gallagher, T., 1996. NIMH Diagnostic Interview Schedule: Version IV (DIS-IV). Washington University, St. Louis.
Sauer, R.D., 1998. The economics of wagering markets. Journal of Economic Literature 36, 2021–2064.
Simon, J., 1998. Dreams and disillusionment: a dynamic model of lottery demand. In: Jonathan, S. (Ed.), Four Essays and a Note On the Demand for Lottery Tickets and How Lotto Players Choose Their Numbers. European University Institute, Florence.
Starmer, C., 2000. Developments in non-expected utility theory: the hunt for a descriptive theory of choice under risk. Journal of Economics Literature 38, 332–382.
von Neumann, J., Morgenstern, O., 1944. Theory of Games and Economic Behavior. Princeton University Press, Princeton, NJ.
Welte, J.W., Barnes, G.M., Wieczorek, W.F., Tidwell, M.-C.O., Parker, J.C., 2002. Gambling participation in the U.S.—results from a national survey. Journal of Gambling Studies 18, 313–337.