ON IRELAND'S NATIONAL LOTTERY

by

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ABSTRACT: Ireland's state lottery, established in 1987 and modelled on revenue-raising counterparts in operation in North America since the 1960s, has recently attracted interest in the UK. Although the Irish lottery agency is secretive in important respects, there is enough evidence to show, as in North America, that among socio-economic groups, educational attainment is probably the best predictor of lottery participation, and that the implicit tax in the lottery is quite regressive. The cost/sales ratio of the Irish lottery is inordinately high. Due to discriminatory, yet very loose, legislation, which advocates c. such a scheme for the UK might usefully study, the objectives of the Irish state lottery agency are unclear.

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INTRODUCTION

In commercial operation since 1987, Ireland's National Lottery is operated by a state agency, the National Lottery Company, on behalf of the Minister for Finance. In many respects it is a fairly straightforward replication of similar schemes evolved at state and provincial levels in the US and Canada since the 1960s. But in some important regards it differs from its North American counterparts: like its predecessor the Irish Hospitals Sweepstakes (MacAnthony, 1973; Skelly, 1986; Norton, 1987), details of the kinds which some lottery agencies in North America have made available to consumers or to researchers are kept secret; also like the Sweeps, some of its publicity is (it would seem) deliberately misleading1; finally, in a hasty application of a North American revenue-raising scheme to Ireland, but in contrast to relevant legal mandates and provisions in the US, legislators in Ireland paid relatively little attention to whatever primary objectives they intended the National Lottery Company to pursue (for example, maximization of net revenues, provision of a consumer service, some appropriate mix of the two, etc.), or to constraints under which it was to operate.

It can fairly be said that outside the National Lottery Company itself, information in regard to some features of the lottery's operation and participation has improved but little since shortly after sales commenced late in March 1987. In an earlier version of the present paper it was stated that "pending receipt by the author of hoped-for assistance, from a neutral source, for the financing of sample surveys in regard to National Lottery participation [by the various socio-economic groups], and pending the administration and analysis of such surveys by a disinterested body, this preliminary draft skeleton paper is very incomplete." (Norton, 1990, 1, 2). Immediate responses in Ireland to that 1990 contribution varied from anger

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1 Backed by permissive legislation and financial contributions in the political field, the Sweeps misled in regard to volume of true receipts (by understatements) and beneficiaries of receipts (a few families as well as hospitals). The National Lottery Company seems to mislead in regard to who is paying the bulk of the receipts (probably less educated groups in the population).
or defensive dismissal, through reservation of judgment or relief that somebody was seriously questioning the claims of National Lottery spokespersons, to outright delight. Unfortunately, much of the commentary which received publicity at the time came from persons who had read no more than a summary of the present paper.

The author has not been successful in raising the requisite financial resources -- from any source which could be deemed to be truly neutral on the subject-matter -- in the period which has elapsed since such aspirations were expressed. Therefore, the present paper is also incomplete (or more hopefully, consists of Part I of an analysis which will ultimately be presented in two separate parts). But as a start, it presents a critique of Ireland's National Lottery, along with observations on the legal framework in which it operates, in the light of its North American parentage. Some of the issues pertaining to Ireland's state lottery should be of interest to academics and policymakers outside Ireland, for example in the UK, where replacement of the poll tax system by a state-sponsored lottery has been advocated. This paper tries to avoid policy recommendations. And because the allocation of surplus funds raised by the National Lottery reflects political considerations (including the question of which groups in society deserve what), this question which has generated a lot of bitter controversy in Ireland in connection with disbursement of funds raised through the state lottery, the question of the allocation of lottery funds is largely avoided

the paper.

I. THE DEMAND FOR LOTTERY PRODUCTS: WHY AND WHO

(I. 1). The Products Offered: North America and Ireland

Aided by the fact that some state (provincial) lottery agencies in the US and Canada have not been at all secretive in the supply of relevant information to researchers, a good deal is known to economists regard to the demand for lottery products in those countries. For the most recent -- and the most comprehensive -- major study of US lotteries, see the 1989 National Bureau of Economic Research study
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1. THE DEMAND FOR LOTTERY PRODUCTS: WHY AND WHO

(1. 1). The Products Offered: North America and Ireland

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Clotfelter and Cook (henceforth referred to as CC); a more recent work (1990) by Brenner and Brenner: (henceforth referred to as BB) gives less exhaustive details for Canada. In the process of product development over the past 25 years, suppliers have gradually altered their products, away from passive raffle-type lotteries, in ways designed to increase sales: consumers have therefore been offered variation in the kind of lottery games they may play, games which allow them to participate (e.g. by scratching a card to reveal a number, or picking a number, rather than merely buying a ticket), and games which offer a few big prizes rather than very many small prizes. Of the three basic types of lottery game offered by state agencies in North America, only instant (scratch) and lotto are available in Ireland. ("Numbers" is the other main type of game played in North America).

Development of the instant game (in which prizes are usually predetermined at the moment of purchase and revealed by scratching the ticket or card) owes much to the technical innovation and marketing advice of Scientific Games, Inc. Although two different instant games are sometimes offered concurrently, the standard marketing model is to operate a game with a given theme and a given prize structure for a few months ("Extra Chance", "Celebration Bonus" and "Megadraw" were early examples in Ireland), then end it and introduce a new game while people are still interested rather than bored and restless. According to a spokesperson for Scientific Games, the objective of such tactics is to keep the player in suspense believing he has a worthwhile chance of winning, for as long as possible, and offering players an appropriate proportion of so-called "heartstoppers" -- "near-misses" of a win -- is one of the ways of doing this (CC, 54).

Even as the first instant (scratch) games were being introduced in Massachusetts and New Jersey in the early 1970s, the lottery agencies of those states were considering the implementation of new games which would let consumers select their own numbers -- in the belief of some participants, to apply their skill or supernatural knowledge. Lotto, in which players usually select as many numbers as are designated from a larger given field, was one of these: following the Massachusetts format, that adopted in Ireland has been 6/36. Using a formula well known to some school students -- 36\(!\)/6\(!\)/30\(!\) in the case of the format just mentioned -- it is easy to see that the probability of selecting the number drawn by the lottery opera-

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tors is almost one in two million. The top potential prize in such games is always on a parimutuel basis, and smaller prizes are typically assigned to consumers scoring "near hits". Although the first implementation of lotto in the US was by New York in 1978, for the US as a whole it represented 40 percent of sales by 1987, thereby surpassing both numbers at 37 percent and instant games at 24 percent (CC, 64). A surprising feature of the US experience has been the lack of "cannibalism": the early passive lotteries of New Hampshire and New York in the mid-1960s aside -- they were more like ordinary raffles than games -- the introduction of a new basic type of game did not seem to eat into the market for existing games; thus lotto and instant games did not appear to be gross substitutes in consumption. The Irish experience since the introduction of lotto in 1988 has been similar. (The National Lottery's other offering, a changing variety of instant (scratch) games, has been available since the commencement of its trading). In Ireland, draws for the lotto game take place twice weekly. They have been given very widespread publicity through the state-owned television network and elsewhere.

US lotteries have sometimes been criticized because their average payout ratio -- the proportion of amount wagered returned to punters -- is only about 50 percent, which is far lower than any other form of legal gambling in the US; it is 90 percent or higher in the case of slot machines, card rooms or bookmaking (CC, 68, 9). It has therefore been argued that only a "sucker" would buy lottery tickets rather than engage in other forms of gambling. However, this conclusion might be modified by bearing in mind the tendency to bet repeatedly (in, say, a given hour) on card games, slot machines, etc.
(I. 2). Why: Ignorance or Reason?

Whether a player wins or loses in buying a lottery ticket is not affected by the player's knowledge or skill\(^2\). Why, then, given the statistical odds against participants, is the lottery so popular? Part of the answer may be that many players have no idea of the probabilities of winning, and rely on hope; they may consistently underestimate the objective statistical odds against them; they may believe that they can improve on such odds by using lucky numbers, by studying recent trends in winning numbers, by analysis of dreams and other portents, or by being hooked into the net of a professional lottery consumer adviser. In the minds of such players, the National Lottery's lotto does not just offer a one in two million chance of winning or sharing the jackpot; rather, it provides an opportunity to beat the odds by using one's imaginary skill or knowledge by correctly predicting the number drawn.

In their observations on the ways in which many people play the lottery in the US, the authors of the National Bureau of Economic Research study note that the evidence suggests that "ancient superstitions and beliefs about numbers are still thriving in the modern age. Interestingly, the lottery agencies do nothing to educate the public on these matters; if anything they seek to encourage magical thinking" (CC, 71).

Any lottery offers the participant a probability distribution of prizes in exchange for money. A decision to participate implies a judgment by the buyer that the probability distribution is worth the price of a ticket. The judgment may be based on scientific reasoning, on superstition, on impulse or addiction, but in all cases the possibility of winning money is the primary attraction of playing the game; the excitement and social aspects of participation are derived from such a possibility.

\(^2\) It is assumed throughout this paper that the lottery is not "fixed" or subject to similar dishonesties, eg. by using a "crooked wheel", loaded balls, etc. There seem to have been very few cases of criminal acts, biasing the outcome of the lottery draw in favour of particular players, in the administration of modern state lotteries in developed countries. Perhaps the worst example was a 1981 scandal involving Pennsylvania's numbers game in which balls other than those numbered 4 and 6 were injected with liquid to make them less likely to be drawn. However the perpetrators including the television announcer for the drawings were identified, reportedly quickly (CC, 170, 1).
Conventional economic theory offers very little in the way of helpful explanation or predictive power in regard to why some people buy lottery tickets -- for a brief survey see Norton (1987). As has been recently summarized by two researchers, in their theoretical work "economists have looked at all games of chance as if they belonged to one category -- whether the prize was one dollar or a million -- and decided that gambling is a matter of taste. Those who like risks gamble, whereas those who do not like risks do not"; however, in the view of the same researchers (and with but little exaggeration), economists' models of gambling behaviour "could not shed the slightest light on any facts" (BB, 20). Sociologists, on the other hand, have related gambling to social conditions, one such theory being that when conventional avenues for upward social mobility are closed, people find unconventional ones, including crime and gambling (reported by BB, 21).

Instead of invoking any particular theory, CC have usefully classified lottery consumers into four caricatures: the investor, the plunger, the believer and the participant. These differ in terms of two key individual characteristics: "the ability to perceive correctly the probability and prize structure of lottery games, and the preference for monetary as opposed to nonmonetary features of lottery games" (CC, 73).

**Caricature 1: The Investor**

On average since its establishment, Ireland's National Lottery games have paid out less than 50 pence -- say 50 pence -- for each pound bet. Such gambles are described as statistically unfair because the mathematical expectation of a £1 wager is negative (minus 50 pence). The statistical law of large numbers ensures that anyone betting a sufficient number of times is bound to lose. However, given the methods used by financial analysts for valuing risky assets (the class of which includes lottery tickets), there can exist very unlikely but conceivable circumstances in which the purchase of a lottery ticket could be a worthwhile investment. To illustrate this point consider a lotto game in which the size of the jackpot reflects a series of rollovers (jackpot monies carried forward from earlier games because nobody guessed the number drawn in any of those games). Suppose that there is one chance in two million (as is approxi-
mately the case in Ireland) of guessing the number drawn, that there is over £2 million in the rolled-over pot, that only one more lottery ticket, reading a single number, is available at a price of £1, and that it is offered to you. Under the conditions stated, the expected value of buying the ticket is positive. From the standpoint of investment behaviour, such a purchase would not necessarily be irrational (though the mathematical expectations of returns on other assets would also have to be considered). However, the restrictiveness of these assumptions, and especially the generally increased rates of ticket purchase which are made on occasions when jackpots are carried forward (implying increased probabilities that the jackpot will have to be shared if you do win), mean that extraordinary circumstances aside, lottery tickets will not be a sensible component of your investment portfolio. Perhaps there is only a single class of investor for whom the lottery might be a sensible allocation of portfolio, and that is the criminal who seeks to launder funds criminally obtained, without fear of detection.

Caricature 2: The Plunger

Consider a person down to his last few pounds. If he does not pay a loan shark £10,000 next week he will be badly beaten up. If he uses his money to buy lottery tickets, and loses, he will be beaten up, and if he earns only a wage which he pays to the loan shark he will still be beaten up (because it is not enough). Nevertheless, purchase of lottery tickets -- even if he knows the adverse odds against him -- may conceivably be the only option rationally open to him. Relaxing the restrictiveness of this extreme example, for some people the possibility of winning a very large amount of money may be the only way of escaping trouble or of rising from the dreariness of their normal lifestyle. For such individuals, who consider their living standard unsatisfactory whether they do not gamble or lose a few pounds gambling, even a remote chance of a huge win in the lottery may be better than no chance and may be worth the few pounds: this would seem to be consistent with utility-maximizing behaviour.

There is another reason why utility-maximizing individuals might make lottery bets which are statistically unfair: they usually have incomplete information of lottery prize structures and probability distri-
butions. According to two psychologists, people appear to assign higher probabilities to events if they know of actual occurrences of the events, and state lottery agencies accentuate such impressions through their advertising and media exposure. The psychologists go on to state that the ensuing wedge between subjective and objective probabilities "contributes to the attractiveness of lottery tickets and insurance policies" (quoted by CC, 77). Quite rational people may take erroneous notions of objective probabilities as given in their expected-utility calculations.

In summary, a plunger is someone who buys lottery tickets because he has an exaggerated notion of the odds in his favour, or as one who feels that his present plight is so desperate that losing money on the lottery could not make that plight much worse, whereas a huge win would perhaps be the only way out (from the loan shark, in the extreme example).

Although they do not use the word "plunger", the authors of the 1990 Canadian study on lotteries, already cited, regard most lottery participants as portraying some features of plunger behaviour. This is apparent from their predictions early in their study, "that a chance to win the big prize will be one of the main reasons for lottery-ticket buying; that the relatively poor will plan to spend a greater fraction of their wealth on lotteries than the relatively rich; that people of all classes who have not previously gambled may decide to do so when they suddenly lose part of their wealth .... If people want either to become richer or to restore their wealth after losing a significant part of it, games of chance giving away small prizes will not be perceived as attractive, but others giving away large prizes will" (BB, 22, 3).

_Caricature 3: The Believer_

Some people tend to deny or greatly discount the operation of chance even in situations in which rational thought would indicate that outcomes are entirely chance-determined. This tendency, "the illusion of control", is amplified in games which allow players to make choices, such as selecting numbers. Thus, "part of the lottery's clientele is immersed in a culture of superstition that attaches significance to certain numbers.... Alien as it is to scientific calculation, and irrelevant as it is to the outcome of lottery draw-
ings, this culture of belief must be taken seriously in assessing the demand for products sold by state lotteries" (CC, 77, 8). The culture is guided by an industry supplying "win the lottery" kits, literature on "systems", on the interpretation of dreams and on "numbers due", and advice in return for a fee. In this manner the cult leaders can exploit the ignorance and superstition of their subscribers.

Dream books are among the artifacts used by the cult of believers among lottery consumers in the US. These associate numbers with themes occurring in dreams, etc. Although surprising in view of empirical results reported later, these books appear to thrive even in some of the most erudite environments, among them a lottery outlet on Harvard Square: in 1989 CC reported that its stock of dream books included Prince Ali Lucky Five Star, Original Real Lucky 13, and 3 Wise Men. Also in the US, many of the pulp newspapers offer advice on how to improve the odds of selecting winning lottery numbers, and these are supplemented by subscription services and newspaper advertisements offering their assistance, in effect, to change the laws of probability.

Just as the evolution of Ireland's National Lottery has been in replication of key features of US schemes, so also has the production in Ireland of cult artifacts and advice for believers. Some months after the publication in Ireland of the book Win the Lotto: An Essential Book for Anyone Playing the Lotto (which obtained free publicity from the state-owned television network, and was reviewed by Philbin-Bowman, 1990, who states that 24,000 copies were sold), the first issue of Lottery Fortunes appeared on newsstands in Ireland late in 1989 (and was followed by a second issue in 1990). The principal articles in the 1989 issue included the following: "Dreams & E.S.P.", an astrological item on "Chance"; "Playing Lotto to Win" (Analysis of past results, frequency chart, how a system works and "new systems to help you win the big one"); "Your Lucky Numbers"; "Lotto Gadgets" ("To help you select your numbers").

A biographical detail -- she "spent some time in research at Trinity College, Dublin" -- offers credentials for the author of the contribution on ESP, who advises that "to interpret your dreams it is necessary to invest in a good Dream Book"; The contribution "Playing Lotto to Win" apparently questions the statisticians' notion that the probability of any lotto number being drawn is independent of any other in the
field being drawn, or that it is independent of the frequency with which it has been drawn in the past; thus it is observed that "with the very high regularity of successive numbers being drawn, you just simply cannot ignore them". The article goes on to list "specific pairs worth watching" based on past frequencies in the lotto; such "study might well prove rewarding". The article on "What is a System?" opens by noting that selecting lotto numbers at random "makes perfect sense" but this is apparently suboptimal because it is considered worthwhile to give an eight page elaboration on the insight that "in advanced or scientific terms, a system can be defined in an entirely different way".

The publication of Win the Lotto and the two volumes of Lottery Fortunes was followed in the summer of 1990 by a "Win the Lotto" Kit. Its contents must be left to one's imagination here, as it was sold only in a sealed pack on newsstands. All of the immediately aforementioned literature and equipment eminated from the same source in Dublin, with a business address located very close to the offices of the Department of Finance.

A final set of remarks on lotto advisers: Given that people are guaranteed to lose money if they play lotto sufficiently often, for any given amount of money spent their losses over time will tend to be increased to the extent that they adhere to the same advice (eg. in regard to a specific number or combinations of numbers) from professional advisers. That is because when any such punter does select the number drawn (which is of course just as likely as any other number in the lotto format), he is more likely to end up sharing the prize with other punters. Thus, even if a decision to gamble $x$ on lotto is made quite independently of advisers, adhering to their advice on selection of numbers may be destructive rather than constructive, in the sense that the decisions which it induces among believers are likely to increase the losses which they would otherwise mathematically be expected to incur. (Of course, the conclusion just mentioned would not hold for clients of relatively unpopular deviant advisers who recommend that if one is going to gamble anyway, their small groups of clients should "operate against the crowd" by avoiding those numbers deemed "hot" and "due" by the guru advisers).
It is understood that the leader of the Irish lotto's cult of believers -- who has been closely associated with all of the above-mentioned Irish publications and gadgets -- has in fact selected some of the winning lotto numbers, using a "system". So what? "No system" is just as likely to yield the number drawn as any "system". But more fascinating, perhaps, was a magazine report (based on an interview) that "when it comes to winning he believes more in the law [sic] of probability than in Lady Luck or mere chance .... He applies the law [sic] of probability minutely scrutinising the numbers that have been drawn so far" (K. O'Connor in *Modern Woman*, March 1990). However, it is hoped that until the laws of probability are repealed, and unless "crooked wheels" and the like are involved, readers of the present paper will continue to recognise that within the lottery format the probability of any set of numbers being drawn is the same as that for any other set, that these have nothing to do with the frequencies of their occurrences in the past, and that no acquisition of advice or cult artifacts is going to change that.

*Caricature 4: The Participant*

Quite apart from considerations of winning prizes and evaluation of probabilities, some people buy lottery tickets because they enjoy nonmonetary aspects of the games. In CC's terminology, these belong to the participant class. Some might do so because their friends do and it enhances social interaction; others might do so because it is both entertaining and "for a good cause". A 1986 survey of lottery ticket buyers in California, which asked them whether they played more for money or fun, suggested that this type of lottery consumer -- the participant class -- is biased toward the better off: "Those with incomes below $30,000 were 25 percent more likely to cite money than fun, while the reverse was true at upper incomes. What is amusement to the affluent may seem more like an investment to those less well off" (CC, 80). In the Irish context, these considerations suggest that lotteries organized by or on behalf of charities and voluntary organizations are more likely to attract the (generally better off) participant class than is the National Lottery. Thus the literature and gadgets marketed to the believer class have in fact focused almost entirely on the National Lottery's lotto. Also, in Ireland the top prize in any lottery other than that of the state is limited by law to a maximum of £10,000, so by definition, its consumers are not playing
because of any probability of winning very large prizes, relative to the millions of pounds which are sometimes possible in the National Lottery's lotto. Rather, they are more likely to feel that they are assisting "worthy causes". For example, in Ireland, the surplus margin on Rehab Lotteries (the second largest lottery in the country but one which, like any lottery other than those organized by the National Lottery Company, is greatly restricted by legislation from which the state agency is exempt), goes to voluntary charitable organizations for the disabled. However, despite the legal framework under which Rehab must operate (such as constraints pertaining to prize maxima), the revealed actions of the National Lottery Company will later be shown to be consistent with the view that it seeks to drive Rehab out of the market, even though its share of the total market is very small.

(1. 3). North American Studies: Who?

The four caricatures of lottery player suggest that educational attainment is a key variable determining lottery play (and perhaps the kinds of games played). North American studies support this hypothesis.

1. The US

The details which follow are drawn from the 1989 CC study.

Although most adults who live in lottery states have played the lottery at least once, a small percentage of consumers are so active that they account for the bulk of sales. In 1986, average expenditure per adult in lottery states was about $2 per week; however, "the $2 bettor is not at all typical of lottery players. Rather, the distribution of lottery play is concentrated among a relatively small fraction of the public who spend much more than that.... In any given week, only about one-third of all adults play; over the course of the year participation broadens to encompass one-half or more of the adult public. Among those who do play, the top 10 percent of players in terms of frequency account for 50 percent of the total amount wagered" (CC, 92). Given the nonparticipation ratio, this means that 5 percent of adults in lot-
lottery states accounted for close to one half the total wagered. This inference is consistent with a 1986 California survey in which half the respondents indicated that they had bought a lottery ticket in the preceding two months; however, the 10 percent of the sample (players and nonplayers) most active in lottery play yielded 65 percent of the amount wagered (CC, 92, 3). Such skewness in the distribution of lottery play warns researchers of the pitfalls in referring to the "average" lottery player; a relatively small group is making most of the noise. CC add that "the degree of concentration of drinking [alcohol] is much the same as the concentration of lottery play, and the basic implication is the same for both alcohol and lotteries" (CC, 94).

Several US studies have indicated the principal characteristics of lottery players (by socioeconomic group, income, education, religion, race, gender, etc). The survey data methodology of these studies is subject to an innate limitation, but this will be deferred till later. The principal findings of these surveys (outlined in Chapter 6 of CC) are:

i. **Age:** The pattern is represented by an inverted U, with heaviest participation in the broad middle years of life.

ii. **Gender:** Any differences in participation rates are small, but of people who do participate, men tend to bet more heavily.

iii. **Religion:** Catholics have a much higher rate of participation than those adhering to other major religions, or none. This presumably reflects the relatively more liberal attitude toward gambling of the Catholic churches (as exemplified by raising church finances through bingo, etc).

iv. **Race:** Blacks and Hispanics play more than non-Hispanic whites.

v. **Income:** On the basis of survey data (and its limitations discussed later) there seems to be little systematic relationship between income and the absolute amount spent on lottery play. Of course, these findings imply that the poorer the respondent, the higher the proportion of income spent on the lottery, on average.

vi. **Formal Education:** The findings are that "anytime a lottery critic calls the lottery a 'sucker bet' or decries the exploitation of uninformed citizens the role of education in lottery play is being questioned. Indeed, there is no more clear-cut correlation with lottery participation.... This clear association contrasts sharply with that for gambling in general" where the odds -- as revealed by payout ratios -- are much less against the punter. Thus "it is clear that lotteries appeal to a less well educated clientele than most other forms of gambling" (CC, 97).

vii. **Occupation:** Among six broad occupational categories in a California survey for one week in 1986, labourers had the highest participation ratio at 46 percent, while advanced professionals were among those with the lowest participation rates.
It is interesting to observe that even when socioeconomic variables are taken into account, it has also been found that groups of individuals who are prone to gambling in any case are also strongly predictive of lottery play. In the most complete survey of gambling participation ever conducted in the US, "for the respondents from lottery states, lottery participation was twice as high among gamblers as among those who did not participate in other commercial gambling (74 percent as opposed to 36 percent) and that association remained strong in a multivariate analysis" (Clotfelter and Cook, 1990b, 112). This finding suggests that promotion by state lotteries increases the problems of "the problem gambler".

It should be noted that those findings are based on survey data; more on that point later. Also, the warning set out in the first principal paragraph of this subsection is important: within the averages for the various groups, most of the action may be coming from a relatively small number of individuals. Nevertheless, among socioeconomic groupings, the findings strongly suggest that the level of attainment in formal education is the best predictor of lottery play.

2. Canada

Before reporting the empirical findings of BB (1990) for Canada, it is worthwhile noting their a priori hypotheses, as follows: Because they believe that a high proportion of lottery players depict plunger-type features in seeking big improvements in their wealth, BB expect to find a "relationship between one's relative position in total wealth distribution, fluctuations in this position, and expenditures on lottery tickets". But empirical data do not permit a straightforward testing of such relationships, since adequate information on wealth is not available. Also, "the motivation for buying lottery tickets stems from two entirely different sources: (a) People who are relatively poor plan to spend a larger fraction of their wealth on tickets relative to richer people, and (b) people who have suddenly become poorer may decide to buy such tickets. But this last group may be found in any wealth bracket; misfortune may strike any category of people". Unfortunately for the empirical testing of their hypotheses, data refer to income rather than wealth. However, "another variable that may complement the information on relative wealth is the level
of education. This is because (drawing on "permanent income" or "life cycle" notions of wealth) one may expect that, ceteris paribus, the lower the level of education, the lower one's expectations for future increases in income, and thus the lower one's wealth. If so, people with less education will plan to spend a greater fraction of their wealth on lottery tickets" (BB, 181, 2). Thus, in stating that less educated people are likely to spend higher proportions of their income on lottery play, BB draw on reasons other than the likelihood that less educated groups are more prone to the cult of the believer, portrayed by CC; in fact BB ignore or deny the effective existence of that cult. Note that the dependent variable in BB's equations is the proportion of family income spent on lotteries -- not just the absolute amounts of money spent on such games.

BB conduct two sets of multivariate exercises using sample survey data (at first uncorrected for understatements, but see below), one for Quebec, the other for Canada as a whole.

For Quebec they find that as a proportion of family income, "the higher one's income, the less one's spending on lottery tickets", and "the more upwardly mobile one is, the less one buys lottery tickets". For education, the estimated relationship with the proportion of income spent on lotteries was not quite monotonic: "for the sample with ten or more years of schooling, the relationship between years of schooling and relative expenditure on [lottery] gambling is negative, whereas it is positive for the sample with under ten years of schooling" (BB, 184).

BB also tried to test their hypotheses for Canada as a whole using Family Budget Survey data (initially uncorrected for understatements) collected by Statistics Canada in 1982. Annual lottery expenditures by families as percentages of their total after-tax incomes was the dependent variable. On the basis of such data BB concluded that as a proportion of income, "family units where one or more members receive unemployment benefits buy proportionally more lottery tickets than units where no member is unemployed .... There seems to exist a negative relationship between level of education and lottery participation. People with a college or university degree buy relatively fewer lottery tickets than people who did not complete secondary education. This result is statistically significant". But according to the data
uncorrected for understatements by respondents "families with higher incomes play relatively more than their poorer brethren. Possibly we can relate this last result to the significant (40%) underreporting on lotteries we found [see below]; the results are improved when one assumes that poorer people underdeclare their expenditures more than richer people" (BB, 189-91).

Taking the US and Canadian studies together, sampled survey data -- mainly uncorrected for underreporting by respondents -- on balance suggest that the absolute amount spent on lotteries falls with attainment in formal education, while the share of income allocated to lottery purchases falls as income increases.

(I. 4). Sample Survey Data: The Problem of Underreporting in Canadian and Irish Data

As already indicated, BB noted a tendency of questionnaire respondents to understate their expenditures on lottery tickets. This illustrates a more general problem in the interpretation of survey data on consumer expenditures, in which "underdeclarations are typical when alcohol, tobacco and gambling consumption are questioned. (Overdeclaration -- bragging, that is -- seems to be a problem when a person's sexual appetite is questioned.)" (BB, 197). In the case of the lottery, orders of magnitude are quite startling.³

The broader of the two samples used by BB was based on a survey of expenditures of almost 11,000 Canadian families, conducted by Statistics Canada, where purchase of lottery tickets was one of many items on the list. If, using appropriate statistical procedures to generate provincial aggregates, one projects onto the population the amounts people said they spent on the lottery, and if peoples’

³ The possibility that questionnaire respondents or even published statistics derived from other sources may systematically understate or overstate the true data sought does not mean that the raw data are useless for the researcher. In fact, the "wrong" data may reveal some very interesting features of human behaviour. See, for example, Norton (1986, 1988).
answers were accurate, then the ensuing sums should approximate the respective provinces' lottery receipts. However "they are off the mark by 35 percent in Western Canada, 39.2 percent in Ontario, 40 percent in the Atlantic Provinces, and 49 percent in Quebec" (BB, 35). Thus, in the case of Quebec, people's expenditures on the lottery were in fact almost double the sums they stated. It is possible that some people understated their lottery play because, as with alcohol consumption, they were ashamed of its magnitude. This explanation of the discrepancies seems more plausible in the case of poorer families where physical deprivation (fewer clothes and schoolbooks for the children, etc) was presumably most severe.

The tendency to understate lottery expenditures was in fact noted in at least one earlier Canadian study. A 1988 paper on "Canadian Lotteries As Taxes: Revenues and Incidence", the research for which was in part funded by the provincial lottery agency, Loto Quebec, observed that in all Canadian provinces lottery sales were greatly in excess of those implied by the expenditure survey data used in preparing the study. It concluded that "should the degree of underestimation be the same across all income groups (deciles), our results [in regard to the calculated degree of regressiveness of the lotteries' implicit tax] would be unaffected. As a matter-of-fact, survey evidence for Quebec and recent econometric work show that the degree of underestimation of lottery expenditures is higher for low-income households than for others. Taking this finding into account increases the degree of regressivity" of the tax implicit in provincial lottery sales (Vaillancourt and Grignon, 1988, 16).

The available evidence suggests that the degree of understatement of their lottery activity by consumers of Ireland's National Lottery may be even more severe than in Canada. The possibility of such understatement should be taken into account in any study based on survey data of participants in the National Lottery. The evidence is as follows:

The Household Budget Survey 1987, prepared by Ireland's Central Statistics Office (CSO), encompassed questionnaire-based data from a sample of close to 8,000 households between February 1987 and April 1988. Each participant household was required to maintain detailed but confidential diary records
of its expenditure over a period of fourteen consecutive days. The Introduction to the published survey results warns that "the expenditure estimates, with the principal exception of alcoholic drink, are considered to be far more reliable than those derived from income" (CSO, 1989, 11). For similar reasons, the qualification in regard to reliability might usefully have included expenditure on the category "betting", listed under Code 432 in the published tables.

In the case of survey participants who engaged in gambling during the period of their questionnaire diary, they were asked to state the nature of their bets (bookmaker, totalisation, bingo, football pools, raffle tickets, other betting) and the amounts of money directly involved. Any winnings were to be listed under a separate question (rather than be deducted from the amount bet); thus, the figures for "betting" are to be interpreted as gross, excluding any winnings. (If households had stated their gambling outlays, mistakenly net, then one would expect that some of them would have reported negative betting expenditures. But it is understood that there were no such returns.) The published figure for average weekly household expenditure on betting in 1987 was (gross) £2.55 (CSO, 1969, 22). This questionnaire-based estimate, if accurate, would imply that total expenditure on all forms of betting (gross) came to about £130 million in 1987. The existence of huge understatements implied by the Budget Survey data for 1987 can be proved by comparing the £130 million just mentioned with the known levels of certain gambling activities in that year.

From the Sixty Fifth Annual Report of the Revenue Commissioners it can be found that the Exchequer's receipts from a 10 percent excise duty on off-course betting amounted to £19.5 million in 1987; thus, recorded off-course betting with bookmakers, including duty paid, came to £215 million in 1987. It can also be found, from the First Annual Report of the National Lottery Company, that in 1987 (i.e. over the first nine months of its operation in sales) receipts from sales of National Lottery tickets came to £102 million. Thus, recorded bets with bookmakers plus bets via the National Lottery came to approximately £317 million in 1987.

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4 The figure of £130 million is estimated as follows: 2.55 * 52 (weeks) = £132.6 (annually); £132.6 * 976,304 (number of households) = £129.5 million. The multiplier of 976,304 is that recommended by the CSO; see also the CSO's Census 86 Summary Population Report, November 1987.
If one could add to that £317 million the amounts wagered on-course at horse and dog race tracks, the unknown amount of unrecorded betting with Irish and foreign-based bookmakers (e.g. by large-scale gamblers using telephones) upon which tax was not paid, plus gross outlays on bingo, raffle tickets, football pools, slot machines, etc., the ensuing sum would inevitably yield a sum greatly in excess of the known lower bound of £317 million for the value of betting activity in 1987. One can say little more than that the questionnaire-based estimate (from the CSO's Household Budget Survey) for the value of the amount bet in 1987 -- £130 million -- would have to be adjusted upwards by several hundred percent in order to yield the true figure for the value of betting in Ireland in that year.

With regard to the theme which will immediately follow in this paper, it can be stated that any unadjusted questionnaire-based estimates of expenditure on the National Lottery (classified by, say, the various socio-economic groups) can be expected to be severe understatements, provided, of course, that the samples chosen are truly representative of the population at large. For the reasons indicated, any study of the pattern of participation in the National Lottery, which purports to show that the behaviour of its questionnaire-based sample survey respondents (with those responses unqualified for underreporting) is representative of national aggregates by approximating the total amount actually wagered, must a priori be treated with reserve.

(I. 5). On Participants in Ireland's National Lottery: The DKM Report

In December 1989, a report entitled An Assessment of the Economic Impact of the National Lottery was completed for the National Lottery Company by an Irish firm of economic consultants, Davy Kelleher McCarthy Ltd. (DKM). A version of the report was published by DKM, and widely circulated among the Press, the Media and elsewhere, early in January 1990. Although journalists in general treated it as an objective and disinterested piece of research (by "independent consultants"), one newspaper, The Southern Star, having expressed its concern over the financial costs of having such an attractive-looking study prepared, expressed its view that "while many conclusions contained therein could well be perfectly valid,
there is no doubt as to its blatant purpose as a white-washing propaganda exercise against the various criticisms" to which the National Lottery had been subjected, such as those which asserted that the lottery was "a tax on the poor", "State-sponsored addiction", and the like.

The most lengthy section of the report -- and that which the National Lottery Company sought to use to most advantage in its lottery sales promotion -- was that entitled "Profile of Lottery Participants and Prizewinners". The sources for that profile were twofold: (1). Analysis of prizewinner data. (2). Analysis of sample survey data.

Source 1: On Participants by Prizewinner Data

Until January 1989, each prizewinner of over £20 on any ticket in National Lottery instant games was required to complete a form indicating the occupation, sex and age of the claimant, as well as name and address. A sample of over 50,000 such claimants was accordingly made available to DKM.

Subsection (3.1) of the DKM report states that because "prizewinners are a random sample of participants; the analysis of claim forms should give an accurate picture of all participants". (Note that this assertion is extremely dubious in view of CC's findings that a high proportion of sales is to a small proportion of those persons who buy tickets.) In dismissing the notion that National Lottery participation might be skewed towards any specific socio-economic groupings, it is furthermore stated that "the analysis shows that on balance participants in the National Lottery reflect the profile of the total adult population". Using the claim forms, DKM provide a breakdown of participants by age, sex and area of residence. However, they provide no information from this source on the occupations of the participants. Although the 50,000-plus claimants were asked to indicate their occupation, DKM give no reason for the omission of such information in their report, as published. Given that all the other information from the claim forms was utilised, it is possible (correctly or otherwise) to draw the inference that the reason why the 50,000-plus claim forms were not used, to present a classification of prizewinners by occupational or socio-economic groups, was that those people were not representative of the adult population of Ireland,
and were accordingly deemed unsuitable for disclosure in the National Lottery's public relations efforts. Instead, DKM used a much smaller, and presumably less reliable, sample of questionnaire-based survey data to present a profile of participants by occupational and other socio-economic categories.

*Source 2: On Participants by Sample Survey Data*

Until indicated to the contrary, it will be assumed that respondents to the sample survey, which will be briefly considered next, provided answers which were accurate. The size of the sample population was 3,258 adults; some 1,890 of them (58 percent of the full sample) had bought lottery tickets over specified fortnightly periods. For purposes of the analysis, those 1,890 individuals formed the class of representative "regular participants" in the National Lottery.

Using the *survey base* of 1,890 individuals (the "regular participants") from the *sample population* of 3,258, DKM next proceeded to derive characteristics of National Lottery participants, and according to DKM, "overall, the social class of National Lottery participants closely reflects the social class distribution of the population as a whole". For the entire sample of 3,258, DKM calculate the arithmetic mean weekly expenditure on the National Lottery as £1.11. However, the possible pitfall in resorting to this single statistic can be seen by noting that according to DKM, some 6 percent of the 3,258 spent "£8 or more" per week on National Lottery tickets. Similarly, although the arithmetic mean expenditure of the 1,890 "regular participants" was estimated as £1.92 per week, some 10 per cent of them spent "£8 or more" on the National Lottery per week. Because of skewness in distributions, even these data confirm CC's warning, reported earlier, that reference to the "typical" lottery player can be extremely misleading.

Subsection (3.4) of the DKM report is headed *Participation by Lower Income Groups*. However, it provides no direct information on incomes of participants. Instead, it provides information on the sample population (3,258) and the sample base (of 1,890 "regular participants") classified by six socio-economic classes. But it misleads in the manner in which it uses such information. On the basis of data from the above-mentioned sample and its subsample, DKM state in the *Introduction and Summary* (ie. that part of
the report which busy journalists are most likely to consult) that "the two social classes with the highest average weekly expenditure levels [on the National Lottery] are F50- (small farmers) and C2 (skilled workers)". But even using the sample information tabulated by DKM, this is wrong, because it ignores the different participation rates (indicated on page 14 of the report) within the sample of 3,258. Using that information, it is easy for us to calculate, within the sample of 3,258, average weekly expenditures by each of the six socio-economic classes. It turns out that the six social classes are ranked, in descending order of magnitude of their average weekly National Lottery expenditures, as follows: skilled working class; other working class, unemployed, etc. (a composite group); small farmers; lower middle class; middle and upper middle class; large farmers. So even the data presented in the DKM report are inconsistent with some of DKM's central conclusions, and strongly suggest that education (as well as income) is a key variable determining expenditures on National Lottery tickets.

(I. 6). Sample Design, Credibility and Professional Ethics

Recall the central conclusion of section (I. 4) above: Because of understatements to be suspected from questionnaire respondents in regard to their betting behaviour, in Ireland as in Canada, any sample-survey-based study which (when the sample is projected onto the population) yields predictions of total lottery receipts which are approximately correct, must a priori be held in some reserve. A surprising feature of the sample used by DKM is that when that sample is used to project aggregate expenditures on the National Lottery, the ensuing total approximates lottery receipts very closely. DKM provide no comment on this feature of the sample. On the first page of the report it is stated that "DKM has been asked to undertake this study based on the data available on the operation of the National Lottery and drawing on international comparisons wherever relevant". In spite of this directive, the published version of the DKM report shows no indication of the known tendency of questionnaire respondents to understate their state lottery and other gambling expenditures.
If we use 1986 Census of Population data on the number of adults in the country, to project onto the population the DKM sample estimates of expenditures on the National Lottery, we find that total National Lottery receipts predicted by the sample come to £134 million in 1989. From the lottery company's Annual Report & Accounts 1989 we find that actual receipts came to £140 million in that year. This degree of predictive accuracy is remarkable. Even if the sample used by DKM had been adjusted in order to fit known data on total lottery receipts, some underprediction would have been expected because: (i) The published version of the DKM report is dated December 1989, and it states that the sampling was conducted in May, June and August of that year; thus, at the time of their research, DKM were not in a position to know the full extent of National Lottery receipts in 1989. (ii) The National Lottery's receipts in 1989 were on a rising trend; nominal receipts in that year were in fact 27 percent up on 1988.

Four Possibilities

Doubts concerning DKM's findings pertaining to the demand for National Lottery products raise the following conceivable possibilities: (i) No sample survey at all was conducted, and claims to the contrary are tailored to suit the marketing of National Lottery products. (ii) A sample survey was indeed conducted, but inclusion or exclusion of individuals in the sample supplied to DKM was mined in such a manner that, when projected onto the population, the sample would accurately predict total receipts of the National Lottery Company. (iii) The sampling process itself was in accord with professional practice; however, it was found that respondents greatly understated their expenditures on National Lottery tickets; therefore, respondents' replies in regard to their expenditures were adjusted upwards in order to approximate known lottery receipts. (iv) All of the research, including sample design and the DKM analysis as published, was in accord with best professional practice.

This author must immediately state that he considers some procedure along the lines of possibility (iii) to have been the most likely.
1. First Possibility: No Sample Survey and the Question of Professional Ethics

Some features of the behaviour of officers of Ireland's state lottery company are consistent with the possibility that there was no sample at all, or if there was, circumstances surrounding the use of the DKM report for publicity purposes were of such dubious character that the National Lottery Company felt that unpublished features of the sample, or some of the findings therefrom, were best kept secret. Reasons for this statement are as follows:

In July 1990 the author requested the National Lottery Company to permit him to inspect (a) blanks of the questionnaire forms used in the sample survey upon which DKM's findings were based, and (b) the unprocessed raw responses in the questionnaire forms. Both of these requests were instantly rejected.

According to DKM, the sample survey data used for its report were prepared by a leading market research firm. It is understood that the sample surveys were for the National Lottery Company, and that the results were then made available to DKM. If the market research firm had merely conducted a survey for the National Lottery Company (which it did) and if that company had not used DKM's findings from such sample data as key features of its public relations and marketing campaigns (but it did), then the matter would rest between the National Lottery Company and its contracted consultants only. But such was not the case. An earlier version of the present paper observed that the refusal of the National Lottery Company to reveal the basis of its public relations campaigns (in regard to participants) violates professional ethics and greatly detracts from the credibility of its marketing efforts (Norton, October 1990).

Insofar as the author can determine, it appears to be true that a majority of the more prominent personnel with Irish market research firms are members of The Market Research Society (based in the UK), and are therefore expected to abide by its code of ethics. In this context, note the following extract from the Code of Conduct (Rules C: "The Mutual Responsibilities of Clients and Agencies") of both The Market Research Society and The Industrial Marketing Research Association of the UK:

"Reports and any other material associated with a survey are normally intended for use within a client's organisation and its associated organisations such as advertising agents. Should a client intend wider promulgation of any results then: (a) the client and the agency [conducting the market survey work] shall agree the exact form and content, and (b) they shall agree which items under Clause 10 above [pertaining to reporting of survey
results], will be made by the agency [conducting the survey work] to recipients of this wider circulation. These must include the sample size and definition, the basic method used and the dates and locations of fieldwork. In addition, details of the questions used to produce the published results must also be made available”.

The National Lottery Company apparently did not agree with the last-mentioned of such guidelines for ethical behaviour. However, in November and December 1990 -- after the earlier version of this paper had generated some controversy -- the National Lottery Company did send the author a copy of two pages which purported to be blanks from the questionnaires upon which the sample survey used by DKM was based. But the raw (ie. unprocessed) survey data used by DKM remain secret.

2. Second Possibility: Survey data Mined

Apart from the information that the sample was "quota controlled to reflect the known demographic characteristics of the adult population of the State" (DKM, 10), very little more is known about the nature of the sampling process (and as already indicated, the National Lottery Company has not been prepared to reveal the relevant details). An unsympathetic interpretation of the information (and lack of it) provided by DKM on this matter would be along the following lines:

"The market research firm looked at known features of the adult population as a whole (including, from National Lottery sales receipts, total purchases of National Lottery tickets) and proceeded to accept or reject individuals for inclusion in a final sample until there emerged a sample which, when projected onto the adult population, would (among other things) correctly project aggregate receipts of the National Lottery; DKM were then supplied with that sample, from which it inferred a few characteristics of the adult population, broken down by degree of participation in the National Lottery; DKM's profile of participants was a by-product of that procedure". If that were what was done, the whole exercise could have been little more than an expensive but fairly useless waste of time. But given the reputation of the market research firm, the author does not believe that the procedure was in fact as just characterized. However, the National Lottery's secrecy on the matter can only invite suspicions against, and embarrassments for, two of its consultant firms.
3. Third Possibility: Sample Surveys Fair but Expenditures Adjusted

The third possibility is that the sample survey was designed and conducted in accordance with good professional practice, but that the levels of expenditure on National Lottery tickets implied by respondents' answers, when the sample was projected onto the population, fell significantly short of known levels of sales receipts of the National Lottery. If something like this was the case, we cannot sensibly evaluate DKM's findings until we know the criteria by which expenditures of the various participating groups were adjusted upwards.

4. Fourth Possibility: Research Methods and their Revelation Above Reproach

Through both the Press and Media, and in oral assertion to this author, the National Lottery Company has reckoned the DKM report to be in the same category of information, balance and professionalism as that to be expected from major independent research institutes. Observations in this context will here be confined to a set of two:

First, consistent with maintaining confidentiality where appropriate, such institutes do not usually have a policy of suppressing information on the questionnaire basis or other data sources of their publications.

Second, although DKM were directed to undertake their study "drawing on international comparisons wherever relevant" (DKM, 1), the report does not consider, or even mention, the role of education in its profile of National Lottery participants; yet a priori considerations mentioned earlier in the present paper, as well as North American studies also reviewed above, suggest that educational attainment may be the best single predictor of National Lottery participation. In its defence, DKM could (but did not) reasonably respond by pointing out that data on educational attainment of participants in Ireland were not made available for its study. Also, apart from the finding that, for unemployed participants, "an average expenditure of marginally over £2 per week is sufficiently low to dispel the myth that there is a general problem of excessive participation by people on lower incomes" (DKM, 2), the study as published tells us
very little directly about the role of income in participation or about degrees of skewness of expenditures on the National Lottery within income groups. In fact, as already indicated, some of the information provided in the report strongly suggests that as in the case of expenditures on North American state lotteries, expenditures on the National Lottery are generally lower the higher the level of educational attainment, and that in the Irish case, such expenditures may be negatively related to income.

It can be concluded at this stage that despite a great deal of controversial comment on the market for National Lottery products (whether the lottery is a "tax on fools, the uninformed, the poor and disadvantaged", etc), research funded from sources in Ireland to date has revealed little extra light on the matter. The behaviour of the National Lottery Company itself detracts from the credibility of that organization's marketing and public relations campaigns. Analysis based in part on appropriately conducted sample surveys, which allow some focus on educational attainment and other variables (eg. income) pertaining to participants, and which might have to be adjusted for understatements of respondents' expenditures (in a plausible and open manner) should yield further significant light on these matters.

II. THE SUPPLY SIDE AND GOVERNMENT

II. 1. US State Lotteries: Supply-Side Aspects

Although banned throughout the US in the present century before 1963, by 1988 about 66 percent of the US population lived in lottery states. Following New Hampshire and New York in the 1960s, the rapid growth of such lotteries was a phenomenon of the 1970s and 1980s. Thus, when the National Lottery (modelled on those of the US East Coast, especially Massachusetts) was being set up, there were already in existence legal frameworks to which reference could easily have been made in designing legal terms of reference for the Irish lottery, and in drafting constraints which might have been specified for its operation. There was in existence in the US a group of firms offering advice on the establishment and imple-
mentation of state lottery systems, including the requisite technologies. A well-tested portfolio of lottery
games, which could be readily implemented in Ireland "off the shelf" from the US experience, was also
available. In Ireland, however, inadequate attention was focused on the legal framework in which the
National Lottery was to operate.

A central feature of US lotteries is that they are all state monopolies. Operating on commission,
retail sales agents receive a fixed percentage of their ticket sales -- usually 5 percent -- plus various extra
payments for selling winning tickets in some states. Thus, commissions average 5.5 percent (CC, 180).
Also, "whether in marketing existing games, reconsidering their designs, or developing new games", an
industry of suppliers to the state lottery agencies "stands ready and willing to help the agencies in their
relentless push for increased sales. The industry's role here is not unlike that of the weapons industry in
military appropriations at the federal level" (CC, 184). The statutes governing the monopoly state lottery
agencies usually specify that a minimum of 45 or 50 percent of revenues be allocated to prizes. Legal
maxima for operating costs -- normally restricted to no more than about 15 percent of sales receipts (CC,
164, 5) -- are also set. Some states earmark net receipts for specific uses. Thus, in recognition of social
problems which its lottery could induce, Iowa earmarks some 0.5 percent of the net receipts of its lottery
for a gamblers' aid fund (CC, 163). In regard to objectives in the US, "the emphasis on revenue is clearly
reflected in the statutes setting up state lotteries" (CC, 167), and several states explicitly require their lot-
tery agency to maximize net revenues, sometimes subject to clear constraints. Limitations on advertising
are common: Iowa and Arizona both limit advertising outlays to a maximum of 3.5 percent of sales.
Absolute maxima on advertising outlays are laid down in other states (CC, 168). Three states require that
the odds of winning be advertised, while others require that the odds be listed on tickets. The statute set-
ting up Virginia's lottery -- which became law in 1987, at about the same time that Ireland's National Lot-
ttery commenced sales -- bans advertising designed to induce people to play, allowing only information
about odds, prizes and other features of games. Evidence from Illinois that the lottery agency of that state
had allocated a disproportionate amount of its advertising outlay to increase sales in black neighbour-
hoods was cited in support of such restrictions (CC, 157). In other states in recent years, there appears to
have been increased concern about the appeal of lottery products to low income groups (CC, 178). No state allows minors to play. In 1987 US state lotteries had an average payout ratio of 50 per cent (above that applied in Ireland), and some state laws permit no flexibility in that regard (CC, 174). The Irish state lottery operates in a much less restrictive environment.

Reference has already been made to statutory limitations on costs (as percentages of sales, on advertising, etc) of US lottery agencies. In spite of these and other institutional restrictions, there is evidence that the supply of lottery products is subject to economies of scale: per dollar of receipts, states in which sales are high tend to have lower unit costs than those in which sales are very low. But according to Clotfelter and Cook (1990b, 108), "it appears that scale economies in provision are exhausted at about $300 million in annual sales". Scale economies are due mainly to characteristics of the lotto game, recently investigated in detail by Cook and Clotfelter (1990). The latest available data indicate that in 1989, operating expenses as a percentage of sales varied from an exceptional high of 30 percent in low-population Montana -- with an adult population of less than 600,000 and which began its lottery as recently as fiscal 1988 -- to 6 percent in Connecticut and 7 percent in New York. Denoting in parentheses (in millions) population aged 18 years and over, Table 1 provides some details.
Table 1

Adult Population and Cost/Sales (Percent), US Lotteries, 1989

<table>
<thead>
<tr>
<th>State</th>
<th>Year Begun</th>
<th>(Operating Costs / Sales)</th>
</tr>
</thead>
<tbody>
<tr>
<td>California (20.9)</td>
<td>1985</td>
<td>11</td>
</tr>
<tr>
<td>New York (13.5)</td>
<td>1967</td>
<td>7</td>
</tr>
<tr>
<td>Florida (9.6)</td>
<td>1988</td>
<td>12</td>
</tr>
<tr>
<td>Massachusetts (4.5)</td>
<td>1972</td>
<td>10</td>
</tr>
<tr>
<td>Virginia (4.5)</td>
<td>1988</td>
<td>15</td>
</tr>
<tr>
<td>Wisconsin (3.5)</td>
<td>1988</td>
<td>11</td>
</tr>
<tr>
<td>Maryland (3.5)</td>
<td>1973</td>
<td>8</td>
</tr>
<tr>
<td>Kentucky (2.7)</td>
<td>1989</td>
<td>16</td>
</tr>
<tr>
<td>Connecticut (2.5)</td>
<td>1972</td>
<td>6</td>
</tr>
<tr>
<td>Oregon (2.1)</td>
<td>1985</td>
<td>15</td>
</tr>
<tr>
<td>Iowa (2.1)</td>
<td>1985</td>
<td>18</td>
</tr>
<tr>
<td>Arizona (1.8)</td>
<td>1981</td>
<td>13</td>
</tr>
<tr>
<td>Montana (0.6)</td>
<td>1988</td>
<td>30</td>
</tr>
<tr>
<td>Vermont (0.4)</td>
<td>1978</td>
<td>16</td>
</tr>
</tbody>
</table>


In their closing observations on the importance of economies of scale, CC state that "a footnote to this discussion has to do with a peculiarity of lotto that has definite implications for the success of lotteries in small states. Because demand appears to be affected by the absolute size of prize jackpots, large states have a decided advantage in generating high per capita sales: (CC, 181, 2). Given that, because of its restrictions on the size of prizes on any lottery other than those operated by the state agency, Irish law in effect prevents Rehab Lotteries (the National Lottery's closest lottery competitor) from running a lotto, and given the small size of the Irish market, this remark suggests that as compared to the National Lottery Company, and even in the absence of advertising outlay, Rehab would have much higher unit costs. But more on that later.
In the context of what has been stated in Part I of this paper, it is only fair to note that in their inquiries to state lotteries in the US, CC found that "while a few lottery agencies refused our requests for specific data, for the most part lottery personnel cheerfully cooperated with our many inquiries". However, "the agencies are usually reluctant to release information they fear could damage their public support .... They tended to balk at responding in two areas .... The agencies are for the most part quite reluctant to share information they collect in their marketing surveys about who plays their games and how much they play. One reasonable conclusion is that this reluctance stems from sensitivity to charges that lotteries are regressive and played disproportionately by minority groups and the poor. Another topic that tends to give the agencies pause concerns the details of their marketing strategies" (CC, 184). Thus, among lottery agencies, Ireland's National Lottery Company may not be alone in lacking balanced credibility5.

(II. 2). The National Lottery Act and the Licence

Ireland's National Lottery Act of 1986 enabled the Minister for Finance to issue an exclusive licence for the conduct of a lottery on his behalf. In October 1986 the licence was awarded to An Post National Lottery Company. (An Post is the state-owned Irish Post Office). The Act provides that at any time during the (up to ten-year) currency of the licence, the Minister may, by notice in writing, amend the conditions of the licence, and that "the Company shall comply" with such directions.

A crucial feature of the Act is that it exempts the National Lottery Company from the very major restrictions of the Gaming and Lotteries Acts (of 1956, 1979 and as further amended by the National Lottery Act, 1986). In consequence, apart from that Act's stipulation that prizes must amount to at least 40 percent of the National Lottery's sales receipts, there are no statutory limitations on the amounts of individual prizes in the National Lottery. The Act does not clearly specify the objectives intended for the conduct of the National Lottery; nor does it indicate much about the constraints under which that lottery

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5 In private correspondence, Philip Cook has mentioned that "the response to our book from lottery agencies, and from other state officials, has been mixed.... Massachusetts [where the lottery has by far the highest per capita sales among US states, and upon which the Irish state lottery is largely modelled] will have nothing to do with us".
should be operated. Thus, "the sole objects of the Company shall be the holding of the National Lottery pursuant to a licence under this Act and the doing of all such other things as are incidental or conducive to the attainment of the first-mentioned object" (Sec. 10-2). These loose directives do not necessarily imply net revenue maximization. However, Sec. 19-2 directs that each annual report of the National Lottery Company "shall include information, in such form as the Minister may direct, regarding the cost-effectiveness of the operations of the Company"; but this does not necessarily imply cost minimization subject to any clear constraints.

The licence directs that "the Company shall operate the National Lottery on the Minister's behalf on a cost recovery plus management fee basis.... The Company's operational costs plus management fee shall be based shall be based on the cost framework set out in Appendix A" and "the Company shall make every effort to minimise costs". However, the main text of the licence gives no further hint of the objectives intended in setting up the lottery agency. This author has been unable to consult the aforementioned Appendix A because, according to a communication from the Department of Finance (October 1990), "it is confidential". However, it is thought that the appendix sets a ceiling on the lottery's costs/sales ratio. This inference is drawn from the fact that the Media Fact Book of the National Lottery Company (March, 1987) states that "expenditure is on a cost recovery basis and subject to a maximum of 19.75% of sales when the lottery is fully up and running (estimated for year 3)". Keeping to round figures, then, we can take it that sales proceeds must be broken down as follows: prizes, at least 40 percent; costs, maximum 20 percent; residual made available to the Minister for Finance.

It can be observed from the foregoing that insofar as can be determined, and unlike some of its US counterparts, Ireland's National Lottery Company (i) is left with a great deal of discretion in the interpretation of its intended objectives: Note that it is not directed to maximize net revenues for the state, subject to any clearly stated sets of constraints. (ii) is subject to a maximum costs/sales ratio which is high by US standards. (iii) is not subject to any known effective restrictions on advertising outlays designed to induce people to buy its tickets. (iv) is not obliged actively to inform potential buyers of the statistical odds against them. Note also that neither the National Lottery Company nor the government are obliged
absolutely to earmark any part of the lottery's net surplus for specific uses. In particular, there is no earmarking of any part of sales receipts for a gamblers' aid fund (as in Iowa). In the absence of more clearly specified controls, it would therefore not be at all surprising if the National Lottery Company were found to be acting in some significant respects contrary to the public interest. However, if details were available of any or all directives to the National Lottery Company from the Minister for Finance (in accordance with the Act), some of the foregoing remarks might need qualification.

Unequal Terms for the National Lottery's Opposition

The reaction of Ireland's charitable organizations to the award of the National Lottery licence to An Post -- the reader is reminded that this is the Post Office -- was one of great concern to them because, in consequence of the state-run lottery, and correctly it seems, they feared they would lose revenues from traditional sources such as raffles, pools and the like. In June 1987 two of Ireland's largest charitable organizations set up Rehab Lotteries Ltd., which launched its first lottery games in November of that year. Rehab Lotteries acts as an agency raising funds for various charitable organizations in the area of health care.

A crucial constraint on the fund-raising success of Rehab Lotteries is that (unlike the National Lottery which is exempted) its operations are subject to the Gaming and Lotteries Acts, 1956 to 1986. Because of this, Rehab Lotteries have been subject to a maximum weekly prize fund of £10,000 per licence. Furthermore, such licences cannot be aggregated in order to enable any prize larger than that sum. On this count (and on many others, some of them noted below) Rehab operates under a severe disadvantage as compared to the state-run lottery, which has no fixed upper bound on its prize fund.

Research in the US, Canada and elsewhere strongly suggests that a high proportion of lottery ticket buyers are motivated by the prospect of winning a very large prize rather than many small ones, even if the mathematically expected value per pound bet is the same in either case (BB, 23; CC, 114). This confirms features of plunger-type behaviour, discussed earlier. In fact, an Israeli manuel on how to create a
successful lottery "concluded that experience shows that there must be a prize that will improve people's circumstances in a way they cannot achieve otherwise" (BB, 23, who refer to M. Landau, A Manuel on Lotteries). The £10,000 constraint on the legal maximum prize fund for any lottery, other than those of the National Lottery Company, in effect means that Rehab cannot offer lotto games of the kinds operated with great success by the state agency. Because this opportunity for availing of economies of scale is closed to Rehab, inevitably its market share is lower, and its unit costs are higher, than would otherwise be the case.

Other features of the restrictions imposed under the Gaming and Lotteries Acts, which reduce the public appeal of Rehab Lotteries and therefore reduce the net yields to charities, are as follows: (i) Each charity organizing a lottery through Rehab must compile the name and address of each prizewinner -- even for winnings as low as one pound -- in a return to the police. Some notion of the administrative burden implied by this requirement can be appreciated by noting that Rehab's first five lottery games had 632,000 winners (from November 1987 to about April 1989), and individual details of each of those winners had to be supplied at various police stations. In this manner the police could verify that the weekly prize limit of £10,000 per licence was not exceeded. (ii) The need to make frequent court applications for licences to run individual lotteries has cost the charities participating in Rehab substantial sums in legal fees. (iii) The charities holding lotteries through Rehab are prevented from having, or referring to, "instant" prizes: technically, a player cannot win a prize in a Rehab lottery without first entering a weekly draw so as to ensure compliance with the £10,000 weekly prize limit on a licence. The National Lottery is subject to none of the aforementioned constraints, all of them imposed by the Gaming and Lotteries Acts.

As an agency organizing lotteries on behalf of charitable bodies, Rehab Lotteries Ltd. is further disadvantaged relative to the National Lottery in that it is subject to a value added tax of 23 percent levied on all its staff costs. Rehab argues that as currently organized, the National Lottery Company is not subject to such value added tax charges.
The legal restrictions on the operation of Rehab lotteries, outlined in the two immediately preceding paragraphs, are not the fault of the National Lottery Company. Rather, they reflect the design of Irish law. Each of those restrictions was noted in an October 1989 submission to the Director of Consumer Affairs and Fair Trade, by Rehab Lotteries and its participating charities. The submission was entitled *The Unfair Trading Practices of the National Lottery and Other Issues Preventing Open Competition in the Irish Lottery Market*.

In view of the aforementioned legal restrictions which favour the National Lottery over Rehab, it is not surprising that the state-owned organization dominates the Irish lottery market: in 1989 its sales accounted for about 95 percent of all spending on lottery tickets in Ireland. However, predatory behaviour by the National Lottery Company itself has solidified its virtual monopoly position and through restrictive practices it has threatened Rehab lotteries with extinction. In this context, *The Unfair Trading Practices* document made complaints to the effect that the National Lottery Company was abusing its dominant position in the lottery market. It charged that: (i) The National Lottery Company had insisted on exclusiveness in its retail agency outlets (only some of which are post offices), and thereby prevented retailers from selling Rehab products along with its own; (ii) The National Lottery Company had imposed pressures on suppliers of essential goods and services to Rehab to cease those supplies and to supply the state company on an exclusive basis. In making those accusations in October 1989, Rehab complained that its 1989 sales were expected to be down around 30 percent, at a time when the National Lottery Company was reporting a sales increase of over 40 percent for the first half of 1989.

The sequel to the submission is interesting because it indicates the extreme resistance of the National Lottery Company to yielding in its predatory behaviour. Around the end of April 1990 the Director of Consumer Affairs and Fair Trade upheld one of Rehab's complaints -- that the state lottery agency was engaging in restrictive practices by supplying only retail outlets which would agree not to stock Rehab products. However, the National Lottery Company immediately indicated that it would defy the Director's decision on the ground that it had no legal force (B. Dowling, May 1990). In fact, within a short period of the Director's decision the state lottery agency twice refused to end its restrictive agreement
with retailers; first, following an approach made by the Director after his investigation; secondly, an approach by the office of the Minister for Industry and Commerce was in effect ignored (D. Coghlin, May 1990). But after consultation with the Minister for Finance, an Order was finally issued by the Minister for Industry and Commerce on 24 May 1990, demanding an end to such restrictive practices by the state lottery company insofar as its dealings with ticket retailers was concerned.

It is probable that bookmakers' shops are in competition with the state lottery to a marginal extent only. But it is interesting to contrast the restrictive existing legislation pertaining to off-course betting (surveyed by B. Carpenter, 1989) with the liberal attitudes toward state-sponsored gambling in the National Lottery Act, 1986, and with the active promotion of such gambling as revealed by the behaviour of the state lottery company.

Under Ireland's Betting Act, 1931, grounds for refusal of a Certificate of Suitability, legally necessary for bookmakers' premises, include opinions "that the premises are in close proximity to a place of worship, a religious institution, a school, an employment exchange, a factory or works, or other similar place in or near which a large number of persons congregate, or are situate in a residential area" (Sec. 11-c). No such restrictions are placed on sales outlets for National Lottery tickets at post offices which serve as places for payment of social welfare benefits. Similarly, many shops selling its tickets are located in residential areas.

The following are listed as offences in bookmakers' shops: carrying on any business other than bookmaking; permitting overcrowding; announcement of odds; exhibition of lists "or any other incitement or inducement to bet" so as to be seen from the street; permitting premises to be open except at legally specified times (which excludes evening or Sunday bets). The contrast with National Lottery outlets, which do engage in business other than the sale of lottery tickets, most of which do engage in Sunday trading, and where complaints of overcrowding in the hours immediately preceding the twice-weekly lotto draws have been persistent, is glaring. Avoidance of inducement to bet is one intent of the laws pertaining to book-
makers' shops. In this context Deputy McDowell stated in the Irish Parliament that "it is a puritanical thing with all sorts of regulations about not having inducements to go into betting shops; it is almost as if they were something between a morgue and a public loo, or like a brothel which cannot even be decorated" (Quoted by Carpenter, p. 66). It is thought that regulations in the UK are in many respects similar.

The contrasts between the Betting Act, 1931, the Gaming and Lotteries Acts, and the National Lottery Act, surely illustrate national hypocrisy. Although the first-mentioned piece of such legislation is not in practice enforced to its full potential, it seems that the inconsistencies could give rise to successful challenge of the Irish legislation, under EC (competition and perhaps other) law. Proposals for a large-scale national lottery in the United Kingdom, along the lines of that in Ireland, could usefully be assessed in the light of such considerations.

(II. 4). The National Lottery and Taxation

State-run lotteries are often criticised on the grounds that they are inefficient or undesirable instruments for raising tax revenues, that they exploit poor and ignorant groups, etc. Assertions like these raise a few questions: (i) To what extent is the National Lottery an instrument of taxation? (ii) Does the provision of a lottery, of a kind which was previously illegal (such as the National Lottery), ever involve an increase in welfare? (iii) Is the tax implied by the lottery inequitable, in the sense that it takes higher proportions of their incomes from the poor than from the rich, or in that it taxes problem gamblers whose gambling problem itself may be contrived and accentuated by the very marketing of state lottery tickets?

[ENTER FIGURE 1 ABOUT HERE]
*Taxation and Welfare*

Answers to questions (i) and (ii) above are best clarified by resort to Figure 1 (a variant of which was used in Clotfelter and Cook, 1987), which depicts a "representative" individual's demand curve for the lottery product of a monopoly supplier. The vertical axis denotes the expected net price (the effective price) of a lottery ticket as measured by the takeout ratio -- the proportion of the lottery's total receipts not returned to customers in general as prizes. The horizontal axis denotes the individual's expenditure on such tickets.

The takeout ratio in Ireland's National Lottery has been over 50 percent; for illustration suppose it is .50 only. The National Lottery reports that its unit costs have been about .20 of sales receipts: these can be taken as constant when dealing with sales to an individual (as in the diagram). Given the takeout ratio, the individual depicted in the diagram spends C per week on lottery tickets, so we can think of the National Lottery's receipts from him, after prizes have been given out, as OCBA. If the use of ordinary demand curves is a legitimate basis for drawing welfare conclusions in the case of lottery products (but see below), then the availability of lottery tickets increases the consumer's welfare; the consumer's surplus -- the difference between what he is willing to pay and what he actually does pay -- is ABE in the diagram. Thus, the government has raised revenue on the one hand, while on the other (assuming that welfare conclusions can legitimately be drawn from demand curves for lottery products) the consumer has also gained in welfare from his purchases of lottery tickets.

It is important to note that *the implicit tax* from the lottery is *not* the same as the lottery's gross receipts after prizes have been paid. The lottery's operating costs on sales to the consumer are given by the area OCFG in the diagram. Rather than being a tax, these are costs of providing a service to demand; even if the lottery products were supplied by private firms under competition, there would still be operating costs (though here we ignore complications arising from economies of scale, and also possible waste of resources involving higher costs than are necessary by the state monopoly). Thus, the area OCFG is not to be treated as a collection cost of a tax. The implicit tax on the consumer is the difference between
the lottery's receipts, after prizes have been paid out, and its costs in providing the service -- the area GFBA in the diagram. Hence, even though the lottery is indeed an instrument for raising taxation, (and on the assumption already stated about the welfare significance of a demand curve for state lottery tickets) the consumer also gains, in welfare, from its introduction. Of course, the consumer would gain even more utility if the lottery were not used as a means of taxation: if the state ran a lottery on a cost-minimizing breakeven basis, or if the lottery were provided by private firms under competition, consumer surplus would be raised to the area GHE in the diagram. (Note that the latter remarks still ignore problems caused by economies of scale in lottery supply, and possible inefficiency under a state monopoly supplier, as well as objections to applying the notion of consumer surplus in the case of state lottery ticket demand).

The foregoing remarks, to the effect that consumer welfare could be enhanced if lottery products, hitherto illegal, were made available, apply to a well informed and unaddicted gambler; in short, they assume that lottery tickets merit inclusion in the portfolio of goods and services to which "consumer sovereignty" applies. However, in view of the fact that many or most consumers are unlikely to know details of objective odds and prize structures (CC, 76), and because of possible addiction to gambling (deficiencies accentuated by the advertising and public relations campaigns of the National Lottery Company), it is very doubtful whether consumer sovereignty -- the view that the consumer is the best judge of his own interests -- usually applies in the case of National Lottery tickets. If consumer sovereignty be rejected in the case at hand, then consumer surplus analysis of the kind sketched above is invalid.

Economists and others have been willing to replace the assumption of consumer sovereignty by one of paternalism in the case of "children and madmen" who do not know their interests. Even the National Lottery Act, in banning the sale of National Lottery tickets to persons aged under 18, to some extent rejects consumer sovereignty by adopting a paternalistic stance.
Taxation and Equity

A tax is usually regarded as inequitable if it is regressive -- if it takes a higher proportion of their incomes from people with low than from those with higher incomes. By this standard criterion, the state lottery's implicit tax is inequitable. A summary review of several studies on this topic, for the US and for Canada, finds that "without exception, the evidence shows that the implicit tax on [state] lotteries is regressive" (CC, 223). For Ireland, the data used by DKM in their study of National Lottery participants also clearly show that the implicit tax in that lottery is regressive. However, in the published version of their report, DKM did not mention the matter.

The general finding that the implicit tax on state lotteries takes higher proportions of their incomes from the poor than from the rich hides the important fact that within any income group, lottery participation is not uniform. Thus, studies which focus on the implicit lottery taxes paid by the arithmetic means of the various income groups, hide the differential rates of tax paid (reflecting different levels of lottery play) within income groups. In this context Table 2 compares the average weekly expenditures on lottery tickets by all adults (whether or not any given respondent bought lottery tickets) in each income group, with the average for the 20 percent in each income group who spent most on the lottery.

Table 2

Weekly Lottery Play Within Income Groups, Maryland 1984

<table>
<thead>
<tr>
<th>Annual Income ($)</th>
<th>All Adults</th>
<th>Top 20% ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 10,000</td>
<td>7.30</td>
<td>32.56</td>
</tr>
<tr>
<td>[10,000-15,000)</td>
<td>5.37</td>
<td>21.85</td>
</tr>
<tr>
<td>[15,000-25,000)</td>
<td>2.99</td>
<td>12.15</td>
</tr>
<tr>
<td>[25,000-50,000)</td>
<td>3.21</td>
<td>14.70</td>
</tr>
<tr>
<td>[50,000 +</td>
<td>2.57</td>
<td>12.48</td>
</tr>
</tbody>
</table>

The very high levels of play by the most active 20 percent in lower income groups is striking. There is no major reason for believing that Irish data, if we had them, would show a greatly different pattern. In fact, the second table on page 15 of the DKM report gives support for that view.

For the moment we can say little more than that the Maryland data, if representative of the adult population at large -- it was collected by the Gallup Organization -- show that the implicit tax through the lottery was not only regressive, but that within income classes, and especially among the poor, the lottery was taking most of its implicit taxation from relatively small groups of people. Therein lie "the problem gamblers". Although further research of the kind mentioned at the beginning of this paper is needed for Ireland, the National Lottery appears to have its intensive users also, as in Maryland, among the poor.

One of the policy dilemmas posed by the findings in this subsection, as expressed by a Maryland state senator, is as follows: "[State] lotteries place an inordinate burden on the poor to finance state government. But the poor are willing suckers, and its hard to defend a group that doesn't want to be defended" (Quoted by CC, 215). In view of the findings in regard to the role of educational attainment, reported earlier, a policy of earmarking some of the National Lottery's net revenues to educate the poor might be a suggested answer. But the evidence is that if people in general, and the poor in particular, were more educated, then the levels of potential funding from National Lottery resources would be much smaller than they are at present.

(II. 5). The Question of Objectives

Any definite evaluation of the operation of Ireland's National Lottery Company, if the analyst is not to be forced into specifying personal value judgments, must be relative to the objectives intended in establishing that state agency. Unfortunately, both the National Lottery Act and the main text of the related licence are very vague on objectives. As indicated earlier, they state little more in that context other than that the lottery should be operated on behalf of the Minister for Finance, that it should transfer its net revenues (which it was merely presumed would exist) to an account under the Minister's control, and that it
should be run in a cost-effective manner. Thus, although the National Lottery Company is a public body, it seems that it has been allowed to set its own objectives. It would therefore not be surprising if it were found that in some important respects, its operation has been contrary to the public interest.

Chapter 12 of CC distinguishes three possible models of state lottery, the Revenue Lottery, the Consumer Lottery, and the Sumptuary Lottery. "The three differ fundamentally, for each of them has a different objective, a different concept of how a lottery serves the public interest" (CC, 242). A further possible distinction will be added below.

The archetypal Revenue Lottery would have the primary objective of maximizing government revenue, subject to fairly mild constraints. It would be subject to relatively few restrictions in its promotional behaviour, and its payout ratio would be low -- meaning that the effective price of tickets, the takeout ratio, would be high.

A pure Consumer Lottery would have consumer welfare -- maximization of consumer surpluses -- as its primary objective. It would be limited to truth in advertising, particularly in providing information in regard to odds, prize structures and the like. Its pricing policy would differ fundamentally from that of the Revenue Lottery -- its payout ratio would be high (ie. its takeout ratio would be low). It would accept the basic assumption of consumer sovereignty -- that the consumer, well informed of the choices before him, is the best judge of his own interests.

In rejecting consumer sovereignty for some kinds of gambling behaviour, the Sumptuary Lottery would be paternalistic, with emphasis on the dangers of gambling. A government might set up such a lottery if it were of the view that gambling is bad, but that people will engage in it anyway, and that the state should regulate it by taking it under public control. The lottery agency's promotional activity would then consist of information and warnings, and (as with the Revenue Lottery but for different reasons) its payout ratio would be low, implying a high takeout ratio, or high-price policy.
A fourth, less clearcut model of state lottery could be described as the *Hybrid Lottery*, which would incorporate features of the other three models. One variant of hybrid would be a *Sales Maximization Lottery*, which might, for example, seek to maximize consumer surpluses through low-price and informative promotional policies, subject to a net revenue constraint. Or the agency's management might seek sales maximization in reflection of its own perception of importance, self-fulfilment, power, etc., subject to a constraint to the effect that its behaviour will not be tolerated by government unless the agency keeps the Exchequer content with the volume of net receipts. In the absence of clear indications of the government's intentions in setting up a hybrid lottery, including, in principle, marginal rates of substitution between the objective variables, the performance of such a lottery might be assessed by focusing on whatever constraints are specified for its operation. Whatever the objectives intended in setting up a hybrid state lottery, it is reasonable to expect its management to minimize costs, subject to relevant constraints, in any evaluation of the lottery's operation.

*Is the National Lottery a Revenue Lottery?*

It is not immediately clear where Ireland's National Lottery fits into the model framework just outlined. Although its mandate by Act and (insofar as is known) by licence is extremely vague, some features of its behaviour correspond to that of the Revenue Lottery. But other aspects of that behaviour seem to be inconsistent with maximization of net revenues for the Exchequer. Reasons for this statement are as follows:

Although the dominant objective of US state lotteries is net revenue maximization, the legal constraints under which they operate are generally much more restrictive than in the case of the National Lottery, and even then, two serious researchers have recently criticised the US state lotteries for being allowed to operate too much like aggressive private businesses (Clotfelter and Cook, 1990a). Given their objectives and constraints, a *summary statement* of the overall performance of the US state lotteries is provided in Table 3.
Table 3

Breakdown of Sales Receipts, US State Lotteries

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Takeout Ratio</td>
<td>.50</td>
</tr>
<tr>
<td>Of Which: Cost/Sales Ratio</td>
<td>.10</td>
</tr>
<tr>
<td>Implicit Tax Ratio</td>
<td>.40</td>
</tr>
<tr>
<td>Payout Ratio</td>
<td>.50</td>
</tr>
</tbody>
</table>


From the National Lottery Company's Annual Report 1989, corresponding percentages for Ireland's state lottery in 1989 (with 1988 in parentheses) were as in Table 4:

Table 4

Breakdown of Sales Receipts, Ireland's National Lottery

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Takeout Ratio</td>
<td>.51 (.54)</td>
</tr>
<tr>
<td>Of Which: Cost/Sales Ratio</td>
<td>.19 (.20)</td>
</tr>
<tr>
<td>Implicit Tax Rate</td>
<td>.32 (.33)</td>
</tr>
<tr>
<td>Payout Ratio</td>
<td>.49 (.46)</td>
</tr>
</tbody>
</table>

The fact that the National Lottery was modelled on US agencies which were mandated to maximize net revenues might itself suggest that it is primarily a Revenue Lottery. Its takeout ratio -- the effective price per pound of lottery play -- is just above that applying in the US. The slightly higher takeout ratios
in Ireland may reflect the less constrained legal environment under which the National Lottery Company operates. Other features of the Irish agency -- eg. its predatory stances against Rehab -- may seem to confirm that it operates a Revenue Lottery. However, the troubling statistic is the National Lottery's cost/sales ratio of about 20 percent. It is to be observed in passing that the cost of fixed assets is not included in statements of the National Lottery's costs -- see the auditor's notes on "accounting policies" in the Annual Reports of the National Lottery Company. But we will ignore the latter interesting observation in what follows. It is important to know why the National Lottery Company's unit costs are so high.

The National Lottery's high cost/sales ratios of almost 20 percent are not only due to the fact that the rates of commission which it pays to retailers are slightly higher than those paid by its US counterparts: Commission paid to retailers comes to about 5.5 percent of sales in the US; in the case of the National Lottery it was at rates of 6 percent and 6.3 percent in 1988 and 1989, respectively.

It might be argued that the National Lottery's high cost/sales ratio must be mainly due to the small size of the Irish market and ensuing inability to avail of economies of scale. In this context, it is worthwhile noting that the adult population of the Republic of Ireland numbered just over 2.3 million in the late 1980s. From Table 1 above (pertaining to 1989) it can be seen that this is intermediate between the 2.1 million of Oregon (cost/sales = .15) and Iowa (cost/sales = .18) on the one hand, and Connecticut (cost/sales = .06) on the other. Of course, it may be objected that actual sales are a better measure of market size. But noting that the National Lottery's sales in 1989 came (almost exactly) to $200 million (using market exchange rates), and comparing its cost/sales ratio with those of the many US state lottery agencies which had sales of about $200 million, or less, in the same year (Clotfelter and Cook, 1990b, 107), the Irish state lottery still performs very poorly. Thus, the very high cost/sales ratios of the National Lottery are not due solely to its inability to avail of economies of scale.

The National Lottery Company has responded to criticisms in Norton (1990) by claiming that its cost/sales ratios have been similar to those of US lotteries which are at a similar stage of development. Only two observations need be made here. First, in 1987 the National Lottery Company itself indicated
that it expected to have got beyond the development stage by 1989 (*Media Fact Book*, 11). Second, it can be seen from Table 1 that the assertion of the National Lottery Company in the present context is incorrect: With the exception of Montana, the Irish state lottery's cost/sales ratios compare very unfavourably with those of US state lotteries which commenced sales as late as 1988 and 1989.

Secret contracts which it appears to have made with US suppliers of technology and advice may be factors underlying the high cost/sales ratios of the National Lottery Company. But it may also be the case that, in an obsession by its management for aggrandizement *per se*, the National Lottery has expanded beyond a sales level which would maximize net revenues (to be transferred to government). It may have done this by means of excessive levels of seductive promotional campaigns. If that were the case, its operations would be akin to the *sales maximization* (subject to a minimum profit constraint) model of oligopoly theory where, given a divorce between ownership and control, the firm's management may build its own empire, contrary to the interests of its shareholders (Baumol, 1967). The National Lottery Company's emphasis on sales rather than on net profit is illustrated by its four-page "Review of Operations" in its Annual Report 1989, which tells its reader nothing about costs, but is focused almost entirely on marketing and public relations promotion. Note that (as indicated earlier) although the National Lottery Company is understood to be subject to a Ministerial directive to maintain a *maximum* cost/sales ratio of almost 20 percent, it has in fact abided by that ratio almost exactly. Also, one can go to either the DKM report or to the lottery company's Annual Report 1989 for further support for the sales maximization (subject to a minimum "profit" constraint) interpretation of the lottery management's own objectives, as follows:

According to the DKM report (page 2), "about 58% of the adult population participate regularly in the National Lottery (i.e. at least once a fortnight)". The same claim is made in the state lottery's *Annual Report 1989* (page 4). Presumably this statistic causes National Lottery participants to feel that they are "among the majority" of adults. Whether or not one takes into account the fact that some individuals also buy Rehab Lottery products, such a participation rate, if the statistic is correct, is extraordinarily high in the light of experience in the US, where "the data indicate that half or more of the adult public in lottery
states play at least once a year. One third play regularly” (CC, 240). Given that per capita incomes in Ireland are far lower than in the US, with the result that fewer can afford to play National Lottery games, the high cost/sales ratios of the National Lottery may be a consequence of inordinately high levels of promotion by that company. Two further sets of remarks close the present subsection:

(i) A frequent interpretation of Baumol's model of the oligopolistic firm which seeks to maximize sales subject to a minimum profit constraint, implies (unless maximum and constrained minimum profits happen to coincide) that the firm is acting contrary to the interests of its shareholders. To the extent that the objectives of the management of the National Lottery Company are similar to those of the firm in Baumol's model, then it too could appear to have usurped accountability to its shareholders -- ultimately the public at large whose interests it is intended it should serve.

(ii) Even if the observed behaviour of Ireland's state lottery is consistent with being a Revenue Lottery, rather than one which operates along the lines of Baumol's oligopolist, it is not clear that such behaviour is in accord with that intended under the National Lottery Act or the associated licence. For example, it is not clear that Ireland's legislators intended to undermine the private sector initiatives of charitable organisations such those represented by Rehab. If that were the intent, then presumably it would have been more sensible to exterminate competition quickly, thereby giving greater scope for the exploitation of scale economies by the National Lottery Company. But it seems very unlikely that such was what politicians and the public they represent really intended.

A Consumer Lottery or a Sumptuary Lottery?

Given what has been stated in the immediately preceding subsection, it does not appear to be appropriate to analyse the revealed objectives of the National Lottery Company under either of the above headings. Its sumptuary aspects are minimal and consumer welfare is incidental to its primary objectives, whatever they may be.
III. SUMMARY

Avoidance of policy recommendations was promised in the INTRODUCTION. Thus, only a summary is outlined here, as a list of points, more or less in ordered sequence as they arise in the text.

1. Ireland's state-owned Irish National Lottery Company, which commenced sales in March 1987, has attracted some interest in the context of the UK's quest for new sources of government revenue. It is suggested that legislators and other policymakers in the UK could greatly benefit from an understanding of the legislative framework under which the Irish state lottery operates (and lessons therefrom), from details concerning its operation, and from some knowledge of which socio-economic groups appear to be bearing the burden of the implicit lottery tax.

2. To date, and apart from the National Lottery Company itself and some of its client firms, relatively little has been known about important features of the Irish state lottery's operation, or of the socio-economic groups providing most of its patronage. So far, the author has not been successful in raising adequate funding for appropriate sample surveys of lottery participation.

3. Ireland's National Lottery is modelled on those in North America, about which much research has been published in recent years. A priori reasoning suggests that the level of educational attainment is a key variable predicting which individuals are most likely to engage in state lottery play. This is in fact very strongly confirmed by North American empirical studies, which also indicate that the share of income allocated to state lottery purchases is higher for low income groups than for those earning high incomes.

4. North American studies indicate that even within income groups, a small percentage of lottery consumers are so active that they account for the bulk of lottery sales. Hence, reference to the "typical" or "average" lottery player can be extremely misleading. Similar skewness in the distribution of players is suggested by limited Irish data.

5. Canadian studies indicate that there is a very strong tendency of questionnaire respondents to understate their expenditures on lottery tickets. Orders of magnitude are quite startling. For example, in Que-
be, people's actual expenditures on the lottery were almost double the sums they stated. It seems that the poor may understate by most (relative to their incomes). Shame and deprivation induced by excess lottery play may be a reason for this. For Ireland, the evidence cited strongly suggests that the degree of understatement of National Lottery purchases may be even more severe than in Canada. Hence, any study of the pattern of participation in the National Lottery, which purports to show that the lottery behaviour of its questionnaire-based respondents (with their responses unadjusted for underreporting) is representative of national aggregates by approximating the known total amount actually wagered, must *a priori* be treated with some reservation.

6. Toward the end of 1989 a firm of economic consultants, DKM, published an economic assessment of the National Lottery. This has elsewhere been described as "a white-washing propaganda exercise" absolving the National Lottery of much of the criticism which it has faced, especially in regard to the socio-economic status of its most active participants.

7. Two sample sets were made available to DKM: one giving details (including occupations) on almost 51,000 National Lottery prizewinners; the other of much smaller size, 3,258, being based on a sample survey. But, for reasons unknown, DKM did not use the large sample to provide information on the occupations of participants; instead, DKM used the much smaller sample in order to provide details on social groupings (rather than incomes) of National Lottery participants. Although the consultants' brief directed them to refer to international evidence where relevant (and North American studies indicate education as the key variable predicting lottery play), it does not seem to have occurred to the consultants that educational attainment might be a variable to consider in their profile of National Lottery participants -- the lengthiest section of their report. DKM did not mention education in that context.

8. DKM state that some 58 percent of their smaller sample of 3,258, or 1890 individuals, were "regular participants" in the National Lottery, and that the social class distribution of those individuals was representative of the population at large. But skewness in levels of lottery spending among "regular participants" is apparent from DKM's data. Hence, a high proportion of National Lottery receipts comes from a
small proportion of the adult population. The "problem gamblers"? A subsection of the DKM report is headed Participation by Lower Income Groups. But it provides no direct information on the incomes of participants. DKM summarise that "the two social classes with the highest average weekly expenditure levels" on the National Lottery are small farmers and skilled workers. But even using the limited information revealed in their report, this is (at best) misleading, because it ignores the different participation rates in the National Lottery -- actually tabulated by DKM -- within the sample of 3,258. In fact it is easy to see, within DKM's "representative" sample of 3,258, that average weekly expenditures by each of the six social classes, ranked in descending order of magnitude of their mean weekly National Lottery expenditures, are as follows: skilled working class; unemployed, and other working class (a composite group); small farmers; lower middle class; middle and upper middle class; large farmers. (Note that DKM rank "other working class, unemployed, etc" as fourth in their ordering, as published!). So even the data which DKM used strongly suggest that education -- and income -- is a key variable determining spending on the National Lottery.

9. A feature of the (smaller) sample used by DKM is that when it is projected onto the adult population to yield aggregate spending on the National Lottery, the ensuing total approximates actual sales receipts very closely. DKM provide no comment on this feature of their report, despite the known tendency of questionnaire respondents to understate their gambling expenditures.

10. In its sales publicity campaigns, the National Lottery Company has placed great emphasis on the apparent findings as presented in published form by DKM. However, it has been unwilling to make available for inspection the raw (unprocessed) sample data which it made available to DKM. This means that further comment on the consultants' profile of National Lottery participants does not seem worthwhile. It also raises questions of professional ethics, as well as wonder in regard to why the state lottery company feels that it must protect the basis of its publicity campaigns, as secrets.

11. Turning to the supply side, although the National Lottery is modelled on US state lotteries, the legal framework under which it is allowed to operate is vague, and much more lax than in many US states. The
revenue maximization objective is clear in the statutes of US states. But limitations on the amounts which may be spent on advertising are specified in some. The statute which set up Virginia's lottery -- which became law in 1987 around the time that Ireland's lottery commenced sales -- bans advertising which is designed to induce people to play, allowing only information on odds, prizes, etc. Wisconsin's provisions in regard to advertising are very similar. Iowa earmarks 0.5 percent of the net proceeds of its lottery to a gamblers' aid fund. In contrast to the more strict statutory environment in which many US state lotteries must operate, Irish legislation does not clarify its intended objectives for the National Lottery Company, and the legal constraints under which it must operate are, insofar as is known, minimal. In the absence of clarity in the governing legislation, it would not be surprising if the National Lottery Company were deemed to be acting in some respects contrary to the public interest.

12. In contrast to the liberal legislation -- or lack of effective legislation -- governing the operation of the National Lottery Company, the legal stance toward its potential competitors is hypocritically repressive. This may raise issues, as yet untested, of unconstitutionality, under European Law.

13. A simple diagram is used in the text to illustrate implicit tax and welfare aspects of state lotteries. An inference -- that legalization of lottery sales can raise welfare by giving rise to increased consumer surpluses -- would be justified in the case of well-informed and unaddicted lottery ticket buyers. But the notion that objective statistical odds are known to the bulk of National Lottery consumers, and that the assumption of consumer sovereignty should apply, is not plausible. (In this context one can think of the National Lottery Company's refusal to reveal full information on odds and prize structures, the role of advisers and the sale of literature and other cult artifacts.) Even the (for the state lottery agency) very liberal National Lottery Act, in banning the sale of tickets to persons aged under 18, partially rejects the assumption of consumer sovereignty applied to National Lottery products.

14. All of the studies known for the US and Canada show that the implicit tax in their government lotteries is regressive. The data revealed in the DKM report show that the implicit tax in the National Lottery is regressive (though the consultants refrained from mentioning the matter). Data from a Maryland sur-
very show that the implicit tax in that state's lottery was not only extremely regressive, but *within* income classes, and especially among the poor, the lottery was taking most of its implicit taxation from relatively small groups of people. There is in fact some evidence in the DKM report (though not developed therein) indicating that the situation in regard to the National Lottery's implicit taxpayers may be similar to that in Maryland.

15. Although Ireland's state lottery has some features of a Revenue Lottery, there is some evidence that the main objective of the lottery agency's management has been to maximize sales subject to a constraint of some minimum amount of net revenues being available for transfer to the government. Thus, backed by advertising and promotional campaigns (in which it has invoked the DKM findings as published), the National Lottery Company may, in a sense, be producing "too much" -- producing an output level in excess of that which would maximize net revenues transferable to government.

16. A very troubling statistic is the National Lottery's costs/sales ratio of almost 20 percent, which contrasts with a summary norm of 10 percent in the US. Analysis suggests that its high costs/sales ratio (a) is *not* due to Irish retailers' commissions being marginally higher than those of their US counterparts, (b) is *not* due to the size of the Irish market causing Ireland's state lottery to be unable to avail of economies of scale, and (c) is *not* due to the fact that Ireland's state lottery commenced sales as recently as 1987. These observations give support to the hypothesis at (15) above.

17. In Ireland, because of the high costs/sales ratios of the state lottery agency, and expressed as proportions of that lottery's total sales proceeds, the net returns to both the Exchequer and to the lottery-playing public are lower than the corresponding ratios normal for US state lotteries.

18. Even if the observed behaviour of Ireland's state lottery were consistent with that of a Revenue Lottery (which seems unlikely), it is not clear that such behaviour is that intended in the (quite vague) legislation governing its operation. For example, in providing for the establishment of the National Lottery Company, it is not clear that Ireland's legislators intended to undermine voluntary charitable organizations.
19. The above considerations suggest that if the adoption of a state lottery remains under consideration in the UK, adherence to Alfred Marshall's motto -- "festina lente" or "hasten slowly" -- may be prudent. By contrast -- and perhaps like Britain's poll tax -- Ireland's statutory provisions for its state lottery seem to have been hastily conceived, without due regard for the implications. In designing the relevant legislation for a government lottery in the UK, lawmakers and their advisers may find much to benefit them from study of Ireland's experience with such a scheme, the net proceeds of which amount to less than one percent of total revenue from taxation in Ireland.
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