THE SPATIAL DIFFUSION OF STATE LOTTERY SYSTEMS

By

JAMES GERALD CAIN

Bachelor of Science

Northwest Missouri State University

Maryville, Missouri

1984

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
July, 1987

THE SPATIAL DIFFUSION OF STATE

LOTTERY SYSTEMS

Thesis Approved:

Thesis Adviser

Dean of the Graduate College

PREFACE

I have found throughout the course of my graduate study that patience, perseverance, and dedication are essential for completion of a thesis. The knowledge I have gained from this research will hopefully prove invaluable in my future career goals. The spatial diffusion of state lotteries proved to be a dynamically changing topic which required constant alterations as the number of lottery states increased. The most significant finding of the study came from the Boundary Population Index variable. The geographical diffusion of state lotteries is influenced greatly by large population concentrations near state borders. The high statistical correlations of the Boundary Population Index with a state's lottery adoption status has helped confirm the influence population has on lottery diffusion.

I would like to express my sincere thanks to those who helped make my graduate studies possible. Their confidence has inspired me to achieve career goals I once thought were impossible. Prof. Richard Hackett deserves special consideration as one who has provided me with guidance since the beginning of my college studies. His encouragement and confidence in my abilities convinced me to pursue graduate studies.

My thesis committee members have all been a pleasure to work with and have been very helpful in offering suggestions to improve the thesis. Dr. John F. Rooney, Dr. Richard Hecock, and Dr. Anthony Brown are each to be acknowledged for their thoughtful guidance during my thesis research. I cannot thank them enough for taking the time when I needed their help.

My deepest gratitude goes to Dr. Robert E. Norris, my thesis adviser. Dr. Norris has been a constant source of encouragement throughout my graduate studies. His special talents as a person as well as a teacher receive my highest admiration and gratefulness. It has been a privilege to work with him.

Also, Prof. James H. Stine should receive thanks for his contributions to my work. Although not a member of my thesis committee, he showed great interest in the topic and it was a joy to have him available for suggestions.

The last five years of graduate study have been an experience which will always be remembered. My fellow graduate students are to be commended for a very unique and close kinsmanship and spirit of togetherness.

Finally, I want to thank my parents, Gerald D. and Jean J. Cain, for their wonderful love and support. I dedicate this to you, Mom and Dad.

TABLE OF CONTENTS

LIST OF TABLES

Table | Page

LIST OF FIGURES

CHAPTER I

HISTORY OF LOTTERIES IN THE UNITED STATES

A. Introduction

Although modern state lottery systems are a recent phenomenon created within the last twenty years, the use of lotteries as a means of raising needed money represents a method used for centuries by governments, educational institutions, and private citizens. Use of lotteries for raising needed revenue dates back to the Roman Empire which reportedly used a type of lottery as a form of entertainment for its citizens. Feudal lords, throughout Europe, also used various lottery games to raise funds in their respective kingdoms during the fourteenth and fifteenth centuries.

Historically, lotteries have been used worldwide. People foster a false impression in assuming that the recent development and expansion of lotteries in the United States represent a unique trend in the history of government revenue. Due to some confusion as to the meaning, extent, and forms of lotteries existing within the world, a brief historical review of lotteries is offered. The review will distinguish between past lottery characteristics and current lotteries at the state government level.

B. Colonial to Civil War Period

The first mention of lotteries used in America (Sullivan (87)) indicates that in 1612, the Jamestown settlement was granted lottery proceeds by England for establishing the colony. Later the pilgrims themselves raised revenue for financing construction of churches, schools, bridges, and roads through lotteries. Sullivan (87) further notes the efforts of the Continental Congress which conducted a national lottery to help support the Revolutionary War effort in 1776.

Lotteries continued to grow in popularity and were used by many municipalities and organizations during the early mid-1800s. In 1833, the city of Philadelphia used more than 200 vending offices devoted to the selling of lottery tickets. Famous people such as Thomas Jefferson and Benjamin Franklin were avid supporters of lottery activities. Even prestigious universities such as Harvard, Yale, and Princeton held lotteries to raise funds for educational purposes. Lotteries throughout this time period received overwhelming support by the majority of people in America. Only the Quakers and Puritans vehemently opposed lotteries, but they were not very active or successful in reducing gambling activities.

As new states were coming into the Union in the early 1800s, lotteries were conducted to help establish states and to develop transportation systems throughout frontier regions. In the fifty years prior to the Civil War, over 300 schools and universities benefited from lottery proceeds. Lottery corruption briefly diminished the number of lotteries in the 1840s but the Civil War prompted governments to once again relax anti-lottery laws so revenue could be raised for helping the war effort and for reconstruction of the South after the war. Relaxation of lottery regulations led to corruption and crime so extensive that lotteries never again were controlled by private businesses.

C. Louisiana Lottery

The Louisiana Lottery Company, operating out of New Orleans, signaled the beginning of the end for lotteries run by monopolistic private enterprises.

The Louisiana lottery, responsible for the wildest betting spree in United States history, dominated the gambling world for almost 30 years up to 1900. Sullivan (87) mentions the growing strength and corruption of the Louisiana lottery best through a quote of a state official at the time who spoke of the lottery as: "Spreading its monstrous tentacles to every corner of the nation enveloping people in its icy grip." The Louisiana lottery was an example of a gambling business allowed to operate uncontrolled which severely abused people for personal gains. Agents for the Louisiana lottery sold tickets across the United States with gross receipts of up to \$3 to \$5 million annually. As a result of the corruption associated with lotteries, the federal government followed earlier state actions banning all lottery-type gambling activities nationwide which effectively destroyed the lottery for nearly 75 years.

D. Lottery Prohibition

It was not until 1964 that lotteries in any form re-emerged within the United States, and only then in a form which was strictly regulated by state governments. Society had adopted a deep rooted mistrust of lottery activities because of the wide scale corruption in Louisiana. Many states tried unsuccessfully to introduce lottery legislation between 1920 and 1950. Constitutional law of most states strictly prohibited lotteries and required significant amendments before any serious lottery legislation could be passed. In 1930, 45 states had statutes outlawing all lottery activities. It was only through an extraordinarily severe financial crisis that New Hampshire finally adopted the first state lottery game in 1964 after several earlier fruitless attempts to establish a lottery.

E. Re-Emergence of Lotteries--Origin of Modern State Operated Lotteries

The state of New Hampshire, reacting to a budget crisis within state government and fearful of raising already high taxes, developed the first state lottery in July of 1964 at Rockingham Park in Salem, New Hampshire. Government sponsored gambling was thus born, starting the spatial diffusion process of state lotteries. New Hampshire was determined to learn from the history of earlier lotteries and avoid mistakes of the past by incorporating high degrees of integrity and many safeguards against lottery fraud. Revenues generated from the lottery were earmarked for education as a supplement to the general fund. New Hampshire's lottery did not meet with immediate success and struggled to survive until 1974, when on-line computerized systems revolutionalized the lottery's popularity and efficiency. New Hampshire faced strict regulatory control on all types of lottery advertising from the Federal Communications Commission (FCC) and the U.S. Postal Service on dissemination of lottery materials through radio, television, newspaper, and mailing media.

The limitations imposed on advertising of lotteries through media sources caused state lottery diffusion to be very slow at first. It was three years later (1967) before New York established a state lottery. Many states were waiting in the wings to see how successful New Hampshire would be before venturing into a state sponsored gambling industry. Once the concept was proven as a successful revenue raising method for state governments, state lotteries rapidly spread throughout much of the Northeast in the 1970s (94).

CHAPTER II

THE RESEARCH PROBLEM

A. Introduction

By May, 1987, 26 states plus the District of Columbia will be operating state lottery systems. The diffusion process is so rapid that it is continuously changing over the course of only a few months as new lottery states keep emerging. In 1985 alone, four new states (Iowa, Missouri, California, and West Virginia) joined the lottery parade and in 1987, Florida, Kansas, South Dakota, and Montana are adopting lotteries which will begin by this spring.

There are many factors associated with the rate and geographical pattern of lottery diffusion. Lotteries are definitely concentrated in the Northeast, West, and Midwest regions of the United States with a complete absence, except for Florida, in the South and Southeast (Figure 1). Debate is heated between opponents and proponents of lotteries as to their utility for government and society. In the South, religious differences and political opposition from conservative state governments have prevented lotteries from developing, although several lottery bills have been introduced in state legislatures. Public support is overwhelmingly in favor of lotteries (85% in states with lotteries) in most areas, but is weak in most of the South at approximately 37%. Opposition to lotteries in the south can be attributed to southern cultural values, religion, and government. Corruption, historically associated with lotteries, may also be a factor because of the Louisiana lottery of the late 1800s. The Louisiana

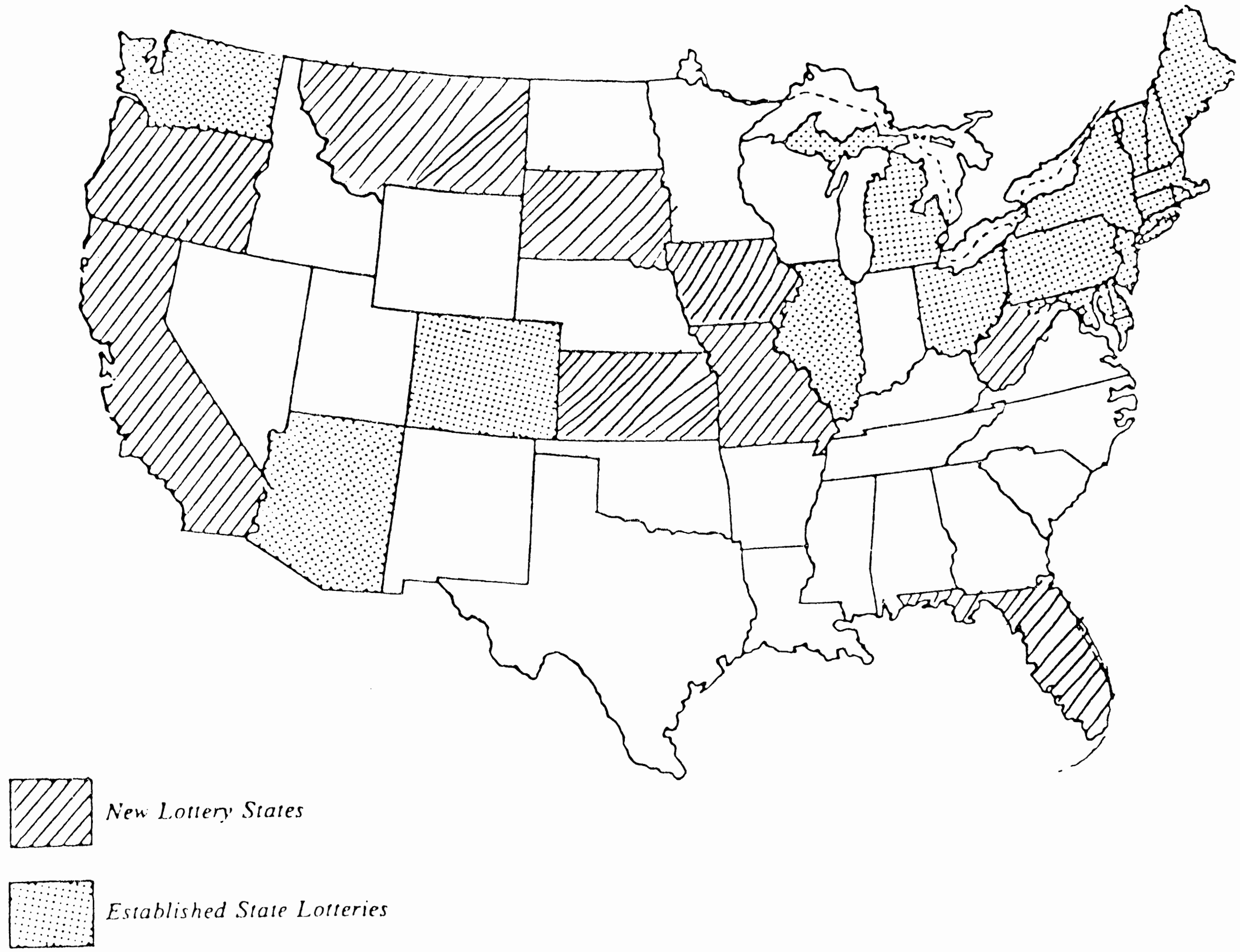


Figure 1. Geographic Pattern of Lottery Adoption

lottery may have represented a strong negative reinforcement, as many people still remember how lotteries abused the public and eroded confidence in gambling ventures.

Despite a strong pocket of opposition in the South, lotteries nationwide meet with strong approval as 61% of the people favor a state run lottery system (Table I). Widespread public confidence in lotteries can be considered one of the many reasons that state lotteries have spread rapidly throughout parts of the United States in the past twenty years. State lotteries seem to undergo an evolutionary process in which the form and type of games played change to adapt to the public's preference. What is constant about all state lotteries is the fact that they are used by state governments as an alternate revenue source in troubled financial times to help alleviate dwindling state revenues. There is no doubt that lotteries represent big money for state governments. A report by USA Today (2) shows FY 1985 net profits for lottery states at $3.7 billion dollars. With the addition of Iowa, California, Missouri, and West Virginia as lottery states in 1985, FY 1986 net profits will approach $5 to 6 billion. In November of 1986, there were yet four more states which approved lotteries. With the scheduled beginning of new lotteries in Florida, Kansas, Montana, and South Dakota sometime in 1987, FY 1988 net profits could total nearly $10 billion (84). Public support along with serious financial difficulties continue to be responsible for more states adopting lotteries. The diffusion pattern of state lotteries strongly suggests a contiguous element to the spread of state lotteries which has been enhanced by competition between neighboring states to keep money in state rather than have people cross borders to spend money out of state. The somewhat amazing addition of nine new lottery states in the past three years indicates the increasing influence lottery states are having on bordering non-lottery states.

TABLE I

DEMOGRAPHIC CHARACTERISTICS AND ATTITUDES TOWARD LEGALIZATION OF LOTTERIES

	Positive to Legalization %	Negative to Legalization %	Un-sure %	No Answer %	Total Sample %
Total Sample	61	29	6	4	100
Currently Legal					
Yes	77	14	7	2	100
No	49	41	5	5	100
Geographic Region					
Northeast	84	8	7	1	100
North Central	68	22	8	2	100
South	37	49	6	8	100
West	62	33	3	2	100
Income					
Less than $5,000	38	46	12	4	100
$5,000-10,000	53	33	8	6	100
$10,000-15,000	66	25	5	4	100
$15,000 and over	71	24	4	1	100
Marital Status					
Married	62	29	6	3	100
Divorced/Separated	69	23	6	2	100
Widowed	36	39	16	9	100
Never Married	69	24	5	2	100
Education					
Less Than High School	45	38	10	7	100
High School	66	27	4	3	100
Some College	73	22	5	0	100
College Degree	72	22	4	2	100
Age					
18-24 Years	64	28	4	4	100
25-44 Years	69	23	6	2	100
45-64 Years	61	30	6	3	100
65 and Over	34	50	10	6	100
Distance From Largest 25 Cities					
Less Than 25 Miles	72	20	6	2	100
25-49 Miles	80	14	6	0	100
50 Miles or More	51	38	6	5	100

B. Justification for Study

There have not been any significant studies on state lotteries which have concentrated on the geographical pattern and rate of diffusion across the United States. Some studies make specific references confirming the influence a state's location plays in determining if lottery adoption will occur. They suggest that a state is more likely to approve a lottery if bordering states have already established a lottery. These studies, however, mainly look into the political aspects of lottery adoption.

Kaplan (40) noted that lotteries spread as adjacent states seek to capitalize on the mania and to stop the flow of dollars across their borders. This statement tends to verify the significance of the spatial diffusion of state lotteries because of the contiguous nature of the diffusion from state to state. As the state lottery business continues to expand and becomes more of a major economic factor for state budgets, the controversy will become more intense. The study of state lottery diffusion is a very current and dynamic topic which is steadily gaining national attention. The topic is geographically significant when studied in terms of the diffusion from state to state.

C. Statement of the Problem

What are the primary geographical factors accounting for the pattern and rate of state lottery diffusion in the United States up to the present time? What factors have been responsible for encouraging the diffusion of lotteries in Northeastern states and prohibiting diffusion (barriers) in the Southeast? What can the pattern and rate of diffusion reveal about the current and future distribution of state lotteries? A distinction must be made between the geographical factors which influence the spatial diffusion rates and patterns of lotteries as compared to political factors responsible for the method and rate of adoption by state lottery officials. The distinction at times can be very difficult to measure because many geographical and political variables tend to interrelate strongly with each other. The effect of such a distinction can be seen as lotteries have not spread in a perfectly contiguous pattern but have been refracted in places (Indiana) due to political conservatism and cultural opposition. Refraction of the diffusion comes about as a result of cultural and political barriers which act to prevent acceptance of lotteries. Many ideological issues like the lottery are subject to refraction around states which oppose them. Final analysis should offer possible future trends in state lotteries based on the geographical rate and pattern of lottery diffusion and the political factors which influence those patterns given the variations in the method of adoption from state to state (initiative, referendum, legislation, and Senate approval).

D. Statement of the Hypotheses

1. State lottery adoptions will be found to have a contiguous pattern of diffusion.
2. Population and distance along state borders should be the key factors affecting the rate and pattern of lottery diffusion.
3. The method of lottery adoption used by governments (initiative, constitutional amendment, referendum, legislation) directly affects the rate of diffusion.

The first hypothesis is based on the geographical pattern of lottery adoption up to 1987 (Figure 1) (82). The figure shows a contiguous pattern to the present distribution of state lotteries. Based on this pattern up to the present time, it is expected that the diffusion will continue in a contiguous fashion.

Much of the reasoning for the contiguous diffusion hypothesis is due to the economic competition that exists between bordering lottery and non-lottery states.

It is evident there are very few states completely surrounded by lottery states which are not themselves lottery states. Money is escaping states (such as Indiana, Kentucky, Virginia, Wisconsin, Minnesota, and Arkansas) which do not have lotteries because people will go to bordering lottery states to participate. This becomes highly significant when there are major market areas in non-lottery states which are near to states that do have lotteries (e.g., Memphis, Tennessee; Indianapolis, Indiana; Kansas City, Kansas; Omaha, Nebraska). The states these cities are in represent areas having enough population and distance along their borders to significantly influence lottery diffusion across their borders. This is the basis for the second hypothesis.

Legislation is usually the shortest step to legalizing a lottery, but the voter initiative option present in some states provides an additional chance of passing a lottery in states where legislative action has failed. The initiative option therefore increases a state's chances for adopting the lottery, especially given its popularity in the eyes of the public as compared to a controversial view taken by state government legislators who may doubt the effectiveness of lotteries. Since each political adoption method has different legalization requirements for a lottery, it is likely to assume the rate of diffusion will be affected by this.

E. Definitions of Terms

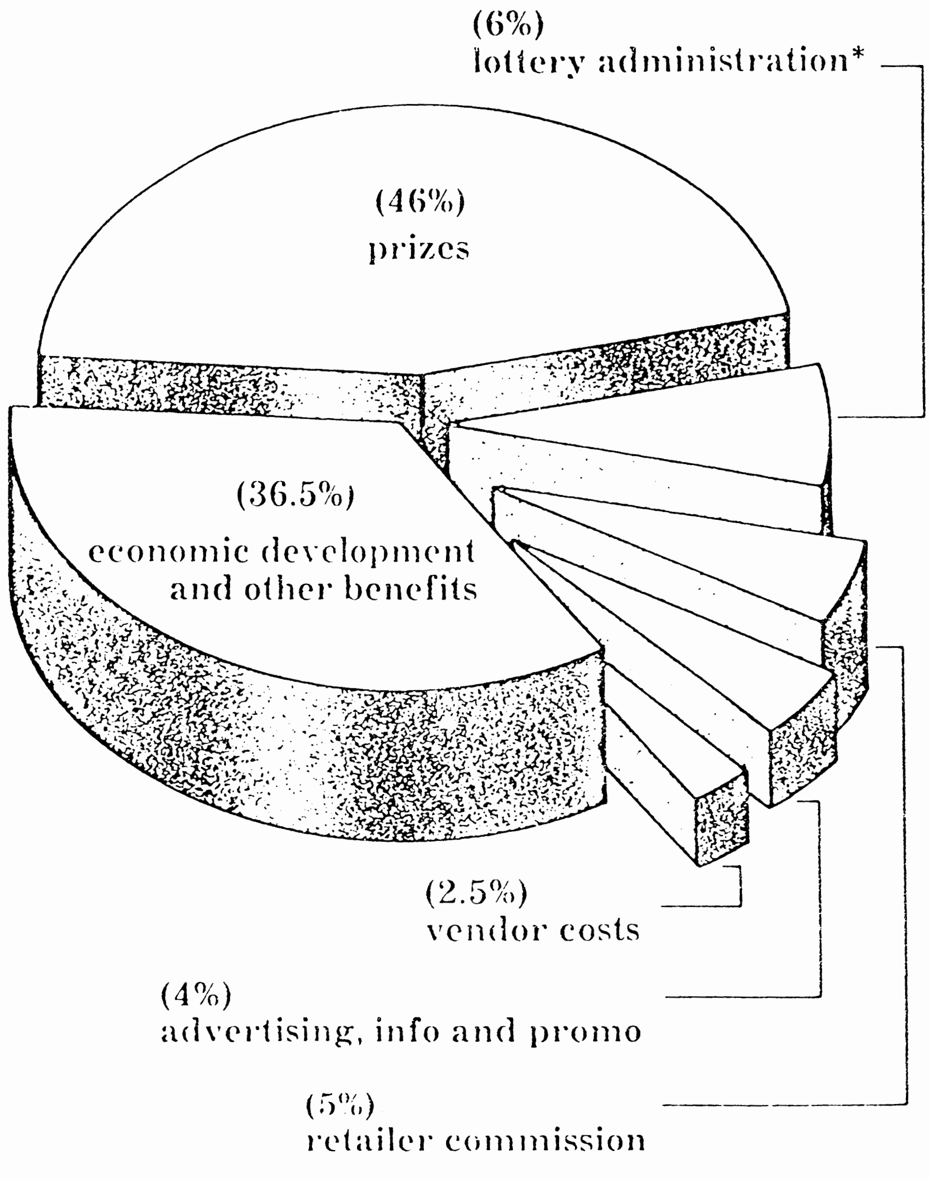
Lottery in General: (1) A form of gambling in which chances to share in a distribution of prizes are sold. Three essential elements of a lottery are investment by a player, chance, and prize. (2) U.S. Code Definition (Congressional Research Service, the Library of Congress): The pooling of proceeds derived from the sale of tickets or chances and allotting those proceeds or parts thereof to one or more chance takers or ticket purchasers (definition offered is a statutory one interpreted differently under various state and federal laws) (92).

State Lottery: A lottery which is operated and regulated by state government lottery officials and commissions. Forty to forty-five percent of the proceeds goes to the state which are used as part of the general fund or is earmarked for specific purposes such as the elderly, recreation, or education. Forty-five to fifty percent goes for prizes paid to lottery game participants. The remaining five to fifty percent goes toward commissions made by retail outlets selling the lottery tickets, to contractors making the tickets, and to state lottery personnel to pay salaries, operating expenses, and advertising costs (94) (Figure 2).

Specific Variations of State Lottery Games: (1) Instant games: rub-off tickets which instantly reveal whether the bettor is a winner. Most often this is the first in a variety of lottery games offered by a state. (2) Lotto: players pick a combination of numbers from a larger group, say six out of forty. A drawing determines the winning numbers and the jackpot builds if no one wins. This is fast becoming the most popular form of lottery due to its larger prizes. (3) Numbers: players will chose three or four numbers, and the numbers are drawn daily, weekly, or biweekly. (4) On-line video: it is any game which uses a retail terminal linked to a central computer. The on-line video games represent the newest generation of lottery games and appeal to younger age groups (18 to 25) (45).

Contagion or Contiguous Diffusion: This type of diffusion is based on the adjacent location of a phenomenom. The lesser distance separating an innovation from its outlying areas increases the likelihood that the diffusion will occur. For lotteries, individual states are seen as the units by which the diffusion progresses. Contagion diffusion spreads from one point to its nearest

Where Does Lottery Money Go?
(average of instant and LOTTO games)



*includes leases, contracts, vehicles, start up consultant charges, personnel and other costs to manage games.

Figure 2. Iowa Lottery Revenue Breakdown (36)

adjacent points. In the lottery's case, this would be diffusion from one state to adjacent bordering states.

Barriers: They are factors which prevent the diffusion of innovations. Barriers are usually based on cultural, political, or economic circumstances that hinder movement of innovations into certain areas. Barriers act to disrupt the normal pattern of diffusion causing refraction around them. In the lottery's case, there are states such as Indiana and Wisconsin, where the diffusion was forced around them because of political legalization requirements and possible moralistic opposition (barriers to this type of diffusion).

Refraction: When an innovation encounters a barrier to diffusion, refraction of the innovation around the barrier most usually results. Sometimes the refraction goes directly back to its point of origin, but more likely, as in the lottery's case, the barriers will be semi-permeable allowing movement around them. Refraction results in a change in direction of the diffusion movement. This change in direction of the diffusion's path occurs quite frequently for many innovations but is not so apparent for state lotteries. One notable exception in which refraction of lottery diffusion took place was in Indiana, where the innovation went around it from Ohio and Michigan into Illinois.

F. Study Limitations

Data availability, which was thought to be a problem due to the current nature of the topic, was not as much a factor as originally perceived. The diffusion process is such that it is changing rapidly and can be expected to change during the course of the thesis study. This research cannot go into a detailed analysis of each lottery organization state by state because of the time and cost of such a pursuit. State lottery patterns which exist for individual states can be related to the overall pattern involved on a national scale to determine any significant trends in state lottery diffusion throughout the United States. The most specific analysis this study will incorporate will be employed on a regional basis to gain insight into the more recent states involved in the diffusion process. Due to the extensive number of alleged factors from pro and con forces behind state lottery adoption, this study will be concerned with the factors most responsible for lottery adoption which are spatially oriented rather than politically, but most of the relevant factors will be discussed at least briefly.

G. Review of Literature

The majority of research on lotteries has been conducted by political scientists and economists, and are mainly concerned with state government policies and the economic effects that lotteries would have on state gambling industries. Although many articles have made reference to the importance of the geographical distribution of state lotteries, no extensive studies have focused on specific factors which offer key contributions to the spatial diffusion trends of lotteries for each state.

Sullivan (87) provides an excellent historical review of lottery gambling. Lotteries have existed since biblical times when the Roman Empire conducted a lottery for improving roads and buildings. By the fifteenth and sixteenth centuries, lotteries spread throughout much of Europe as many feudal lords organized lotteries to raise money for their kingdoms. The first evidence of lotteries in North America comes from the Jamestown Settlement which benefited from lottery proceeds raised by the English motherland. Lotteries became very influential in the foundation of the United States as money raised was used for war efforts, the building of schools and homes, and as an aid to needy people.

The importance of the lottery to the foundation of America was further studied by Kaplan (40). Kaplan discussed the influence private and public lotteries had on establishing early colleges, schools, and churches. Once established, many educational institutions held their own lotteries to fund teaching, dormitories, and educational materials. Almost 50 colleges including prestigious Ivy League universities such as Harvard, Yale, Princeton, and Dartmouth conducted lotteries to support their schools. The height of the free enterprise lottery era, according to Kaplan, was in the mid-1800s when over 21 states issued over 200 lottery licenses to numerous private and public organizations.

One other important note about the early lottery period in American history is given by Weinstein (94) who compared early lotteries with modern state lotteries and found major irony in their distribution. Lotteries in the 1800s were most dominant and widespread in the South (Louisiana lottery), while current state lotteries are concentrated in the Northeast. He conjectures that the absence of lotteries in the South may be significantly related to the earlier history of lottery corruption in the South.

There are other more recent historical overviews of lotteries which cover the time they became state agencies to the present. The Public Gaming Research Institute provided a draft copy of "The History of North American Lotteries and the North American Association of State Lotteries" (1). Instead of early lottery history, this article concentrates on the history of the modern day state lotteries since 1964. Mention is made of the lottery as a traditional method for raising revenue, but the paper goes into more detail on how state governments adopted lotteries. The circumstances leading to New Hampshire's original adoption are discussed followed by other states' early efforts at establishing a lottery. From there, the focus shifts to the formulation of the

North American Association of State Lotteries as the major governing agency for state lotteries nationwide. Later the NAASL became the National Association of State Lotteries, which still exists today. The article finishes by tracing the evolution of lottery game types through the last 20 years and describing the future goals of the NASL.

Individual state lottery agencies have also written research articles on lottery history. The Oregon lottery had a "Research Monograph on State Lotteries" (27) developed by Legislative Research, Inc. of Salem, Oregon. The article is mostly devoted to answering the question of why more states are adopting lotteries. Several factors were mentioned for why more states have been influenced to adopt lotteries, but the key reason stressed was a state's worsening economic conditions. Another important factor touched on by the monograph determines the number of variables which affect the amount of revenue a state can generate from a lottery. This article is typical of the type of research done by most state lottery agencies which are very interested in the revenue potential of lotteries and the degree of competition from other states.

The most comprehensive information source concerning state lotteries is a 627-page collaboration of articles reviewed by the United States Senate (92). The Senate hearings conducted on October 3, 1984, provided an extensive overview of proponent and opponent positions on state lotteries. The hearings also include testimony from state lottery officials, lottery game contractors, gambling organizations, and leading national economists.

The above hearings provided detailed statistical analysis of net and gross revenues of every state having a lottery for FY 1983 along with projections of possible revenue potentials on non-lottery states. The document, in addition, provides specific percentage breakdowns of where lottery revenues go, personal income level participation figures for lotteries, and the percentage of lottery players playing various forms of lottery games for each state. Distinctions are made between the several varieties of lottery games available for each state, the payoffs for winners, the odds of winning, and how each game is played. Detailed political analysis gives the manner of authorization required for lottery adoption, the demographic characteristics of lotteries, and even a model bill for establishing a state lottery.

Another important issue affecting the success of state lotteries is dealt with in a separate United States Senate (91) hearing which called for modernizing restrictions on dissemination of lottery information through the media. Lottery advertising has meant big dollars for state governments and the hearing results significantly enhanced the authority of states to advertise their lotteries. Many lottery states can now advertise through television, radio, newspaper, and mail brochures within their own states and in other lottery states. In addition to the United States Senate, the Congressional Research Service (Library of Congress) (73) represents a good source for a neutrally legalistic political viewpoint on lotteries. The report covers state lottery operations in general with particular emphasis on gross lottery sales, types of lottery game players, and player demographics.

Dr. John R. Koza's testimony before the United States Senate (92) hearing included an extensive study dealing with lottery participation rates by ethnicity and neighborhood types. Koza also argues against the criticism that lotteries are a regressive tax by presenting facts and figures which support a fairly even income distribution of lottery players. Mote (66), a public affairs representative for Scientific Games, Inc., discusses the economic potential of a state lottery. Mote, whose organization produces most instant lottery tickets and is responsible for national state lobbying efforts to adopt lotteries, gives a model which can project the gross revenue potential of a lottery for non-lottery states by multiplying the average per capita expenditures times the states population (Table II and Figure 8). States with the most recent success in adopting lotteries have voter initiatives where the public can vote for a lottery if signatures are gathered in a referendum. Many states which have good public support for lotteries have not adopted one because lottery adoption is subject to legislative approval only and does not have the voter initiative option.

Most of the current research dealing with state lotteries is found in political science and state government journals and is not confined to any one single authority on the subject. Many articles do not have single authors but are written by research staffs. State Government News and State Policy Reports represent two of the most authoritative sources on state lotteries. Each journal is a bi-monthly publication which reports on recent and changing state policies.

Kearny (41) recently reported for State Government News that people in Montana will vote on a lottery in November of 1986. Knapp (45, 46, 47) has written recent articles highlighting the increasing popularity of lotteries as an alternative revenue source for states. Knapp (45) gives a good summary of lottery revenue totals for each state, where each state allocates the net profits received, the major types of lotteries being played, and the advantages/disadvantages of lotteries for state governments.

Aside from Knapp's articles, most information on lotteries from State Gpvernment News pertains to current updates and voting actions involving lotteries. The journal reports the financial success of state lotteries, any lottery game format changes, and the attempts by non-lottery states to legalize a lottery. State Government News continued reporting the success of state lotteries by describing people's growing anticipation for prospects of a lottery. It mentioned a $41 million jackpot winner in New York, the opening of the

TABLE II

PROJECTED ANNUAL 1985 LOTTERY REVENUES
FOR NON-LOTTERY STATES (61)[a,b]

State	Population[c]	Projected Gross @ $72.02/Capita	Pr. Net @ $29.40/Capita
Alabama	3.890	$ 280.2	$114.4
Alaska	0.400	28.8	11.8
Arkansas	2.286	164.6	67.2
California	23.669	1,704.6	695.8
Florida	9.740	701.5	286.4
Georgia	5.464	393.5	160.6
Hawaii	0.965	69.5	28.4
Idaho	0.944	68.0	27.8
Indiana	5.490	395.4	161.4
Iowa	2.913	209.8	85.6
Kansas	2.363	170.2	69.5
Kentucky	3.661	263.7	107.6
Louisiana	4.204	302.8	123.6
Minnesota	4.077	293.6	119.9
Mississippi	2.521	181.6	74.1
Missouri	4.917	354.1	144.6
Montana	0.787	56.7	23.1
Nebraska	1.570	113.1	46.2
Nevada	0.799	57.5	23.5
New Mexico	1.300	93.6	38.2
N. Carolina	5.874	423.0	172.7
N. Dakota	0.653	47.0	19.2
Oklahoma	3.025	217.9	88.9
Oregon	2.633	189.6	77.4
S. Carolina	3.119	224.6	91.7
S. Dakota	0.690	49.7	20.3
Tennessee	4.591	330.6	135.0
Texas	14.228	1,024.7	418.3
Utah	1.461	105.2	43.0
Virginia	5.346	385.0	157.2
W. Virginia	1.950	140.4	57.3
Wisconsin	4.705	338.9	138.3
Wyoming	0.471	33.9	13.8

[a]Using 1984 per-capita gross revenue and net income for the lotteries as a base, the non-lottery states can expect to generate funds approximating the above figures.

[b]All figures in millions.

[c]According to 1980 census figures.

California lottery, and the fact that Iowa sold $11.5 million in instant lottery tickets between its opening on August 22, 1985, and September 16, 1985.

State Policy Reports deals more specifically with government policies on lotteries and explores the possible effects lotteries might have on the public and the economy. The best lottery article from State Policy Reports (82) details nearly every aspect of lotteries including their history and associated law enforcement problems. Most importantly, this article presents a map portraying the geographical pattern of lottery adoption up to 1985 (a revised form for 1987 is included in this thesis). The article cites the geographical location of a state as a key factor for influencing lottery adoption. According to the article, several out-of-state players account for a relatively high percentage of any one state's lottery revenue. Non-lottery states which border states having lotteries lose out because money which otherwise would remain in state is going out-of-state. Specific examples include Iowa residents who crossed into Illinois to buy lottery tickets before Iowa itself adopted a lottery. This instance comes from a story in the Des Moines Registar featuring a picture of a Gulfport, Illinois, liquor store with a line of lottery ticket buyers (most all Iowans) stretching out of sight. Examples of people crossing state borders are numerous where lottery games are not played.

Over the summer of 1986, the majority of research time was spent corresponding to state lottery agencies and gambling agencies. Information from most state lottery agencies consisted of annual yearly revenue reports or game materials (pamphlets, sample lottery tickets, advertisements), but a few states did provide key information on out-of-state sales and winners. There are several key journals and magazines devoted solely to state lottery agencies and industry which provided invaluable information concerning lottery states. The Lottery Journal, Public Gaming Magazine, and Gaming and Wagering Business are three major publications dealing with the political, economic, and cultural aspects of state lotteries.

Gaming and Wagering Business (51) contains information on lottery legislation developments in state governments which lists current lottery bills pending in state legislatures. It also includes information on the federal cutbacks state governments can expect from the Gramm-Rudmann Federal Budget Deficit Reduction Plan. La Fleur (48, 49) wrote two recent articles which give an excellent insight into why more states are adopting lotteries. The lottery "tidal wave" she mentions as washing over the United States (48) has come about from the increasing public popularity of lottery games. The impact of many citizen groups supporting the lottery has made it extremely difficult for state legislators to ignore the lottery issue. For the first time in United States history, more than half of the nation's population live in lottery states. The new boom area for lotteries, according to La Fleur, is ironically in the traditionally conservative Midwest where the depressed farm economy coupled with impressive sales has changed many politicians' minds. La Fleur believes that states bearing a close watch for lottery adoption in the next few years are Indiana, Minnesota, Nebraska, and Texas, because of their generally depressed economies. Another story by La Fleur (49) deals with the changing types of lottery games played. Until recently, the most popular type of lottery game was the three-digit game. Lotto has now replaced it as America's favorite. Except for the instant ticket game, more states are now offering lotto more than any other lottery game format.

The Public Gaming Research Institute is one of the premier national authorities on state lotteries. They publish two major journals dealing with the state lottery industry, Public Gaming Magazine and the Lottery Journal. The Lottery Journal deals more with the general political issues with which state officials are concerned, and is intended as a source of information for those involved in lottery legislation. Public Gaming Magazine, on the other hand, is mainly concerned with lottery industry activity and keeps readers informed of the current developments in games strategy and efforts by states to adopt lotteries. One of the best articles to give credit to the role of geography in lottery adoption comes from Public Gaming in "Lottery Legislation Up for Review Across the United States" (59). It is inferred that a certain geographic pattern of lottery expansion is emerging across the United States. With the addition of West Virginia, the Northeast corner of the United States represents a solid block of lottery states, while California and Oregon's adoptions adjoin the West Coast. The reason for such a rapid rate of lottery expansion, according to the article, stems from the competition among bordering states. Neighboring non-lottery states are just tired of seeing their dollars stream out the window across state borders into lottery states.

Comparison of two articles by Public Gaming show the changes over time in the lottery industry. "The Economic Potential of State Lotteries" (26) is a 1982 study that describes how controversial lotteries were to state legislators in the early 1980s. Although the number of lottery states was steadily increasing, the arguments by opponents against lotteries was fierce. The lottery industry at that time was considered a very young business still untested in major market areas (e.g., California). Discussion of the game contractor's role along with the revenue potential of each game format are other topics in the article. Gross sales in 1981 were $3 billion with the net returned to states at $1.2 billion. The more recent "Industry Outlook for 1985" (58) remarks of the strength of the gaming industry in state governments. A snowball effect is predicted which will carry lotteries across the country throughout the remainder of this decade. According to the Public Gaming Research Institute, industry experts predict that the two major trends for lotteries in the next few years will be: (1) more states will legalize lotteries, and (2) lotto will be the major game played. The reported gross lottery sales nationwide for 1984 was $8.075 billion dollars, a growth of over $5 billion in three years.

Public Gaming Magazine tracks the recent developments in lottery legislation and game format changes on a state-by-state basis. "The Adoption of the Lottery Amendment in Kansas" (25) gave readers a strong indication of Kansans' intention of adopting a lottery in the fall of 1986. In May, 1986, Public Gaming reported that the Kansas legislature passed a parimutuel wagering and lottery package amendment to allow the issue to be brought up for a vote later in the year. Reasons for the observed political action were directly related to the serious economic problems the state faced. The depressed agricultural and oil industries, loss of federal funding, and finally competition from Missouri and Colorado (both lottery states) was more than enough to convince Kansas politicians that they needed a lottery. The influence of the Missouri lottery was especially noted as a major incentive for Kansas to act on lottery legislation. Reports showed that 20% of the Missouri lottery outlets were purposely located within two miles of the Kansas border to attract out-of-state sales. Eight out of ten of the top ticket selling outlets for the Missouri lottery are confirmed to be in the Kansas City metropolitan area.

From the Lottery Journal a special series of articles review the key questions legislators want to know before beginning a lottery in their state. The author of "Starting a Lottery" (80) examines the legal and political requirements for getting lottery legislation on state bills. Many states recently have required Consitutional amendments to allow lotteries. This is somewhat surprising, because states have shown an increased frequency of lottery adoption despite the seemingly stringent legalization requirements. In addition to the legislative adoption technique, the public initiative is discussed as a viable alternative method for adopting a lottery.

Studies on the effects lotteries have on gambling habits present evidence that parimutuel racing and lotteries are mutually beneficial (55) and that compulsive gambling is not likely correlated to lotteries (24). An example used to help convince the parimutuel industry of how lotteries and racing can work together to increase profits comes from the state of New Hampshire. At race tracks in New Hampshire, lottery tickets are sold while at the state's lottery headquarters winning lottery tickets are based on winning race numbers. Since lotteries began in states already having parimutuel racing, an increased profit has been noted by most states for each gambling type (Table VI). Experts believe that lottery players and race track attenders are two different gaming patrons, and the lottery and parimutuel racing industries are entirely separate demographic markets. Findings on gambling behavior show that lotteries are not likely to cause compulsive gambling, because they are more of a passive gaming type based on luck compared to the active and slightly more skill-oriented casino and parimutuel gambling types. The excitement generated by lotteries is not enough to form an addiction, according to gambling behavior analysts.

Just as Public Gaming reported on the recent progress of Kansas as a new lottery state, the Lottery Journal looks at the developments in Florida (69). A well-organized public initiative drive by the "EXCEL" citizens group was able to get a lottery ballot together for the November, 1986, elections. Despite strong opposition from Florida's large parimutuel racing industry, public support for a lottery in the state (58%) meant it was only a matter of time before Florida adopted the lottery via the initiative. This article accurately predicted that by 1986, Florida would have adopted a lottery. Lottery sales for Florida are estimated at $700 million gross sales and $286 million net to the state for their first fiscal year of operation, not including spillover sales from the neighboring non-lottery states of Alabama and Georgia, which could account for another 10% of the total sales.

Executive gaming industry experts speak out on the important issues addressing lotteries. Puncke (60, 75), the former president of the National Association of State Lotteries, represents the heart of the lottery industry's intended integrity toward good business practices. Puncke is a former law enforcement official who has taken the responsibility of being the NASL president to help ensure the integrity of the lottery industry. In "Lotteries Success Based on Positive Image," Puncke (75) notes that the actions of the individual states will affect the industry as a whole. He is proud of the fact that lotteries have now gained a positive image of integrity and fairness with the people and state governments. Puncke confirms the fact that states have had an influence on each other to adopt lotteries. From personal correspondence with Puncke, I gained a reassurance, through his opinion, of the role of geography in state lottery adoptions. Puncke believes the research to be a worthwhile endeavor that may provide some insight into the diffusion pattern of lotteries. Puncke has also examined the effect of the Gramm-Rudmann budget deficit reduction plan (60). Federal cutbacks in state funding have enhanced the rate at which many states are adopting lotteries. A desperate need for alternative sources of revenue has caused many legislators to immediately look to lotteries as replacements to the federal cutbacks.

Burke, the chairman of the Public Gaming Research Institute and publisher for Public Gaming Magazine, feels "Lotteries are Good for State Governments" (14). Burke bases this on the fact that this sort of gambling has been able to operate without creating some of the social problems (e.g., compulsive gambling, crime, dishonesty) that other forms of gambling cause. Burke believes lotteries are a dependent additional source of revenue for state governments which appeal predominantly to middle class citizens. Although lotteries as state agencies are fairly efficient organizations, there is room for improvement on some of the state lottery laws (83). A Public Gaming Magazine editorial viewpoint feels state lotteries should be established as independent agencies instead of normal state agencies so they can be run in a more business-like manner with greater freedom. This would allow lottery agencies to change marketing and gaming strategies faster and without lengthy approval from government. Leonard (53) believes lotteries are not receiving the due recognition they deserve. Major opinion leaders are either for or against lotteries as there appears to be no middle ground to the issue. The amount of controversy over lotteries gives the industry a love/hate relationship with the people. Leonard, a gaming industry expert who is concerned with lottery accounting and auditing systems, stresses a major system of controls to supervise the financial operations of lotteries and to insure honesty and integrity in systems analysis.

The mixed results of lottery states' success was studied by Curry (23). In 1984, the states of Arkansas, California, Florida, and Oregon had initiative campaigns to adopt lotteries. Since then, of course, three of the four states have passed lotteries. One issue Curry brings to the forefront is the added business lotteries represent for smaller retail outlets marketing them. Particularly blessed are the retail stores in localities across the state line from a non-lottery state. Safeway food stores were found to be the nation's top chain dealer for lottery tickets.

Weinstein (94), Sternlieb (86), and Kaplan (40) each cite geographical factors as being very important in influencing lottery adoption by states. Weinstein bases out-of-state lottery sales on: (1) the length of state borders, and (2) the proximity of population centers in adjoining non-lottery states to those in lottery states. He believes that geographic and political considerations are the two most decisive factors for states in developing a lottery, given basic fiscal needs and a sociologically receptive population. Kaplan echoes the same sentiment, and Sternlieb mentions the "Domino Effect" theory where states in the Northeast were adopting a lottery only because neighboring states had. The actual amount of out-of-state lottery sales from state to state would be a key concept to study given the influence of non-lottery state residents who cross borders to play neighboring states' lotteries. This will result in a significant loss of revenue to non-lottery states and make it more likely that they may adopt lotteries to counter the revenue losses from bordering states. Unfortunately, data on the total out-of-state lottery sales for each state are nearly impossible to obtain because most states do not collect that type of information. The significance of this factor, however, is revealed in the information on out-of-state lottery winners and players which draws remarkable parallels for the states of Iowa (35), West Virginia (71), and Colorado (72).

The diffusion of state lotteries fits well with classical geographical diffusion studies that examine the innovation of an idea, its increased approval and adoption, and eventual diffusion outward until reaching the maturity stage. In Hagget's book (31), the diffusion of state lotteries would fall into what is called "expansion diffusion" as at the point of origin lotteries have remained strong and intensified as new generations of lottery games continue to be developed. Hagerstrand's 1953 (89) work can be incorporated into a model of state lottery diffusion very well as the lottery evolves through his given stages of diffusion. Adoption of the lottery in New Hampshire in 1964 was the primary stage and the rapid expansion now occurring represents the diffusion stage. Lotteries cannot be considered in the condensing stage as yet, because the South and Southeast remain as areas immune from lotteries. Many cultural barriers seem to be intact which help to prevent lottery diffusion into those areas. The state of Florida may soon change all that when they actively begin the lottery this spring.

To fully account for all the factors influencing the diffusion of lotteries across the United States, it is vital to look at some political science studies dealing with policy diffusion of innovations which occur in government. Walker (93) was the pioneer in diffusion research of states; "The Diffusion of Innovations among the American States" was a landmark achievement which inspired many other studies. Walker developed a series of innovativeness and progressiveness indices which rated the states' status as leaders, followers, or laggards in policy issues. Most lottery states are among the leaders in innovativeness according to Walker's indices. The index developed by Walker fits lottery and non-lottery states perfectly according to how innovative a state is. It was used in this thesis as a primary variable affecting lottery diffusion. Follow-up studies by Clark (18) and Savage (79) give Walker credit as a major force in policy diffusion research. In Savage's article, it is noted that the policy diffusion among the American states exhibits a geographic rather than the client-oriented focus that is found in most other types of diffusion research. Political science is seen as a discipline where the geographic spread of innovations is dominant according to states and localities. The geographically centered policy diffusion research focuses on the spread of adoptions across given populations as the innovation becomes more acceptable. Clark (18) gives due credit to Walker's milestones in policy diffusion research. She feels research in diffusion has concentrated too much on the pattern and rate of change. What is lacking is a study of the scope of change in policy diffusion and the variations of the programs. All states may adopt a particular policy but the scope (coverage) of the program varies from state to state.

Brown (11, 12) looks at the geographical aspects of diffusion in the private sector in "The Market and Infrastructure Concept of Adoption: A Spatial Perspective on the Diffusion of Innovation." In this article, it is difficult to draw any parallels to the diffusion of state government programs. However, Brown's article is part of a selection from his larger work involving "Innovation Diffusion: A New Perspective" (12). His contributions to the subject do well in describing diffusion processes in general by adding a finer degree of understanding to the concept. He says that, prior to adoption, diffusion agencies are established through which the innovation will be distributed to the population at large. The adoption step may be seen as the demand side of diffusion while the agencies' establishments are aspects of the diffusion process that control the availability of the innovation to potential adopters (supply side). Since Brown's study deals mostly with the private sector of diffusion, it is difficult to compare lottery diffusion to any of his models. If forced to draw comparisons, however, lotteries would probably fit into polynuclear diffusion types. This is based on profit motivated diffusion in which each diffusion agency (state) is established independently by economic entities which carry the burden of risk, capital provisions and decision-making responsibility.

Morrill and Manninen (65) have provided a good general definition of spatial diffusion in their article: "Spatial diffusion concerns the spread of a phenomenon from limited origins through a susceptible population over time and space." They have developed a rather unique type of diffusion model which they believe can tie hierarchical and contagion diffusion together. Lottery diffusion seems to show some hierarchical aspects to its predominantly contagion and expansion diffusion centered characters.

The interplay of state boundaries seems to be a crucial aspect to lottery adoption and the subsequent diffusion. The information about the competition between bordering states as well as the limited data on out-of-state lottery winners and players shows considerable interstate activity for lotteries. Brunn (13) describes some important aspects of boundaries and spatial interaction (see pages 177-195 of Reference (13)). He feels boundary behavior will be reflected in the perceptions, attitudes, and forms of interaction if there is some special significance attached to the political space immediately beyond the border itself. In the lottery's case, it is the old "have" and "have not" dilemma. People in states without the lottery see special significance in crossing state borders to play the games. Brunn continues by saying that individuals in nearby states know that the boundary acts as a division separating different political spaces. When crossing state boundaries, individuals are affected by a new environment or new laws. Jones (38) was a boundary research pioneer of sorts in Boundary Making. He detailed the motivations for varied boundaries according to local, state, and federal laws. His work relates the significance of geography to boundary making laws.

Blakey (6) explains the conflict which developed between state and federal government officials as more states adopted lotteries. Congressional action was finally taken in 1975 to decriminalize lottery gambling by rescinding anti-lottery statutes which banned the transportation, broadcasting, and mailing of lottery materials. The effects of the relaxation of these advertising restrictions can clearly be seen today as lottery states spent $118.5 million in FY 1986 for advertisements, an 89% increase since 1984 (56). Television is the favorite advertising medium for lottery states, accounting for an average of 60% of the budget.

Newspaper articles represent the most current reports on lottery activities for individual states. Brennan (10), Glover (29), and the Council Bluffs Nonpariel (17) keep track of lottery developments in Iowa. Articles by Brennan and the Nonpariel demonstrate how states keep changing the format of a lottery game to attract public attention. Iowa has had thirteen editions of an instant lottery game and a lotto. In the spring of 1987, they plan to introduce a video lottery game. The prize amounts, odds, and design of the tickets are slightly different for each version of the instant game which changes every four to five months (10). Lotto is a type of lottery game which began in May, 1986, in Iowa (17). It is the kind of lottery game that offers a cumulative prize and is played using on-line computer terminals. It is advertised by Iowa officials as having better odds of winning than the Illinois lotto. This is an example of the competition existing between the states. The state funds earned by the Iowa lottery are earmarked for state economic development.

As mentioned earlier, one of the best ways of obtaining information on lotteries is through mail response. Bret Voorhees, the communications director of the Iowa lottery, sent an unpublished article, which was to have come out late last fall in Public Gaming Magazine, on the progress of the Iowa lottery since its inception in August of 1985 (36). The article reviewed Iowa's dim economic situation and the need for a lottery in the face of revenue shortfalls and a bleak agricultural economic outlook. The Iowa lottery is similar to that in other Midwestern states today which encounter special marketing challenges when offering a lottery. In many states, lottery sales have shown dramatic rises in poor economic times. In Iowa's case, this may not seem to hold true because its $31.20 per capita lottery spending ranks next to last for all lottery states (63). Iowa's geography is also an important factor to marketing challenges. The fragmented population scattered across the state means advertising costs are greater due to the large areas promotional media has to cover (36). The Iowa lottery also sent the author a monthly marketing report (35) and overview of revenue generated from August of 1985 to May of 1986. Carole Custer, the director of marketing for the Iowa lottery, has kept revenue information for each instant game played up to May of 1986. The addition of a lotto had helped at first to increase Iowa lottery sales, but once the novelty of the idea wore off a noticeable decline in sales was observed. Of particular interest in Custer's report is out-of-state information (Table VII) which shows the three top states for out-of-state high tier winners come from the bordering non-lottery states of Nebraska, Minnesota, and South Dakota.

The states of Colorado and West Virginia also supplied to the author valuable information on out-of-state winners (72) (Figure 9) and players (71) (Table VIII). The annual report of the Colorado lottery (March 1, 1986) indicates it is the only lottery state that does not yet have lotto. In the face of dropping lottery revenues, the report from Raymond J. Herrick, chairman of the Colorado Lottery Commission, urges the immediate approval of lotto by the Colorado legislature. Colorado's majority of lottery proceeds have gone to conservation and recreational development. Player demographics for the state indicate the age groups, education levels, sexes, and geographic areas which play the lottery most often.

Because state lotteries are such a controversial and dynamically changing part of our society, there is an abundance of information from local newspapers throughout the country on recent lottery developments. Massachusetts, with a $212 per capita spending rate on the lottery, is the highest in the nation for FY 1986 (63). In Massachusetts, it is estimated that only 4% of their lottery players are from out of state, mainly because all of the surrounding states have their own lotteries. The District of Columbia has the second highest per capita spending rate at $180, followed by Maryland, New Jersey, and Connecticut.

An example of the influence lottery states can have on bordering non-lottery states comes from the <u>Kansas City Star</u> (76). Polls taken in early 1986 showed the lottery to be gaining popularity in the two-state, Missouri and

Kansas, region. Seventy-six percent of the Kansas residents surveyed had played the Missouri lottery at least once. The strategic location of Missouri lottery ticket outlets near the Kansas border was a major influence to the volume of border flow into Missouri. Eighty-six percent of the Kansas residents surveyed approved of a lottery for their state. As it turns out, this influence was apparently strong enough to help convince the Kansas legislature to approve a lottery bill which has since been passed by the voters.

Part of a side venture to the study of state lottery diffusion was a personal exchange of information with local lottery interests of this state. In Oklahoma, as most people are aware, there was an initiative petition campaign to get a lottery bill on the fall 1986 ballots. As part of the thesis research, interviews were conducted with Carolyn Thrift of "The Lottery is OK Committee" about how the initiative drive in Oklahoma was instigated (70). Thrift gave many reasons why she felt Oklahoma needed a lottery. Like many other states, economic reasons were near the top. Although the required number of signatures were gained in record time to get the lottery initiative on the fall ballot, judicial forces declared the lottery petition unconstitutional. This may be especially upsetting to many residents given the overwhelming support for an Oklahoma lottery in most major public opinion polls. Kielhorn and Associates (42) (a public opinion consulting and research firm) found there was 72% statewide support for an Oklahoma lottery as of February, 1986 (70). This represented a 16% increase in popularity since the last survey was done in October, 1984. According to all major demographic categories, including religion, Oklahomans favored the passage of a lottery. Despite these facts, a few small special interest groups in the state had enough power to thwart the 1986 lottery effort in Oklahoma. Much of the local media in the state seemed to support or at least show neutrality toward a lottery. Bradshaw (8), writing for the Shawnee News Star, feels moral opposition to the lottery is unjustifiable given the dire need of the state in an economically depressed time period. Bradshaw feels that the popularity of the lottery with Oklahoma residents was proven by the "Lottery is OK Committee" which gained more than enough of the required 150,000 signatures for the initiative petition in record time.

Several valuable sources were used to help develop the data analysis procedures. Some of the literature was actually of use to the methodology section as well. Taylor's (89) chapter, "Quantitative Methods in Geography: An Introduction to Spatial Analysis," details the factor analysis procedure as it may be used for geography studies. It is also a very comprehensive source for spatial analysis and diffusion processes which are applicable to quantitative geography. A chapter on factorial ecology (pp. 231-278) covers the spectrum of factor analysis from the initial operationalization of the data to factor maps portraying regional characteristics. The operationalization stage discusses data preparation, input, and output procedures for preparing the data for factor analysis. Each step used in the thesis was discussed in Taylor's work and proved invaluable to the actual data analysis and synthesis in this theses (Figure 3).

Taylor describes factor labeling as going back to the original data and labeling factors by trying to find a name which expresses the pattern of variable loadings. The goal is to look for the higher loadings and attempt to produce a general name reflecting the factor loadings. The Q-mode transposal of the data matrix is detailed by Taylor also. Taylor places extra significance to the Q-mode technique because the factors will represent clusters of objects with areal units. The factors thus can be interpreted as regions or regional types. Q-mode factor analysis is important, according to Taylor, because geographers can define functional regions from the factor loadings which indicate the areas or regions that are correlated with each factor.

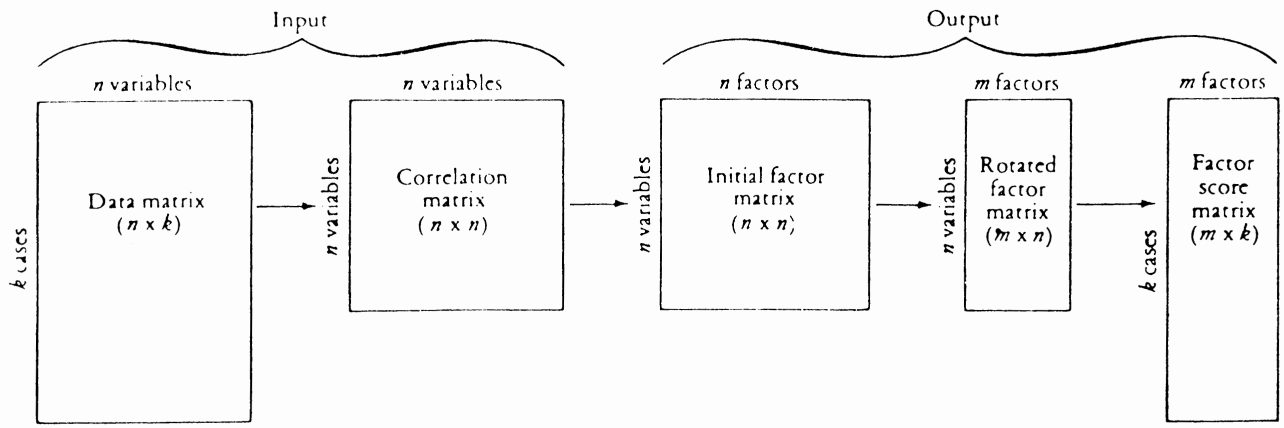


Figure 3. Factor Analysis Procedure

Taylor has acknowledged the importance of location in diffusion studies. From theoretical geographer William Bunge comes the assumption that location can be considered a single variable by considering it in terms of nearness (88). For example, Iowa is locationally more similar to Illinois than California because of the small distance separating the two states. Bunge feels a simple data matrix of places can be viewed as indicating the pattern of locational similarities. This view could very well be used to consider the pattern of lottery distribution according to locational similarities. Russett (see Reference (88)) stressed a similar type of concept. He states that: "One condition for integration is simple geographic proximity and states nearer to each other are more likely to integrate." This remark by Russett sounds remarkably applicable to some characteristics of lottery adoption. Stewart (87) developed a population potential theory which is yet another idea that parallels lottery diffusion analysis. The population potential model suggests that the influence one location has on another depends on two factors: (1) the locations' relative populations, and (2) the distance separating them. In the model, the impact declines with distance and the locations with larger populations have the greater impact than those areas with smaller populations. Stewart's analogy pinpoints the way lottery diffusion appears to be evolving and is an excellent model.

Cureton and D'Agostino (22) and Kim and Mueller (43, 44) wrote introductory manuals to the factor analysis statistical technique which are aimed at the apprentice level of comprehension. The procedure for running factor analysis programs is described as a relatively elementary step compared to the interpretation and manipulation of the results. The three articles look at factor analysis from a purely mathematical viewpoint and do not include examples of how quantitative geography studies would benefit from using factor analysis.

Taylor (88) and Zelinsky (95) help to visualize examples of how factor analysis is used in geographic studies. Zelinsky used Q- and R-mode factor pattern maps to portray personal preference patterns in American society. The factor analysis operation Zelinsky has employed displays geographic patterns of regions by Q and R models. The resulting composite maps were developed using a cluster analysis of unweighted factor scores. Two regional types were portrayed by the maps: first order culture areas and regionalization by personality and habits. Zelinsky was not totally satisfied by the results, however, despite the delineation of territorial patterns by regions. He claimed the results were inconclusive at best.

H. Methodology

Primary data for the thesis were obtained from many of the individual state lottery commissions and the national gaming industry agencies. The Book of the States 1984-1985 provided a list of all state lottery organizations and their directors. Mail response from these sources was outstanding as they all provided many articles on reasons why states adopt lotteries. Major national lottery research agencies include: The Public Gaming Research Institute, The National Association of State Lotteries, and Scientific Games, Inc. (81). These organizations provided some data which were transformed into geographical and political indices portraying the pattern and rate of diffusion among the various state lotteries.

Analysis of the population in major cities near state boundaries was combined with a measure of distance along state borders. Population data were gathered for all border counties at each state. The population data gathered from the County and City Data Book (20) required tabulation of the border population county by county for each state to arrive at the Boundary Population Index used in the thesis. Distance data for the indices developed were obtained from the Hammond World Atlas (32). To get these distance data it was necessary to measure from state to state the distances between lottery states and population centers. Total distances were combined with the adoption status of states to create the final distance indices. Political and economic data were developed from information received from state lottery organizations and gambling research agencies. Also, the information for the gaming indices comes from these sources. With the information received and that which was created, a series of political, geographical, economic, and gambling indices were devised to help test the hypotheses. The composite factor and principal component maps represent the final products of the data synthesis and were developed to show the overall regional correlations of the population, distance, border influence, and innovativeness of states.

The Statistical Analysis System (SAS) was used to run the data correlations and factor analysis procedures (77). A stepwise regression program was also run through SAS to determine the importance of the independent variables. Plotting of the dependent (adoption status) variable with other variables in the data set reveals linear relationships of the variables. Interpretation and manipulation of the computer output were aided greatly by Taylor's (88) and Zelinsky's (95) articles on factor analysis.

CHAPTER III

SUBSTANTIVE REPORT

A. Introduction

The report section of the thesis constitutes the presentation, analysis, synthesis, and final testing procedures for the data. The data presentation section will introduce 20 lottery variables by dividing them into four main categories. The data analysis section will describe the methodology used for extracting information from the primary variables by means of data transformation and weighted indices. The data synthesis section then condenses the data to portray definable patterns to the diffusion process. Data synthesis methods include explanation of the Pearson Product Moment Correlation Coefficients and Principal Components Factor Analysis. Finally, the testing procedures used for accepting or rejecting the hypotheses will be discussed by examining the correlational strength of the data through statistical techniques done by the computer.

B. Data Presentation

Twenty variables were used to test the hypotheses concerning the spatial diffusion of lotteries. Lottery variables were divided into geographical, political, economic, and sports/gambling categories. Most of the variables used were developed through a series of weighted indices and other data transformation techniques. Some variables are represented only by lottery states and others only by non-lottery states. For these variables, it was necessary to incorporate a set of constant variables to represent "no data" so the computer could interpret the data sets. The use of zeroes would lead to false correlations. The weighted indices were developed so descriptive data could be represented by numerical data. The computer's interpretation of numerical weighted indices is necessary for statistical correlations.

B.1 Geographical Variables

Four weighted indices are used as the geographic variables of the thesis. They are the Boundary Influence Index, Boundary Population Index, Distance Influence Index CC (distance from center of a state to nearest lottery state center) and Distance Influence Index UC (distance from major urban center to nearest lottery state center). Use of a United States atlas (32) and the County and City Data Book (20) was required to measure distances between states and to tabulate population along state borders. Looking at the four geographical variables assumed to be related to lottery diffusion; it is obvious there are a few main concepts. In the diffusion of lotteries, boundary length of states, population near state borders, and distances between states/major cities are all critical factors to the rate and pattern of movement of lottery diffusion. These geographic variables are important to the spatial diffusion of lotteries because they will help provide information on lottery diffusion patterns and their rate of movement.

B.1.1 Boundary Influence Index. The Boundary Influence Index (BII) (Figure 4) was developed with a weighted index procedure. The distance in miles between two state borders was measured and given a numerical rating of 1 to 10 based on the number of miles along the state borders. A distance of 0 to 50 miles is one, 51 to 100 is two, etc. That number was then multiplied by zero, one,

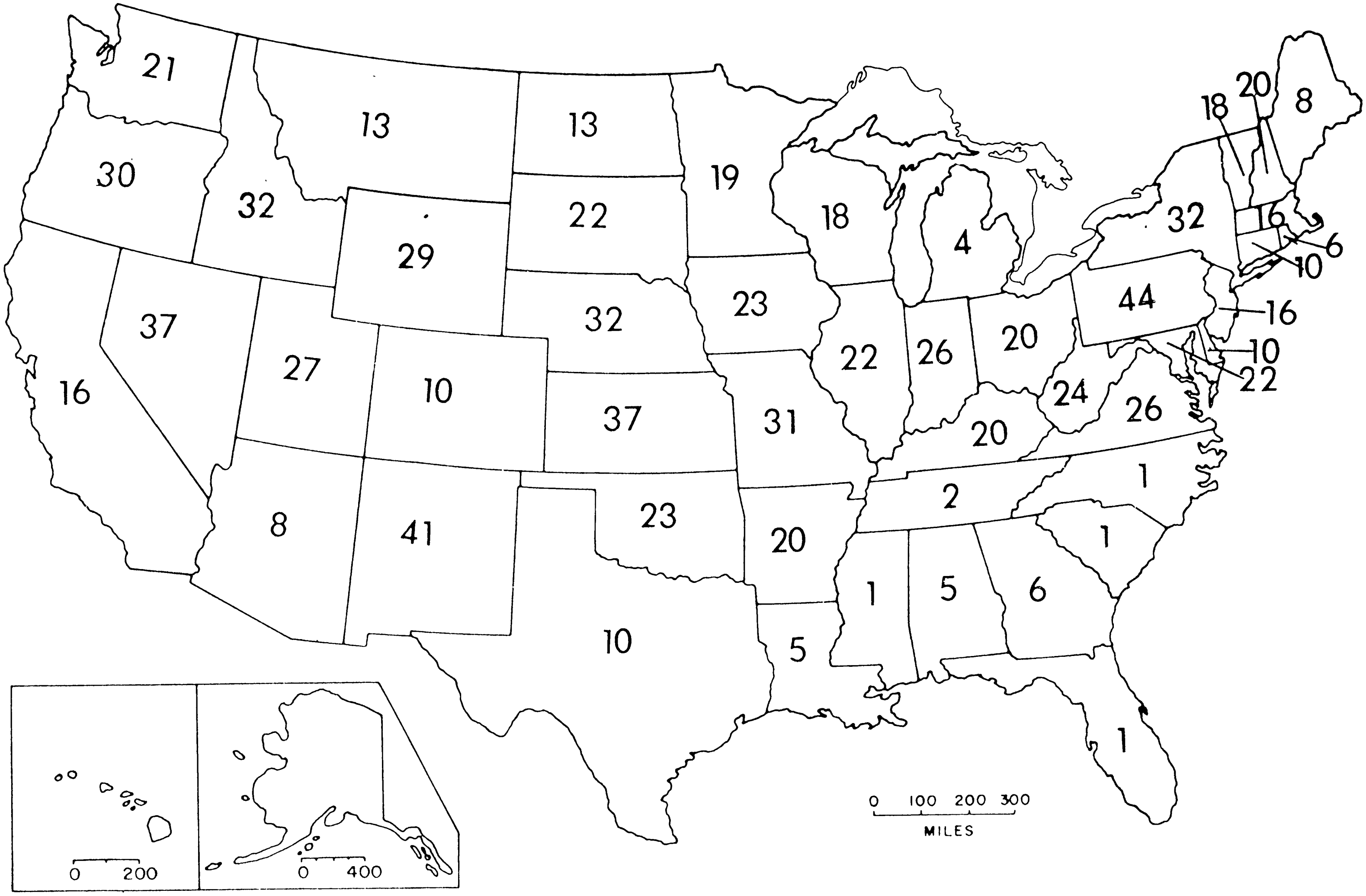


Figure 4. Boundary Influence Index

or two representing non-lottery, potential lottery, and lottery states, respectively. This was done for each state with all other states which border it to determine a cumulative number of index representing the degree of influence each state has with respect to the states bordering it. The significance of this index is best reflected when looking at Figure 4.

Figure 4 shows the boundary influence by using numerical indices for each state. The higher values represent the states that are influenced most by their neighbors, because of the number of states bordering them and a greater total contiguous distance along the borders. It is a combination of the number of states bordering any one state and the total distances of those borders which can be considered the key element of the figure. New Mexico, for example, has the greatest distance in miles along its border and is represented as a 41 on the BII. The total distance along New Mexico's borders (1270 miles) is given a weighted value of 26 to represent the actual number of miles. The states of Texas, Oklahoma, Colorado, and Arizona border New Mexico. The border distance for each of these states with New Mexico is given a weighted index which is taken times the adoption status of each of the four states to give the final BII value of 41. The boundary influence is highest in states which have a combination of large cumulative border distances with states which have lotteries (adoption status three). In Pennsylvania's case, all of the bordering states have lotteries. The six states bordering Pennsylvania account for a total border distance of 980 miles, which is converted to 22 using the weighted indices procedure. The total distance (22) multiplied by two gives Pennsylvania a BII of 44, the highest value on the map.

The combination of Pennsylvania being a lottery state which has six states bordering it (all lottery states), along with the total distance of those borders, gives it the highest BII on the map. This index shows that the state of

Pennsylvania is influenced by its neighboring states to a greater degree than any other state.

Although Pennsylvania has the highest BII, it is likely non-lottery states will be influenced more by lottery revenue potential, and the diffusion across state borders. States like Kansas, Indiana, and Kentucky have relatively high BII's, despite the fact they are non-lottery states because they have several lottery states on their borders which influence them. The boundary influence on these states will be more important to the actual diffusion than states which are already lottery states.

A definite pattern can be seen on the map in Figure 4 by examining all states. The lower BII values can be found on all exterior states which have a smaller number of states bordering them and less total border distances. Coastal lottery states such as California, Oregon, and Washington in the West; and Maine, Massachusetts, Rhode Island, Delaware, Connecticut, and New Jersey in the East have lower BII's than any other interior lottery states. Also of notice is the very low BII for Southern coastal states, all of which are non-lottery states except for Florida. A state's interior location gives it a greater number of bordering states and a greater boundary distance in which interstate lottery activities can be influenced by contiguous states. Even some of the interior non-lottery states have higher BII's than coastal lottery states because of the higher potential they have to become lottery states.

When summarizing the importance of the BII, it would likely be most important to look at not only the total number of states bordering a lottery or non-lottery state but also the number of non-lottery states that lottery states have on their borders. This would indicate the potential influence lottery states may have on the diffusion into new states. The number of lottery states bordering a non-adopted state is a key to the volume of border flow among states. The border influence states have will be carefully analyzed later in the thesis through the Q-mode factor analysis.

B.1.2 Boundary Population Index. The Boundary Population Index (BPI) is a measure of the border population for each state. This index is created from summation of the border population of all adjacent states. Using Missouri as an example, the total border population of all counties adjacent to the state of Missouri is taken to arrive at the BPI for Missouri. Eight states share contiguous borders with Missouri, which results in a higher than average BPI for Missouri. The procedure was done for all of the 48 contiguous United States. The 48 border populations then are based on the population of the border counties of adjacent states. This total border population figure was given a logarithmic translation and multiplied by the adoption status (1, 2, or 3) to give the BPI (Figure 5). Missouri, used as an example again, has a total border population of 1,956,000. This is logarithmically transformed to 6.29 and multiplied times 3 (lottery state) to give a BPI of 18.9.

The BPI ranges from a low of 5.7 in Utah (sparse population, non-lottery state) to a high of 21.3 in Connecticut (dense population, lottery state). The population is over 12 million in the bordering tier of counties of the three states adjacent to Connecticut. This indicates that a significant population market is in place in the Northeastern United States for lottery revenue generation (554,000) which, when combined with the fact that it is not a lottery state, gives it a minimal BPI. Although North Dakota has the lowest total border population (239,000), it has been cited as a potential lottery adopter (5.38 * 2) giving a BPI of 10.8 (Figure 5). This has since been proven accurate as North Dakota did vote on a lottery ballot in the November, 1986, elections. Although the lottery issue

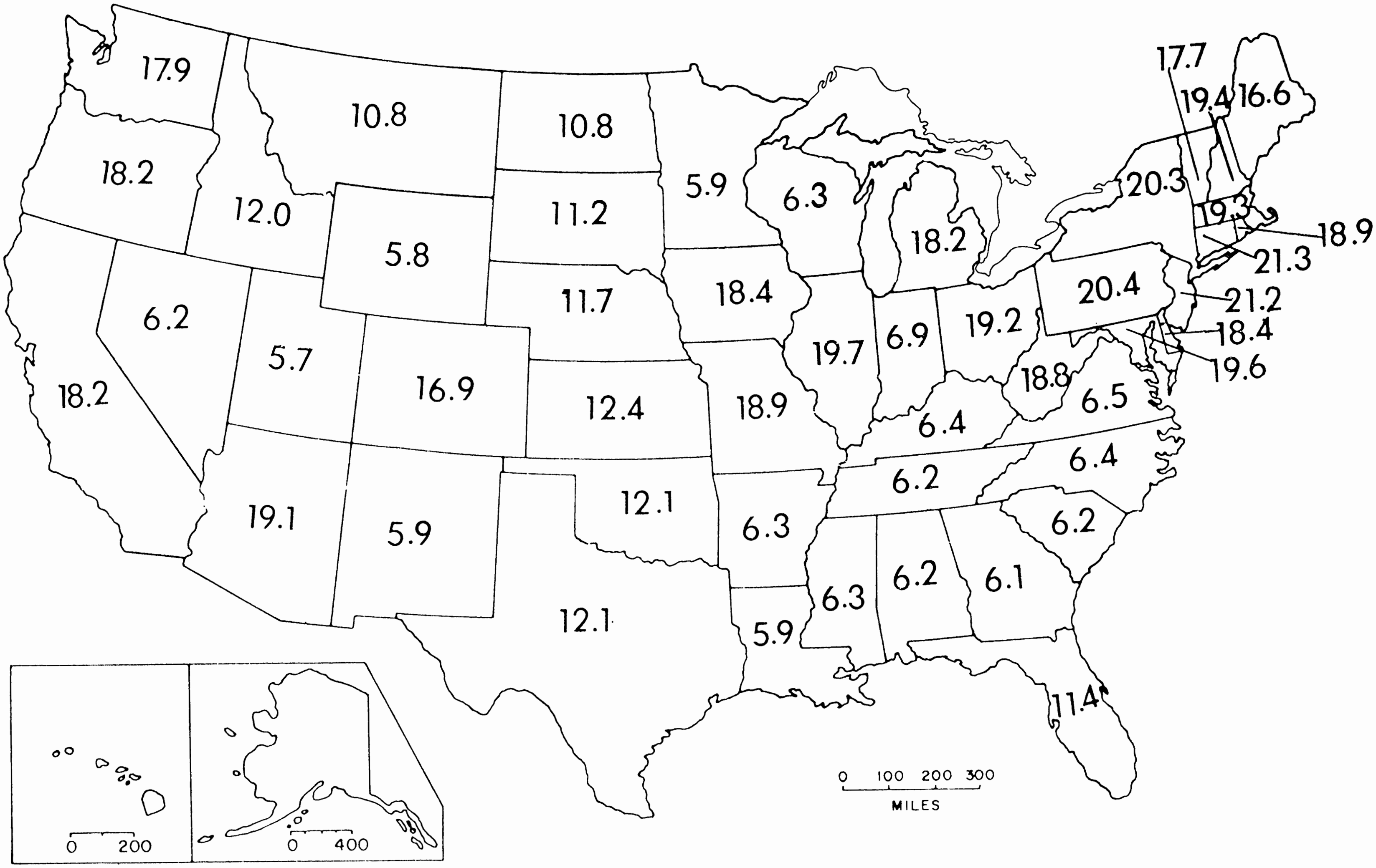


Figure 5. Boundary Population Index

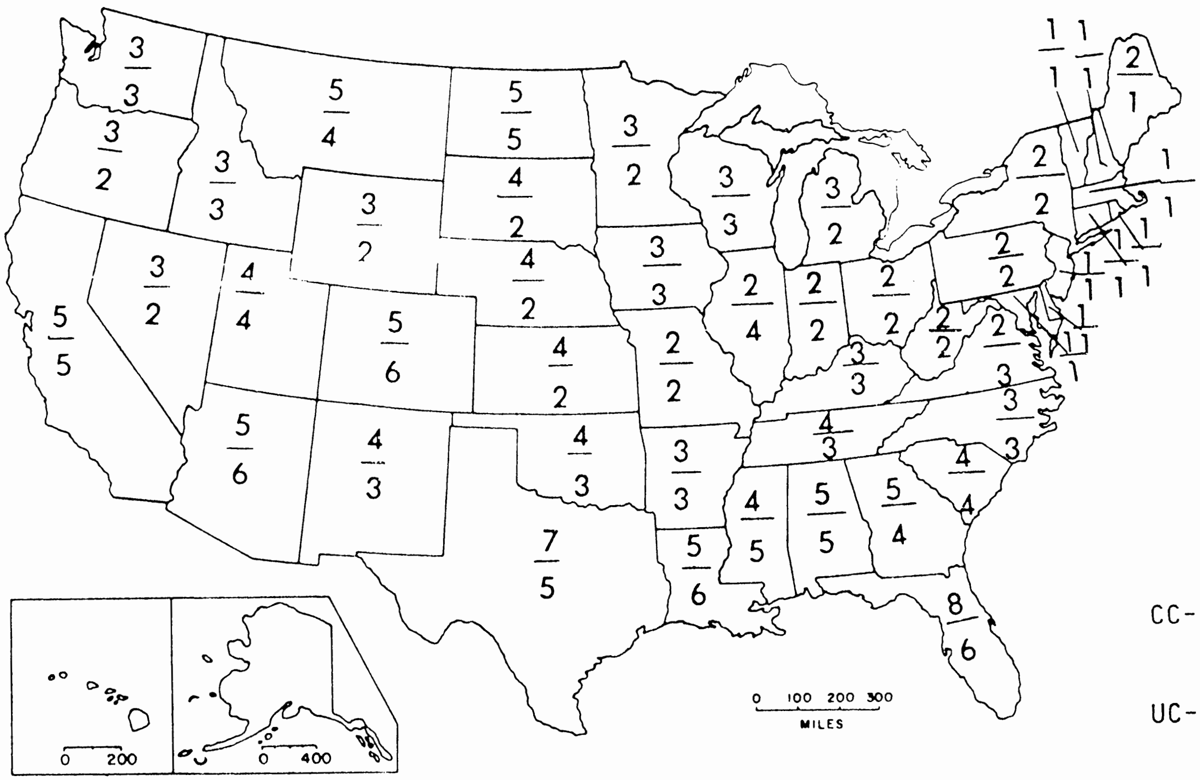
failed in North Dakota, it may help to influence surrounding states to consider the lottery more seriously.

When predicting the future diffusion of state lotteries, the BPI can be a crucial indicator of the lottery revenue potential which can be generated based on area population. This should be most significant in major population centers of non-lottery states which have lottery states bordering them, as earlier stated in a hypothesis of the study. The state of Texas has the highest population market for potential lottery revenues but has a low BPI because it is a non-lottery state which has no lottery states on its borders. Lottery states such as Maryland, Missouri, Michigan, Iowa, Illinois, California, Arizona, Ohio, and West Virginia all have high BPI's because they all have non-lottery states which border them and because there are significant populations along the non-lottery states' borders. Northeastern lottery states also have higher BPI's but are not as important to the lottery diffusion process as some Western and Midwestern states because they have no non-lottery states bordering them. States like Kentucky, Virginia, Indiana, and Minnesota have lower BPI's (in the five to seven range) but are more significant than the deep south because there are lottery states bordering them. Most of the southern states remain isolated from any lottery states bordering them and are thus expected to have very low BPI's. The only exception to this is Florida, which recently adopted the lottery in the fall of 1986. Florida could cause a readjustment of the BPI for states bordering it once the lottery actually begins there.

Summarizing the Boundary Population Index, it was found that counties with greater populations account for higher BPI values for each state. The index should help confirm the expected strong influence that the geographical location of population may have in determining whether a state adopts the lottery. To some degree this has already been proven to be a viable influence with the recent adoption of lotteries in states close to the major population centers of lottery states. Missouri was responsible for a large part of the Kansas decision to adopt the lottery during November, 1986. Out-of-state lottery ticket sales were high in Missouri due to Kansans who flooded across the borders. The significant population markets near the two state borders combined with the potential adoption status of Kansas gave Missouri a high BPI for its influence on the bordering states.

B.1.3 Distance Influence Index CC. It was necessary to divide the Distance Influence Index (DIICC) according to whether a state is a lottery or non-lottery state. This was done because the distances in miles used to develop this index were different depending on the state's adoption status. For all states, the index (Figure 6) was calculated as the distance from state centers to the center of its nearest lottery state. For most lottery states, there are other bordering states which have lotteries, given the contiguous nature of the diffusion pattern over time. The adjacent proximity of contiguous lottery states will generally indicate there is less distance between two lottery states as compared to distances between non-lottery and lottery states. The only apparent exception to this contiguous pattern is Colorado; but not for long as Kansas has adopted the lottery most recently. Florida represents the only isolated lottery state with its recent adoption of the lottery in November, 1986.

The distances from the center of non-lottery states to the centers of the nearest neighboring lottery states are generally greater than those between the centers of two lottery states. This is because many lottery states have contiguous locations adjacent to each other while non-lottery states in many cases are isolated from lottery states.



CC--Center of state to center of nearest lottery state

UC--Major city of state to center of lottery state

Figure 6. Distance Influence Index

The best example comes from Figure 6 where it is evident that the Southeast is isolated from lottery states by distance. The higher distance index values are mainly concentrated in the Southeast with weighted values from 4 to 8. The larger numbers indicate that Southeastern states are separated from lottery state centers by greater distances than the rest of the nation. Texas, for example, has a DIICC of 7 (high) because it is 600 to 700 miles from the state's center to the center of the nearest lottery state. Texas is effectively isolated by the greater distance to the nearest lottery state and has no lottery states on its borders. The states of Indiana and Virginia, for example, have much lower DIICC's (2), which means that the distances from their centers to the nearest lottery state centers is far less (101 to 200 miles) than the Texas distance. The greater the distances are separating non-lottery and lottery states, the more likely it is that the diffusion will not occur.

Figure 1 (Geographic Pattern of Lottery Adoption) seems to confirm the importance of distance on diffusion. The Northeast has been saturated by lotteries, probably because the distances between two states in that area are much less than other parts of the country. The lower distance indices come from lottery states adjacent to them. It is expected that any future diffusion will first spread into states which border lottery states because of the lesser distance separating the two states' centers. Distance has always been an important factor in diffusion studies, and this case appears to be no exception.

B.1.4 Distance Influence Index UC. The Distance Influence Index (DIIUC) takes into account the importance of the location of population (Figure 6). The BPI (Figure 4) confirmed the importance of large populations to the revenue generating capacities of state lotteries. The DIIUC is a measure of the distances from major urban centers of states to centers of the nearest lottery state.

Again, this index is of most importance to non-lottery states due to the direct influence that distance has on the future diffusion possibilities into new states. The DIIUC will normally have different values than the DIICC because of the variability in urban locations. Cities having predominantly interior locations will be located farther from the center of the nearest bordering lottery state than cities with peripheral locations near state borders.

Taking the non-lottery states of Kansas and Nebraska, for example, distances from centers of those two states to centers of the closest lottery states (Missouri, Iowa) rate a 4 (301 to 400 miles) for the DIICC. For the DIIUC, the distance from two major urban centers of Kansas and Nebraska (Kansas City, Kansas; Omaha, Nebraska) to the centers of Missouri and Iowa is rated only a 2 (101 to 200 miles), a significant difference in distance from the DIICC. The index indicates there are major population centers on the borders of Kansas and Nebraska which are very close to the centers of neighboring lottery states, and this is confirmed by looking at a map of the area. Given the closer location of the two cities to lottery states, it would be expected that lottery sales for the counties of Missouri and Iowa bordering Kansas and Nebraska would be great. In fact, data from Iowa lottery officials (36) confirm Pottawattamie County, Iowa (adjacent to Nebraska), as the leading county for state lottery sales. This is undoubtedly due to the influx of Nebraskans into the county from the nearby city of Omaha. Other non-lottery states have cities such as Tulsa, Memphis, Minneapolis, and Indianapolis which are all within 200 miles of lottery state borders despite the fact that it is farther from each of their state centers to lottery state centers.

A distinct pattern can be seen by observing the Distance Influence Indices (Figure 6). The highest values represent the greatest distances separating states from the nearest lottery states. In the Southeast, the isolation from lottery states is confirmed by all of the higher distance values for each of the distance indices. Differences in the two distance figures occur because some cities have interior locations within their states while other cities are located closer to the borders.

The large DIIUC values from Figure 6 indicate more distance between major urban areas and lottery state centers. The smaller numbers indicate less distance between cities and lottery state centers. The distance from lottery state centers is crucial to the spatial diffusion that takes place. The greater distances (denoted by the higher numbers) from cities to the nearest lottery state center is generally found in non-lottery states because of a lack of bordering lottery states.

The lowest distance values for both the DIICC and DIIUC come from either lottery or non-lottery states which are close to or border other lottery states. These lower values indicate less distance in which the diffusion has or may have to spread. Less distance between lottery and non-lottery states is more likely to result in spatial diffusion because the strength of the innovation would not be weakened by greater distances. The lottery innovation would have to move greater distances when spreading from lottery states to the Southeast. The rate of the diffusion would at least be slowed by the greater distances between the adopted and non-adopted states. The Northeastern United States has lower distance values because of the smaller sizes of each state which are separated by less distance from each other. The highest values come from the Southeast which is isolated by greater distances from lottery states. The only exception to this rule is in some of the larger Western states like California, Colorado and Arizona, which are separated by sparsely populated great distances from each other.

B.2 Political Variables

Because lotteries are a state government form of activity, there are several key political variables which could affect the diffusion process. The four political variables selected to test the hypotheses are adoption status of lotteries, the adoption method, the legalization requirement, and an innovativeness index. The political ideology of states could be a major factor in the rate of diffusion of lotteries into some states. These variables are used to show the degree to which political influences affect the diffusion process.

B.2.1 Adoption Status. The adoption status is used as the dependent variable of the study, and indicates whether a state has adopted the lottery or not. Like some of the other variables, it has been given a numerical weighted index for computer compatibility. A 3 was used for states that have adopted lotteries, a 2 was used for potential adopters, and a 1 was used for non-adopted states. The criterion for distinguishing between states given a 2 and those given a 1 is based on the frequency of legislative action on lottery bills introduced to state legislatures. After this research began, four new lottery states have emerged (Florida, Montana, South Dakota, and Kansas), all of which were given a 2 because of their potential adoption status.

The adoption status is particularly important when combined with geographical factors such as boundary length, population, and distance. The adoption status was found to play a major role in the geographical and political influences that states have on each other. Lottery states have the greatest amount of influence on diffusion, but potential lottery states also may influence other non-adopted states to consider a lottery. A good example of this was displayed by Oklahoma's "Lottery is OK Committee" administered by Carolyn Thrift (70). Although the Oklahoma lottery initiative was unsuccessful in 1986, it did manage to influence the neighboring state of Texas to organize a belated attempt at getting the lottery issue on the ballot. Potential adopters can therefore cause other states to become potential adopters and, if nothing else, promote more attempts to introduce lottery legislation.

B.2.2 Adoption Method. The adoption method pertains to lottery states only. To avoid difficulties of data transformation by the computer, l's were incorporated into the data matrix for the non-lottery states. The adoption method refers to the type of political action used to pass the lottery for each state. The weighted index ranges on a scale of 1 to 5 according to the adoption method used: 1 means the non-lottery states; 2 means the state used a legislative or constitutional voter initiative to pass the lottery (e.g., California); 3 means a referendum was used; 4 means statutory legislation was necessary; and 5 means a combination of the initiative, referendum, and statutory legislation were required.

Most states have passed the lottery through House and/or Senate statutory legislation. This form of legalization has been used by most liberal Northeastern states which have no major opposition to lotteries. Although statutory legislation has been used by most lottery states, there has been a trend toward the voter initiative with some of the more recent state adoptions. Officials in politically conservative Western and Midwestern states have shown reluctance to support lotteries. This has prompted more initiative drives by the public to get lotteries on ballots. Potential new lottery states are watching closely at how other states are adopting lotteries and have copied other states' political manuevers to legalize lotteries. The current popular initiative drive has been copied by Oklahoma (unsuccessfully) and Florida (successfully) from past initiatives such as those in Oregon and California.

B.2.3 Legalization Requirement. This index represents non-lottery states only and is concerned with the political steps necessary to legalize a state lottery (Table III). It is the equivalent of the adoption method for the non-lottery states. The legalization requirement uses a weighted index from 2 to 6, based on the degree of difficulty, to represent the political techniques required to pass the lottery. Statutory legislation is usually employed by states to adopt lotteries despite the fact that it may not be the easiest legalization requirement. Although the initiative is a lengthier, time consuming procedure, it is given a 2 as the least difficult legalization requirement.

The initiative is usually attempted by states after legislative actions have failed. Therefore, it is a more difficult procedure if measured by the time it takes to get it passed. The key to an initiative is the ease with which it is passed once left to the voters. Left to the people by an initiative vote, the lottery has never failed to pass. States which have managed to develop strong public organizational skills on issues through initiatives have managed to gain shortcuts to otherwise lengthy legal ramifications involved in lottery issues.

Unfortunately, the government makes it difficult to develop a successful initiative drive in many states. Oklahoma was a state which had public support of over 70% but was thwarted by bureaucratic red tape and judicial manuevering. Although the public in most non-lottery states favor lotteries, governments sometimes believe that people are not knowledgeable enough to make their own decisions. In Oklahoma, the people's power to vote on a lottery through the initiative was taken away despite major support. A few special interest groups had enough influence to turn government in Oklahoma away from letting the citizens decide the issue. The initiative would be the easiest legalization requirement only if it is eventually voted on by the people. Public support for the lottery is stronger than statutory approval would be, making the initiative a

TABLE III

LOTTERY LEGALIZATION REQUIREMENTS (7)

State	Const. Amend. Req'd.	Leg. Vote Req'd. on Const. Res.	Consid. by 2 Sessions Required	Constitut. Initiative	Legis. Initiative
Alabama	Yes	3/5	No	No	N/A
Alaska	No	2/3	No	N/A	Yes
Arkansas	Yes	Majority	No	No	N/A
California	Yes	2/3	No	Yes	N/A
Florida	Yes	3/5	No	Yes	N/A
Georgia	Yes	2/3	No	No	N/A
Hawaii	No	---[a]	---[a]	N/A	No
Idaho	Yes	2/3	No	No	N/A
Indiana	Yes	Majority	Yes	No	N/A
Iowa	No	Majority	Yes	N/A	No
Kansas	Yes	2/3	No	No	N/A
Kentucky	Yes	3/5	No	No	N/A
Louisiana	Yes	2/3	No	No	N/A
Minnesota	Yes	Majority	No	No	N/A
Mississippi	Yes	2/3[b]	No	No	N/A
Missouri	Yes	Majority	No	Yes	N/A
Montana	No	2/3	No	N/A	Yes
Nebraska	No	3/5	No	N/A	Yes
Nevada	Yes	Majority	Yes	Yes	N/A
New Mexico	No	Majority	No	N/A	No
N. Carolina	No	3/5	No	N/A	No
N. Dakota	No	Majority	No	N/A	Yes
Oklahoma	No	Majority	No	N/A	Yes
Oregon	Yes	---[c]	No	Yes	N/A
S. Carolina	Yes	2/3[d]	Yes[d]	No	N/A
S. Dakota	No	Majority	No	N/A	Yes
Tennessee	Yes	---[e]	Yes[e]	No	N/A
Texas	Yes	2/3	No	No	N/A
Utah	Yes	2/3	No	No	N/A
Virginia	No	Majority	Yes	N/A	No
W. Virginia	Yes	2/3	No	No	N/A
Wisconsin	Yes	Majority	Yes	No	N/A
Wyoming	No	2/3	No	N/A	Yes

[a] 2/3 vote in each house at one session or majority vote in each house in two sessions.

[b] The 2/3 must include not less than a majority elected to each house.

[c] Majority to amend; 2/3 to revise.

[d] 2/3 first passage; majority after public ratification.

[e] Majority first passage; 2/3 second passage.

less difficult legalization requirement for those states having the initiative option.

The legalization requirement indices are numerically ordered: 3 indicates no Constitutional amendment; 4 indicates approval by one session only (House or Senate); 5 indicates statutory approval by two sessions (House and Senate); and 6 indicates a Constitutional amendment is required. Based on a rank ordered degree of difficulty, the Constitutional amendment is the most difficult legalization requirement. It requires a great deal of time to change state laws just to consider the lottery issue; this does not include the time it would take to introduce lottery legislation. States like Indiana, Wisconsin, Tennessee, and South Carolina would have the hardest time legalizing a lottery based on the need for a Constitutional amendment (rated 6 as the most difficult legalization requirement).

A test of the accuracy of the legalization index can be shown by looking at the political requirements of the four most recently adopted lottery states of Montana, South Dakota, Kansas, and Florida, and the failure of recent lottery ballots in Oklahoma, Texas, North Dakota, and Idaho. Montana, Florida, and South Dakota required no Constitutional amendment to introduce and pass lottery legislation, and had the voter initiative option present (rated as 2). Kansas was represented by 4 which required approval by either the House or Senate. This still gives three of the four newly adopted lottery states the least difficult legalization requirement. When looking at failed lottery bills in Oklahoma, Texas, North Dakota, and Idaho, two of the four states (Texas, Idaho) had the more difficult legalization requirement of 4, while Oklahoma and North Dakota had initiative options. Although inconclusive, this index does provide some validity for the degree of difficulty a state faces when legalizing a lottery. States with initiative options represent states with a back-up plan in case the government rejects introducing the lottery issue. Even though the initiative is a lengthy last resort option, it is almost always passed when people are allowed to vote on it; however, statutory action fails to gain political support sometimes because lotteries are still a controversial form of raising government funds. The initiative option gives states a broader range of alternatives to fall back on if other measures fail.

B.2.4 Innovativeness Index. This index reflects some of the cultural, religious, and political values of each state. States are rated on their innovativeness from 1 to 48 for the contiguous United States (Table IV, Figure 7). The innovativeness ranking of a state fits very well with its classification as a lottery or non-lottery state, as the top nine ranked states on the innovativeness index are all lottery states while the bottom eight are all non-lottery states. The ranking supports the assumption that lotteries tend to develop first in the more liberal and innovative states (93). There are some exceptions in states ranked 10 through 40, but these are the few exceptions to the rule. Six lottery states are in the bottom 24 innovators while 8 non-lottery states are in the top 24. This is not of too much concern, however, because state lotteries are no longer a new concept. The traditional laggards are beginning to consider the lottery as a proven and effective agency for raising funds.

For the United States as a whole (Figure 1), the states in the core of the non-lottery region (Southeast) are all rated in the bottom half of the innovativeness index. This can be attributed to conservative state governments and strong religious beliefs, both of which tend to reject changes and innovations. The pattern is not perfect, as highly innovative states such as Minnesota, Indiana, and Wisconsin have not adopted lotteries while less innovative states such as South Dakota and Missouri have adopted lotteries. In general, the innovativeness index

TABLE IV

STATE INNOVATIVENESS INDEX RANKINGS

State	Innovativeness	State	Innovativeness
Alabama	30	Nebraska	26
Arizona	36	Nevada	47
Arkansas	32	New Hamp.	16
California	3	New Jersey	4
Colorado	9	New Mexico	41
Connecticut	6	New York	7
Delaware	40	N. Carolina	24
Florida	31	N. Dakota	23
Georgia	37	Ohio	11
Idaho	32	Oklahoma	42
Illinois	13	Oregon	8
Indiana	18	Penn.	7
Iowa	29	Rhode Island	15
Kansas	25	S. Carolina	45
Kentucky	27	S. Dakota	43
Louisiana	19	Tennessee	34
Maine	20	Texas	44
Maryland	16	Utah	22
Mass.	2	Vermont	28
Michigan	5	Virginia	21
Minnesota	12	Washington	14
Miss.	48	W. Virginia	35
Missouri	39	Wisconsin	10
Montana	38	Wyoming	46

Figure 7. State Innovativeness Index Rankings

is a good indicator of lottery (high ranking) and non-lottery (low ranking) states. Geographically, the Northeast and West are the most innovative regions while the South and parts of the Midwest are the least innovative.

B.3 Economic Variables

The economic variables are important because they represent the potential earnings the states can expect if they adopt the lottery. The five economic variables pertain to non-lottery states only, and it is again necessary to give the lottery states an index of I. The time and cost of lottery start-ups are usually minimal and profit is seen once the states have repaid the start-up costs (Table V). Decisions to adopt lotteries are often based on the revenue potential a state can expect from a lottery (Table II, Figure 8). Five economic variables are used as key indicators of potential lottery diffusion for the non-adopted states. The five variables used in the data matrix are: (I) General Revenue Index Ranking, (2) General Revenue Index Percentage, (3) Gramm-Rudmann Index Revenue Cutbacks, (4) Cost Per Capita, and (5) Savings Per Capita. Also, the total lottery revenue potential for non-lottery states is examined. This is based on state populations times the average per capita expenditures (Table II, Figure 8).

Gross and net revenue potential is considered the key economic variable for lottery adoption. States want to know how much money they can expect to make if they have a lottery. They look at established lottery states for clues on how profitable a lottery can be. The number of people in a state is extremely important to how much money a state can earn in a lottery. The Boundary Population Index should be related to some of the economic variables for the non-lottery states.

B.3.I General Revenue Index Ranking/Percentage. This index is divided

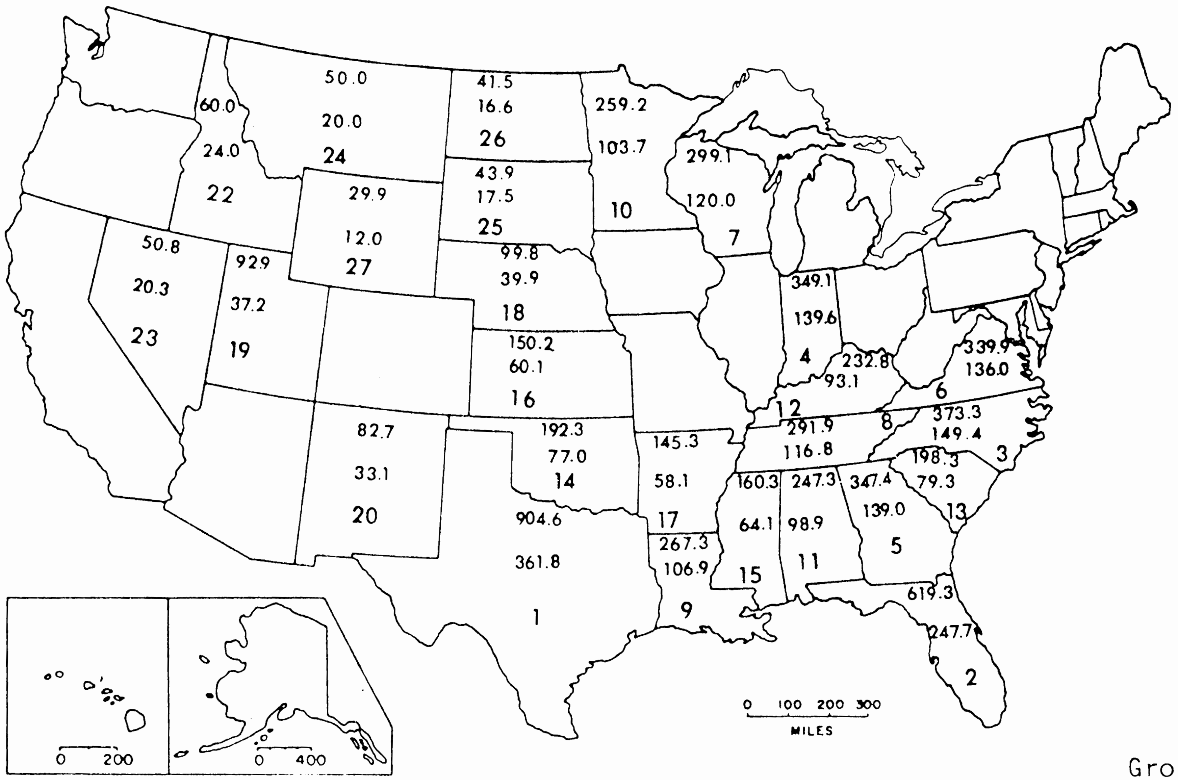
TABLE V

LOTTERY STARTUPS: TIME AND COST

State	Startup Time	Seed Money	State Repaid
Arizona	7 months	$1,400,000	12 months
Colorado	8 months	$2,000,000	2 months
Connecticut	7 months	$2,150,000	10 months
Delaware	7 months	$ 250,000	18 months
D.C.	17 months	$ 628,000	1 month
Illinois	9 months	$2,000,000	1 month
Maine	7 months	$ 400,000	12 months
Maryland	6 months	$2,300,000	1.5 months
Massachusetts	6 months	$2,000,000	3 months
Michigan	3 months	$4,400,000	6 months
New Hampshire	11 months[a]	$ 250,000	2 months
New Jersey	12 months	$1,500,000	12 months
New York	5 months	Not avail.	Not avail.
Ohio	14 months	$2,000,000	4 months
Pennsylvania	6 months	$1,000,000	10 months
Rhode Island	1.7 months	$ 500,000	2 months
Vermont	10 months	$ 250,000	12 months
Washington	4 months	$1,500,000	5 months
Average	7.8 months	$1,400,000	6.7 months

[a]The nation's first lottery was delayed waiting for a public vote after legislative approval.

Source: Interviews with state lottery officials.



Gross--Top figure

Net--Middle figure

Ranking--Bottom figure

$63.58/Per Capita * State Pop. = Gross Revenue

40% = Net Revenue

($ millions)

Figure 8. Total Lottery Revenue Potential--Non-Lottery Status

into two parts, a ranking and percentage for each non-lottery state. The General Revenue Index Ranking represents the potential lottery earnings as a percentage of the FY 1985 general revenue earnings for each non-lottery state. The ranking used is based on the percentage of funding a lottery could provide for the entire general revenue fund of a state. The higher ranked states would represent states in which a lottery would provide a greater percentage of the state's total revenue. It does not mean it would make more money on a lottery than other states; only that a lottery would account for a higher percentage of the total state revenue. Top ranked states have relatively low spending-low revenue levels and high proportions of expenditures in special funds.

The numerator for the General Revenue Index is $29 per capita times the state population (82). States with less economic diversity are usually higher rated in the revenue indices. Montana, South Dakota, and Idaho are the top ranked states according to the percentage of funding a lottery could provide to their general revenue funds. It is interesting to note that all three states had lottery legislation in the fall of 1986, with Montana and South Dakota successfully establishing lotteries and Idaho narrowly missing legalization because of political and religious opposition in the state.

A state lottery that accounts for a higher percentage of the general revenue fund can be economically more important than an opposing state which generates more revenue but accounts for less of the total percentage of the general revenue budget. Texas is the top rated state for gross lottery revenue potential based on the largest population of any non-lottery state. Although Texas could gross $1 billion and net $418.3 million from a lottery (Table 11), the state ranks only fourteenth in the General Revenue Index at 4.4% of the total revenue provided by a lottery. According to this index (82), the total revenue capacity of a lottery is not the only, and perhaps not the most important, factor for the economic potential a state can expect from a lottery.

The total lottery revenue potential (Table II, Figure 8) projects the annual gross and net revenue a state can expect from a lottery. The revenue potential is calculated using $72.02 per capita (average yearly income spent on lotteries) times the state population. This gives the gross revenue potential a state can expect from a lottery and the net revenue would be 40% of the gross on the average. The 40% which is returned to the state is the average amount left for programs after the remaining revenues are used for prizes and operating expenses (Figure 2). Each state is ranked by the amount of gross and net revenue which could be generated from the lottery. Texas, Florida, and North Carolina could be expected to have the highest earnings from a lottery based on their populations. The total revenue potential is somewhat overestimated for each state because it accounts for only minimal percentages of the entire state budget. Still, it is a very important economic factor for states because of the effect it may have on future lottery diffusion.

B.3.2 Gramm-Rudmann Index--Revenue Cutbacks. The Gramm-Rudmann Index is divided into three categories: revenue cutbacks, cost per capita, and savings per capita. The index is based on the Gramm-Rudmann deficit reduction law which is designed to help balance the federal budget through major cutbacks in funding of state programs. States are facing $12.4 billion in revenue cutbacks for FY 1987 and are forced to pursue alternate sources of income. Lotteries are sought after as possible solutions to the federal cutbacks. This index corresponds with the revenue cutbacks for each state (millions of dollars). The amount of revenue each state will be losing corresponds with state populations and the total revenue potential a lottery could generate. Texas faces the most cuts ($661 million) based on the highest population of all non-lottery states.

B.3.3 Gramm-Rudmann Index--Cost Per Capita. The loss of federal funding is reflected by the cost per capita to each state which has not adopted a lottery. States with sparse populations will be affected most by the loss of money per capita because of the greater percentage of the total general revenue fund the lottery would account for in those states. Wyoming faces a $79.0 loss per capita, North Dakota faces $76.9, and Idaho faces $59.5. Even states like Texas and North Carolina face per capita losses of over $40 which can cumulatively deflate the economy. The most important factor in the Gramm-Rudmann index would be the savings per capita if states had a lottery. Although not enough to offset the cost per capita of the cutbacks in most states, the savings from a lottery would help boost states' sagging budgets slightly.

B.3.4 Gramm-Rudmann Index--Savings Per Capita. This index was calculated by using the savings per capita states with lotteries could expect from federal budget reductions. Although the savings per capita for most states would not be as much as the cost per capita of the revenue cuts, it still could cut revenue losses in half. South Dakota, Montana, Minnesota, and Indiana would actually have a higher savings per capita from a lottery than the cost per capita of the Gramm-Rudmann cuts. South Dakota, by adopting the lottery, will save $80.5 per capita when it may have lost $77.2; Montana will save $23.4 versus a $19.0 cutback; Minnesota could save $74.2 from a cutback of $53.9; and Indiana could save $66.7 from a cutback of $44.0. This new federal law increases the economic importance of lotteries as states are forced to become more self-sufficient and seek alternative sources of revenue.

B.4 Sports/Gambling Variables

It is assumed that other forms of gambling will likely be important factors in the analysis of lottery diffusion. There are seven gambling variables which were used in the data matrix; they are sports betting, off-track betting, horse racing, dog racing, jai alai, casinos, and bingo. These variables include all other forms of legalized gambling in the United States (26).

For the gaming index a value of 2 represents states that do not have the gambling type while 3 indicates states that do have it. The more types of gambling a state has, the better the chance that the state has the lottery. Contrary to some sources, there are reports that show lotteries are not detrimental to other types of gambling. This is mainly because lotteries are a passive type of gambling based more on luck than skill. Other forms of gambling usually generate more excitement and require certain degrees of skill. Gamblers that participate in horse racing, dog racing, and casinos are known to be more compulsive than those who buy lottery tickets, and lottery players are usually entirely different crowds than other gamblers.

Every state in America has at least one form of legalized gambling, except Indiana, Utah, and Mississippi. These three states have somehow managed to prevent even bingo, because of strong religious and moralistic opposition and more difficult lottery legalization requirements. Bingo is the most widespread form of gambling, and is found in 45 states including many Southeastern Baptist "bible belt" states. In most areas, bingo is not really considered a legitimate form of gambling because it is often played in churches with the proceeds going to charitable organizations. In other areas, however, bingo is big-time business (e.g., Indian bingo) because of the larger dollar value of the purses. Bingo cannot normally be considered the stepping stone to lotteries. Recent history shows that states with horse or dog racing have usually followed up with lotteries. There are very few lottery states that do not have some form of parimutuel racing.

The gaming index should give an indication of how the number of gambling types might affect lottery diffusion. Other types of gambling for the most part should not adversely affect the chances for any one state to adopt a lottery. Positive correlations are expected between each of the gambling types, probably because they are complementary to each other. Except for casino gambling, lotteries are not expected to be hindered much. Lottery games are similar to some forms of casino gambling in that they are based more on luck than skill (e.g., instant lottery tickets and slot machines). This could possibly be seen by casino owners as a threat to parts of their business. The presence of most other additional gambling types can only enhance the chances for lottery diffusion in the wider majority of states (Nevada and casino gambling are one exception).

B.4.1 Off-Track Betting. Regionally there is not a very clear pattern of distribution to this gambling type. Off-track betting is spread out very randomly throughout parts of the Midwest, West, South, and Northeast in 14 states. This gambling type should have minimal positive or negative influence on lotteries.

B.4.2 Sports Betting. Next to casino gambling, this is the least frequent type of legalized gambling for states. Only Delaware, Montana, Nevada, and Washington have legalized sports betting. Fewer prevalent forms of gambling like this should have little influence in the analysis compared to other, more numerous gaming types.

B.4.3 Horse Racing. Horse racing now occurs in 35 states, making it the most prevalent gambling type next to bingo. An absence of horse racing exists in the fundamentalist religious strongholds of the Southeast and in states with only bingo. Horse racing is still seen as a more acceptable form of gambling than lotteries based on the higher number of states having it. The amount of revenue generated by horse racing is more than lotteries, but the higher single purses that lotteries are now offering are becoming very attractive to many people. There are many states which have both horse racing and lotteries, indicating that an adequate market is in place to support both activities. Research has shown that different types of people attend the races versus those who buy lottery tickets. The total parimutuel handle for both horse and dog racing has not been adversely affected by lottery adoption for most states. In fact, most states have clearly seen an increase in profits for parimutuels after lotteries began (Table VI).

B.4.4 Dog Racing. Although highly competitive with horse racing, dog racing is normally complementary to state lotteries. Evidence of this fact is the state of Kansas which passed an all-in-one lottery and dog racing package in November, 1986. Several state lottery agencies have promoted each gambling type interchangeably with state racing commissions. Lottery tickets are sold at the racetracks and the winning race numbers are used for lottery ticket winners. Dog racing is slightly less prevalent than lotteries (16 states compared to 26 lottery states) because of the resistance it has met from some horse racing interests (most notably in California). Lotteries have had the advantage of less resistance which has allowed them to spread into more states.

B.4.5 Jai Alai. Jai alai is a less common gambling type found only in Connecticut, Florida, Nevada, and Rhode Island. It is expected to have minimal influence on lotteries compared to some other gambling types. Some localized

TABLE VI

TOTAL PARIMUTUEL HANDLE: 1983[a]

State	Year Lottery Started	1983
Arizona	$219,582,147	$221,475,756
Connecticut	115,384,222[b]	299,218,968
Delaware	153,605,048	64,555,603
Illinois	745,997,779	967,554,363
Maine	23,809,098	30,997,496
Maryland	279,025,178	420,512,305
Massachusetts	293,877,519	560,145,560
Michigan	317,329,493	355,357,249
New Hampshire	115,813,861[b]	91,052,367
New Jersey	371,738,369	958,685,566
New York	1,459,528,840	3,116,166,404
Ohio	283,788,081	384,849,073
Pennsylvania	384,511,879	524,571,927
Rhode Island	125,123,509	117,090,434
Vermont	14,881,654	13,708,922
Washington	205,063,436	209,771,980
TOTAL	$5.1 Billion	$8.3 Billion

[a]The left column shows total parimutuel betting for each state's lottery startup year. The right column shows the the same state's 1983 parimutuel handle.

[b]First year available after lottery started.

Sources: American Horse Council; Greyhound Publications, Inc.; Connecticut Division of Special Revenue.

variation may be possible when viewed on a regional basis (e.g., Florida), but would not account for any noticeable diffusion patterns.

B.4.6 Casinos. Casinos are the only gambling type which should be found to be detrimental to lotteries. Although New Jersey has casino gambling, it is not as widespread as Nevada. Nevada has avoided the lottery due to the influence casino owners have on state government. Like lotteries, many forms of casino gambling are based on luck (e.g., slot machines) rather than skill. The influence of casino gambling overall is expected to be weak except in Nevada, where it should stand out with a high negative correlation to lotteries.

B.4.7 Bingo. Bingo is usually the first type of gambling that a state will legalize. It is a question to some whether bingo can be considered a genuine form of gambling, because of the minimal prize earnings in most states and the fact that most bingo games are conducted in churches or by charitable organizations. Bingo is common even in the Southeastern bible belt states and has little active opposition. It is not as good an indicator of whether a state may adopt a lottery as are parimutuel racing types. Unlike many other forms of gambling, bingo has been legal for a long time. In contrast, parimutuel sports have not been established as long in most states as bingo and can be seen as more of a parallel to lotteries.

B.5 Out-of-State Lottery Winners/Players

Sufficient information on out-of-state lottery sales and winnings would prove to be an enormous asset to determining the influence bordering states have on each other. Research in the summer of 1986 found that such records are not generally kept by all state lottery agencies. This factor could not be used in the overall data matrix because of the limited availability of such information. The information that was received does point to a strong relationship between a lottery state and its bordering states. In all three cases displayed in this study, a lottery state's greater percentage of out-of-state winners and players has come from the non-lottery states which border them.

It is important to mention the information obtained from the states of Iowa, West Virginia, and Colorado because of the similarities found for each state. Information from the Iowa lottery (Table VII) shows that Nebraska, Minnesota, and South Dakota were the top three states for out-of-state high tier lottery winners in May, 1986. Four out of the top five states accounting for Iowa's out-of-state winners were at that time non-lottery states (Nebraska, South Dakota, Minnesota, Wisconsin). In the period from August 22, 1985, to May, 1986, 9.3% of Iowa's high tier lottery winners were from out of state. The state of West Virginia shows the same type of pattern as the Iowa lottery. The non-lottery states of Virginia and Kentucky are the top two bordering states in the percentage of out-of-state lottery players for West Virginia (Table VIII). For August, 1986, 12.7% of West Virginia's lottery players were out of state, 7.53% of which came from the bordering non-lottery states of Virginia and Kentucky. The same pattern is seen when looking at the out-of-state winners for the Colorado lottery (Figure 9). The pie chart for Colorado's instant "Bonanza" game shows the greater percentage (60%) of out-of-state winners came from the bordering non-lottery states of Wyoming, New Mexico, Kansas, Texas, and Nebraska.

This information is far from conclusive as the figures come from only monthly reports of the three states mentioned. The fact that non-lottery states made up the greater percentage of out-of-state winners and players (in Iowa, West Virginia, and Colorado) should suggest that lottery states have a strong influence on bordering or nearby non-lottery states. This information helps to support the hypothesis of contiguous diffusion based on the observed economic

TABLE VII

IOWA LOTTERY--OUT-OF-STATE WINNERS

During the month of May, 3,745 prizes of $50 or more were claimed. Of these, 388 (or 10.3%) were claimed by out-of-state residents. These prizes totaled $19,400. Out-of-state players contributed approximately $561,000 to May sales.

Out-of-state high tier winners reside in the following states:

Nebraska	133 winners	Indiana	2 winners
Minnesota	64 winners	North Dakota	2 winners
South Dakota	42 winners	Arkansas	2 winners
Illinois	41 winners	Florida	2 winners
Wisconsin	31 winners	North Carolina	1 winner
Missouri	24 winners	Alabama	1 winner
California	11 winners	New York	1 winner
Kansas	10 winners	West Virginia	1 winner
Colorado	5 winners	Michigan	1 winner
Oklahoma	4 winners	Wyoming	1 winner
Texas	3 winners	Kentucky	1 winner
Washington	3 winners		

Out-of-state high tier winners (recap since August 22, 1985):

	Iowans	Out of State	Percentage Out of State
Aug. 22-Sep. 18, 1985	1,599	153	8.7
Sep. 19-Oct. 8	796	85	9.6
Oct. 9-Nov. 11	1,324	126	8.6
Nov. 12-Dec. 31	1,210	152	11.1
Jan. 1-Jan. 31, 1986	735	81	9.9
Feb. 1-Feb. 28	2,056	174	7.8
Mar. 1-Mar. 31	2,156	229	9.6
Apr. 1-Apr. 31	4,518	440	8.8
May 1-May 31	3,361[a]	388	10.3
Total	17,755	1,828	Avg. = 9.3

[a]Estimated May 6, 1986; includes $50 prizes.

TABLE VIII

WEST VIRGINIA LOTTERY--OUT-OF-STATE PLAYERS

Out-of-State Performance

For the month of August, 1986, Game 4 out-of-state players comprise 12.77% of all players of the West Virginia Lottery.

Out-of-State Players

State	Percentage of Total West Virginia Lottery Players, Game 4
Virginia	5.38
Kentucky	2.15
Ohio	1.96
Maryland	0.87
Pennsylvania	0.45
Other States	1.96
	12.77

Most out-of-state lottery players came from Virginia, followed by Kentucky, Ohio, Maryland, and Pennsylvania. The percentage of out-of-state players from other non-bordering states remains higher than usual during the summer months due to increased travel to West Virginia for vacations.

August 1, 1986, through August 30, 1986.

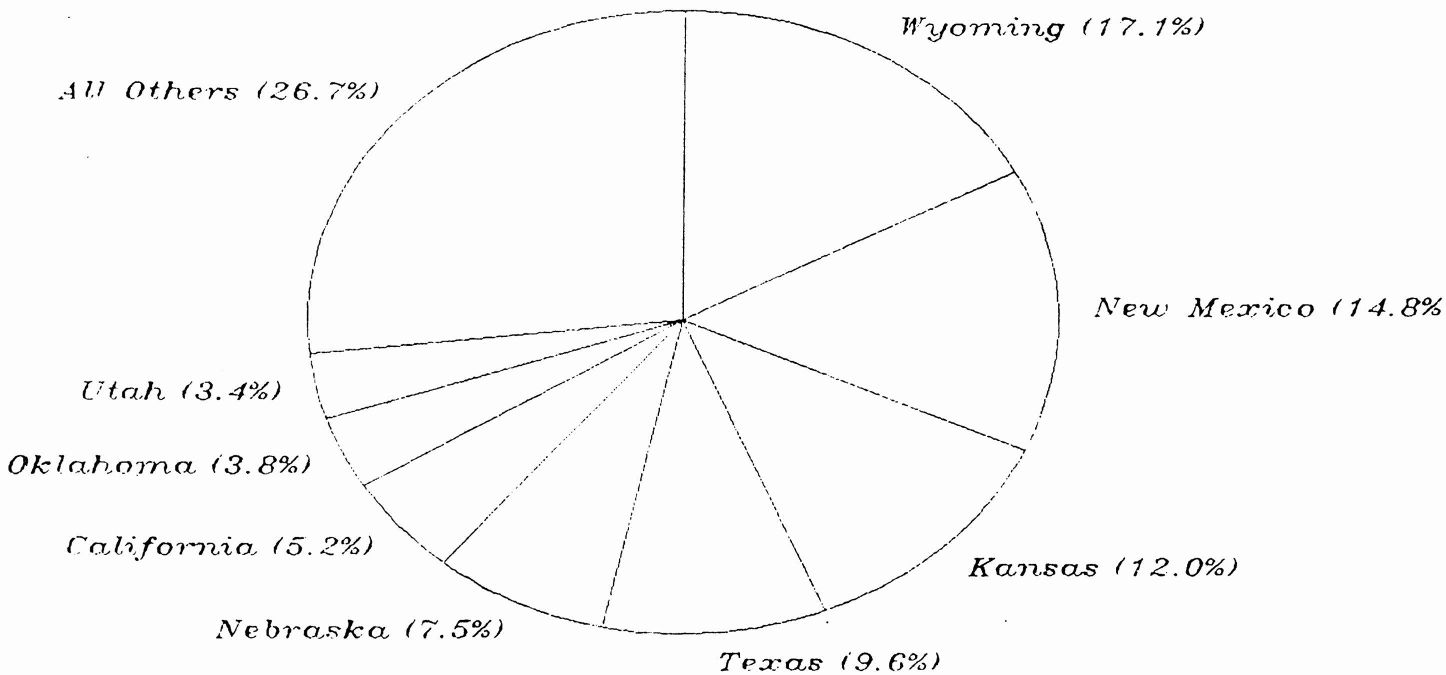


Figure 9. Colorado Lottery--Out-of-State Winners

competition along state borders. The data suggest that Colorado, Iowa, and West Virginia are all significant border influences to their neighboring non-lottery states, and may influence future lottery diffusion into new states. There are numerous cases where non-lottery states have lost revenue to bordering lottery states and are then influenced to adopt lotteries to offset this. Further study on the impact of out-of-state sales and winners would require more data, but the initial impression has to strongly favor the trends such data would reveal to the lottery diffusion process given the flow of money across state borders.

B.6 Lottery Distribution--1987

Since the start of the research, four new states have passed lotteries. The diffusion process, as predicted, is continuing at a rapid rate as more states compete economically for lottery dollars. Montana, Florida, Kansas, and South Dakota have all recently passed lottery legislation in the fall of 1986 and will begin lotteries in the spring of 1987. The distribution pattern generally confirms the hypothesis that lotteries are diffusing in a contiguous pattern except for Florida, which is an anomaly to the otherwise conservative southern bible belt area. The map (Figure 10) includes the year of lottery adoption for states. General distribution shows lotteries concentrated in the Northeast, Midwest, and West, with almost a complete absence in the Southeast part of the United States. Florida represents the only southern state to adopt a lottery to date. Although Florida is very different culturally from any other southern state, it will be interesting to see what effect it will have on the bordering states of Georgia and Alabama. Areas around the Mobile and Pensacola metropolitan region could have significant border flow of lottery sales based on the short distance between the two cities. Also of note is the future influence the new lottery states of Kansas and South Dakota may have on their bordering non-lottery states.

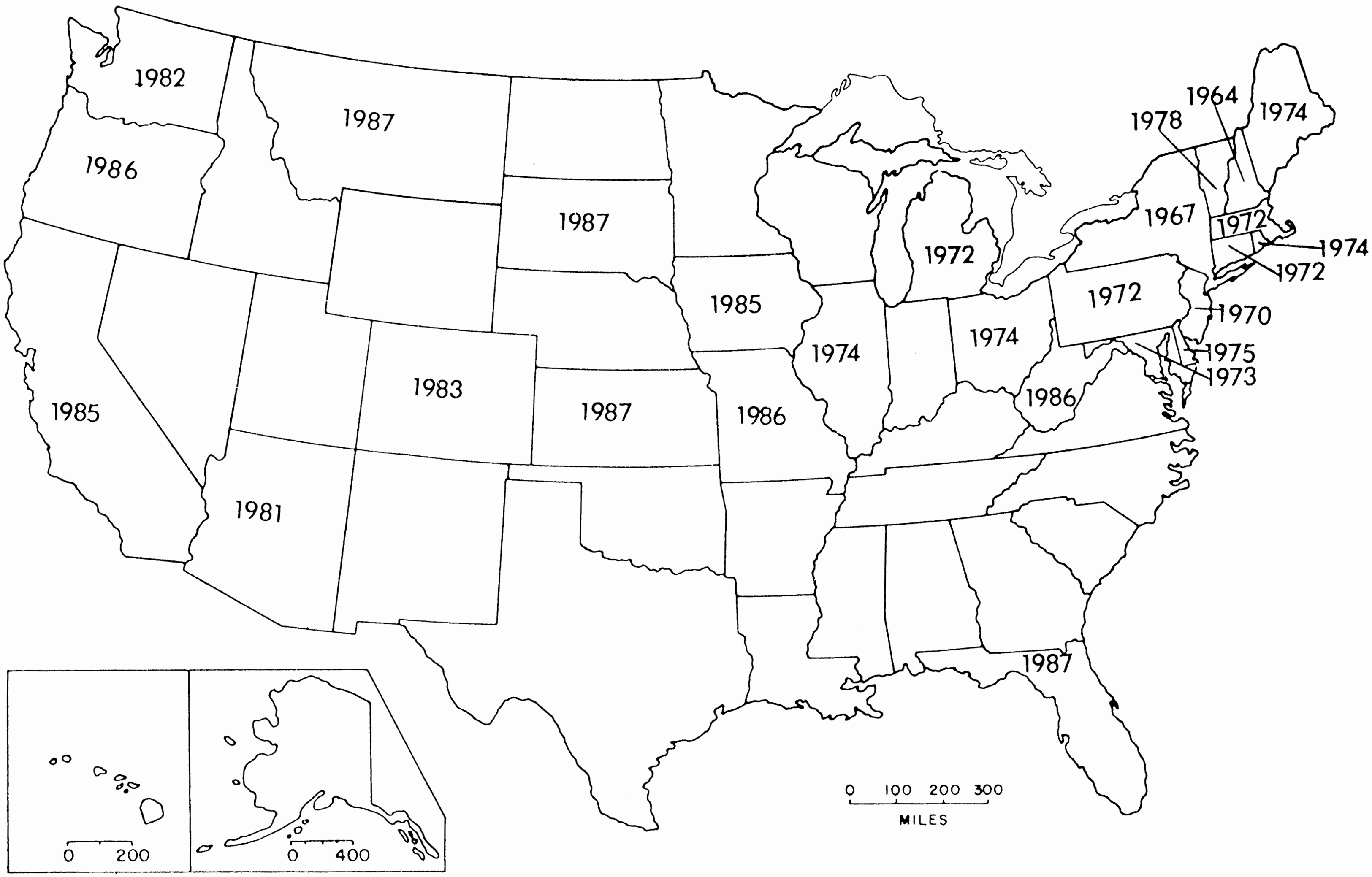


Figure 10. Lottery Distribution--1987

B.7 Total Lottery Revenue Potential, Non-Lottery States

As mentioned previously, Texas could earn the most money from a lottery based on their population. California, with the highest population of any state, has a lottery which rates among the top 40 corporations in America in terms of financial gross and net revenue earnings. The revenue potential model for non-lottery states is based on an average of $72.02 per capita times the state's population, giving the gross revenue potential (Table II, Figure 8). The net revenue is figured at 40% of the gross on the average. For Texas, as an example, their expected gross revenue would exceed one billion dollars and the net (40%) over $418 million (ranked first for non-lottery states). Population will be a major factor for determining which states eventually adopt lotteries. Higher revenue potentials will do more to convince state officials of the economic feasibility of lotteries. Florida was ranked second in gross revenue potential for non-lottery states but has since adopted a lottery. After Texas, North Carolina, Georgia, and Indiana have the highest populations for potential lottery revenues.

C. Data Analysis

C.1 Introduction

The data matrix was developed using the Statistical Analysis System program (SAS) and contains 48 state observations for each of the 20 lottery variables (geographical, political, economic, and gambling variable types) (Table XV; Tables XIV through XXIV are presented in the Appendix). Weighted indices have been developed for several of the lottery variables to aid in the necessary data transformation of descriptive information to numerical data which can be statistically correlated. All lottery variables are not included for each state because data classification separation was necessary according to lottery, non-lottery, and all states. States having no information for any one lottery variable are represented by 1's (constants) in the data matrix.

The data matrix was manipulated through factor analysis and Pearson Product Moment Correlation Coefficients to attempt to develop patterns of regionalization according to states and variable names. It is possible that factor analysis will be able to synthesize the data into a few key factors that will help to test the hypotheses. By confining the 20 lottery variables into a few key factors, a pattern of regionalization may emerge according to states which are associated by similar lottery variables.

In a pattern of regionalization it is possible that homogeneous regions (Southeast, Northwest, Southwest, and Midwest) will be discernible according to lottery variable similarities. The Q-mode factor analysis used in the study, and later to be interpreted by data synthesis, was used to produce a regionalization of the variables. The Q-mode factor pattern map (Figure 13) is an end result of the factor analysis procedure and can best display any regional patterns which may emerge. Correlations from states like Alabama and Georgia, for example, are expected to be similar for more variables than California and Texas because of the adjacent location they have in the same geographic region and the non-lottery relationship they both share.

<u>C.2 Pearson Product Moment Correlation Coefficients</u>

The correlation coefficients are important indicators because they test how well the lottery variables relate to each other and how well each state is related to the lottery variables. A high positive correlation for the key diffusion variables would indicate the hypotheses of the study could be accepted. High negative correlations of variables mean it would be more likely that hypotheses will have to be rejected in favor of an alternative hypothesis. High positive correlations would indicate variables are similar to each other while negative correlations reflect they are opposite to each other. If it is known that variables correlate well with each other, it can be assumed the relationship existing would favor support of the hypotheses.

For the lottery thesis the highest positive correlation coefficents (Table XVI) are between the Adoption Status/Adoption Method and the Boundary Population Index. The adoption status has a 0.9870 positive correlation to the BPI while the adoption method has a 0.8738 positive correlation. This shows that these variables are highly related to each other and should offer some insight into the processes involved. The high positive correlations help confirm the notion that a state's boundary population is a major influence on whether it is a lottery state or not. The relationship suggests that population along border areas helps to determine a state's adoption status (lottery, non-lottery, or potential lottery). The method of adoption (lottery states) is strongly related to population also. Overall, it suggests that the density of state populations is a factor which determines if a state has a lottery or not. These correlations are confirmed by the fact that the majority of the United States population lies within lottery states (over 50%). Less populated areas are more likely to be non-lottery states, probably because of their lower revenue potential.

Moderately high positive correlations exist between the political and economic variables as they each are related to the legalization requirement (Table XVI). The relationships exist because the legalization requirement is based on political and economic factors concerning the possibility of lottery adoption. Each of the three variable categories pertain in a large degree to non-lottery states, and the economic and political factors that are important to each state for legalizing the lottery. There is also some slight relationship between the political and economic variables, and the geographical distance influence indices. The highest correlation here is between the Distance Influence Index CC (center of a state to center of nearest lottery state) and the Gramm-Rudmann state revenue cutbacks (0.6224). The correlations of the gaming variables are very weak, suggesting little positive or negative relationship to lottery diffusion. Gambling types can be concluded to be neither advantageous nor detrimental to lotteries based on the lack of strong correlations overall. There is a possibility that relationships may be imbedded within the data on a regional basis for individual states. For the state of Nevada, a special exception may apply due to the negative influence casino gambling is expected to have on lottery adoption possibilities. Finally, as expected, the two distance influence indices (CC, UC) have high positive correlations to each other (0.8421).

In general, for the entire correlation matrix, there are very high correlations between the adoption status/adoption method political variables and the geographical Boundary Population Index variable. Economic and political variables show moderate to strong positive correlations to each other as do the distance indices with each other. The four geographical variables did not show much relationship to each other witnessed by the lack of any strong positive or negative correlations. The Boundary Influence Index shows a total lack of any strong correlations with any other variable. The strongest negative correlation was between the adoption status and the cost per capita (Gramm-Rudmann Index). This suggests that whether a state is a lottery state or not makes little difference in the amount a state would lose from revenue cutbacks attached to the cost per capita. This, of course, is assuming the savings per capita figure is not interjected into the relationship. The amount of revenue cutbacks and the associated losses per capita are not based on a state's adoption status but on the total state population.

Looking at the correlation matrix alone still gives one no clear idea of whether the hypotheses can be accepted or rejected. So far the most important thing it tells is that the border populations of states are highly positively related to whether a state will adopt a lottery (adoption status). This turns out to be fairly accurate as states with higher populations have adopted the lottery. From here, it is necessary to condense the 20 lottery variables into a few key factors that hopefully will better test the hypotheses. This is where factor analysis was used to attempt to develop more identifiable patterns to the data. It should be possible to find that some variables are common to certain regions. That would allow the determination of area patterns to the variables according to states and regions.

C.3 Factor Analysis

The correlation coefficients from the raw data matrix are used in the factor analysis procedure. The goal of factor analysis is to take a large amount of data (20 variables) and reduce them to fewer (6) factors. This data reduction technique combines the data of the original matrix. There are five main statistical procedures to follow for obtaining factor analysis solutions. The data matrix is created, the correlation matrix is calculated, the extraction of the initial factors is done through the initial principal components factor analysis, the factors are rotated to a terminal solution and interpretation, and finally the factor scores are obtained from the rotated correlation matrix and factor loadings (Figure 3). The primary use of factor analysis is to find out if a smaller number of factors can account for the bulk of the correlations among the much larger original set of variables.

C.3.1 Principal Components Factor Analysis. The first step that must be done in principal components factor analysis is to run the initial factor method to obtain the first set of factors (Table XVII). Table XVII illustrates the results of the initial statistical procedure of factor analysis. The 20 lottery variables are transformed into 20 factors which are rated according to a series of eigenvalues ranging from 0.004425 to 8.220953. The eigenvalue criterion is the most common way to determine the number of initial factors to be extracted and retained from the correlation matrix. Generally, those factors with an eigenvalue of one or greater are retained by the computer program. For the lottery diffusion correlation matrix, six factors have eigenvalues greater than one and are retained by the mineigen criterion. The six retained factors are arranged on a horizontal axis while each of the original lottery variables are arranged on a vertical axis of the initial factor correlation matrix (Table XVII). The initial six factors retained are arranged according to the highest values in order of importance from one to six in a factor pattern matrix. Factor one with an eigenvalue of 8.220953 explains the most variance of any factor and has the highest negative and positive correlations with all of the lottery variables.

The initial factoring step has determined the minimum number of factors (6) that will adequately account for most of the observed correlations and has shown the commonalities each variable has with each other. The initial six factors are orthogonal and arranged in descending order of importance. These six factors can explain the majority of the variance for the correlation matrix. Once they are rotated and developed into factor scores, definite regional and categorical patterns will be possible based on how well each factor correlates to the 48 states and 20 lottery variables.

C.3.2 Factor Rotation. After the initial factors have been extracted, the next step is to rotate the six factors to a terminal solution (Table XVIII). Factor rotation is done so that a simpler, more easily interpretable data matrix is developed. The factors are rotated on their axes in order to obtain more identifiable patterns to the data matrix. The goal of this procedural step is to find a factor pattern matrix that is closest to the simplest ideal structure. The factor pattern matrix may be rotated several times by many different rotation methods to gain the ideal structure suitable for the factor scores.

For the lottery data matrix, the varimax rotation type was used because it will maximize the variance of the squared factor loadings for the six retained factors. This will allow for a clearer separation of each factor score according to its correlational strength. The varimax factor rotation takes the six initially retained factors from the factor pattern matrix and rearranges them into a rotated factor pattern matrix. The rotated factor pattern produced by the varimax rotation (R-mode) (Table XVIII) reduced the numerical strength of the correlations between the 6 factors and the 20 lottery variables, allowing better separation of the variables by factor types. Varimax rotation assumes that the factors are uncorrelated and that smaller positive and negative correlations will be exhibited. The smaller numerical difference of the six factors for each variable is a means by which patterns can be detected because fewer lottery variables are strongly correlated to each factor.

The main objective of the factor rotation step is to help in showing the relationship the original lottery variables have with each of the six retained factors. The problem which still exists is that too many lottery variables are attached to each factor. It is not possible yet to determine which variables are best reflected by which factors. To do this the final step is employed by obtaining the factor scoring coefficients.

<u>C.3.3 R-Mode Factor Scoring Coefficients.</u> Once the rotated factor

matrix is developed from the initial factor matrix, it is possible to develop a factor scoring coefficients matrix from the SAS program (Table XIX, standardized scoring coefficients). The factor scores are derived from the multiplication of the original lottery data with the factor loadings (rotated). The factor scores produced allows for the labeling of each factor according to a few key categories (economic, geographic, gambling, borders, betting, and political). It indicates which variables are most strongly associated with each of the factors, and allows for labeling of each factor based on the typology of the lottery variable names. Factor one, for instance, has the highest loadings on cost/savings per capita and can be labeled the "economic" factor. Factor two has the highest positive loadings on the Distance Influence Indices and is labeled the "geographic" factor. Based on the strongest positive loadings, factor three is the "gambling" factor, factor four is the "boundary" factor, factor five is the "sports betting" factor, and factor six is the "political" factor (Table XIV). All of the values of the factor score matrix are less than the initial and rotated factor matrices. This allows for the elimination of many original variables from each factor and helps to affix more exact categorical labels to each factor. This procedure is termed an R-mode factor analysis because each lottery variable is correlated with each other to obtain the six factors. The end result of the R-mode procedure is represented by a principal components map (Figure 14) that was developed from principal components factor analysis by state (Table XXIV). This table has produced six principal components for each of the contiguous 48 states which are different than the six factors (Table XIX) which correspond to each lottery variable. Through the factor pattern and principal components map, the results of the factor analysis procedure are clarified and synthesized. The R-mode principal components map displays regional similarities for some of the lottery variables.

To be able to obtain a synthesis of the data according to contiguous regions, the Q-mode factor analysis is used.

C.3.4 Q-Mode Factor Scoring Coefficients. In the Q-mode analysis, the data matrix is transposed so that the vertical columns represent real units (states) and the horizontal rows represent the lottery variables. This provides a way of correlating each lottery variable by state observations. With the Q-mode technique, factors can be interpreted as regions or regional types according to each state observation. The states are correlated with each other to develop a set of five regional factors which account for lottery diffusion patterns. Each factor is made up of certain states which share common regions. The Q-mode transposal of the data matrix helps to better identify which states correspond to the five factors retained. With this transposal, it is possible to plot correlations state by state, revealing regional patterns.

It is important to distinguish the major differences between the Q- and R-modes of factor analysis. In the R-mode it is termed a N*N correlation matrix which will intercorrelate the 20 lottery variables with each other. The Q-mode modification can transpose the data matrix to make the columns represent the states (areal units) and the rows represent the lottery variables. A 20 by 48 data matrix (lottery variables) was transposed into a 48 by 20 matrix so that each state can be compared for correlational strength. The Q-mode factor analysis is a technique used by geographers to identify regional patterns.

The Q-mode factor analysis produces the same type of output as the R-mode except it is by states. The output includes the Pearson Correlation Coefficients matrix, the initial factoring procedure, and the factor scoring coefficients. A special problem encountered in the Q-mode analysis was related to the singularity of the data matrix. The SAS program has matrix algebra limitations on data sets which are transposed by the Q-mode. This made it necessary to use the varimax rotated factor patterns to develop Q-mode regional labels for the retained factors. The labeling procedure was able to attach factor names to each of the first four factors having the highest correlations.

The first step initiated by the Q-mode procedure developed Pearson Correlation Coefficients (Table XX) for the states (Alabama, Wyoming) as opposed to the variables (adoption status, bingo) (R-mode). Next, the initial factoring procedure reduced the variables into five factors (as opposed to six under the R-mode) with eigenvalues of one or greater (Table XXI). The last two steps were the varimax rotation (Table XXII) and the factor scoring coefficients (Table XXIII), which encountered the singularity problem in scoring. The varimax rotation pattern in the Q-mode did, however, allow for the labeling of the first four factors with the highest positive correlation loadings. The pattern of regionalization is well displayed when each factor is combined into a composite United States map of the factor distributions (Figure 13).

D. Diffusion Patterns of State Lotteries

D.1 1964-1987

In Figure 11, the arrows indicate the general direction of movement of the lottery diffusion across the contiguous 48 United States. Generally, the diffusion has moved in a wide band from the Northeast United States across the Midwest to the West coast. Notable areas lacking lotteries exist in the Southern United States and parts of the upper Midwest. Florida is a very recent and unique case where the diffusion has not come from any other states. It represents a possible new secondary source of lottery diffusion aside from Arizona and New Hampshire's original diffusion. For the most part, the diffusion has been influenced by

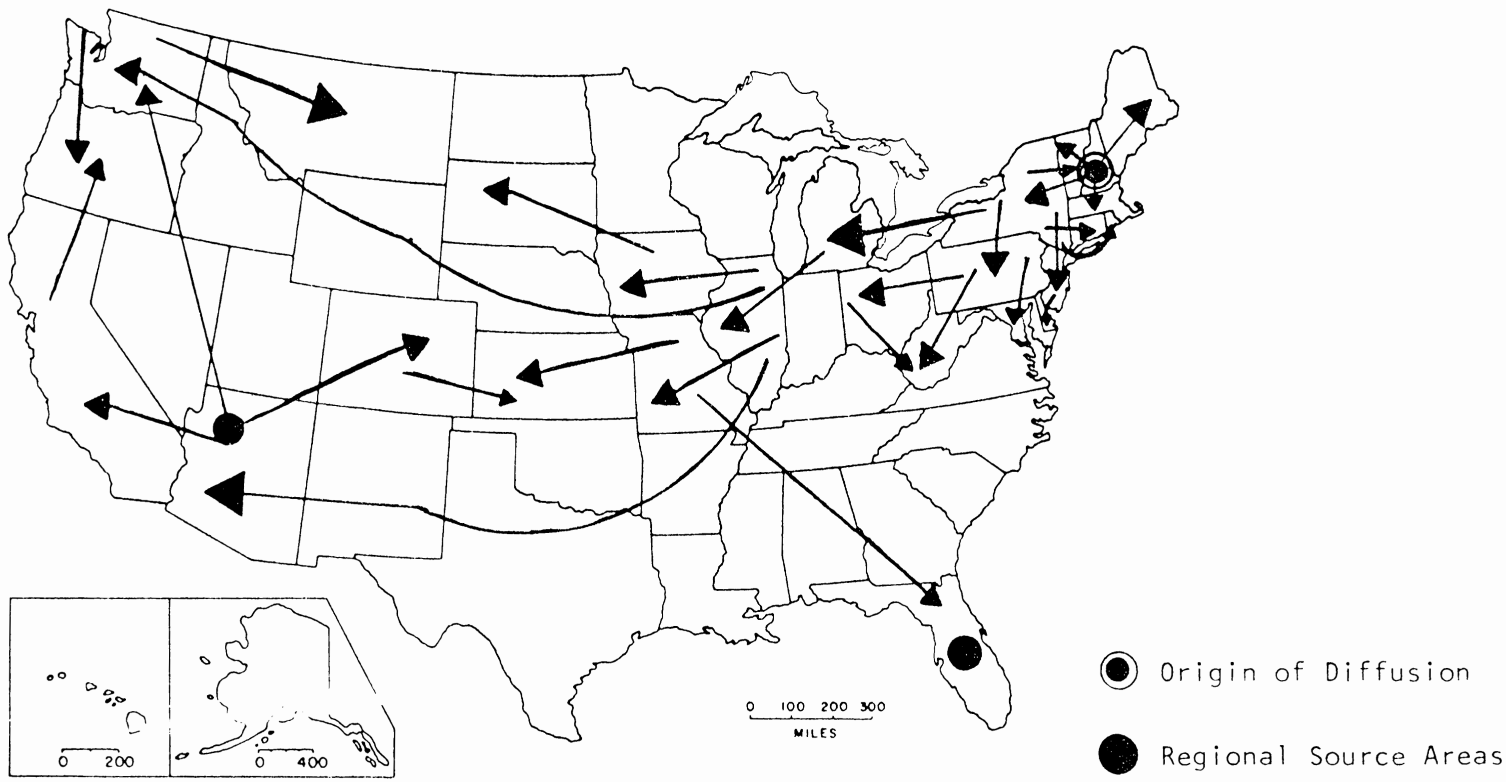


Figure 11. Lottery Diffusion--1964-1987

the contiguous location of states. The diffusion pattern indicates lotteries have spread from one state border to another.

D.2 Potential Future Diffusion Pattern

Most of the heavily populated areas of the United States are now lottery states (over 50% of the United State population). Areas to experience future diffusion are more than likely to be nonlottery states which border lottery states (Figure 12). This is because more influence will be exerted by lottery states separated by less distance from non-lottery states. The likely diffusion pattern will seep over into states bordering lottery states like Minnesota, Wisconsin, Kentucky, etc. Another very important influence to the future diffusion is the population of a state. Texas has the largest remaining market potential for a lottery based on its status as the most densely populated non-lottery state. Isolated deep south states not bordering lottery states are likely to be some of the last states to have lotteries because of the lack of border influence. In addition, the states of Utah and Nevada are likely never to adopt lotteries due to religious and casino gambling influences.

D.3 Analysis of Lottery Diffusion Patterns

By comparing the lottery diffusion from state to state (Figure 11) with the Q- and R-mode maps (Figures 13 and 14), certain similarities emerge. The diffusion which has taken place up to the present time can be identified very well for the four most highly correlated factors on the Q-mode map (Figure 13). Two points of origin for lottery diffusion are seen. The original source area was in the Northeast (New Hampshire) and spread into the Midwest, while a second area began in Arizona and Colorado before moving along the West coast. The two movements appear to be converging in the center of the country as Montana and

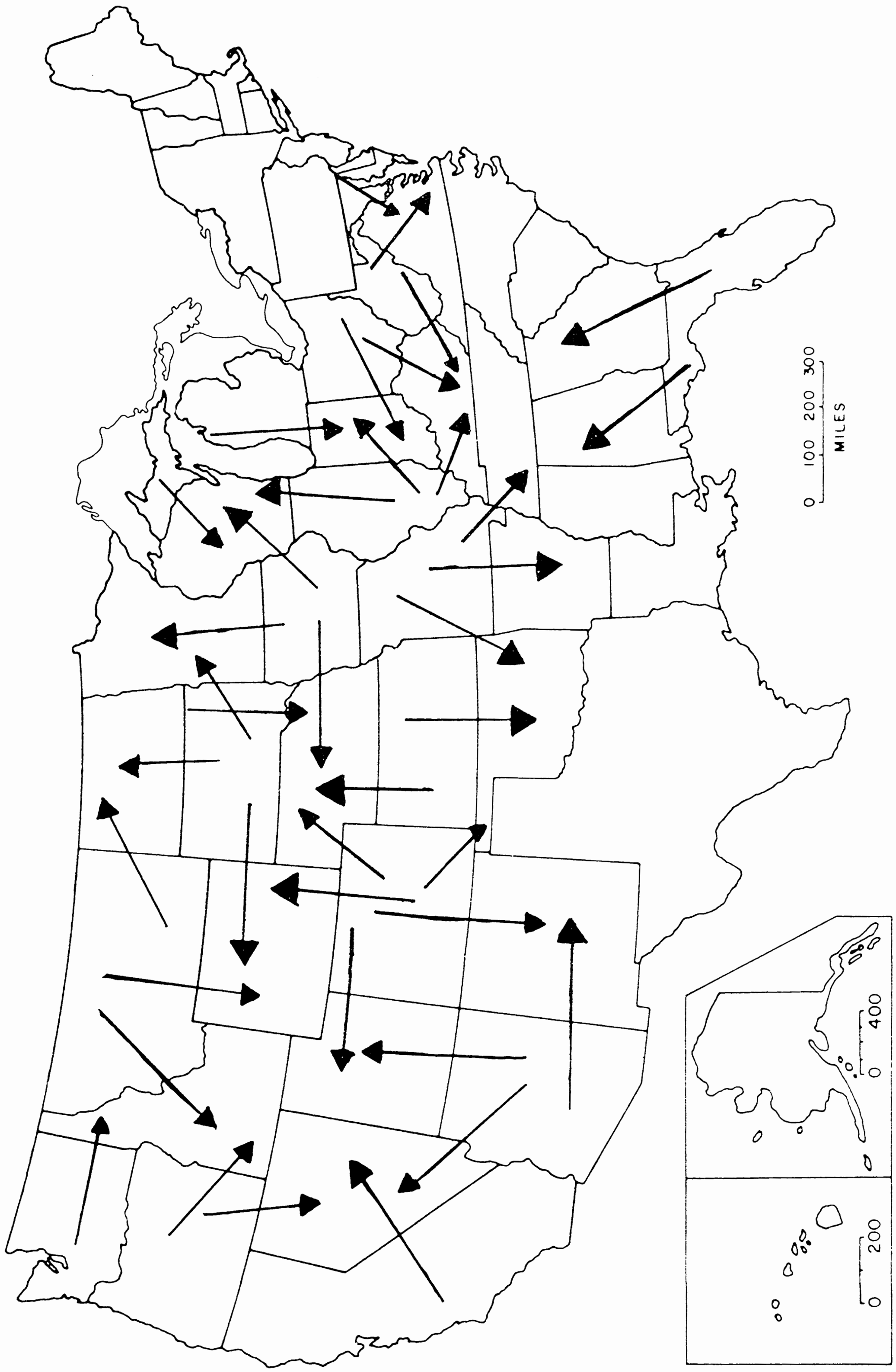


Figure 12. Potential Future Diffusion Patterns

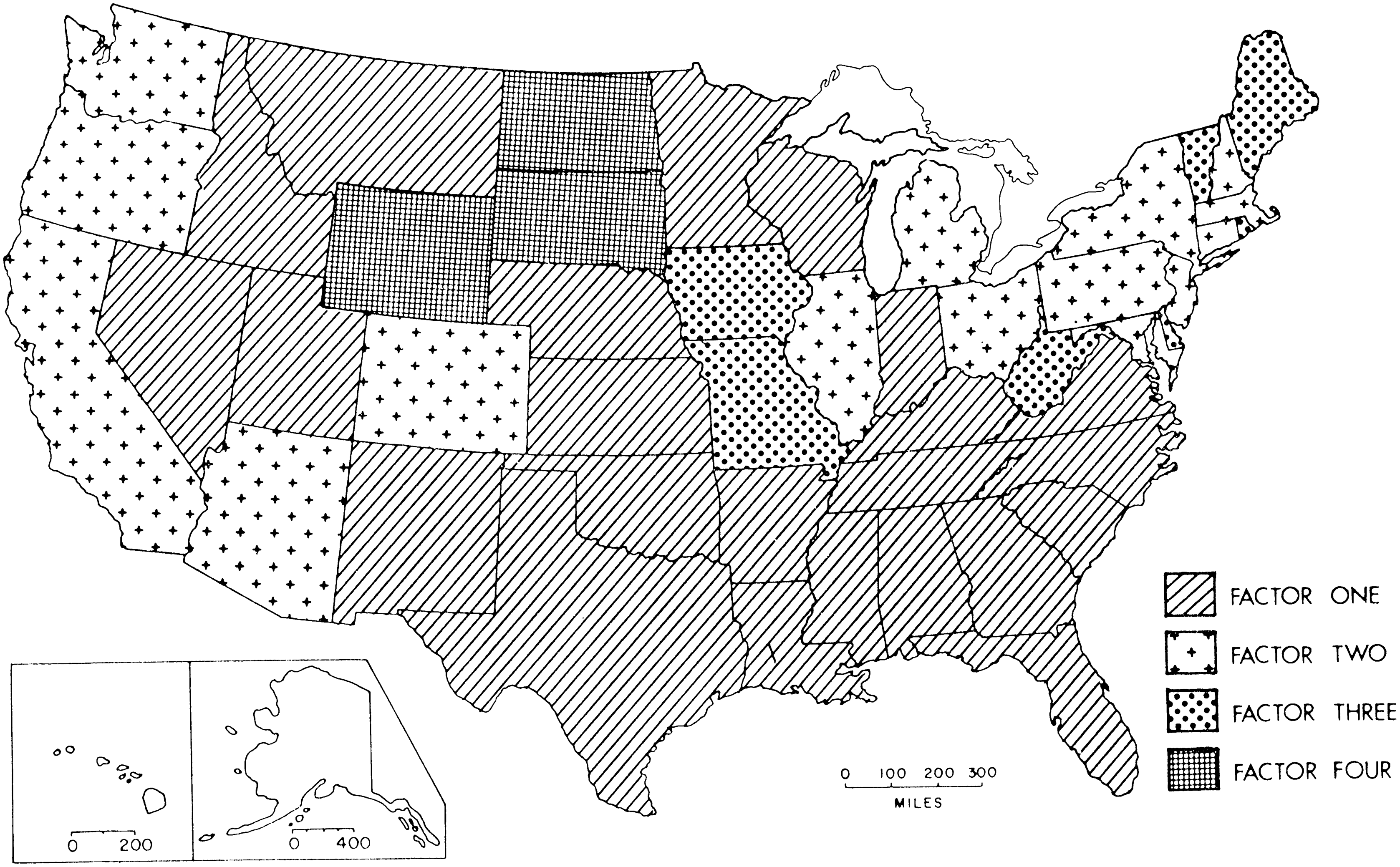


Figure 13. Factor Pattern Map--Q-Mode

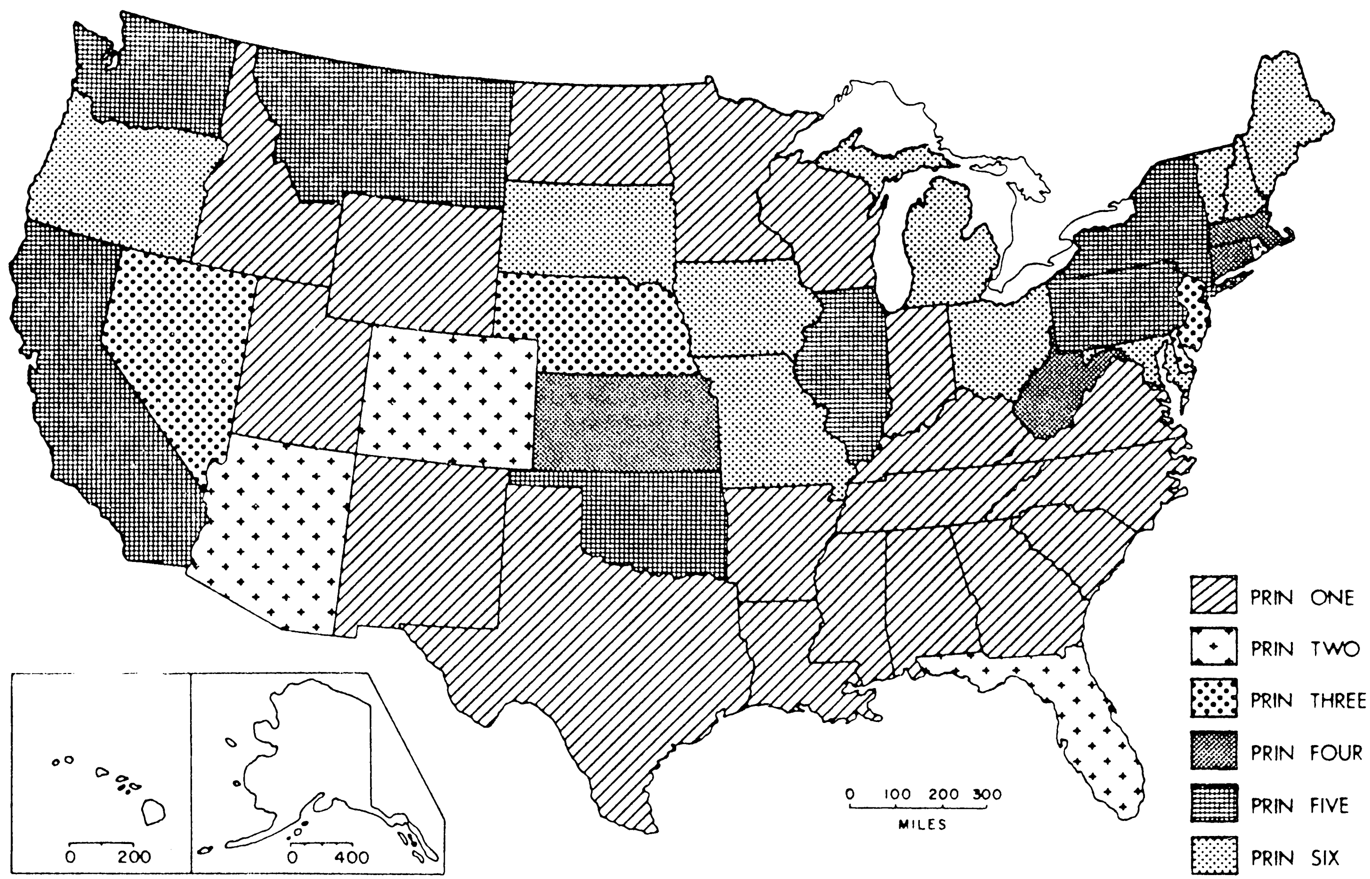


Figure 14. Principal Component Map--R-Mode

South Dakota have been influenced to adopt from the Western branch and Kansas from the Eastern diffusion branch. The New Hampshire diffusion has continued moving west from Iowa and Missouri while the Western diffusion is moving east from Montana and Colorado. The central United States appears to be the focal point of lottery diffusion at the present time. The discussed movements are well represented by states with factor values of two (established lottery states) and three (recent adopters). Since this research started, the adoptions of Montana, South Dakota, Florida, and Kansas represent the most recent lottery diffusion.

Future diffusion was hypothesized to occur in a contiguous manner. The recent addition of three out of the four newest lottery states supports this hypothesis well. Florida represents a third source area for lottery diffusion in addition to New Hampshire and Arizona/Colorado because they are the first states in their region to adopt the lottery and thus were not influenced by any bordering states. With the near connection of lottery states from east to west across the northern half of the United States, the influence Florida might have on southern diffusion will be interesting to observe. The contiguous seep theory would seem to indicate that new lottery adoptions, if they occur in the South, will be influenced by states such as Missouri, Illinois, and West Virginia which are adjacent to the north of many non-lottery states. Data synthesis for the spatial diffusion patterns of lotteries should be available from the results of the Q-mode (factor pattern) and R-mode (principal components) maps. By comparing the actual lottery diffusion patterns to the Q- and R-mode maps, similarities may exist which can verify the hypotheses.

E. Testing Procedures for Accepting/Rejecting Hypotheses

E.1 Correlational Strength of Geographic Variables

The Boundary Population Index has the highest positive correlation of any of the lottery variables in the correlation matrix. It is correlated at +0.9870 with the dependent variable-adoption status (lottery, non-lottery, potential adopter). This indicates that a state's adoption status depends very much on the population along its borders. The length and number of bordering states (Boundary Influence Index) does not seem to be nearly as important as the population market along these borders. This assumption is logical because without dense populations, lotteries cannot turn significant profit and revenues. States such as Wyoming and Nevada have a large number of total miles along their borders but do not have the population along their borders--or anywhere in the state for that matter--needed to support lotteries. Economic competition between two bordering states is at least partially based on population concentrations near the two or more state borders. The contiguous diffusion thus far observed shows some hierarchical aspects by spreading through areas with the highest population markets. This is not uniform across the United States, because in some areas lotteries have spread into the more heavily populated places. The recent diffusion into the Midwest, for example, has taken place in states with less population than many Southern sunbelt states. Their adoption may be more a case of desperation than anything because of the farm and oil crises which have drained budgets to all time lows in these places. This example is indicative of Midwestern states having cities located along state borders where the contiguous contagion diffusion would more readily apply.

The two distance indices are highly related to each other but do not show much correlational strength with the adoption status or any of the other geographic variables. Preliminary indications show that higher populations near state borders (Boundary Population Index) can be proven to be an acceptable hypothesis given the very high correlation of the BPI with the adoption status.

E.2 Correlational Strength of Other Variables

Based on results of the Pearson Correlation Coefficients, there are no other highly significant correlations to be observed. Thus, it became necessary to look to the factor analysis procedures to help in verifying or rejecting the other hypotheses. Factor analysis was used to better define some of the weaker correlations so they could be grouped according to states (regions) and lottery variables (categories).

E.3 Stepwise Regression Analysis

In testing the importance of all of the variables used, stepwise regression was the final test procedure employed. The adoption status represented the dependent variable which was compared to all other lottery (independent) variables. The variables retained by the stepwise procedure show the best linear relationships (Tables IX and X). A plot of the dependent variable (adoption status) with the highly positive BPI (Table XI) reveals a strong linear relationship. States having a low BPI have adoption status one (non-adopted), a moderate BPI has adoption status two (potential adopters), and the higher BPI values have adoption status three (adopted). This information indicates the majority of states with large populations already have a lottery. To some extent this is true, as over 50% of the United States population lies in lottery states. The stepwise regression procedure selects the independent variables meeting the 0.1500 significance level. The procedure retained seven variables which met this level of significance. The two most important independent variables retained were the Boundary Population Index and the Distance Influence Index (center of one state to center of nearest lottery state, DIICC). Both of these variables are spatially oriented geographic indices and they have the highest mean square of the seven

TABLE IX

STEPWISE REGRESSION PROCEDURE

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE BPI ENTERED R SQUARE = 0.97425594 C(P) = 40.47189015

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	37.48855656	37.48855656	1740.82	0.0001
ERROR	46	0.99061011	0.02153500		
TOTAL	47	38.47916667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.11463835				
BPI	0.15242994	0.00365337	37.48855656	1740.82	0.0001

BOUNDS ON CONDITION NUMBER: 1, 1

STEP 2 VARIABLE DIICC ENTERED R SQUARE = 0.97927795 C(P) = 25.99356368

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	37.68179950	18.84089975	1063.30	0.0001
ERROR	45	0.79736717	0.01771827		
TOTAL	47	38.47916667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-0.10436889				
BPI	0.15803097	0.00372273	31.93054803	1802.02	0.0001
DIICC	0.04547601	0.01377062	0.19324294	10.91	0.0019

BOUNDS ON CONDITION NUMBER: 1.261933, 5.047731

TABLE IX. (CONTINUED)

STEP 3 VARIABLE LR ENTERED R SQUARE = 0.98218909 C(P) = 18.44147947

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	37.79381773	12.59793924	808.80	0.0001
ERROR	44	0.68534894	0.01557611		
TOTAL	47	38.47916667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.19358814				
LR	-0.05321077	0.01984197	0.11201822	7.19	0.0103
BPI	0.14549830	0.00583290	9.69182337	622.22	0.0001
DIICC	0.04332676	0.01293585	0.17473550	11.22	0.0017

BOUNDS ON CONDITION NUMBER: 3.524265, 23.88806

STEP 4 VARIABLE OTB ENTERED R SQUARE = 0.98439786 C(P) = 13.18403355

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	37.87880923	9.46970231	678.26	0.0001
ERROR	43	0.60035743	0.01396180		
TOTAL	47	38.47916667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.40488972				
LR	-0.06000916	0.01898664	0.13946985	9.99	0.0029
BPI	0.14657611	0.00553963	9.77477836	700.11	0.0001
DIICC	0.04847141	0.01242342	0.21253483	15.22	0.0003
OTB	-0.09843803	0.03989752	0.08499151	6.09	0.0177

BOUNDS ON CONDITION NUMBER: 3.546318, 36.88125

TABLE IX. (CONTINUED)

STEP 5 VARIABLE CASINOS ENTERED R SQUARE = 0.98616327 C(P) = 9.40133630

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	37.94674076	7.58934815	598.68	0.0001
ERROR	42	0.53242591	0.01267681		
TOTAL	47	38.47916667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.84897968				
LR	-0.06721007	0.01835730	0.16992644	13.40	0.0007
BPI	0.14421009	0.00537659	9.11982956	719.41	0.0001
DIICC	0.04296361	0.01207466	0.16049498	12.66	0.0009
OTB	-0.08941397	0.03821654	0.06939337	5.47	0.0241
CASINOS	-0.19541169	0.08441503	0.06793153	5.36	0.0256

BOUNDS ON CONDITION NUMBER: 3.679279, 52.85499

STEP 6 VARIABLE GISPBET ENTERED R SQUARE = 0.98792775 C(P) = 5.61168911

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	38.01463652	6.33577275	559.20	0.0001
ERROR	41	0.46453015	0.01133000		
TOTAL	47	38.47916667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.61170474				
LR	-0.05734987	0.01781606	0.11740092	10.36	0.0025
BPI	0.14666622	0.00518105	9.07936353	801.36	0.0001
DIICC	0.04359336	0.01141814	0.16515057	14.58	0.0004
GISPBET	0.14817101	0.06052809	0.06789576	5.99	0.0187
OTB	-0.09733501	0.03627406	0.08157851	7.20	0.0105
CASINOS	-0.24976129	0.08283571	0.10300186	9.09	0.0044

BOUNDS ON CONDITION NUMBER: 3.822636, 73.15753

TABLE IX. (CONTINUED)

STEP 7 VARIABLE GRCUTS ENTERED R SQUARE = 0.98860019 C(P) = 5.40525152

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	38.04051163	5.43435880	495.55	0.0001
ERROR	40	0.43865504	0.01096638		
TOTAL	47	38.47916667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.57439141				
LR	-0.04589427	0.01904844	0.06365919	5.80	0.0207
BPI	0.14671360	0.00509732	9.08489779	828.43	0.0001
DIICC	0.05428858	0.01321626	0.18503898	16.87	0.0002
GRCUTS	-0.00027390	0.00017831	0.02587511	2.36	0.1324
GISPBET	0.13861379	0.05987303	0.05877783	5.36	0.0258
OTB	-0.09359738	0.03577008	0.07508458	6.85	0.0125
CASINOS	-0.24317436	0.08160834	0.09737100	8.88	0.0049

BOUNDS ON CONDITION NUMBER: 4.151714, 111.3207

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

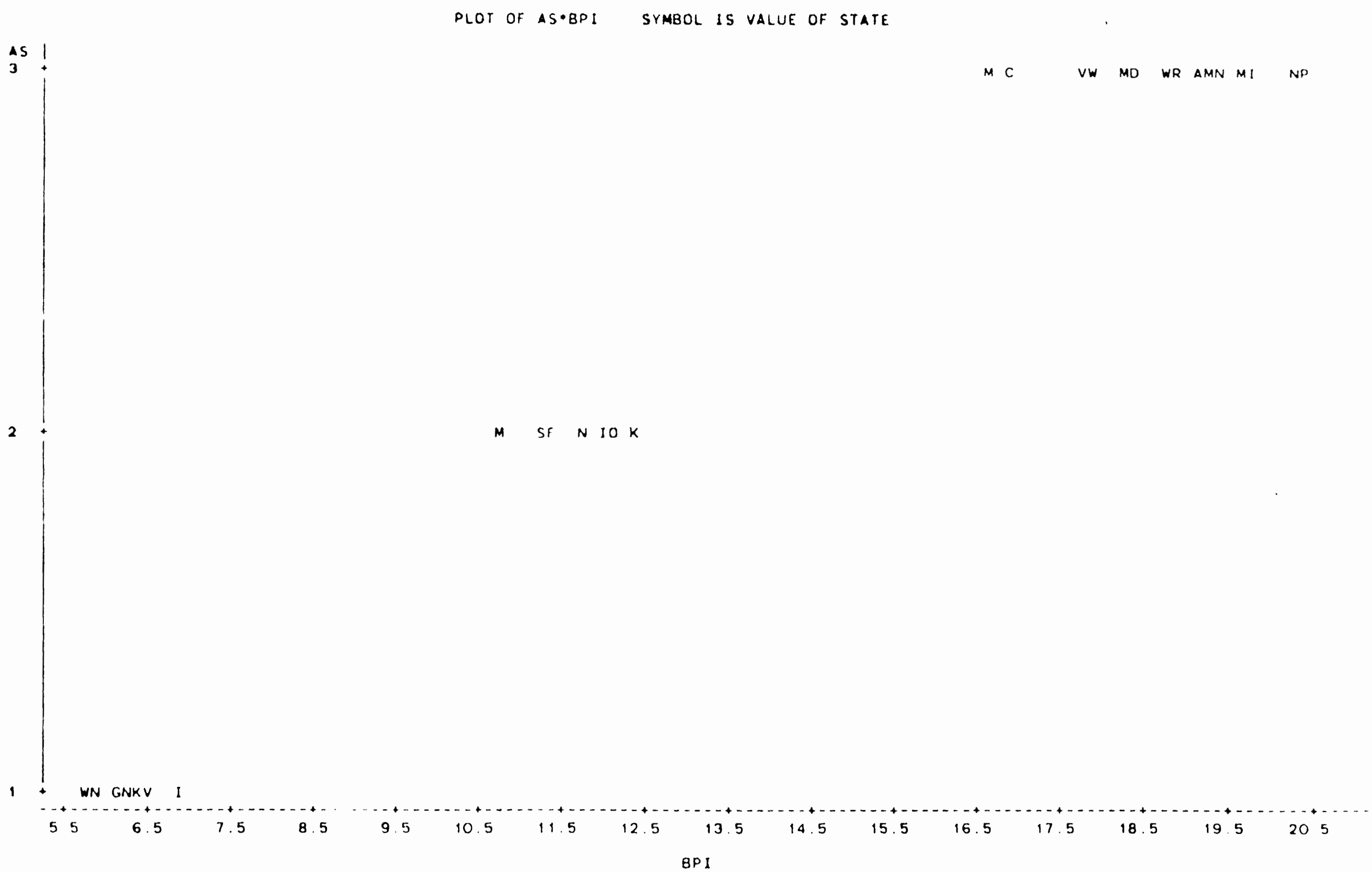
TABLE X

STEPWISE REGRESSION SUMMARY

Step	Variable Entered	Variable Removed	Number In	Partial R**2	Model R**2	C(P)	F	Prob>F
1	BPI		1	0.9743	0.9743	40.4719	1740.8197	0.0001
2	DIICC		2	0.0050	0.9793	25.9936	10.9058	0.0019
3	LR		3	0.0029	0.9822	18.4415	7.1917	0.0103
4	OTB		4	0.0022	0.9844	13.1940	6.0874	0.0177
5	CASINOS		5	0.0018	0.9862	9.4013	5.3587	0.0256
6	GISPBET		6	0.0018	0.9879	5.6117	5.9926	0.0187
7	GRCUTS		7	0.0007	0.9886	5.4053	2.3595	0.1324

TABLE XI

BOUNDARY POPULATION INDEX--ADOPTION STATUS PLOT



NOTE: 18 OBS HIDDEN

variables retained. Each of the seven variables retained represents the best fitting linear relationship. The degrees of freedom are low for each of the seven retained independent variables and can help show the areal association of the factor plots.

Other variables which were included in the stepwise regression are the lottery legalization requirement for non-lottery states (political label); the three gambling variables of off-track betting, casinos, and sports betting; and the economic variable of the Gramm-Rudmann state budget cuts.

The stepwise regression procedure seems to indicate how important political legislation is to the adoption of lotteries. It can be suggested that the number and type of political options a state government has in adopting lotteries plays a major role in the success or failure of lottery legalization efforts. The data are inconclusive on whether voter initiatives result in faster adoption rates because of the lower correlations of the legalization requirement to other independent variables. The only concrete thing that the relationship of the adoption status to the legalization requirement tells is that potential adopters have more political options than non-adopting states, which in many instances require Constitutional amendments to enact lottery bills. Although potential adopting states have a greater number of legalization options, including the initiative, the data availability is too limited to confirm or reject the initiative hypothesis at this time. No significant correlations exist which can undeniably confirm this assumption.

The three gaming variables retained by the regression analysis show strong linear relationships to the adoption status. The relationship between the three gaming variables and the adoption status can be explained descriptively. The three gambling variables (casinos, sports betting, off-track betting) occur in areas dominated by illegal gambling and high crime rates. A state such as

Nevada, in particular, represents an area not likely to adopt a lottery any time in the near future. The adoption status relationship could be one of non-adopter because of the influence organized crime has over legal state gambling. The type of gambling represented by the three gaming variables is very competitive with lotteries unlike parimutuel gaming types. Therefore, a negative relationship exists between the lottery states and those three types of gambling.

The Gramm-Rudmann cuts (the economic variable) are much less important in the regression analysis than some of the other variables, because they do not support the hypotheses as well as the geographic and political variables. The relationship of this variable to the dependent variable refers to non-lottery states only and the revenue cutbacks they can expect. It shows that economic factors may influence lotteries in some ways, but it is difficult to determine just how based on the data available.

The two most important relationships to the adoption status come from the two geographical variables concerned with boundary population (BPI) and distance (DIICC). The higher state border populations correlate positively to lottery adopter states. The greater distances from the center of any one state to the center of its nearest lottery state accounts for isolated non-lottery states while less distance separating the two state centers (which also means less distance separating the innovation from a state) predominantly accounts for lottery states which border each other (e.g., Northeastern states, less distance separating states, which also means less distance for the innovation to travel). Less distance for an innovation to travel may also apply to non-lottery states which have contiguous borders with lottery states.

F. Findings of Hypotheses

For the first stated hypothesis, there are no indices that can concretely prove the contiguous diffusion of state lotteries. The Boundary Population Index and the Boundary Influence Index are not correlated well enough with each other to suggest acceptance of this hypothesis based on statistical data alone. However, by observing the diffusion process on the maps, the hypothesis proves to have validity. The hypothesis, "state lotteries have a contiguous diffusion pattern," can be accepted based on the events which have transpired. The Boundary Population Index proves to be part of an acceptable hypothesis, based on very high statistical correlations. It has an indirect relationship with the economic competition among bordering states. In the most recent lottery diffusion which has taken place, two of the four states that adopted help to verify the contiguous diffusion theory. South Dakota and Kansas share contiguous borders with established lottery states, while Montana is separated only by the panhandle of Idaho from a contiguous lottery border. The ongoing diffusion taking place is maintaining itself in an almost perfectly contiguous pattern except for the adoption in Florida, which is obviously due to other factors besides contiguity.

The great amount of literature concerning the economic competition for lottery revenue near state borders is one good indication of the increased rate of the diffusion process. Confirmation of this hypothesis has come from numerous state lottery agencies and national gambling agencies that have responded on the effect of economic competition between state borders on lottery diffusion. Based on the actual observed diffusion over just the past year, confirmation from lottery authorities, and the relationship to the Boundary Population Index, this hypothesis is acceptable. Although not statistically concrete, the relationship to the stronger BPI hypothesis makes the contiguous diffusion hypothesis valid. The factor and principal components maps (Figures 13 and 14) show the contiguous distribution of the key geographical variables which are essential to the diffusion process.

The second hypothesis infers that the length of state boundaries along lottery and non-lottery states (Boundary Influence Index) and the distribution of states with major population areas close to or adjacent to lottery states (Boundary Population Index) are the key spatial factors influencing the rate and pattern of state lottery diffusion and the level of economic competition among states.

The statistical significance of the Boundary Population Index confirms the validity of the second hypothesis. Although the distance influence and economic indices have not shown very strong correlations to each other or to the BPI, they are tied in with the BPI. The Boundary Influence Index and key economic indices were not correlated solely with the states having the highest boundary populations. The overall correlation matrix was not able to show state-by-state relationships of the variables, but instead separate correlations of states and lottery variables. If the correlation matrix had been isolated to only those states with a higher BPI, the relationship between these indices may have shown higher relationships. The population along state borders is undoubtedly the most important spatial factor affecting lottery diffusion, and may be the most important factor of the entire research. It was by far the most statistically significant index. Combined with the Boundary Influence Index and economic revenue indices, the hypothesis can be accepted. The states having high Boundary Population Indices are also depicted by principal component six on the R-mode United States map (Figure 14).

The final hypothesis cannot be accepted or rejected based on an absence of any statistical correlations. The voter initiative option represents an additional method of legalizing a lottery, and gives states a better chance of adopting the lottery based on the higher number of alternatives to legalization. The hypothesis states that "the method of lottery adoption used is the major political factor accounting for the variation in the rate of lottery diffusion." This may be accurate, but the idea of the voter initiative option accounting for a faster adoption rate is highly speculative at best. State governments vary so much from state to state that it is difficult to take one political adoption method (legislation, Constitutional amendment, initiative, referendum) and call it the most effective way to legalize a lottery. A separate study is needed to give due credit to this hypothesis.

G. Data Synthesis

G.1 Introduction

In the synthesis, the findings of the Q- and R-mode factor analysis procedures will be examined by interpretation of the factor pattern and principal components maps.

G.2 Q-Mode Factor Pattern Results

Each state shows high correlations with some of the factors. The highest positive correlation coefficients for the four factors used was taken for each state to attach regional labels to them (Figure 13). Factor one represents non-lottery states, factor two represents lottery states, factor three represents recent adopters and Eastern states, and factor four represents Western, non-lottery states (Table XII). When the four factors are developed into a composite factor pattern map, the regional patterns show several areas where states are grouped together into various sub-regions (Figure 13). The non-lottery states represented by factor one show the highest concentration in the Southeast and Southern plains with other pockets in the interior West and upper Midwest. The factor two lottery states show a broad belt stretching from the Northeast to the

TABLE XII

Q-MODE FACTORS BY STATES (12)

Factor One	Non-Lottery States
Factor Two	Lottery States
Factor Three	Recent Lottery Adopters
Factor Four	Western Non-Lottery States

Note: Taken from Q-mode rotated factor pattern, Table XXII.

Midwest and out along the West coast. Factor three corresponds to the more recent lottery adopters since 1978, and does not show as large or as concentrated regions as the first two stronger factors. Pockets of recent adopters are found in smaller regional areas of the Midwest, New England, the Atlantic coast, and the Southeast (Florida). The fourth factor consists of Wyoming, South Dakota, and North Dakota, which are tied together regionally as Western non-lottery states. South Dakota's characteristics are likely to change, however, as they begin a lottery by May of 1987.

The composite map of the first four rotated Q-mode factors (Figure 13) shows definite regional patterns which have emerged across the United States. The lack of any isolated lottery states indicates the significance of the contiguity of the states and their adoption status. Most states with lotteries share borders with each other and are grouped together in regional pockets as are the non-lottery states. States became grouped together regionally through correlations and this conforms to the idea that contiguity plays a role in the diffusion of lotteries. The distance, population, and economic variables to which the states correlate are aiding in the development of these regional factorial patterns. States are tied together in easily identifiable regional units which were developed from key geographical variables.

The Q-mode factor analysis procedure allowed for a well developed regional pattern. The final composite map of the four varimax rotated factor patterns (Figure 13) shows excellent regional trends for each of the four factors having the strongest positive correlations. The regional geographic clarity to which each of the four factors correspond indicates how important regional variations in the variables are to lottery diffusion. The regional patterns developed by the factor analysis procedure help to verify the contiguity theory of lottery diffusion. All factors portrayed on the map show some degree of contiguity based on similar regional locations.

G.3 R-Mode Principal Components Results

The principal components procedure for the R-mode factor analysis created a correlation matrix of the top six principal components for each state observation (Table XXIV, columns 1-48). For this table the states are arranged according to the strength of the principal component loadings and are not in alphabetical order as are the Q-mode tables. When the highest correlations of the six principal components were mapped for each state, a composite map was created that labeled each state according to one of the six principal components (Figure 14). The distributional pattern for the R-mode was somewhat less apparent than the Q-mode because it did not fit into regional areas as well. The R-mode, remember, correlates the lottery variable's relationship to each other, while the Q-mode looks at each state and is mainly concerned with the lottery adoption status. For the R-mode map, each state was found to be mainly associated with gambling types. The six principal components when mapped show less geographical proximity according to location but instead more of a relationship to the number and types of gambling for each state (Figure 14).

Principal component one (like the Q-mode factor) represents non-lottery states, two represents states with parimutuel racing similarities (dog/horse), three represents states with casinos/bingo/horse racing, four represents states with horse/dog/bingo, and five represents states with horse racing and bingo (Table XIII). Principal component six represents states with fairly high Boundary Population Indices (Figure 5). Principal component one reflects the distribution of non-lottery states which also happen to have the least number of gambling types. Principal components two through five represents states with similar

TABLE XIII

R-MODE PRINCIPAL COMPONENTS BY STATES (13)

Principal Component One	Non-Lottery States
Principal Component Two	Dog/Horse Racing
Principal Component Three	Casino/Bingo/Horse
Principal Component Four	Horse/Dog/Bingo
Principal Component Five	Horse/Bingo
Principal Component Six	Boundary Population Index

Note: Taken from principal components by state, Table XXIV.

numbers and types of gambling. It is interesting to determine how well similar gambling types fit together into regional areas. Although less defined than the Q-mode, Figure 14 does show states bordering each other to have gambling similarities. Several smaller regional pockets exist between a few states in the West, Midwest, Ohio Valley, and Northeast. The sixth principal component may be the most significant to the lottery diffusion process because it shows small regional nodes of areas with high Boundary Population Indices. Distribution of principal component six is highest in areas of recent lottery diffusion where it is assumed boundary population plays the more important role (e.g., Iowa/Missouri, Ohio/Michigan).

Through the use of principal component (R-mode) and factor reduction (Q-mode), it was possible to determine definite regional patterns on the maps. States are given a factor or principal component labeling according to the highest factor correlation loadings. The synthesis of the data has allowed for the development of the composite maps (Figures 13 and 14) and has shown well defined regional patterns according to each factor and principal component.

G.4 Data Synthesis of Spatial Diffusion Patterns

By using the factor analysis procedure to produce the Q-mode factor pattern map and the R-mode principal components map, it is possible to identify the pattern and rate of lottery diffusion as it has occurred to the present time. Looking at the Q-mode composite map (Figure 13), one can detect two major pockets of established lottery states. The diffusion started in New Hampshire and spread from the Northeast to the Midwest. A secondary diffusion node developed in Arizona and Colorado, and spread along the West coast. The more recently adopted states are seen as a continuation of the diffusion out of Illinois into Iowa and Missouri, also spreading into upper New England, and south into

West Virginia and the mid-Atlantic coast. The Q- and R-mode maps show strong regional similarities which help to indicate a definite pattern and rate to the diffusion. With the recent adoption of South Dakota and Montana, lottery states are almost connected from the West to the East coasts except for Indiana and a small sliver of Idaho.

The state of Florida is one of four new lottery states to begin operations some time in the spring of 1987. This change in the diffusion was not included in the data input and will probably account for a new secondary point of origin for lottery diffusion. This development may put a squeeze on parts of the conservative Southeast, especially the states of Georgia and Alabama which border Florida and thus are subject to border influences. Every new state adopting a lottery results in increased border influence on neighboring non-lottery states. As a result, in all likelihood, the diffusion will continue to be predominantly contiguous expansion diffusion. This has been indicated by the addition of three new lottery states, two of which had lottery states on their borders prior to adoption (South Dakota, Kansas). Florida represents a special exception based more on cultural differences from the rest of the South than any border influences.

CHAPTER IV

CONCLUSION

A. Development of Theory, Predictions, and Recommendations

State lotteries are continuing to show contiguous diffusion across the United States. The sigmoid curve of innovation (s-shaped curve) seems to fit lottery diffusion well. The lottery innovation started out very slowly at first (bottom of s) taking ten years from New Hampshire's original adoption until the idea really became acceptable (middle part of s). The diffusing stage represented by the middle portion of the s has taken place since the early 1970s and the final condensing stage (top of s) may take place by the 1990s. The condensing stage of diffusion would represent a leveling off of the lottery's popularity and would take place when all areas of the country are saturated by the lottery innovation. Florida's recent adoption of a lottery may be the first clue to the final condensing stage of diffusion. Lottery diffusion will not reach the top of the sigmoid curve until all areas of the country have become represented by lottery states. The Southeast, for the most part, remains an area having strong but weakening cultural barriers to lottery diffusion. The adoption in Florida will likely result in future diffusion into other areas of the Southeast.

The rate and patterns of lottery diffusion are essentially geographic or research phenomena. There is a real need to conduct further study on this topic which looks into the scope of the diffusion. Interdisciplinary research by geographers and political scientists could offer a study that might better combine the key ingredients. The study of lotteries as state government entities can continue long after the classic spatial diffusion has ceased. What would be especially interesting to research is the intensity or scope of the diffusion and political variations state to state of the type and number of lottery games offered.

Objective scientific research must maintain a strictly neutral viewpoint or opinion on such issues as the lottery which draw so much heated debate. In the author's opinion, based on the data and tests conducted, there is a good chance lotteries will continue to spread throughout additional states in a contiguous fashion as long as so many states continue to suffer from serious economic difficulties. States often use lottery funds as an alternative revenue source to supplement state taxes. Politically speaking, many new lottery states have represented state governments which have been forced to become more self-sufficient one way or another by federal government revenue cutbacks. The enormous popularity which lotteries enjoy has also helped to influence the lottery diffusion. As long as the public approval rate is high and states are economically troubled, I look for lotteries to move into areas with enough population to support them. The research findings of this study show border population to be the most important determinant to lottery diffusion based on the correlations. States such as Texas, Minnesota, and Oklahoma seem likely candidates for a lottery, given a combination of strong public approval rates, economically depressed conditions, and adequate border populations.

Future research on this topic should be conducted once the diffusion process has run its course. Studies concentrating on the scope of the diffusion can be initiated once the diffusion ceases. The intensity and duration of the innovation may be very interesting factors to examine for lotteries. State policy variations can account for program variation in lotteries.

A SELECTED BIBLIOGRAPHY

(1) "A History of North American Lotteries and the North American Association of State Lotteries." Public Gaming Research Institute--Draft Copy 25 March 1985: 1-27.

(2) "Across State Lines: 'Lotteries Make 22 States $3.7B Richer.'" USA Today 29 April 1986.

(3) Akey, Denise S. "National Organizations of the U.S., Part I." Encyclopedia of Associations 1985. 19th ed. 1985.

(4) "Americans Are Warned About Canadian Lotteries." Stillwater News Press 12 Feb. 1986: 16.

(5) "Annual Report, Colorado Lottery." Colorado Lottery Commission, Raymond J. Herrick, Chairman March 1986.

(6) Blakey, Robert G. "Legal Regulation of Gambling Since 1950." Annals of the American Academy of Political and Social Science July 1984: 12-22.

(7) The Book of the States 1984-1985. Lexington, Kentucky: The Council of State Governments, 1984.

(8) Bradshaw, Jim. "What's Wrong With the Lottery." Shawnee News Star, Shawnee, OK. 29 June 1986.

(9) Brasmer, Nancy J. "California State Lottery Initiative Constitutional Amendment and Statute." California Schools Employees Association Feb. 1985.

(10) Brennan, Joe. "New Lottery Game Offers Instant $20,000 Jackpot." Council Bluffs Nonpareil 5 March 1985: 7.

(11) Brown, Lawrence A. "The Market and Infrastructure Context of Adoption: 'A Spatial Perspective on the Diffusion of Innovation.'" Economic Geography July 1975: 185-216.

(12) ________. Innovation Diffusion: A New Perspective. London & New York: Methuen, 1981.

(13) Brunn, Stanley D. Geography and Politics in America. New York: Harper & Row, 1974.

(14) Burke, Duane V. "Lotteries are Good for State Government." Public Gaming Aug. 1984: 2.

(15) Calubrese, Dominic. "Taxes, Lotteries Among Nov. 6 Ballot Issues." State Government News Oct. 1984: 10-11.

(16) "Casinos." State Policy Reports 29 Jan. 1986: 12-18.

(17) "Chance to Win Iowa Lotto Better Than Illinois Game." Council Bluffs Nonpareil 26 Feb. 1986: 11.

(18) Clark, Jill. "Policy Diffusion and Program Scope: Research Directions." Publius: The Journal of Federalism Fall 1985: 61-70.

(19) "Colorado Lottery Approved." State Government News July 1982: 20.

(20) County and City Data Book 1983. Washington, D.C.: U.S. Department of Commerce, Bureau of the Census, 1983.

(21) Cousineau, Colleen. "Southern Report." State Government News June 1983: 19.

(22) Cureton, Edward E., and Ralph B. D'Agostino. Factor Analysis, An Applied Approach. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1983.

(23) Curry, Bill. "State Lotteries: Roses and Thorns." State Legislatures March 1984: 9-16.

(24) "Do Lotteries Increase Compulsive Gambling?" The Lottery Journal Jan. 1985: 22-23.

(25) Duncan, Harley T., Kansas Secretary of Revenue. "Adoption of the Lottery Amendment in Kansas." Public Gaming May 1986: 28-30.

(26) "The Economic Potential of State Lotteries." Public Gaming Jan. 1982: 4-21.

(27) Elverum, Ken. "Research Monograph on State Lotteries." Legislative Research Inc., Salem, Oregon March 1983: 1-16.

(28) Gaylord, Edward L. "Raising Revenue on Greed." EDITORIAL. Daily Oklahoman (Oklahoma City, Ok.) 12 Feb. 1986: 34.

(29) Glover, Mike. "Lottery Bucks Can't Solve Everything." Council Bluffs Nonpareil 13 Feb. 1986: 12.

(30) Greiner, John. "Senate Panel Rejects Bill on Lottery." Daily Oklahoman (Oklahoma City, Ok.) 12 Feb. 1986: 6.

(31) Hagget, Peter. Geography: A Modern Synthesis. New York: Harper & Row Publishers, 1972.

(32) Hammond World Atlas New York: 1980.

(33) "House Committee Defeats Lottery Election Bill, 4-3." Daily O'Collegian (Stillwater, Ok.) 20 Feb. 1986: 7.

(34) "Illinois Totals Lottery Take." State Government News March 1982: 19.

(35) "Iowa Lottery Monthly Marketing Report." Carole Custer, Director of Marketing 17 June 1986: 1-2.

(36) "Iowa Lottery Summary 1985-1986." UNPUBLISHED, Bret Voorhees, Communications Director--Iowa Lottery Commission July 1986: 2-21.

(37) "Iowa On-Line." Public Gaming June 1986: 44-45.

(38) Jones, Stephen B. Boundary Making. Washington, D.C.: Carnegie Endowment for International Peace, 1945.

(39) Johnston, R. J. Political, Electoral, and Spatial Systems: An Essay in Political Geography. Oxford: Clarendon Press, 1979.

(40) Kaplan, Roy H. "The Social and Economic Impact of State Lotteries." Annals of the American Association of Political and Social Science July 1984: 91-106.

(41) Kearney, Shery. "Phosphate Bans, Legal Gambling at Issue." State Government News May 1985: 28.

(42) Kielhorn, Thomas. "Oklahoma Lottery Survey Executive Summary." Thomas Kielhorn and Associates Public Opinion Consulting and Research June 1986.

(43) Kim, Jae-on, and Charles W. Mueller. Introduction to Factor Analysis--What It Is and How to Do It. New York: Sage Publications, 1978.

(44) ______________________________ . Factor Analysis--Statistical Methods and Practical Issues. New York: Sage Publications, 1978.

(45) Knapp, Elaine S. "More States Look at Lottery Profits." State Government News Aug. 1985: 9-11.

(46) ____________. "Lotteries Raise Cash for States." State Government News June 1983: 4-11.

(47) ____________. "1985 State Issues Anticipate 1986 Actions." State Government News Jan. 1986: 4.

(48) La Fleur, Terri. "The State of Lotteries 1986: 'Lottery Tidal Wave Washes Over U.S.'" Gaming and Wagering Business June 1986: 1-2.

(49) ______________ . "Lotteries--'Three Digit Game is Eclipsed as America's Choice.'" Gaming and Wagering Business June 1986: 48.

(50) Lanegian, David A., and Risa Palm. An Invitation to Geography. New York: McGraw-Hill Book Company, 1973.

(51) "Legislation: 'What's Hot, What's Not in the U.S.'" Gaming and Wagering Business April 1986: 9.

(52) "Legislative Actions--'Iowa Divides Lottery Revenues.'" State Government News Oct. 1985: 24-25.

(53) Leonard, Saul F. "Lotteries are Integral to the Picture." Gaming Business Magazine June 1984: 42.

(54) "Lotteries Make Bucks." State Government News Jan. 1983: 11.

(55) "Lotteries, Parimutuel Mutually Beneficial." The Lottery Journal Oct. 1984: 38-39.

(56) "Lotteries Spend $118.5 M on Advertising in Fiscal 1986." Gaming and Wagering Business June 1986: 48.

(57) "Lottery Fever Continues." State Government News Oct. 1985: 12.

(58) "Lottery Industry Outlook 1985." Public Gaming Magazine Jan. 1985: 16-23.

(59) "Lottery Legislation Up for Review Across the United States." Public Gaming Magazine March 1985: 9-14.

(60) "Lottery Revenue Raising Potential is Becoming a Hot Topic in State Legislatures." Public Gaming Magazine May 1986: 3.

(61) "Lottery Revenues Continue to Climb." The Lottery Journal Oct. 1984: 22-23.

(62) "Lottery Update." State Government News July 1983: 10.

(63) "Massachusetts Has Highest Lottery Purchase Rate." Stillwater News Press (Stillwater, Ok.) 24 Aug. 1986: 10A.

(64) "Montana Sets Lottery Vote." State Government News July 1985: 28.

(65) Morrill, Richard L., and Diane Manninen. "Critical Parameters of Spatial Diffusion Processes." Economic Geography July 1975: 269-288.

(66) Mote, Robert L. "Scientific Games, Inc." (ADVERTISEMENT) State Government News Sept. 1983: 24.

(67) ______________ . "Scientific Games, Inc." (ADVERTISEMENT) State Government News Feb. 1984: 2.

(68) The Municipal Year Book 1984. Washington, D.C.: International City Management Association, 1984.

(69) "Next Up for a Lottery: Florida?--'Lottery Prospect: The Sunshine State.'" The Lottery Journal Jan. 1985: 16-17.

(70) "Oklahoma Initiative Lottery Petition." Lottery Is OK Committee, Carolyn Thrift, Chairperson. Oklahoma City, Ok. Aug. 1986.

(71) "Out of State Lottery Players." West Virginia Lottery, Nancy Hill; Public Relations and Drawing Manager. Charleston, West Virginia Sept. 1986.

(72) "Out of State Lottery Players." Colorado Lottery, Vickie Robb; Communications Director. Denver, Colorado 22 Sept. 1986.

(73) "Overview of State Lotteries." Congressional Research Services; Library of Congress. Washington, D.C.: 14 Jan. 1985: 1-35.

(74) "Polling Results Released on Oklahoma Lottery." Lottery Is OK Committee Oklahoma City, Ok. 19 May 1986.

(75) Puncke, Martin M. "Lotteries Success Based on Positive Image." The Lottery Journal Oct. 1985: 42.

(76) Reeves, Gregory S. "Poll Shows Lottery Winning Widespread Bi-State Support." Kansas City Star 2 March 1986: 17B.

(77) SAS User's Guide: Basics 1984 Edition. Cary, North Carolina: SAS Institute Inc., 1984.

(78) SAS User's Guide: Statistics 1984 Edition. Cary, North Carolina: SAS Institute Inc., 1984.

(79) Savage, Robert L. "Diffusion Research Traditions and the Spread of Policy Innovations in a Federal System." Publius: The Journal of Federalism Fall 1985: 1-26.

(80) "Starting a State Lottery." The Lottery Journal Jan. 1985: 6-10.

(81) State Administrative Officials Classified by Function 1985-86. The Book of States--Supplement Three. Lexington, Kentucky: The Council of State Governments, 1985.

(82) "State Lotteries." State Policy Reports 15 June 1985: 1-25.

(83) "State Lottery Laws: 'There's Room for Improvement.'" Public Gaming Jan. 1982: 49-50.

(84) "States Giving OK's to Lotteries, Tax Measures." Tulsa World 5 Nov. 1986: 5C.

(85) "State Update." State Policy Reports 5 Sept. 1985: 27.

(86) Sternlieb, George, and James W. Hughes. The Atlantic City Gamble. Cambridge, Massachusetts: Harvard University Press, 1983.

(87) Stewart, John Q. "Empirical Mathematical Rules Concerning the Distribution and Equilibrium of Population." Geographical Review July 1947: 461-485.

(88) Sullivan, George. By Chance a Winner: The History of Lotteries. New York: Dodd & Mead, 1972.

(89) Taylor, Peter J. Geography of Elections. New York: Holmes & Meir Publishers, 1979.

(90) ____________. Quantitative Methods in Geography: An Introduction to Spatial Analysis. Prospect Heights, Illinois: Waveland Press Inc., 1977.

(91) Tillet, Debbie. "Gambling on Revenues--'State Lotteries.'" State Government News June 1983: 15.

(92) United States Senate. "Subcommittee on Criminal Law of the Committee on the Judiciary." Modernizing Federal Restrictions on Gaming Advertising. 98th Cong., 1st sess. S. 1876. Washington, D.C.: GPO, 1984.

(93) ______________. "Subcommittee on Intergovernmental Relations of the Committee on Governmental Affairs." State Lotteries: An Overview. 98th Cong., 2nd sess. S. HRG. 98-1265. Washington, D.C.: GPO, 1984.

(94) Walker, Jack L. "The Diffusion of Innovations Among the American States." American Political Science Review Sept. 1969: 880-899.

(95) Weinstein, David. The Impact of Legalized Gambling: The Socioeconomic Consequence of Lotteries and Off-Track Betting. New York: Praeger, 1974.

(96) Zelinsky, Wilbur. "Selfward Bound? 'Personal Preference Patterns and the Changing Map of American Society.'" Economic Geography Jan. 1974.

APPENDIX

TABLE XIV

R-MODE FACTORS BY LOTTERY VARIABLES

	Factors	Lottery Variable Factors Load on
Factor One	Economic Factor	Cost/Savings Per Capita
Factor Two	Geographic Factor	Distance Influence Index
Factor Three	Gambling Factor	Dog Racing
Factor Four	Boundary Factor	Boundary Influence Index
Factor Five	Sports Betting Factor	Sports Betting
Factor Six	Political Factor	Innovativeness Index

Note: Taken from factor scoring coefficients, Table XIX.

TABLE XV

RAW DATA MATRIX

OBS	STATE	AS	AM	LR	BII	BPI	DIICC	DIIUC	II	GRIRNK	GRIPCT	GRCUTS	COST	SAVINGS	GISPBET	OTB	HORSE	DOG	JA	CASINOS	BINGO
1	AK.	1	1	4	20	6.3	3	3	32	12	4.7	120	51.0	22.2	2	2	3	3	2	2	3
2	AL.	1	1	4	5	6.2	5	5	30	9	5.2	214	53.7	22.7	2	2	2	3	2	2	3
3	AZ.	3	2	1	8	19.1	5	6	36	1	1.0	1	1.0	1.0	2	3	3	3	2	2	3
4	CA.	3	2	1	16	18.2	5	5	3	1	1.0	1	1.0	1.0	2	2	3	2	2	2	3
5	CO.	3	3	1	10	16.9	5	6	9	1	1.0	1	1.0	1.0	2	3	3	3	2	2	3
6	CT.	3	4	1	10	21.3	1	1	6	1	1.0	1	1.0	1.0	2	3	3	3	3	2	3
7	DE.	3	4	1	10	18.4	1	1	40	1	1.0	1	1.0	1.0	3	2	3	2	2	2	3
8	FL.	2	1	2	1	11.4	8	6	31	10	5.1	468	42.6	27.8	2	3	3	3	3	2	3
9	GA.	1	1	4	6	6.1	5	4	37	21	3.9	278	47.6	25.6	2	2	2	2	2	2	3
10	IA.	3	4	1	23	18.4	3	3	29	1	1.0	1	1.0	1.0	2	2	3	3	2	2	3
11	ID.	2	1	4	32	12.0	3	3	32	3	6.0	60	59.5	57.2	2	2	3	2	2	2	2
12	IL.	3	4	1	22	19.7	2	4	13	1	1.0	1	1.0	1.0	2	3	3	2	2	2	3
13	IN,	1	1	6	26	6.9	2	2	18	11	4.8	242	44.0	66.7	3	2	2	2	2	2	2
14	KS.	2	1	4	37	12.4	4	2	25	16	4.3	119	48.8	30.4	2	2	3	3	2	2	3
15	KY.	1	1	4	20	6.4	3	3	27	15	4.3	190	50.9	23.8	2	3	3	2	2	2	2
16	LA.	1	1	4	5	5.9	5	6	19	24	3.1	250	56.0	24.8	2	3	3	2	2	2	3
17	MA.	3	4	1	16	19.3	1	1	2	1	1.0	1	1.0	1.0	2	3	3	3	2	2	3
18	MD.	3	5	1	22	19.6	2	2	16	1	1.0	1	1.0	1.0	2	2	3	2	2	2	3
19	ME.	3	3	1	8	16.6	2	1	20	1	1.0	1	1.0	1.0	2	2	3	2	2	2	3
20	MI.	3	4	1	4	18.2	3	2	5	1	1.0	1	1.0	1.0	2	2	3	2	2	2	3
21	MN.	1	1	4	19	5.9	3	2	12	26	2.3	224	53.9	74.2	2	2	3	2	2	2	3
22	MO.	3	4	1	31	18.9	2	2	39	1	1.0	1	1.0	1.0	2	2	2	2	2	2	3
23	MS.	1	1	4	1	6.3	4	5	48	8	5.3	151	52.0	20.2	2	2	2	2	2	2	2
24	MT.	2	1	2	17	10.8	5	4	38	1	6.5	65	19.0	23.4	3	2	3	2	2	2	3
25	NC.	1	1	3	1	6.4	3	3	24	17	4.2	249	40.4	24.3	2	2	2	2	2	2	3
26	ND.	2	1	2	13	10.8	5	5	23	22	3.5	53	76.9	28.6	2	2	2	2	2	2	3
27	NE.	2	1	2	32	11.7	4	2	26	5	5.8	89	55.5	28.1	2	2	3	2	2	2	3
28	NH.	3	4	1	20	19.4	1	1	16	1	1.0	1	1.0	1.0	2	2	3	3	2	2	3
29	NJ.	3	3	1	16	21.2	1	1	4	1	1.0	1	1.0	1.0	2	2	3	2	2	3	3
30	NM.	1	1	3	41	5.9	4	3	41	23	3.1	80	56.4	23.2	2	2	3	2	2	2	3
31	NV.	1	1	2	37	6.2	3	2	47	4	5.8	51	55.5	29.5	3	3	3	3	3	3	3
32	NY.	3	3	1	32	20.3	2	3	1	1	1.0	1	1.0	1.0	2	3	3	2	2	2	3
33	OH.	3	4	1	20	19.2	2	2	11	1	1.0	1	1.0	1.0	2	2	3	2	2	2	3
34	OK.	2	1	2	23	12.1	4	3	42	6	5.6	144	43.8	26.9	2	3	3	2	2	2	3
35	OR.	3	2	1	30	18.2	3	2	8	1	1.0	1	1.0	1.0	2	2	3	3	2	2	3
36	PN.	3	4	1	44	20.4	2	2	7	1	1.0	1	1.0	1.0	2	3	3	2	2	2	3
37	RI.	3	3	1	6	18.9	1	1	15	1	1.0	1	1.0	1.0	2	2	3	3	3	2	3
38	SC.	1	1	6	1	6.2	4	4	45	18	4.1	147	44.5	22.8	2	2	2	2	2	2	3
39	SD.	2	1	2	22	11.2	4	2	43	2	6.3	55	77.2	80.5	2	2	3	3	2	2	3
40	TN.	1	1	6	2	6.2	4	3	34	7	5.6	225	47.6	23.8	2	2	2	2	2	2	3
41	TX.	2	1	4	10	12.1	7	5	44	14	4.4	661	41.3	28.3	2	2	2	2	2	2	3
42	UT.	1	1	4	27	5.7	4	4	22	20	4.0	91	55.1	22.4	2	2	2	2	2	2	2
43	VI.	1	1	3	26	6.8	2	3	21	13	4.4	241	42.8	29.6	2	2	2	2	2	2	3
44	VT.	3	3	1	18	17.7	1	1	28	1	1.0	1	1.0	1.0	2	2	3	3	2	2	3
45	WA.	3	3	1	21	17.9	3	3	14	1	1.0	1	1.0	1.0	3	3	3	2	2	2	3
46	WI.	1	1	6	18	6.5	3	3	10	25	3.1	232	48.7	28.2	2	2	2	2	2	2	3
47	WV.	3	4	1	24	18.8	2	2	35	1	1.0	1	1.0	1.0	2	3	3	3	2	2	3
48	WY.	1	1	2	29	5.8	3	2	46	19	4.0	40	79.0	28.9	2	2	3	2	2	2	3

TABLE XVI

PEARSON CORRELATION MATRIX--R-MODE

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / N = 48

	AS	AM	LR	BII	BPI	DIICC	DIIUC	II	GRIRNK	GRIPCT	GRCUTS	COST	SAVINGS
AS	1.00000	0.84462	-0.84879	0.07286	0.98704	-0.38661	-0.30709	-0.46743	-0.80761	-0.76934	-0.60374	-0.86758	-0.68280
	0.0000	0.0001	0.0001	0.6226	0.0001	0.0066	0.0337	0.0008	0.0001	0.0001	0.0001	0.0001	0.0001
AM	0.84462	1.00000	-0.72878	0.06097	0.87385	-0.62088	-0.44669	-0.47253	-0.68679	-0.84034	-0.61466	-0.86461	-0.72653
	0.0001	0.0000	0.0001	0.6806	0.0001	0.0001	0.0015	0.0007	0.0001	0.0001	0.0001	0.0001	0.0001
LR	-0.84879	-0.72878	1.00000	-0.16097	-0.82673	0.34563	0.28667	0.32395	0.71741	0.65346	0.64626	0.69987	0.63887
	0.0001	0.0001	0.0000	0.2744	0.0001	0.0161	0.0482	0.0247	0.0001	0.0001	0.0001	0.0001	0.0001
BII	0.07286	0.06097	-0.16097	1.00000	0.09651	-0.28411	-0.36714	-0.04522	-0.07183	-0.00373	-0.32434	0.04797	0.10821
	0.6226	0.6806	0.2744	0.0000	0.5140	0.0503	0.0103	0.7602	0.6275	0.9799	0.0245	0.7461	0.4641
BPI	0.98704	0.87385	-0.82673	0.09651	1.00000	-0.45559	-0.34746	-0.50882	-0.80303	-0.79146	-0.60211	-0.88498	-0.69891
	0.0001	0.0001	0.0001	0.5140	0.0000	0.0011	0.0155	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
DIICC	-0.38661	-0.62088	0.34563	-0.28411	-0.45559	1.00000	0.83424	0.38323	0.39497	0.52321	0.62238	0.48510	0.32752
	0.0066	0.0001	0.0161	0.0503	0.0011	0.0000	0.0001	0.0072	0.0055	0.0001	0.0001	0.0005	0.0231
DIIUC	-0.30709	-0.44669	0.28667	-0.36714	-0.34746	0.83424	1.00000	0.21108	0.32608	0.29606	0.45119	0.29558	0.10820
	0.0337	0.0015	0.0482	0.0103	0.0155	0.0001	0.0000	0.1498	0.0237	0.0410	0.0013	0.0414	0.4641
II	-0.46743	-0.47253	0.32395	-0.04522	-0.50882	0.38323	0.21108	1.00000	0.23094	0.61478	0.31976	0.52908	0.35956
	0.0008	0.0007	0.0247	0.7602	0.0002	0.0072	0.1498	0.0000	0.1143	0.0001	0.0267	0.0001	0.0121
GRIRNK	-0.80761	-0.68679	0.71741	-0.07183	-0.80303	0.39497	0.32608	0.23094	1.00000	0.42250	0.58387	0.74712	0.53762
	0.0001	0.0001	0.0001	0.6275	0.0001	0.0055	0.0237	0.1143	0.0000	0.0028	0.0001	0.0001	0.0001
GRIPCT	-0.76934	-0.84034	0.65346	-0.00373	-0.79146	0.52321	0.29606	0.61478	0.42250	1.00000	0.55538	0.83897	0.74154
	0.0001	0.0001	0.0001	0.9799	0.0001	0.0001	0.0410	0.0001	0.0028	0.0000	0.0001	0.0001	0.0001
GRCUTS	-0.60374	-0.61466	0.64626	-0.32434	-0.60211	0.62238	0.45119	0.31976	0.58387	0.55538	1.00000	0.52746	0.49057
	0.0001	0.0001	0.0001	0.0245	0.0001	0.0001	0.0013	0.0267	0.0001	0.0001	0.0000	0.0001	0.0004
COST	-0.86758	-0.86461	0.69987	0.04797	-0.88498	0.48510	0.29558	0.52908	0.74712	0.83897	0.52746	1.00000	0.80867
	0.0001	0.0001	0.0001	0.7461	0.0001	0.0005	0.0414	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001
SAVINGS	-0.68280	-0.72653	0.63887	0.10821	-0.69891	0.32752	0.10820	0.35956	0.53762	0.74154	0.49057	0.80867	1.00000
	0.0001	0.0001	0.0001	0.4641	0.0001	0.0231	0.4641	0.0121	0.0001	0.0001	0.0004	0.0001	0.0000
GISPBET	0.04911	0.02828	-0.16706	0.07728	0.01419	-0.04008	-0.08843	0.22399	-0.21813	0.09705	-0.15581	-0.10492	-0.06575
	0.7403	0.8487	0.2564	0.6016	0.9237	0.7868	0.5501	0.1259	0.1364	0.5117	0.2903	0.4779	0.6570
OTB	0.23250	0.21496	-0.29884	0.06436	0.26066	0.03168	0.21124	-0.17673	-0.22466	-0.19560	-0.09402	-0.24032	-0.25648
	0.1118	0.1423	0.0391	0.6639	0.0736	0.8307	0.1495	0.2295	0.1247	0.1827	0.5250	0.0999	0.0785
HORSE	0.54215	0.40894	-0.63367	0.30040	0.52460	-0.24601	-0.30838	-0.26071	-0.47870	-0.38465	-0.51883	-0.38481	-0.25953
	0.0001	0.0039	0.0001	0.0380	0.0001	0.0892	0.0330	0.0735	0.0006	0.0108	0.0002	0.0055	0.0749

TABLE XVI. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 48

	AS	AM	LR	BII	BPI	DIICC	DIIUC	II	GRIRNK	GRIPCT	GRCUTS	COST	SAVINGS
DOG	0.26325	0.16581	-0.28245	-0.02758	0.25053	-0.03760	-0.08888	0.00213	-0.32570	-0.12963	-0.18025	-0.19198	-0.14640
	0.0706	0.2600	0.0518	0.8524	0.0859	0.7997	0.5480	0.9886	0.0239	0.3799	0.2202	0.1911	0.3208
JA	0.04911	0.02828	-0.16706	-0.13104	0.07270	0.00802	-0.08843	0.00635	-0.13662	0.04306	0.06945	-0.03855	-0.04901
	0.7403	0.8487	0.2564	0.3747	0.6234	0.9569	0.5501	0.9658	0.3545	0.7713	0.6390	0.7947	0.7408
CASINOS	-0.02426	-0.01956	-0.11553	0.15104	0.02330	-0.16075	-0.20093	0.01568	-0.13206	0.04845	-0.11317	-0.00157	-0.02942
	0.8700	0.8950	0.4342	0.3055	0.8751	0.2751	0.1709	0.9158	0.3709	0.7437	0.4438	0.9915	0.8427
BINGO	0.34436	0.28786	-0.42269	-0.08588	0.32880	0.00181	-0.10572	-0.12164	-0.14870	-0.33742	-0.12040	-0.30340	-0.34466
	0.0165	0.0473	0.0028	0.5616	0.0225	0.9902	0.4745	0.4102	0.3131	0.0190	0.4150	0.0361	0.0164

	GISPBET	OTB	HORSE	DOG	JA	CASINOS	BINGO
AS	0.04911	0.23250	0.54215	0.26325	0.04911	-0.02426	0.34436
	0.7403	0.1118	0.0001	0.0706	0.7403	0.8700	0.0165
AM	0.02828	0.21496	0.40894	0.16581	0.02828	-0.01956	0.28786
	0.8487	0.1423	0.0039	0.2600	0.8487	0.8950	0.0473
LR	-0.16706	-0.29884	-0.63367	-0.28245	-0.16706	-0.11553	-0.42269
	0.2564	0.0391	0.0001	0.0518	0.2564	0.4342	0.0028
BII	0.07728	0.06436	0.30040	-0.02758	-0.13104	0.15104	-0.08588
	0.6016	0.6639	0.0380	0.8524	0.3747	0.3055	0.5616
BPI	0.01419	0.26066	0.52460	0.25053	0.07270	0.02330	0.32880
	0.9237	0.0736	0.0001	0.0859	0.6234	0.8751	0.0225
DIICC	-0.04008	0.03168	-0.24801	-0.03760	0.00802	-0.16075	0.00181
	0.7868	0.8307	0.0892	0.7997	0.9569	0.2751	0.9902
DIIUC	-0.08843	0.21124	-0.30838	-0.08888	-0.08843	-0.20093	-0.10572
	0.5501	0.1495	0.0330	0.5480	0.5501	0.1709	0.4745
LI	[illegible]	[illegible]	0.26071	0.00213	0.00635	0.01568	-0.12164
	[illegible]	0.2295	0.0735	0.9886	0.9658	0.9158	0.4102
GRIRNK	-0.21813	-0.22466	-0.47870	-0.32570	-0.13662	-0.13206	-0.14870
	0.1364	0.1247	0.0006	0.0239	0.3548	0.3709	0.3131
GRIPCT	0.09705	-0.19560	-0.36465	-0.12963	0.04306	0.04845	-0.33742
	0.5117	0.1827	0.0108	0.3799	0.7713	0.7437	0.0190
GRCUTS	-0.15581	-0.09402	-0.51983	-0.18025	0.06945	-0.11317	-0.12040
	0.2903	0.5250	0.0002	0.2202	0.6390	0.4438	0.4150
COST	-0.10492	-0.24032	-0.39481	-0.19198	-0.03855	-0.00157	-0.30340
	0.4779	0.0999	0.0055	0.1911	0.7947	0.9915	0.0361

TABLE XVI. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 48

	GISPBET	OTB	HORSE	DOG	JA	CASINOS	BINGO
SAVINGS	-0.06575	-0.25648	-0.25953	-0.14640	-0.04901	-0.02942	-0.34466
	0.6570	0.0785	0.0749	0.3208	0.7408	0.8427	0.0164
GISPBET	1.00000	0.13820	0.18376	-0.05330	0.18182	0.31435	0.10281
	0.0000	0.3489	0.2112	0.7190	0.2162	0.0296	0.4868
OTB	0.13820	1.00000	0.39108	0.22687	0.30403	0.09557	0.06877
	0.3489	0.0000	0.0060	0.1210	0.0356	0.5182	0.6423
HORSE	0.18376	0.39108	1.00000	0.33150	0.18376	0.12708	0.25258
	0.2112	0.0060	0.0000	0.0214	0.2112	0.3894	0.0833
DOG	-0.05330	0.22687	0.33150	1.00000	0.42640	0.07372	0.24112
	0.7190	0.1210	0.0214	0.0000	0.0025	0.6185	0.0987
JA	0.18182	0.30403	0.18376	0.42640	1.00000	0.31435	0.10281
	0.2162	0.0356	0.2112	0.0025	0.0000	0.0296	0.4868
CASINOS	0.31435	0.09557	0.12708	0.07372	0.31435	1.00000	0.07110
	0.0296	0.5182	0.3894	0.6185	0.0296	0.0000	0.6311
BINGO	0.10281	0.06877	0.25258	0.24112	0.10281	0.07110	1.00000
	0.4868	0.6423	0.0833	0.0987	0.4868	0.6311	0.0000

TABLE XVII

INITIAL FACTOR PATTERN MATRIX--R-MODE

PRIOR COMMUNALITY ESTIMATES: ONE

EIGENVALUES OF THE CORRELATION MATRIX: TOTAL = 20 AVERAGE = 1

	1	2	3	4	5	6	7	8	9	10
EIGENVALUE	8.220953	2.082291	2.042960	1.175632	1.167283	1.021863	0.912213	0.629780	0.559714	0.488648
DIFFERENCE	6.138662	0.039331	0.867328	0.008348	0.145420	0.109650	0.282433	0.070066	0.071066	0.086514
PROPORTION	0.4110	0.1041	0.1021	0.0588	0.0584	0.0511	0.0456	0.0315	0.0280	0.0244
CUMULATIVE	0.4110	0.5152	0.6173	0.6761	0.7345	0.7855	0.8312	0.8626	0.8906	0.9151

	11	12	13	14	15	16	17	18	19	20
EIGENVALUE	0.402134	0.393941	0.283442	0.223108	0.137379	0.097164	0.086123	0.047311	0.023633	0.004425
DIFFERENCE	0.008193	0.110498	0.060335	0.085728	0.040215	0.011041	0.038812	0.023678	0.019208	
PROPORTION	0.0201	0.0197	0.0142	0.0112	0.0069	0.0049	0.0043	0.0024	0.0012	0.0002
CUMULATIVE	0.9352	0.9549	0.9690	0.9802	0.9871	0.9919	0.9962	0.9986	0.9998	1.0000

6 FACTORS WILL BE RETAINED BY THE MINEIGEN CRITERION

FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
AS	-0.93121	0.06266	-0.15366	-0.02305	0.09148	0.11413
AM	-0.91380	-0.13102	-0.12935	-0.06104	-0.06812	-0.03791
LR	0.86542	-0.20022	-0.05304	0.04622	-0.15109	-0.15115
BII	-0.14709	-0.32187	0.56980	0.28104	0.45289	0.06513
BPI	-0.94671	0.02868	-0.13351	0.00682	0.04464	0.03792
DIICC	0.60406	0.54542	-0.35364	-0.03815	0.27430	0.14456
DIIUC	0.46520	0.48633	-0.54476	-0.04819	0.35122	-0.11832
TI	0.53753	0.23175	0.25551	-0.32984	0.10325	0.41368
GRIRNK	0.79124	-0.14763	-0.11677	0.13690	-0.08667	-0.10706
GRIPCT	0.84092	0.15437	0.30949	-0.03182	0.08975	0.12386
GRCUTS	0.73383	0.23047	-0.26574	0.00705	-0.18120	-0.09093
COST	0.90609	-0.00504	0.23636	0.14895	0.04995	0.10053
SAVINGS	0.76160	-0.10261	0.31234	0.23777	0.04280	0.11476
GISPBET	-0.10529	0.29216	0.47911	-0.64446	0.20459	-0.09907
OTB	-0.29311	0.55193	0.01630	0.28875	0.34600	-0.45949
HORSE	-0.60666	0.23824	0.33307	0.28259	0.31224	0.13008
DOG	-0.29454	0.50576	0.15800	0.42876	-0.29617	0.36578
JA	-0.11141	0.61505	0.32740	0.17719	-0.46686	-0.20938
CASINOS	-0.09386	0.20866	0.59197	-0.23797	-0.23068	-0.35575
BINGO	-0.36868	0.30875	-0.11580	-0.16937	-0.21074	0.41525

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
8.220953	2.082291	2.042960	1.175632	1.167283	1.021863

TABLE XVIII

VARIMAX ROTATED FACTOR PATTERN MATRIX--R-MODE

ORTHOGONAL TRANSFORMATION MATRIX

	1	2	3	4	5	6
1	0.83317	0.23390	-0.15674	-0.20921	-0.04508	0.06411
2	-0.05911	0.65817	0.66348	-0.08203	0.33736	0.05076
3	0.30427	-0.46300	0.25252	0.53482	0.58487	0.03429
4	0.17260	-0.04127	0.46727	0.38463	-0.65117	-0.42215
5	-0.05758	0.54353	-0.47837	0.68397	0.04435	-0.05140
6	0.00294	-0.02444	0.15585	0.21845	-0.34073	0.90072

ROTATED FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
AS	-0.92835	-0.05754	0.11199	0.18613	-0.04657	0.04604
AM	-0.89107	-0.27366	0.02180	0.05440	-0.02901	-0.07455
LR	0.81852	0.01486	-0.21157	-0.31157	-0.12288	-0.10440
BII	0.07776	-0.27709	-0.12179	0.79400	0.04620	-0.08948
BPI	-0.92704	-0.11769	0.12145	0.16574	-0.04111	-0.03483
DIICC	0.40190	0.81113	0.05138	-0.15573	-0.06231	0.18650
DIIUC	0.21073	0.87691	-0.09678	-0.23272	-0.08825	-0.06845
II	0.60399	0.21858	-0.00502	0.03930	0.28180	0.56153
GRIRNK	0.73986	0.09183	-0.16272	-0.24588	-0.21028	-0.11054
GRIPCT	0.85947	0.20206	0.01026	0.05313	0.17768	0.19274
GRCUTS	0.60169	0.34982	0.04659	-0.45564	-0.09240	-0.02593
COST	0.94088	0.11772	-0.02431	0.05067	-0.03334	0.09105
SAVINGS	0.85072	-0.02337	-0.00006	0.16193	-0.07830	0.05512
GISPBET	-0.09308	0.08605	-0.08311	0.12470	0.84601	0.19682
OTB	-0.27262	0.47453	0.31405	0.27210	0.19282	-0.54377
HORSE	-0.44768	0.01556	0.34022	0.63618	0.08804	-0.03356
DOG	-0.16455	0.00322	0.82065	0.14688	-0.14065	0.17590
JA	0.01615	-0.02879	0.78170	-0.14895	0.33926	-0.20409
CASINOS	0.05136	-0.26557	0.24634	-0.00791	0.68679	-0.18325
BINGO	-0.41341	0.05289	0.31978	-0.12870	0.01251	0.44442

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
7.394215	2.137206	1.797496	1.726927	1.571966	1.083173

FINAL COMMUNALITY ESTIMATES: TOTAL ≈ 15.710982

AS	AM	LR	BII	BPI	DIICC	DIIUC	II	GRIRNK	GRIPCT
0.916617	0.878736	0.839669	0.738245	0.918378	0.885010	0.889376	0.698517	0.699203	0.851171

GRCUTS	COST	SAVINGS	GISPBET	OTB	HORSE	DOG	JA	CASINOS	BINGO
0.703391	0.911671	0.759656	0.782992	0.805029	0.730005	0.772854	0.781088	0.639176	0.480187

TABLE XIX

FACTOR SCORING COEFFICIENTS--R-MODE

SCORING COEFFICIENTS ESTIMATED BY REGRESSION

SQUARED MULTIPLE CORRELATIONS OF THE VARIABLES WITH EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

STANDARDIZED SCORING COEFFICIENTS

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
AS	0.13794	0.06881	-0.01052	0.05146	-0.05055	0.09654
AM	0.12498	-0.06677	-0.04244	-0.07343	-0.00939	-0.02099
LR	0.10982	-0.09500	-0.02962	-0.13374	-0.03331	-0.14220
BII	0.09641	-0.03559	-0.09329	0.53683	-0.04839	-0.06288
BPI	-0.12925	0.03203	0.00089	0.02451	-0.04311	0.02009
DIICC	-0.01830	0.39533	0.01303	0.04971	-0.03284	0.14111
DIIUC	-0.06687	0.45848	-0.10238	-0.00887	-0.00023	-0.09611
II	0.04016	0.08040	-0.01514	0.08510	0.15643	0.49266
GRIRNK	0.10068	-0.04029	-0.00296	-0.07377	-0.10511	-0.13910
GRIPCT	0.12842	0.04252	0.04087	0.12219	0.08874	0.13216
GPCUTS	0.04689	0.07151	0.08979	-0.22063	-0.02324	-0.06782
COST	0.15789	-0.01376	0.06440	0.13850	-0.05224	0.04384
SAVINGS	0.16901	-0.07271	0.08586	0.19383	-0.09972	0.02257
GISPBET	-0.05388	0.10102	-0.20078	0.00444	0.58284	0.14943
OTB	-0.02250	0.32438	0.08636	0.18896	0.10211	-0.51249
HORSE	0.00044	0.11492	0.13284	0.39647	-0.05075	0.00610
DOG	0.05435	-0.04603	0.53387	0.07387	-0.24191	0.19418
JA	0.06710	-0.10157	0.46838	-0.19603	0.14792	-0.20801
CASINOS	0.04701	-0 6143	0.08714	-0.13993	0.44546	-0.20368
BINGO	-0.08114	0 1123	0.17347	-0.12322	-0.03376	0.43883

TABLE XX

PEARSON CORRELATION MATRIX--Q-MODE

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL1	COL2	COL3	COL4	COL5	COL6	COL7	COL8	COL9	COL10	COL11	COL12	COL13
COL1	1.00000 0.0000	0.97405 0.0001	0.04461 0.8519	-0.11252 0.6367	-0.11810 0.6200	-0.10392 0.6628	0.07641 0.7488	0.92839 0.0001	0.95997 0.0001	0.04792 0.8410	0.80850 0.0001	-0.02653 0.9116	0.95358 0.0001
COL2	0.97405 0.0001	1.00000 0.0000	-0.03950 0.8687	-0.16696 0.4817	-0.17000 0.4736	-0.14411 0.5444	-0.02012 0.9329	0.98588 0.0001	0.99615 0.0001	-0.07189 0.7633	0.68739 0.0008	-0.12631 0.5957	0.97630 0.0001
COL3	0.04461 0.8519	-0.03950 0.8687	1.00000 0.0000	0.42171 0.0640	0.72647 0.0003	0.56182 0.0099	0.98155 0.0001	-0.07585 0.7506	-0.03869 0.8713	0.88628 0.0001	0.12320 0.6048	0.66949 0.0012	-0.10096 0.6719
COL4	-0.11252 0.6367	-0.16696 0.4817	0.42171 0.0640	1.00000 0.0000	0.90747 0.0001	0.89032 0.0001	0.37990 0.0985	-0.14613 0.5387	-0.16334 0.4914	0.67157 0.0012	0.00749 0.9750	0.90926 0.0001	-0.12741 0.5925
COL5	-0.11810 0.6200	-0.17000 0.4736	0.72647 0.0003	0.90747 0.0001	1.00000 0.0000	0.91590 0.0001	0.66738 0.0013	-0.16163 0.4960	-0.16694 0.4818	0.81277 0.0001	-0.02013 0.9329	0.91082 0.0001	-0.17780 0.4533
COL6	-0.10392 0.6628	-0.14411 0.5444	0.56182 0.0099	0.89032 0.0001	0.91590 0.0001	1.00000 0.0000	0.54980 0.0120	-0.12893 0.5880	-0.14062 0.5543	0.69398 0.0007	-0.00975 0.9675	0.86590 0.0001	-0.13331 0.5753
COL7	0.07641 0.7488	-0.02012 0.9329	0.98155 0.0001	0.37990 0.0985	0.66738 0.0013	0.54980 0.0120	1.00000 0.0000	-0.06097 0.7985	-0.01857 0.9381	0.90311 0.0001	0.16441 0.4885	0.67259 0.0012	-0.07451 0.7549
COL8	0.92839 0.0001	0.98588 0.0001	-0.07585 0.7506	-0.14613 0.5387	-0.16163 0.4960	-0.12893 0.5880	-0.06097 0.7985	1.00000 0.0000	0.99380 0.0001	-0.10057 0.6731	0.58499 0.0067	-0.13017 0.5844	0.97066 0.0001
COL9	0.95997 0.0001	0.99615 0.0001	-0.03869 0.8713	-0.16334 0.4914	-0.16694 0.4818	-0.14062 0.5543	-0.01857 0.9381	0.99380 0.0001	1.00000 0.0000	-0.06874 0.7734	0.64642 0.0021	-0.12219 0.6078	0.97698 0.0001
COL10	0.04792 0.8410	-0.07189 0.7633	0.88628 0.0001	0.67157 0.0012	0.81277 0.0001	0.69398 0.0007	0.90311 0.0001	-0.10057 0.6731	-0.06874 0.7734	1.00000 0.0000	0.18443 0.4363	0.90342 0.0001	-0.08338 0.7267
COL11	0.80850 0.0001	0.68739 0.0008	0.12320 0.6048	0.00749 0.9750	-0.02013 0.9329	-0.00975 0.9675	0.16441 0.4885	0.58499 0.0067	0.64642 0.0021	0.18443 0.4363	1.00000 0.0000	0.11969 0.6152	0.73599 0.0002
COL12	-0.02653 0.9116	-0.12631 0.5957	0.66949 0.0012	0.90926 0.0001	0.91082 0.0001	0.86590 0.0001	0.67259 0.0012	-0.13017 0.5844	-0.12219 0.6078	0.90342 0.0001	0.11969 0.6152	1.00000 0.0000	-0.10190 0.6690
COL13	0.95358 0.0001	0.97630 0.0001	-0.10096 0.6719	-0.12741 0.5925	-0.17780 0.4533	-0.13331 0.5753	-0.07451 0.7549	0.97066 0.0001	0.97698 0.0001	-0.08338 0.7267	0.73599 0.0002	-0.10190 0.6690	1.00000 0.0000
COL14	0.98530 0.0001	0.94786 0.0001	0.01716 0.9427	-0.00190 0.9937	-0.06067 0.7994	-0.03268 0.8912	0.05286 0.8248	0.90659 0.0001	0.93648 0.0001	0.08898 0.7091	0.83683 0.0001	0.06408 0.7884	0.95572 0.0001
COL15	0.98350 0.0001	0.99590 0.0001	-0.03896 0.8705	-0.12522 0.5989	-0.15066 0.5261	-0.12121 0.6107	-0.01303 0.9565	0.97859 0.0001	0.99260 0.0001	-0.03565 0.8814	0.71709 0.0004	-0.07794 0.7440	0.98131 0.0001
COL16	0.96166 0.0001	0.99588 0.0001	-0.09838 0.6799	-0.17162 0.4694	-0.19621 0.4071	-0.15854 0.5044	-0.08006 0.7372	0.98817 0.0001	0.98650 0.0001	-0.12069 0.6123	0.65652 0.0017	-0.15274 0.5203	0.97768 0.0001

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL14	COL15	COL16	COL17	COL18	COL19	COL20	COL21	COL22	COL23	COL24	COL25	COL26
COL1	0.98530	0.98350	0.96166	-0.10174	-0.00345	0.01804	-0.14036	0.95141	0.08108	0.98336	0.92887	0.95231	0.80145
	0.0001	0.0001	0.0001	0.6695	0.9885	0.9398	0.5550	0.0001	0.7340	0.0001	0.0001	0.0001	0.0001
COL2	0.94786	0.89590	0.99588	-0.15604	-0.11035	-0.06713	-0.14588	0.96648	-0.04851	0.98267	0.88768	0.99495	0.68269
	0.0001	0.0001	0.0001	0.5112	0.6432	0.7785	0.5394	0.0001	0.8391	0.0001	0.0001	0.0001	0.0009
COL3	0.01716	-0.03896	-0.09838	0.36717	0.72709	0.95275	0.56595	-0.13966	0.86827	0.09628	0.32961	-0.07034	0.02593
	0.9427	0.8705	0.6799	0.1113	0.0003	0.0001	0.0093	0.5570	0.0001	0.6864	0.1558	0.7682	0.9136
COL4	-0.00190	-0.12522	-0.17162	0.95677	0.85937	0.60082	0.79639	-0.16182	0.60710	-0.18783	0.00488	-0.16993	-0.11967
	0.9937	0.5989	0.4694	0.0001	0.0001	0.0051	0.0001	0.4955	0.0045	0.4278	0.9837	0.4738	0.6153
COL5	-0.06067	-0.15066	-0.19621	0.84959	0.89155	0.83413	0.88912	-0.21834	0.74142	-0.13249	0.08166	-0.18138	-0.12830
	0.7994	0.5261	0.4071	0.0001	0.0001	0.0001	0.0001	0.3551	0.0002	0.5776	0.7322	0.4441	0.5898
COL6	-0.03268	-0.12121	-0.15854	0.93706	0.84868	0.76424	0.95239	-0.16464	0.61707	-0.13308	0.03851	-0.14549	-0.10359
	0.8912	0.6107	0.5044	0.0001	0.0001	0.0001	0.0001	0.4879	0.0038	0.5759	0.8719	0.5405	0.6638
COL7	0.05286	-0.01303	-0.08006	0.36832	0.74423	0.95642	0.52409	-0.11315	0.89803	0.11854	0.35849	-0.05129	0.05236
	0.8248	[illegible]	0.7372	0.1101	0.0002	0.0001	0.0177	0.6348	0.0001	0.6187	0.1206	0.8299	0.8265
COL8	0.90659	0.97859	0.98917	-0.13409	-0.12065	-0.09264	-0.12649	0.95228	-0.08312	0.94626	0.84686	0.99598	0.55742
	0.0001	0.0001	0.0001	0.5730	0.6124	0.6977	0.5951	0.0001	0.7275	0.0001	0.0001	0.0001	0.0107
COL9	0.93648	0.99260	0.99650	-0.15155	-0.10617	-0.06479	-0.14336	0.96520	-0.04549	0.97218	0.87949	0.99908	0.63368
	0.0001	0.0001	0.0001	0.5236	0.6559	0.7861	0.5465	0.0001	0.8490	0.0001	0.0001	0.0001	0.0027
COL10	0.08898	-0.03565	-0.12069	0.64461	0.94168	0.92694	0.57883	-0.13029	0.99265	0.02476	0.31024	-0.10092	0.01319
	0.7091	0.8814	0.6123	0.0022	0.0001	0.0001	0.0075	0.5840	0.0001	0.9175	0.1831	0.6720	0.9560
COL11	0.83693	0.71709	0.65652	0.01705	0.14332	0.11525	-0.08643	0.75939	0.22250	0.74077	0.82356	0.63539	0.88012
	0.0001	0.0004	0.0017	0.9431	0.5466	0.6285	0.7171	0.0001	0.3457	0.0002	0.0001	0.0026	0.0001
COL12	0.06408	-0.07794	-0.15274	0.89743	0.99108	0.80654	0.72570	-0.14615	0.87011	-0.09139	0.16795	-0.14245	-0.05220
	0.7884	0.7440	0.5203	0.0001	0.0001	0.0001	0.0003	0.5387	0.0001	0.7016	0.4791	0.5491	0.8270
COL13	0.95572	0.98131	0.97768	-0.10908	-0.09326	-0.10759	-0.15989	0.99419	-0.05727	0.94316	0.88834	0.97872	0.65318
	0.0001	0.0001	0.0001	0.6471	0.6957	0.6516	0.5007	0.0001	0.8105	0.0001	0.0001	0.0001	0.0018
COL14	1.00000	0.96980	0.94112	0.01137	0.07718	0.02264	-0.10120	0.95803	0.12091	0.84311	0.91867	0.92857	0.79191
	0.0000	0.0001	0.0001	0.9621	0.7464	0.9245	0.6712	0.0001	0.6116	0.0001	0.0001	0.0001	0.0001
COL15	0.96980	1.00000	0.99356	-0.11135	-0.06379	-0.05578	-0.14578	0.97306	-0.00857	0.97740	0.89677	0.99005	0.70306
	0.0001	0.0000	0.0001	0.6402	0.7893	0.8153	0.5397	0.0001	0.9714	0.0001	0.0001	0.0001	0.0005
COL16	0.94112	0.99356	1.00000	-0.15813	-0.14269	-0.11824	-0.16005	0.97194	-0.09868	0.96625	0.85525	0.99737	0.66528
	0.0001	0.0001	0.0000	0.5055	0.5484	0.6195	0.5003	0.0001	0.6789	0.0001	0.0001	0.0001	0.0014

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=O / N = 20

	COL27	COL28	COL29	COL30	COL31	COL32	COL33	COL34	COL35	COL36	COL37	COL38	COL39
COL1	0.96828	0.00163	-0.07983	0.92794	0.80877	-0.05380	-0.02987	0.99082	-0.02056	-0.01102	-0.03098	0.98058	0.69215
	0.0001	0.9945	0.7380	0.0001	0.0001	0.8218	0.9005	0.0001	0.9314	0.9632	0.8968	0.0001	0.0007
COL2	0.89923	-0.10440	-0.13974	0.82343	0.66216	-0.13621	-0.12549	0.97955	-0.12393	-0.11610	-0.09108	0.98392	0.56223
	0.0001	0.6614	0.5568	0.0001	0.0015	0.5669	0.5981	0.0001	0.6027	0.6259	0.7025	0.0001	0.0099
COL3	0.06630	0.75021	0.45505	0.17865	0.32418	0.26421	0.64144	0.10255	0.44710	0.33854	0.86832	0.08052	0.13875
	0.7812	0.0001	0.0438	0.4511	0.1632	0.2603	0.0023	0.6670	0.0481	0.1443	0.0001	0.7358	0.5596
COL4	0.01227	0.84264	0.95971	0.01686	0.04984	0.92731	0.92130	-0.07022	0.91197	0.86784	0.67597	-0.19758	-0.09446
	0.9591	0.0001	0.0001	0.9437	0.8347	0.0001	0.0001	0.7686	0.0001	0.0001	0.0011	0.4037	0.6920
COL5	-0.03289	0.89132	0.88635	-0.00366	0.07660	0.73758	0.90858	-0.05829	0.79024	0.70091	0.88124	-0.14771	-0.07371
	0.8905	0.0001	0.0001	0.9878	0.7482	0.0002	0.0001	0.8071	0.0001	0.0006	0.0001	0.5343	0.7574
COL6	-0.01373	0.86318	0.95896	-0.02331	0.03114	0.76037	0.89427	-0.05212	0.76953	0.69088	0.87762	-0.14244	-0.06762
	0.9542	0.0001	0.0001	0.9223	0.8963	0.0001	0.0001	0.8273	0.0001	0.0007	0.0001	0.5491	0.7770
COL7	0.10319	0.77032	0.45320	0.22587	0.37562	0.27300	0.65081	0.13095	0.46114	0.36507	0.86125	0.10433	0.17533
	0.6651	0.0001	0.0448	0.3383	0.1027	0.2442	0.0019	0.5821	0.0407	0.1135	0.0001	0.6616	0.4597
COL8	0.82979	-0.11623	-0.12404	0.74046	0.54929	-0.12066	-0.12691	0.94915	-0.12102	-0.11186	-0.10315	0.95316	0.44395
	0.0001	0.6256	0.6024	0.0002	0.0121	0.6124	0.5939	0.0001	0.6113	0.6387	0.6652	0.0001	0.0499
COL9	0.87134	-0.10047	-0.13581	0.80161	0.62181	-0.13162	-0.12123	0.97175	-0.11942	-0.11127	-0.08887	0.97921	0.51404
	0.0001	0.6734	0.5681	0.0001	0.0034	0.5802	0.6107	0.0001	0.6160	0.6405	0.7095	0.0001	0.0204
COL10	0.13450	0.84615	0.69860	0.25959	0.39241	0.64014	0.88279	0.10005	0.78797	0.72254	0.84217	0.01013	0.13182
	0.5718	0.0001	0.0006	0.2691	0.0870	0.0024	0.0001	0.6747	0.0001	0.0003	0.0001	0.9662	0.5796
COL11	0.90716	0.14527	0.04248	0.88164	0.93211	0.09183	0.11476	0.78169	0.13616	0.14771	0.05254	0.72744	0.97003
	0.0001	0.5411	0.8589	0.0001	0.0001	0.7002	0.6300	0.0001	0.5670	0.5343	0.8259	0.0003	0.0001
COL12	0.09509	0.98308	0.91922	0.16678	0.28342	0.88998	0.99517	0.02190	0.95005	0.80493	0.80363	-0.10387	0.02629
	0.6901	0.0001	0.0001	0.4822	0.2810	0.0001	0.0001	0.9270	0.0001	0.0001	0.0001	0.6630	0.9124
COL13	0.89858	-0.09149	-0.10165	0.81172	0.65690	-0.06622	-0.09828	0.96582	-0.06939	-0.04924	-0.12634	0.95165	0.61100
	0.0001	0.7013	0.6698	0.0001	0.0017	0.7815	0.6802	0.0001	0.7713	0.8367	0.5956	0.0001	0.0042
COL14	[illegible]	0.07665	0.02457	0.94033	0.81756	0.08273	0.06421	0.97724	0.10164	0.12013	-0.01856	0.94457	0.70503
	0.0001	0.7481	0.9181	0.0001	0.0001	0.7288	0.7880	0.0001	0.6698	0.6139	0.9381	0.0001	0.0005
COL15	0.92177	-0.06043	-0.09801	0.85837	0.69601	-0.07218	-0.07747	0.98587	-0.06084	-0.04678	-0.08498	0.98058	0.58302
	0.0001	0.8002	0.6810	0.0001	0.0007	0.7623	0.7455	0.0001	0.7989	0.8447	0.7217	0.0001	0.0070
COL16	0.87963	-0.13853	-0.14744	0.80460	0.61833	-0.13538	-0.14865	0.96457	-0.13737	-0.12391	-0.13243	0.97314	0.52572
	0.0001	0.5603	0.5350	0.0001	0.0037	0.5693	0.5289	0.0001	0.5636	0.6027	0.5778	0.0001	0.0173

TABLE XX. (CONTINUED)

	COL40	COL41	COL42	COL43	COL44	COL45	COL46	COL47	COL48
COL1	0.96729	0.92166	0.97774	0.96257	0.05839	-0.01880	0.95891	0.06571	0.70156
	0.0001	0.0001	0.0001	0.0001	0.8068	0.9373	0.0001	0.7831	0.0006
COL2	0.89896	0.98119	0.91776	0.99149	-0.05729	-0.12386	0.98992	-0.05601	0.53173
	0.0001	0.0001	0.0001	0.0001	0.8104	0.6029	0.0001	0.8146	0.0158
COL3	-0.02645	-0.06982	-0.00565	-0.07305	0.91952	0.70729	-0.12485	0.90814	0.24780
	0.9119	0.7699	0.9812	0.7596	0.0001	0.0005	0.6000	0.0001	0.2922
COL4	-0.17231	-0.13520	-0.07127	-0.10885	0.61970	0.88384	-0.13739	0.60044	-0.04151
	0.4676	0.5698	0.7652	0.6478	0.0036	0.0001	0.5635	0.0051	0.8621
COL5	-0.16752	-0.15290	-0.12262	-0.15036	0.79436	0.89994	-0.18929	0.76738	-0.00882
	0.4802	0.5199	0.6065	0.5269	0.0001	0.0001	0.4241	0.0001	0.9705
COL6	-0.14135	-0.12151	-0.10258	-0.11504	0.69928	0.83981	-0.14187	0.64834	-0.03641
	0.5522	0.6098	0.6669	0.6291	0.0006	0.0001	0.5508	0.0020	0.8789
COL7	-0.00612	-0.05350	0.02997	-0.04858	0.94280	0.71330	-0.10212	0.93206	0.29385
	0.9796	0.8228	0.9002	0.8388	0.0001	0.0004	0.6683	0.0001	0.2086
COL8	0.98976	0.89936	0.85178	0.98993	-0.08894	-0.13107	0.98630	-0.08945	0.38872
	0.0001	0.0001	0.0001	0.0001	0.7092	0.5818	0.0001	0.7077	0.0903
COL9	0.99764	0.99148	0.89684	0.99408	-0.05448	-0.11951	0.99223	-0.05304	0.48063
	0.0001	0.0001	0.0001	0.0001	0.8196	0.6158	0.0001	0.8243	0.0319
COL10	-0.06550	-0.08723	0.04645	-0.05620	0.99097	0.82988	-0.11463	0.99510	0.27242
	0.7838	0.7146	0.8458	0.8140	0.0001	0.0001	0.6304	0.0001	0.2452
COL11	0.67205	0.56894	0.85756	0.67605	0.18602	0.12841	0.66610	0.19744	0.87608
	0.0012	0.0088	0.0001	0.0011	0.4323	0.5895	0.0013	0.4041	0.0001
COL12	-0.12639	-0.11589	0.00217	-0.07840	0.86854	0.89478	-0.12567	0.86263	0.13459
	0.5954	0.6266	0.9928	0.7425	0.0001	0.0001	0.5975	0.0001	0.5716
COL13	0.97658	0.96682	0.90638	0.98810	-0.07787	-0.10393	0.98441	-0.07393	0.50174
	0.0001	0.0001	0.0001	0.0001	0.7442	0.6628	0.0001	0.7567	0.0242
COL14	0.93937	0.90160	0.98171	0.95516	0.08595	0.06677	0.95069	0.09542	0.69770
	0.0001	0.0001	0.0001	0.0001	0.7186	0.7797	0.0001	0.6890	0.0006
COL15	0.99321	0.97483	0.94058	0.99489	-0.02717	-0.07587	0.99303	-0.02252	0.56450
	0.0001	0.0001	0.0001	0.0001	0.9095	0.7506	0.0001	0.9249	0.0095
COL16	0.99435	0.98514	0.91034	0.99320	-0.10888	-0.15420	0.99707	-0.10807	0.49572
	0.0001	0.0001	0.0001	0.0001	0.6477	0.5163	0.0001	0.6502	0.0262

TABLE XX. (CONTINUED)

	COL1	COL2	COL3	COL4	COL5	COL6	COL7	COL8	COL9	COL10	COL11	COL12	COL13
COL17	-0.10174	-0.15604	0.36717	0.95677	0.84959	0.93706	0.36832	-0.13409	-0.15155	0.64461	0.01705	0.89743	-0.10908
	0 6695	0.5112	0.1113	0.0001	0.0001	0.0001	0.1101	0.5730	0.5236	0.0022	0.9431	0.0001	0.6471
COL18	-0.00345	-0.11035	0.72709	0.85937	0.89155	0.84868	0.74423	-0.12066	-0.10617	0.94168	0.14332	0.89108	-0.09326
	0.9885	0.6432	0.0003	0.0001	0.0001	0.0001	0.0002	0.6124	0.6559	0.0001	0.5466	0.0001	0.6957
COL19	0.01804	-0.06713	0.95275	0.60082	0.83413	0.76424	0.95642	-0.09264	-0.06479	0.92694	0.11525	0.80654	-0.10759
	0.9398	0.7785	0.0001	0.0051	0 0001	0.0001	0.0001	0.6977	0.7861	0.0001	0.6285	0.0001	0.6516
COL20	-0.14036	-0.14588	0.56595	0.79639	0.88912	0.95239	0.52409	-0.12648	-0.14336	0.57883	-0.08643	0.72570	-0.15989
	0.5550	0.5394	0.0093	0.0001	0.0001	0.0001	0.0177	0.5951	0.5465	0.0075	0.7171	0.0003	0.5007
COL21	0.95141	0.96648	-0.13966	-0.16182	-0.21834	-0.16464	-0.11315	0.95228	0.96520	-0.13029	0.75939	-0.14615	0.99419
	0.0001	0.0001	0.5570	0.4955	0.3551	0.4879	0.6348	0.0001	0.0001	0.5840	0.0001	0.5387	0.0001
COL22	0.08108	-0.04851	0.86827	0.60710	0.74142	0.61707	0.88803	-0.08312	-0.04549	0.99265	0.22250	0.87011	-0.05727
	0.7340	0.8391	0.0001	0.0045	0.0002	0.0038	0.0001	0.7275	0.8490	0.0001	0.3457	0.0001	0.8105
COL23	0.98336	0.98267	0.09628	-0.18783	-0.13249	-0.13308	0.11854	0.94626	0.97218	0.02476	0.74077	-0.09139	0.94316
	0.0001	0.0001	0.6864	0.4278	0.5776	0.5759	0.6187	0.0001	0.0001	0.9175	0.0002	0.7016	0.0001
COL24	0.92887	0.88768	0.32961	0.00488	0.08166	0.03851	0.35849	0.84686	0.87949	0.31024	0.82356	0.16795	0.88834
	0.0001	0.0001	0.1558	0.9837	0.7322	0.8719	0.1206	0.0001	0.0001	0.1831	0.0001	0.4791	0.0001
COL25	0.95231	0.99495	-0.07034	-0.16993	-0.18138	-0.14549	-0.05129	0.99598	0.99908	-0.10092	0.63539	-0.14245	0.97872
	0.0001	0.0001	0.7682	0.4738	0.4441	0.5405	0.8299	0.0001	0.0001	0.6720	0.0026	0.5491	0.0001
COL26	0.80145	0.68269	0.02593	-0.11967	-0.12830	-0.10359	0.05236	0.55742	0.63368	0.01319	0.88012	-0.05220	0.65318
	0.0001	0.0009	0.9136	0.6153	0.5898	0.6638	0.8265	0.0107	0.0027	0.9560	0.0001	0.8270	0.0018
COL27	0.96828	0.89923	0.06630	0.01227	-0.03289	-0.01373	0.10319	0.82979	0.87134	0.13450	0.90716	0.09509	0.89858
	0.0001	0.0001	0.7812	0.9591	0.8905	0.9542	0.6651	0.0001	0.0001	0.5718	0.0001	0.6901	0.0001
COL28	0.00163	-0.10440	0.75021	0.84264	0.89132	0.86318	0.77032	-0.11623	-0.10047	0.94615	0.14527	0.98308	-0.09149
	0.9945	0.6614	0.0001	0.0001	0.0001	0.0001	0.0001	0.6256	0.6734	0.0001	0.5411	0.0001	0.7013
COL29	-0.07983	-0.13974	0.45505	0.95971	0.88635	0.95896	0.45320	-0.12404	-0.13581	0.69860	0.04248	0.91922	-0.10165
	0.7380	0.5568	0.0438	0.0001	0.0001	0.0001	0.0448	0.6024	0.5681	0.0006	0.8589	0.0001	0.6698
COL30	0.92794	0.82343	0.17865	0.01686	-0.00366	-0.02331	0.22587	0.74046	0.80161	0.25959	0.88164	0.16678	0.81172
	0.0001	0.0001	0.4511	0.9437	0.9878	0.9223	0.3383	0.0002	0.0001	0.2691	0.0001	0.4822	0.0001
COL31	0.80877	0.66216	0.32418	0.04984	0.07660	0.03114	0.37562	0.54929	0.62181	0.39241	0.93211	0.25342	0.65690
	0.0001	0.0015	0.1632	0.8347	0.7482	0.8963	0.1027	0.0121	0.0034	0.0870	0.0001	0.2810	0 0017
COL32	-0.05380	-0.13621	0.26421	0.92731	0.73758	0.76037	0.27300	-0.12065	-0.13162	0.64014	0.09183	0.88999	-0.06622
	0.8218	0.5669	0.2603	0.0001	0.0002	0.0001	0.2442	0.6124	0.5802	0.0024	0.7002	0.0001	0.7815

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL14	COL15	COL16	COL17	COL18	COL19	COL20	COL21	COL22	COL23	COL24	COL25	COL26
COL17	0.01137	-0.11135	-0.15813	1.00000	0.85849	0.59786	0.81659	-0.14111	0.58290	-0.18251	-0.00516	-0.15476	-0.11158
	0.9621	0.6402	0.5055	0.0000	0.0001	0.0054	0.0001	0.5529	0.0070	0.4412	0.9828	0.5147	0.6396
COL18	0.07718	-0.06379	-0.14269	0.85849	1.00000	0.85574	0.71268	-0.13818	0.91451	-0.05996	0.20876	-0.12937	-0.03144
	0.7464	0.7893	0.5484	0.0001	0.0000	0.0001	0.0004	0.5613	0.0001	0.8017	0.3771	0.5867	0.8953
COL19	0.02264	-0.05578	-0.11824	0.59786	0.85574	1.00000	0.73962	-0.14758	0.89408	0.04349	0.28542	-0.09150	0.00124
	0.9245	0.8153	0.6195	0.0054	0.0001	0.0000	0.0002	0.5347	0.0001	0.8555	0.2225	0.7012	0.9959
COL20	-0.10120	-0.14578	-0.16005	0.81659	0.71268	0.73962	1.00000	-0.18440	0.48368	-0.12893	-0.00293	-0.14420	-0.12578
	0.6712	0.5397	0.5003	0.0001	0.0004	0.0002	0.0000	0.4364	0.0307	0.5880	0.9902	0.5441	0.5972
COL21	0.95503	0.97306	0.97194	-0.14111	-0.13818	-0.14758	-0.18440	1.00000	-0.10351	0.93540	0.86912	0.96778	0.69940
	0.0001	0.0001	0.0001	0.5529	0.5613	0.5347	0.4364	0.0000	0.6641	0.0001	0.0001	0.0001	0.0006
COL22	0.12091	-0.00857	-0.09868	0.58290	0.91451	0.89408	0.48368	-0.10351	1.00000	0.05309	0.34196	-0.07980	0.04354
	0.6116	0.9714	0.6789	0.0070	0.0001	0.0001	0.0307	0.6641	0.0000	0.8241	0.1400	0.7381	0.8554
COL23	0.94311	0.97740	0.96625	-0.18251	-0.05996	0.04349	-0.12893	0.93540	0.05309	1.00000	0.93028	0.96503	0.74405
	0.0001	0.0001	0.0001	0.4412	0.8017	0.8555	0.5880	0.0001	0.8241	0.0000	0.0001	0.0001	0.0002
COL24	0.91867	0.89677	0.85525	-0.00516	0.20876	0.28542	-0.00293	0.86912	0.34196	0.93028	1.00000	0.86468	0.68614
	0.0001	0.0001	0.0001	0.9828	0.3771	0.2225	0.9902	0.0001	0.1400	0.0001	0.0000	0.0001	0.0008
COL25	0.92957	0.99005	0.99737	-0.15476	-0.12937	-0.09150	-0.14420	0.96778	-0.07980	0.96503	0.86468	1.00000	0.62309
	0.0001	0.0001	0.0001	0.5147	0.5867	0.7012	0.5441	0.0001	0.7381	0.0001	0.0001	0.0000	0.0033
COL26	0.79191	0.70306	0.66529	-0.11158	-0.03144	0.00124	-0.12578	0.69940	0.04354	0.74405	0.68614	0.62309	1.00000
	0.0001	0.0005	0.0014	0.6396	0.8953	0.9959	0.5972	0.0006	0.8554	0.0002	0.0008	0.0033	0.0000
COL27	0.97865	0.92177	0.87963	0.02272	0.11222	0.06799	-0.08442	0.90147	0.16768	0.91816	0.91119	0.86188	0.86875
	0.0001	0.0001	0.0001	0.9242	0.6376	0.7758	0.7234	0.0001	0.4798	0.0001	0.0001	0.0001	0.0001
COL28	0.07665	-0.06043	-0.13853	0.85422	0.99617	0.88066	0.73037	-0.13584	0.91721	-0.04891	0.21795	-0.12350	-0.02528
	0.7481	0.8002	0.5603	0.0001	0.0001	0.0001	0.0003	0.5680	0.0001	0.8378	0.3560	0.6039	0.9157
COL29	0.02457	-0.09801	-0.14744	0.99054	0.88819	0.67394	0.85329	-0.13433	0.63662	-0.15003	0.04082	-0.14160	-0.08531
	0.9181	0.6810	0.5350	0.0001	0.0001	0.0011	0.0001	0.5723	0.0025	0.5278	0.8643	0.5515	0.7207
COL30	0.94033	0.85837	0.80460	0.01724	0.19657	0.15651	-0.12182	0.82064	0.30698	0.86809	0.88712	0.78301	0.87562
	0.0001	0.0001	0.0001	0.9425	0.4062	0.5099	0.6089	0.0001	0.1880	0.0001	0.0001	0.0001	0.0001
COL31	0.81756	0.69601	0.61833	0.04757	0.29541	0.28949	-0.07616	0.66276	0.44249	0.74784	0.84423	0.59864	0.86260
	0.0001	0.0007	0.0037	0.8422	0.2060	0.2157	0.7496	0.0014	0.0507	0.0002	0.0001	0.0053	0.0001
COL32	0.08273	-0.07218	-0.13538	0.92861	0.84207	0.46021	0.57076	-0.10046	0.61057	-0.17281	0.02849	-0.13987	-0.07623
	0.7288	0.7623	0.5683	0.0001	0.0001	0.0412	0.0086	0.6734	0.0042	0.4663	0.9051	0.5564	0.7494

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL27	COL28	COL29	COL30	COL31	COL32	COL33	COL34	COL35	COL36	COL37	COL38	COL39
COL17	0.02272 0.9242	0.85422 0.0001	0.99054 0.0001	0.01724 0.9425	0.04757 0.8422	0.92861 0.0001	0.92406 0.0001	-0.06237 0.7939	0.90093 0.0001	0.86612 0.0001	0.69824 0.0006	-0.18985 0.4227	-0.08403 0.7247
COL18	0.11222 0.6376	0.99617 0.0001	0.88819 0.0001	0.19657 0.4062	0.29541 0.2060	0.84207 0.0001	0.98833 0.0001	0.04628 0.8463	0.92514 0.0001	0.87490 0.0001	0.83529 0.0001	-0.07247 0.7614	0.05924 0.8041
COL19	0.06799 0.7758	0.88066 0.0001	0.67394 0.0011	0.15651 0.5099	0.28949 0.2157	0.46021 0.0412	0.80078 0.0001	0.07868 0.7416	0.60979 0.0043	0.50424 0.0234	0.96568 0.0001	0.02935 0.9022	0.10658 0.6547
COL20	-0.08442 0.7234	0.73037 0.0003	0.85329 0.0001	-0.12182 0.6089	-0.07616 0.7496	0.57076 0.0086	0.75881 0.0001	-0.08503 0.7215	0.57759 0.0077	0.47500 0.0343	0.87271 0.0001	-0.13843 0.5605	-0.10800 0.6504
COL21	0.90147 0.0001	-0.13584 0.5680	-0.13433 0.5723	0.82064 0.0001	0.66276 0.0014	-0.10046 0.6734	-0.14067 0.5542	0.95339 0.0001	-0.10982 0.6449	-0.08756 0.7136	-0.16197 0.4951	0.94741 0.0001	0.64801 0 0020
COL22	0.15768 0.4798	0.91721 0.0001	0.63662 0.0025	0.30698 0.1880	0.44249 0.0507	0.61057 0.0042	0.84504 0.0001	0.12878 0.5884	0.76696 0.0001	0.71284 0.0004	0.78519 0.0001	0.03937 0.8691	0.16819 0.4784
COL23	0.91816 0.0001	-0.04891 0.8378	-0.15003 0.5278	0.86809 0.0001	0.74784 0.0002	-0.17281 0.4663	-0.09682 0.6847	0.98554 0.0001	-0.12620 0.5960	-0.13172 0.5799	-0.00526 0.9825	0.99643 0.0001	0.63865 0.0024
COL24	0.91119 0.0001	0.21795 0.3560	0.04082 0.8643	0.88712 0.0001	0.84423 0.0001	0.02849 0.9051	0.15494 0.5142	0.95604 0.0001	0.11766 0.6213	0.09964 0.6760	0.20208 0.3929	0.92519 0.0001	0.72701 0.0003
COL25	0.86188 0.0001	-0.12350 0.6039	-0.14160 0.5515	0.78301 0.0001	0.59864 0.0053	-0.13987 0.5564	-0.13947 0.5576	0.96427 0.0001	-0.13589 0.5678	-0.12640 0.5954	-0.10701 0.6534	0.97252 0.0001	0.50372 0.0236
COL26	0.86875 0.0001	-0.02528 0.9157	-0.08531 0.7207	0.87562 0.0001	0.86260 0.0001	-0.07623 0.7494	-0.05249 0.8260	0.72998 0.0003	-0.05044 0.8327	-0.04408 0.8536	-0.03674 0.8778	0.73098 0.0003	0.86176 0 0001
COL27	1.00000 0 0000	0.11239 [illegible]	0.04087 0.8642	0.96110 0.0001	0.89857 0.0001	0.09374 0.6942	0.09346 0.6951	0.94894 0.0001	0.12326 0.6047	0.13782 0 5623	0.01868 0.9377	0.90635 0.0001	0 79990 0 0001
COL28	0.11239 0.6371	1.00000 0.0000	0.88780 0.0001	0.19528 0.4093	0.29809 0.2018	0.81715 0.0001	0.88288 0.0001	0.05228 0.8267	0.90697 0.0001	0.84857 0.0001	0.86664 0.0001	-0 06121 0.7977	0.06774 0 7766
COL29	0.04087 0.8642	0.88780 0.0001	1.00000 0.0000	0.04350 0.8555	0.08505 0.7215	0.90514 0.0001	0.94474 0.0001	-0.03682 0.8775	0.89700 0.0001	0.84801 0.0001	0.76585 0.0001	-0.15786 0.5062	-0.05099 0 8309
COL30	0.96110 0.0001	0.19528 0.4093	0.04350 0.8555	1.00000 0.0000	0.93778 0 0001	0.12367 0.6034	0.15475 0.5148	0.89814 0.0001	0.18739 0.4289	0.20282 0.3911	0.06473 0.7863	0.86459 0.0001	0.77675 0 0001
COL31	0.89857 0.0001	0.29809 0.2018	0.08505 0.7215	0.93778 0.0001	1.00000 0 0000	0.14886 0.5311	0.23544 0.3177	0.78091 0.0001	0.24541 0.2970	0 24858 0.2906	0.17559 0.4590	0.72585 0.0003	0.87901 0.0001
COL32	0.09374 0.6942	0.81715 0.0001	0.90514 0.0001	0.12367 0.6034	0.14886 0.5311	1.00000 0.0000	0.89875 0.0001	-0.02698 0.9101	0.97342 0.0001	0.97819 0.0001	0.49837 0 0253	-0.17939 0.4492	-0.04129 0 8628

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL40	COL41	COL42	COL43	COL44	COL45	COL46	COL47	COL48
COL17	-0.15971	-0.12276	-0.06268	-0.09390	0.61218	0.86482	-0.11977	0.58173	-0.03959
	0.5012	0.6061	0.7929	0.6938	0.0041	0.0001	0.6150	0.0071	0.8684
COL18	-0.10834	-0.10632	0.01792	-0.06935	0.91581	0.99382	-0.11955	0.90971	0.17568
	0.6494	0.6555	0.9402	0.7714	0.0001	0.0001	0.6156	0.0001	0.4588
COL19	-0.05526	-0.08479	-0.01912	-0.08112	0.95959	0.83060	-0.13089	0.93259	0.20584
	0.8170	0.7223	0.9362	0.7339	0.0001	0.0001	0.5823	0.0001	0.3839
COL20	-0.14049	-0.12383	-0.16399	-0.14177	0.59985	0.69815	-0.15992	0.53616	-0.11052
	0.5547	0.6030	0.4896	0.5510	0.0052	0.0006	0.5006	0.0148	0.6428
COL21	0.96409	0.94599	0.91889	0.97515	-0.12274	-0.14969	0.97880	-0.12004	0.53674
	0.0001	0.0001	0.0001	0.0001	0.6062	0.5288	0.0001	0.6142	0.0147
COL22	-0.04224	-0.06818	0.08420	-0.03162	0.98199	0.90220	-0.09133	0.89444	0.31901
	0.8596	0.7720	0.7241	0.8947	0.0001	0.0001	0.7017	0.0001	0.1704
COL23	0.98130	0.93947	0.92977	0.95804	0.04954	-0.07971	0.95225	0.05146	0.63427
	0.0001	0.0001	0.0001	0.0001	0.8357	0.7383	0.0001	0.8294	0.0027
COL24	0.89091	0.84370	0.87721	0.97995	0.32630	0.19016	0.85060	0.33445	0.67167
	0.0001	0.0001	0.0001	0.0001	0.1603	0.4220	0.0001	0.1495	0.0012
COL25	0.99653	0.99333	0.88783	0.99395	-0.08621	-0.14226	0.99369	-0.08663	0.45818
	0.0001	0.0001	0.0001	0.0001	0.7178	0.5496	0.0001	0.7165	0.0422
COL26	0.65607	0.53583	0.88128	0.63696	0.02721	-0.04821	0.65796	0.02993	0.93808
	0.0017	0.0149	0.0001	0.0025	0.9093	0.8400	0.0016	0.9003	0.0001
COL27	0.88590	0.82021	0.98206	0.89241	0.13286	0.10062	0.88522	0.14288	0.80421
	0.0001	0.0001	0.0001	0.0001	0.5766	0.6730	0.0001	0.5479	0.0001
COL28	-0.10132	-0.10249	0.01706	-0.06777	0.93054	0.98755	-0.11780	0.81844	0.18122
	0.6708	0.6672	0.9431	0.7765	0.0001	0.0001	0.6209	0.0001	0.4445
COL29	-0.14177	-0.11332	-0.04752	-0.08577	0.67483	0.89233	-0.11406	0.64015	-0.00192
	0.5510	0.6343	0.8423	0.7192	0.0011	0.0001	0.6321	0.0024	0.9936
COL30	0.80850	0.73405	0.86598	0.81691	0.25450	0.18310	0.81053	0.27555	0.87346
	0.0001	0.0002	0.0001	0.0001	0.2789	0.4397	0.0001	0.2396	0.0001
COL31	0.64664	0.53878	0.85418	0.64099	0.39259	0.27923	0.61946	0.41526	0.94049
	0.0021	0.0142	0.0001	0.0023	0.0869	0.2332	0.0036	0.0686	0.0001
COL32	[illegible]	-0.10565	0.01710	-0.05267	0.57075	0.86585	-0.08336	0.57336	0.03746
	0.5422	0.6575	0.9430	0.8255	0.0086	0.0001	0.7268	0.0082	0.8754

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL1	COL2	COL3	COL4	COL5	COL6	COL7	COL8	COL9	COL10	COL11	COL12	COL13
COL33	-0.02987	-0.12549	0.64144	0.92130	0.90858	0.89427	0.65081	-0.12691	-0.12123	0.88279	0.11476	0.99517	-0.09828
	0.9005	0.5981	0.0023	0.0001	0.0001	0.0001	0.0019	0.5939	0.6107	0.0001	0.6300	0.0001	0.6802
COL34	0.99082	0.97955	0.10255	-0.07022	-0.05829	-0.05212	0.13095	0.94916	0.97175	0.10005	0.78169	0.02190	0.96582
	0.0001	0.0001	0.6670	0.7686	0.8071	0.8273	0.5821	0.0001	0.0001	0.6747	0.0001	0.9270	0.0001
COL35	-0.02056	-0.12393	0.44710	0.91197	0.79024	0.76953	0.46114	-0.12102	-0.11942	0.78797	0.13616	0.95005	-0.06939
	0.9314	0.6027	0.0481	0.0001	0.0001	0.0001	0.0407	0.6113	0.6160	0.0001	0.5670	0.0001	0.7713
COL36	-0.01102	-0.11610	0.33854	0.86784	0.70091	0.69088	0.36507	-0.11186	-0.11127	0.72254	0.14771	0.90493	-0.04924
	0.9632	0.6259	0.1443	0.0001	0.0006	0.0007	0.1135	0.6387	0.6405	0.0003	0.5343	0.0001	0.8367
COL37	-0.03098	-0.09108	0.86832	0.67597	0.88124	0.87762	0.86125	-0.10315	-0.08887	0.84217	0.05254	0.80363	-0.12634
	0.8968	0.7025	0.0001	0.0011	0.0001	0.0001	0.0001	0.6652	0.7095	0.0001	0.8259	0.0001	0.5956
COL38	0.98058	0.98392	0.08052	-0.19758	-0.14771	-0.14244	0.10433	0.95316	0.97921	0.01013	0.72744	-0.10387	0.95165
	0.0001	0.0001	0.7358	0.4037	0.5343	0.5491	0.6616	0.0001	0.0001	0.9662	0.0003	0.6630	0.0001
COL39	0.69215	0.56223	0.13875	-0.09446	-0.07371	-0.06762	0.17533	0.44395	0.51404	0.13182	0.97003	0.02629	0.61100
	0.0007	0.0099	0.5596	0.6920	0.7574	0.7770	0.4597	0.0499	0.0204	0.5796	0.0001	0.9124	0.0042
COL40	0.96729	0.99896	-0.02645	-0.17231	-0.16752	-0.14135	-0.00612	0.98976	0.99764	-0.06550	0.67205	-0.12639	0.97658
	0.0001	0.0001	0.9119	0.4676	0.4802	0.5522	0.9786	0.0001	0.0001	0.7838	0.0012	0.5954	0.0001
COL41	0.92166	0.98119	-0.06982	-0.13520	-0.15290	-0.12151	-0.05350	0.99936	0.99148	-0.08723	0.56894	-0.11589	0.96682
	0.0001	0.0001	0.7699	0.5698	0.5199	0.6098	0.8228	0.0001	0.0001	0.7146	0.0088	0.6266	0.0001
COL42	0.97774	0.91776	-0.00565	-0.07127	-0.12262	-0.10258	0.02997	0.85178	0.89684	0.04645	0.85756	0.00217	0.90638
	0.0001	0.0001	0.9812	0.7652	0.6065	0.6669	0.9002	0.0001	0.0001	0.8458	0.0001	0.9928	0.0001
COL43	0.96257	0.99149	-0.07305	-0.10885	-0.15036	-0.11504	-0.04858	0.98993	0.99408	-0.05620	0.67605	-0.07840	0.98810
	0.0001	0.0001	0.7596	0.6478	0.5269	0.6291	0.8388	0.0001	0.0001	0.8140	0.0011	0.7425	0.0001
COL44	0.05839	-0.05729	0.81952	0.61970	0.79436	0.69928	0.94280	-0.08894	-0.05448	0.99097	0.18602	0.86854	-0.07787
	0.8068	0.8104	0.0001	0.0036	0.0001	0.0006	0.0001	0.7092	0.8196	0.0001	0.4323	0.0001	0.7442
COL45	-0.01880	-0.12386	0.70729	0.88384	0.89994	0.83981	0.71330	-0.13107	-0.11951	0.92988	0.12841	0.99475	-0.10393
	0.9373	0.6029	0.0005	0.0001	0.0001	0.0001	0.0004	0.5818	0.6158	0.0001	0.5895	0.0001	0.6628
COL46	0.95891	0.98992	-0.12485	-0.13739	-0.18929	-0.14187	-0.10212	0.98630	0.99223	-0.11463	0.66610	-0.12567	0.98441
	0.0001	0.0001	0.6000	0.5635	0.4241	0.5508	0.6683	0.0001	0.0001	0.6304	0.0013	0.5875	0.0001
COL47	0.06571	-0.05601	0.90814	0.60044	0.76738	0.64834	0.93206	-0.08945	-0.05304	0.99510	0.19744	0.86263	-0.07393
	0.7831	0.8146	0.0001	0.0051	0.0001	0.0020	0.0001	0.7077	0.8243	0.0001	0.4041	0.0001	0.7567
COL48	0.70156	0.53173	0.24780	-0.04151	-0.00882	-0.03641	0.29385	0.38872	0.48063	0.27242	0.87608	0.13459	0.50174
	0.0006	0.0158	0.2922	0.8621	0.8705	0.8789	0.2086	0.0803	0.0319	0.2452	0.0001	0.5716	0.0242

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL14	COL15	COL16	COL17	COL18	COL19	COL20	COL21	COL22	COL23	COL24	COL25	COL26
COL33	0.06421 0.7880	-0.07747 0.7455	-0.14965 0.5289	0.92406 0.0001	0.98833 0.0001	0.80078 0.0001	0.75881 0.0001	-0.14067 0.5542	0.84504 0.0001	-0.09682 0.6847	0.15494 0.5142	-0.13947 0.5576	-0.05249 0.8260
COL34	0.97724 0.0001	0.98587 0.0001	0.96457 0.0001	-0.06237 0.7939	0.04629 0.8463	0.07868 0.7416	-0.08503 0.7215	0.95339 0.0001	0.12878 0.5884	0.98554 0.0001	0.95604 0.0001	0.96427 0.0001	0.72999 0.0003
COL35	0.10164 0.6698	-0.06084 0.7989	-0.13737 0.5636	0.90093 0.0001	0.92514 0.0001	0.60979 0.0043	0.57759 0.0077	-0.10982 0.6449	0.76696 0.0001	-0.12620 0.5960	0.11766 0.6213	-0.13589 0.5678	-0.05044 0.8327
COL36	0.12013 0.6139	-0.04678 0.8447	-0.12391 0.6027	0.86612 0.0001	0.87490 0.0001	0.50424 0.0234	0.47500 0.0343	-0.08756 0.7136	0.71284 0.0004	-0.13172 0.5799	0.09964 0.6760	-0.12640 0.5954	-0.04408 0.8536
COL37	-0.01856 0.9381	-0.08498 0.7217	-0.13243 0.5778	0.69824 0.0006	0.83529 0.0001	0.96568 0.0001	0.87271 0.0001	-0.16197 0.4951	0.78519 0.0001	-0.00526 0.9825	0.20208 0.3929	-0.10701 0.6534	-0.03674 0.8778
COL38	0.94457 0.0001	0.98058 0.0001	0.97314 0.0001	-0.18988 0.4227	-0.07247 0.7614	0.02835 0.9022	-0.13843 0.5605	0.94741 0.0001	0.03937 0.8691	0.99643 0.0001	0.92519 0.0001	0.97252 0.0001	0.73098 0.0003
COL39	0.70503 0.0005	0.58302 0.0070	0.52572 0.0173	-0.08403 0.7247	0.05924 0.8041	0.10658 0.6547	-0.10800 0.6504	0.64801 0.0020	0.16819 0.4784	0.63865 0.0024	0.72701 0.0003	0.50372 0.0236	0.86176 0.0001
COL40	0.93937 0.0001	0.99321 0.0001	0.99435 0.0001	-0.15971 0.5012	-0.10834 0.6494	-0.05526 0.8170	-0.14049 0.5547	0.96409 0.0001	-0.04224 0.8596	0.98130 0.0001	0.89091 0.0001	0.99653 0.0001	0.65607 0.0017
COL41	0.90160 0.0001	0.97483 0.0001	0.98514 0.0001	-0.12276 0.6061	-0.10632 0.6555	-0.08479 0.7223	-0.12383 0.6030	0.94599 0.0001	-0.06918 0.7720	0.93947 0.0001	0.84370 0.0001	0.99333 0.0001	0.53583 0.0149
COL42	0.98171 0.0001	0.94058 0.0001	0.91034 0.0001	-0.06268 0.7929	0.01782 0.9402	-0.01912 0.9362	-0.16399 0.4896	0.91889 0.0001	0.08420 0.7241	0.92977 0.0001	0.87721 0.0001	0.88783 0.0001	0.88128 0.0001
COL43	0.95516 0.0001	0.99489 0.0001	0.99320 0.0001	-0.09390 0.6938	-0.06935 0.7714	-0.08112 0.7339	-0.14177 0.5510	0.97515 0.0001	-0.03162 0.8947	0.95804 0.0001	0.87995 0.0001	0.99395 0.0001	0.63696 0.0025
COL44	0.08595 0.7186	-0.02717 0.9098	-0.10888 0.6477	0.61218 0.0041	0.91581 0.0001	0.95959 0.0001	0.59985 0.0052	-0.12274 0.6062	0.98189 0.0001	0.04954 0.8357	0.32630 0.1603	-0.08621 0.7178	0.02721 0.9093
COL45	0.06677 0.7797	-0.07587 0.7506	-0.15420 0.5163	0.86482 0.0001	0.99382 0.0001	0.83060 0.0001	0.69915 0.0006	-0.14969 0.5288	0.90220 0.0001	-0.07971 0.7383	0.19016 0.4220	-0.14226 0.5496	-0.04821 0.8400
COL46	0.95069 0.0001	0.99303 0.0001	0.98707 0.0001	-0.11977 0.6150	-0.11955 0.6156	-0.13089 0.5823	-0.15992 0.5006	0.97880 0.0001	-0.09133 0.7017	0.95225 0.0001	0.85060 0.0001	0.99369 0.0001	0.65796 0.0016
COL47	0.09542 0.6890	-0.02252 0.9249	-0.10807 0.6502	0.58173 0.0071	0.90971 0.0001	0.93259 0.0001	0.53616 0.0148	-0.12004 0.6142	0.99444 0.0001	0.05146 0.8294	0.33445 0.1495	-0.08663 0.7165	0.02993 0.9003
COL48	0.69770 0.0006	0.56450 0.0095	0.49572 0.0262	-0.03959 0.8684	0.17568 0.4588	0.20584 0.3839	-0.11052 0.6428	0.53674 0.0147	0.31901 0.1704	0.63427 0.0027	0.67167 0.0012	0.45818 0.0422	0.93808 0.0001

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL27	COL28	COL29	COL30	COL31	COL32	COL33	COL34	COL35	COL36	COL37	COL38	COL39
COL33	0.09346	0.98288	0.94474	0.15475	0.23544	0.89875	1.00000	0.01793	0.95182	0.90446	0.81300	-0.10814	0.02140
	0.6951	0.0001	0.0001	0.5148	0.3177	0.0001	0.0000	0.9402	0.0001	0.0001	0.0001	0.6500	0.9286
COL34	0.94894	0.05228	-0.03682	0.89814	0.78091	-0.02698	0.01793	1.00000	0.01346	0.01536	0.03023	0.98334	0.65846
	0.0001	0.8267	0.8775	0.0001	0.0001	0.9101	0.9402	0.0000	0.9551	0.9488	0.8993	0.0001	0.0016
COL35	0.12326	0.90697	0.89700	0.18739	0.24541	0.97342	0.95182	0.01346	1.00000	0.98763	0.60716	-0.13517	0.01347
	0.6047	0.0001	0.0001	0.4289	0.2970	0.0001	0.0001	0.9551	0.0000	0.0001	0.0045	0.5699	0.9550
COL36	0.13782	0.84857	0.84801	0.20282	0.24858	0.97919	0.90446	0.01536	0.98763	1.00000	0.49284	-0.13921	0.01426
	0.5623	0.0001	0.0001	0.3911	0.2906	0.0001	0.0001	0.9488	0.0001	0.0000	0.0273	0.5583	0.9524
COL37	0.01868	0.86664	0.76585	0.06473	0.17559	0.49837	0.81300	0.03023	0.60716	0.49284	1.00000	-0.01813	0.04362
	0.9377	0.0001	0.0001	0.7863	0.4590	0.0253	0.0001	0.8993	0.0045	0.0273	0.0000	0.9395	0.8551
COL38	0.90635	-0.06121	-0.15786	0.86459	0.72585	-0.17839	-0.10814	0.98334	-0.13517	-0.13921	-0.01813	1.00000	0.62333
	0.0001	0.7977	0.5062	0.0001	0.0003	0.4492	0.6500	0.0001	0.5699	0.5583	0.9395	0.0000	0.0033
COL39	0.79990	0.06774	-0.05099	0.77675	0.87901	-0.04129	0.02140	0.65846	0.01347	0.01426	0.04362	0.62333	1.00000
	0.0001	0.7766	0.8309	0.0001	0.0001	0.8628	0.9286	0.0016	0.9550	0.9524	0.8551	0.0033	0.0000
COL40	0.88590	-0.10132	-0.14177	0.80850	0.64664	-0.14489	-0.12549	0.97787	-0.12944	-0.12359	-0.08019	0.98361	0.54678
	0.0001	0.6708	0.5510	0.0001	0.0021	0.5422	0.5981	0.0001	0.5865	0.6037	0.7368	0.0001	0.0126
COL41	0.82021	-0.10249	-0.11332	0.73405	0.53878	-0.10565	-0.11304	0.94497	-0.10499	-0.09495	-0.09728	0.94739	0.42264
	0.0001	0.6672	0.6343	0.0002	0.0142	0.6575	0.6352	0.0001	0.6596	0.6905	0.6833	0.0001	0.0634
COL42	0.98206	0.01706	-0.04752	0.86598	0.85418	0.01710	-0.00077	0.84649	0.03823	0.06025	-0.06952	0.82833	0.74582
	0.0001	0.9431	0.8423	0.0001	0.0001	0.9430	0.9974	0.0001	0.8729	0.8008	0.7709	0.0001	0.0002
COL43	0.89241	-0.06777	-0.08577	0.81691	0.64099	-0.05267	-0.07633	0.97383	-0.05134	-0.03393	-0.10220	0.96410	0.53245
	0.0001	0.7765	0.7192	0.0001	0.0023	0.8255	0.7491	0.0001	0.8298	0.8871	0.6681	0.0001	0.0157
COL44	0.13286	0.93054	0.67483	0.25450	0.39269	0.57075	0.88178	0.11194	0.72801	0.65129	0.88226	0.03545	0.14799
	0.5766	0.0001	0.0011	0.2789	0.0869	0.0086	0.0001	0.6384	0.0003	0.0019	0.0001	0.8820	0.5335
COL45	0.10062	0.98755	0.89233	0.18310	0.27923	0.86585	0.98847	0.03105	0.94335	0.89418	0.80979	-0.09271	0.03917
	0.6730	0.0001	0.0001	0.4397	0.2332	0.0001	0.0001	0.8966	0.0001	0.0001	0.0001	0.6975	0.8698
COL46	0.88522	-0.11780	-0.11406	0.81053	0.61946	-0.08336	-0.12086	0.96184	-0.09277	-0.07292	-0.14256	0.96141	0.52681
	0.0001	0.6209	0.6321	0.0001	0.0036	0.7268	0.6118	0.0001	0.6973	0.7600	0.5488	0.0001	0.0171
COL47	0.14288	0.91844	0.64015	0.27555	0.41526	0.57336	0.83935	0.11733	0.73402	0.66742	0.83508	0.03700	0.15459
	0.5479	0.0001	0.0024	0.2396	0.0686	0.0082	0.0001	0.6223	0.0002	0.0013	0.0001	0.8769	0.5152
COL48	0.80421	0.18122	-0.00192	0.87346	0.94049	0.03746	0.12102	0.63597	0.12001	0.12220	0.10811	0.61434	0.86977
	0.0001	0.4445	0.9936	0.0001	0.0001	0.8754	0.8113	0.0026	0.6143	0.6078	0.6501	0.0040	0.0001

TABLE XX. (CONTINUED)

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 20

	COL40	COL41	COL42	COL43	COL44	COL45	COL46	COL47	COL48
COL33	-0.12549	-0.11304	-0.00077	-0.07633	0.85178	0.98847	-0.12086	0.83935	0.12102
	0.5981	0.6352	0.9974	0.7491	0.0001	0.0001	0.6118	0.0001	0.6113
COL34	0.97787	0.94497	0.84649	0.87383	0.11194	0.03105	0.96184	0.11733	0.63597
	0.0001	0.0001	0.0001	0.0001	0.6384	0.8966	0.0001	0.6223	0.0026
COL35	-0.12944	-0.10499	0.03823	-0.05134	0.72801	0.94335	-0.09277	0.73402	0.12001
	0.5865	0.6596	0.8729	0.8298	0.0003	0.0001	0.6973	0.0002	0.6143
COL36	-0.12359	-0.09495	0.06025	-0.03393	0.65129	0.89418	-0.07292	0.66742	0.12220
	0.6037	0.6908	0.8008	0.8871	0.0019	0.0001	0.7600	0.0013	0.6078
COL37	-0.08019	-0.09728	-0.06952	-0.10220	0.88226	0.80979	-0.14256	0.83508	0.10811
	0.7368	0.6833	0.7709	0.6681	0.0001	0.0001	0.5488	0.0001	0.6501
COL38	0.98361	0.94739	0.82833	0.86410	0.03545	-0.09271	0.96141	0.03700	0.61434
	0.0001	0.0001	0.0001	0.0001	0.8820	0.6976	0.0001	0.8769	0.0040
COL39	0.54678	0.42264	0.74582	0.53245	0.14799	0.03917	0.52651	0.15459	0.86977
	0.0126	0.0634	0.0002	0.0157	0.5335	0.8698	0.0171	0.5152	0.0001
COL40	1.00000	0.98594	0.90307	0.99134	-0.04862	-0.12288	0.98792	-0.04811	0.50687
	0.0000	0.0001	0.0001	0.0001	0.8387	0.6058	0.0001	0.8404	0.0226
COL41	0.98594	1.00000	0.84280	0.98830	-0.07699	-0.11644	0.98336	-0.07661	0.37134
	0.0001	0.0000	0.0001	0.0001	0.7470	0.6249	0.0001	0.7482	0.1070
COL42	0.90307	0.84280	1.00000	0.80978	0.04523	0.00644	0.81474	0.05770	0.79179
	0.0001	0.0001	0.0000	0.0001	0.8498	0.9785	0.0001	0.8091	0.0001
COL43	0.99134	0.98830	0.90978	1.00000	-0.05144	-0.07919	0.99624	-0.04707	0.48774
	0.0001	0.0001	0.0001	0.0000	0.8295	0.7400	0.0001	0.8438	0.0291
COL44	-0.04862	-0.07699	0.04523	-0.05144	1.00000	0.89753	-0.10863	0.99490	0.28148
	0.8387	0.7470	0.8498	0.8295	0.0000	0.0001	0.6485	0.0001	0.2293
COL45	-0.12288	-0.11644	0.00644	-0.07919	0.89753	1.00000	-0.12935	0.89434	0.15618
	0.6058	0.6249	0.9785	0.7400	0.0001	0.0000	0.5868	0.0001	0.5108
COL46	0.98782	0.98336	0.81474	0.99624	-0.10863	-0.12835	1.00000	-0.10627	0.48955
	0.0001	0.0001	0.0001	0.0001	0.6485	0.5868	0.0000	0.6556	0.0285
COL47	-0.04811	-0.07661	0.05770	-0.04707	0.99490	0.89434	-0.10627	1.00000	0.29811
	0.8404	0.7482	0.8091	0.8438	0.0001	0.0001	0.6556	0.0000	0.2017
COL48	0.50687	0.37134	0.79179	0.48774	0.28148	0.15618	0.48955	0.29811	1.00000
	0.0226	0.1070	0.0001	0.0291	0.2293	0.5108	0.0285	0.2017	0.0000

TABLE XXI

INITIAL FACTOR PATTERN MATRIX--Q-MODE

FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6	FACTOR7	FACTOR8	FACTOR9	FACTOR10
COL1	0.99022	0.12450	-0.00343	-0.00411	-0.00462	0.05690	-0.00396	-0.02329	-0.00217	0.00306
COL2	0.98003	0.01691	0.12145	0.14798	-0.00475	0.02748	0.01074	-0.04075	0.00367	0.00200
COL3	-0.05107	0.76690	-0.49426	0.38472	0.01658	0.00792	0.12345	0.01670	-0.02127	0.02012
COL4	-0.21805	0.84324	0.42153	-0.13558	0.09657	0.01138	0.18297	0.00766	-0.03380	-0.03193
COL5	-0.23087	0.90159	0.13618	0.14945	0.18224	0.01830	0.23950	0.00104	0.01683	0.03847
COL6	-0.21095	0.85984	0.28726	0.10386	0.33173	0.00336	-0.10211	-0.01096	-0.00470	0.04015
COL7	-0.02067	0.77584	-0.52286	0.34670	-0.03424	-0.00158	-0.04489	0.00856	0.00916	-0.01094
COL8	0.93979	-0.00377	0.23529	0.23924	-0.05838	-0.01107	0.00693	-0.02177	0.00230	0.00049
COL9	0.96771	0.01626	0.15287	0.19356	-0.04382	0.01948	-0.00144	0.01082	0.00136	-0.00064
COL10	-0.07096	0.94023	-0.26228	0.08602	-0.18326	-0.00144	0.01889	0.00722	0.01277	-0.00251
COL11	0.79551	0.25525	-0.24619	-0.40493	0.15999	-0.22654	0.01011	-0.00227	0.00326	0.00345
COL12	-0.14936	0.97353	0.11706	-0.07645	-0.07856	0.00162	0.02998	0.00353	0.03420	0.02811
COL13	0.96956	0.02462	0.18355	0.05884	-0.02762	-0.14104	-0.01072	0.03680	0.00220	0.00455
COL14	0.97040	0.19507	0.08354	-0.10486	-0.02908	0.00815	-0.01188	0.03167	-0.00950	-0.00418
COL15	0.98431	0.05874	0.13288	0.08599	-0.03654	0.03342	-0.00587	-0.00903	0.00158	0.00374
COL16	0.97247	-0.01934	0.17891	0.13955	-0.00729	0.04594	0.00321	0.01385	0.00338	0.00433
COL17	-0.20727	0.83827	0.45147	-0.14146	0.14184	-0.00055	-0.09122	-0.01444	0.01092	0.03098
COL18	-0.12757	0.98445	0.02759	-0.03682	-0.09281	-0.00174	-0.02901	0.00359	0.04911	-0.01835
COL19	-0.09248	0.88648	-0.30376	0.31548	0.10286	0.00126	-0.04011	0.00565	-0.01408	-0.02979
COL20	-0.23116	0.74196	0.25215	0.26658	0.50676	0.01249	0.00501	-0.00053	0.03945	-0.05106
COL21	0.97326	-0.01707	0.16006	0.00842	0.02468	-0.12778	-0.01613	0.09692	0.00125	0.00474
COL22	-0.03393	0.90935	-0.31634	0.04845	-0.26192	-0.00481	-0.01022	0.01094	0.01192	-0.00814
COL23	0.98027	0.07601	-0.05090	0.15884	0.02198	0.04716	0.01494	-0.04873	0.00526	0.00276
COL24	0.90512	0.33318	-0.15067	0.11326	-0.06246	-0.16356	0.03913	-0.01466	-0.01379	-0.01909
COL25	0.86364	-0.00706	0.18078	0.19425	-0.02677	0.00780	-0.00648	0.00721	0.00064	0.00157
COL26	0.78556	0.09312	-0.27655	-0.39434	0.31367	0.20586	0.01835	0.02993	0.00392	0.00193
COL27	0.94521	0.23409	-0.02969	-0.20736	0.04416	0.01322	0.00630	-0.07457	-0.00177	-0.01080
COL28	-0.12304	0.98764	0.00406	-0.00382	-0.06009	-0.00373	-0.07141	0.00007	0.00410	0.00557
COL29	-0.18971	0.87884	0.38127	-0.08962	0.17051	0.00000	-0.07486	-0.00123	-0.03343	-0.01891
COL30	0.89081	0.30388	-0.16840	-0.23888	-0.07290	0.13541	-0.01003	0.06914	-0.00491	-0.00417
COL31	0.76222	0.39607	-0.38050	-0.33051	-0.01864	-0.00052	0.00038	-0.08660	-0.00572	0.00367
COL32	-0.15505	0.79702	0.44181	-0.35250	-0.14377	-0.00237	0.00793	-0.00318	-0.00593	0.01159
COL33	-0.15220	0.97150	0.15596	-0.07818	-0.03392	-0.00072	-0.02268	0.00237	0.02144	-0.01809
COL34	0.97943	0.17368	0.02595	0.08496	-0.03262	-0.01849	0.00589	-0.03356	-0.00096	-0.00111
COL35	-0.13347	0.88770	0.26587	-0.27977	-0.20430	-0.00398	0.01196	-0.00219	-0.04753	-0.01225
COL36	-0.11618	0.82384	0.30513	-0.36733	-0.28136	-0.00632	-0.01668	-0.00349	0.01042	-0.00202
COL37	-0.13952	0.87276	-0.13655	0.33557	0.27844	0.00292	-0.08419	-0.00136	-0.04350	0.01978
COL38	0.98125	0.06180	-0.03335	0.17099	0.00978	0.04257	-0.00129	0.02795	-0.00146	-0.00038
COL39	0.69249	0.17125	-0.40092	-0.41353	0.27584	-0.28773	0.01122	0.01089	0.00665	0.00487
COL40	0.97439	0.01810	0.12173	0.18298	-0.01664	0.00555	0.00110	-0.03859	0.00237	-0.00227
COL41	0.93162	0.00707	0.24765	0.25098	-0.08510	-0.01006	0.00084	-0.01665	0.00268	-0.00081
COL42	0.96306	0.13822	-0.01702	-0.18965	0.01872	0.12315	0.00054	0.03808	-0.00060	0.00075
COL43	0.86783	0.04671	0.20612	0.11607	-0.06956	-0.01420	-0.00711	-0.00272	0.00166	0.00349
COL44	-0.05842	0.92558	-0.31402	0.15367	-0.11989	-0.00405	-0.05016	0.00515	-0.02085	0.00692
COL45	-0.14221	0.97794	0.05852	-0.06068	-0.11486	0.00022	0.03381	-0.00185	-0.00411	-0.00694
COL46	0.96891	-0.00189	0.22145	0.09577	-0.03164	0.02512	-0.01300	0.03419	-0.00078	0.00146
COL47	-0.04968	0.91242	-0.33492	0.11780	-0.19539	-0.00346	-0.01594	0.00512	0.00859	0.01294

TABLE XXII

VARIMAX ROTATED FACTOR PATTERN MATRIX--Q-MODE

ROTATED FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6	FACTOR7	FACTOR8	FACTOR9	FACTOR10
COL1	0.85080	-0.02473	0.04668	0.29727	-0.03520	-0.05369	-0.00561	-0.02294	0.00369	-0.00177
COL2	0.98826	-0.09202	-0.02121	0.10692	0.02332	-0.02292	0.01252	-0.04102	0.00059	-0.00463
COL3	-0.00475	0.27530	0.94158	0.05705	0.12108	-0.00151	0.13827	0.00274	0.01691	0.00775
COL4	-0.07739	0.95647	0.12379	-0.04897	0.15160	-0.00196	0.18513	0.00562	-0.00648	0.06272
COL5	-0.09142	0.78138	0.47196	-0.07617	0.28815	-0.00393	0.26229	-0.00384	-0.00061	-0.01993
COL6	-0.06416	0.82661	0.31065	-0.07285	0.44809	0.00232	-0.06748	-0.00155	0.05745	-0.03878
COL7	0.01473	0.27605	0.95301	0.09109	0.06988	0.00082	-0.03745	-0.00207	-0.01297	-0.00377
COL8	0.99401	-0.07189	-0.05474	-0.05018	0.01791	0.01514	0.00800	-0.02277	-0.00037	-0.00234
COL9	0.89503	-0.08758	-0.01381	0.04046	0.00668	-0.01564	0.00026	0.00984	-0.00137	-0.00017
COL10	-0.00700	0.62330	0.76626	0.10169	-0.11225	-0.00034	0.01176	-0.00281	-0.02428	-0.00559
COL11	0.63322	0.09457	0.06783	0.72859	-0.03584	0.23010	-0.00481	0.00050	-0.00091	-0.00045
COL12	-0.03975	0.89081	0.44585	0.04078	-0.01558	-0.00045	0.03027	0.00216	-0.01587	-0.04105
COL13	0.97482	-0.02844	-0.09650	0.12878	-0.02106	0.14433	-0.01667	0.03775	0.00058	-0.00292
COL14	0.93748	0.10695	-0.01541	0.31944	-0.07548	-0.00577	-0.01879	0.03301	0.00156	0.01079
COL15	0.98809	-0.03469	-0.03108	0.14120	-0.02193	-0.03010	-0.00646	-0.00856	0.00145	-0.00448
COL16	0.98837	-0.08993	-0.08192	0.07573	0.02364	-0.04138	0.00700	0.01464	0.00109	-0.00452
COL17	-0.06557	0.96511	0.09402	-0.04409	0.21085	0.00206	-0.07645	-0.00418	0.02846	-0.03972
COL18	-0.02762	0.84150	0.53141	0.06049	-0.02130	0.00027	-0.03453	-0.00037	-0.05221	-0.02102
COL19	-0.01356	0.48798	0.84130	0.03897	0.22486	0.00113	-0.02576	-0.00274	0.00031	0.02572
COL20	-0.08007	0.66504	0.32494	-0.13318,	0.65165	0.00018	0.04168	0.00144	-0.03464	0.01131
COL21	0.85596	-0.06194	-0.13478	0.19076	0.00485	0.13177	-0.01905	0.09918	0.00133	-0.00013
COL22	0.01182	0.57968	0.77498	0.13726	-0.20616	0.00014	-0.02421	0.00017	-0.02917	-0.00298
COL23	0.95842	-0.13309	0.12668	0.20409	0.03353	-0.04232	0.01840	-0.05071	-0.00024	-0.00645
COL24	0.88524	0.05096	0.32710	0.26868	-0.05851	0.16698	0.02671	-0.02200	-0.00886	0.02706
COL25	0.99382	-0.09290	-0.04685	0.02731	0.02498	-0.00377	-0.00379	0.00707	0.00227	-0.00193
COL26	0.59611	-0.05807	-0.01699	0.76710	0.10313	-0.19884	0.02940	0.03627	0.00303	0.00044
COL27	0.86752	0.11339	0.02019	0.47528	-0.05172	-0.01013	-0.00305	-0.07295	-0.00452	0.00820
COL28	-0.02340	0.82144	0.56120	0.06075	0.01691	0.00159	-0.07013	-0.00141	0.00323	-0.01434
COL29	-0.05119	0.94549	0.18449	-0.02648	0.24678	0.00232	-0.06298	0.00482	0.02984	0.02845
COL30	0.79543	0.12004	0.15276	0.52273	-0.18073	-0.13510	-0.01931	0.06866	-0.00910	0.00946
COL31	0.61443	0.13150	0.29265	0.69238	-0.17871	0.00016	-0.01627	-0.08783	0.00166	-0.00099
COL32	-0.04537	0.88902	0.00740	0.02936	-0.13590	0.00049	-0.00469	0.00130	0.00330	-0.00338
COL33	-0.03780	0.90759	0.41330	0.03535	0.03500	0.00063	-0.02489	0.00104	-0.02807	-0.00267
COL34	0.97089	0.00665	0.10224	0.21065	-0.02605	0.02195	0.00212	-0.03525	-0.00063	0.00097
COL35	-0.03435	0.95408	0.21630	0.06364	-0.18655	0.00077	-0.00552	-0.00293	0.01590	0.04149
COL36	-0.02815	0.94647	0.12074	0.07879	-0.28326	0.00048	-0.04065	-0.00252	-0.02331	-0.00574
COL37	-0.03248	0.55446	0.71391	-0.01861	0.41662	0.00216	-0.05042	-0.00145	0.06864	0.00261
COL38	0.96512	-0.13966	0.11599	0.18002	0.02750	-0.03817	0.00312	0.02598	0.00105	0.00212
COL39	0.48572	-0.03811	0.10617	0.81438	0.04617	0.29260	0.00030	0.01385	0.00112	-0.00280
COL40	0.99095	-0.09987	-0.00185	0.07575	0.02449	-0.00144	0.00212	-0.03948	-0.00050	-0.00140
COL41	0.99402	-0.05855	-0.04739	-0.07514	0.00001	0.01349	0.00087	-0.01800	-0.00217	-0.00200
COL42	0.88431	0.03481	-0.02891	0.44065	-0.07412	-0.12009	-0.00223	0.04052	-0.00283	0.00259
COL43	0.89480	-0.01379	-0.06644	0.06424	-0.03418	0.01712	-0.00988	-0.00245	0.00042	-0.00407
COL44	0.00234	0.56290	0.81760	0.10160	-0.03661	0.00130	-0.04851	-0.00264	0.01732	0.00221
COL45	-0.03906	0.86117	0.49875	0.04982	-0.05175	-0.00014	0.02776	-0.00657	-0.01107	0.01025
COL46	0.98810	-0.04135	-0.11784	0.07815	-0.00624	-0.02163	-0.01221	0.03569	0.00185	0.00006
COL47	0.00290	0.55337	0.81500	0.11458	-0.12370	0.00030	-0.02105	-0.00427	-0.00868	-0.01799

TABLE XXIII

FACTOR SCORING COEFFICIENTS--Q-MODE

STANDARDIZED SCORING COEFFICIENTS

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6	FACTOR7	FACTOR8	FACTOR9	FACTOR10
COL1	0.17157	-0.09743	0.15088	0.95650	-0.66606	4.50186	0.66758	-9.86268	1.48211	7.45712
COL2	0.58501	-1.57579	1.05170	-5.20095	4.45320	-4.14653	-1.42302	9.40332	-1.29700	-15.75092
COL3	1.04381	-2.78050	1.91077	-7.23632	10.77050	2.53896	-7.84925	13.33374	7.85511	14.59665
COL4	0.03399	0.51381	-0.32500	0.00173	0.74636	-0.26851	-1.48927	-0.67490	4.31460	13.73899
COL5	-0.48025	1.04848	-0.73273	3.39434	-5.41949	-0.39305	8.35017	-6.46128	-10.79815	-16.63974
COL6	-0.07705	0.16995	-0.00573	0.54782	-0.43995	-0.45468	0.39776	-0.46934	4.46692	-4.15716
COL7	0.02533	-0.18064	0.39523	-0.08075	-0.36282	0.33277	0.84043	-0.04102	-2.87451	-2.24691
COL8	1.84722	-4.82121	3.31673	-12.05291	13.80613	10.19646	-6.95174	12.17861	8.87059	5.77043
COL9	-3.62576	11.65816	-7.61481	31.53396	-33.17994	-7.99049	15.24408	-63.03706	-19.55833	24.30101
COL10	-0.70124	1.95260	-0.62383	4.32538	-6.71150	-3.10237	1.26140	-4.82500	16.27889	0.45077
COL11	-0.37950	0.60344	-0.65735	3.25235	0.67735	0.08420	-2.06319	-4.18705	3.22604	10.22091
COL12	-0.21590	0.93531	-0.30110	1.63136	-4.63338	-0.72690	3.76507	-3.15836	2.98243	-10.87471
COL13	0.53557	-0.62934	0.67762	-3.97335	-0.63629	4.22770	1.88829	7.57071	-2.19170	-12.32020
COL14	1.01099	-2.85446	2.13084	-7.07328	4.10830	1.04027	2.88639	18.30446	-6.58898	-22.31168
COL15	-1.49777	5.53185	-3.65594	10.98722	-20.00209	-6.39408	13.79272	-29.29177	-16.40013	-17.49800
COL16	2.18149	-7.66541	4.33433	-17.56653	31.77604	-1.25230	-24.21233	57.94289	33.12040	22.32066
COL17	0.16933	0.07636	-0.10192	-0.96475	2.92141	0.51410	-4.65545	1.08275	5.17066	10.75777
COL18	0.87520	-2.29617	1.16066	-5.88698	10.15321	2.49759	-6.80830	9.82034	-16.58747	6.79133
COL19	-0.38750	0.88590	-0.36121	2.50168	-3.91603	-0.89793	3.10224	-4.59143	-6.14148	-6.23815
COL20	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL21	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL23	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL24	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL25	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL26	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL27	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL28	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL29	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL31	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL33	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL34	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL37	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL39	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL40	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL41	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL42	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL43	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL44	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL45	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL46	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
COL47	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE XXIV

PRINCIPAL COMPONENTS BY STATE--R-MODE

STATE	PRIN1	PRIN2	PRIN3	PRIN4	PRIN5	PRIN6
CT.	-4.0236	1.5427	0.4568	1.6128	-2.2227	-1.1204
MA.	-3.8525	-0.1540	-0.1714	1.2497	-0.4951	-0.4744
PN.	-3.5180	-0.9174	0.2185	0.9007	1.5335	-0.9090
NH.	-3.4662	-0.9045	0.1216	0.4573	-0.9481	0.9478
NJ.	-3.4201	-0.9096	1.6851	-1.2466	-1.6003	-1.8886
RI.	-3.2905	-0.9512	0.5117	0.7853	-2.9765	0.1220
MD.	-3.2669	-1.2841	-0.5195	-0.4203	0.0318	0.1857
NY.	-3.1941	-0.4595	-0.4641	0.7689	1.3106	-1.2030
WV.	-3.1780	0.5276	0.1302	0.6633	0.3984	0.5451
IL.	-3.0834	0.0290	-0.9730	0.2076	1.1873	-1.0184
OH.	-3.0656	-1.2361	-0.5801	-0.3160	-0.0323	0.0534
VT.	-2.9640	-0.6558	0.2988	0.1908	-0.9053	1.3041
DE.	-2.9591	-0.4465	1.0604	-3.2520	0.0922	0.4756
MI.	-2.8842	-0.7548	-1.3597	-0.5748	-0.5117	-0.1290
WA.	-2.8335	0.8614	0.3972	-1.9179	1.8138	-1.1615
IA.	-2.7681	0.1056	-0.4090	0.1390	-0.0037	1.3637
OR.	-2.7040	-0.3615	-0.0406	0.8682	-0.0116	0.9217
ME.	-2.6153	-1.0616	-0.5258	-0.7175	-0.6018	0.3371
CO.	-2.2895	2.1759	-2.0765	0.7634	1.0800	-0.3185
MO.	-2.2524	-1.5000	-0.3499	-1.2536	-0.0801	0.6460
CA.	-1.9031	0.2689	-1.8997	-0.3062	0.9795	-0.1160
AZ.	-1.8063	2.5999	-1.7700	0.1751	1.2527	0.5013
NV.	0.8659	3.7673	6.3456	-1.2024	-0.7651	-1.5246
MT.	0.9634	1.3524	1.1866	-2.8009	1.7607	0.8958
NE.	1.0279	-0.5679	1.1341	0.3212	0.9448	1.1030
OK.	1.0994	0.8976	0.5963	0.2666	1.5289	0.3438
KS.	1.2532	-0.2967	1.1447	1.5203	0.1695	1.4203
AK.	1.9480	0.1347	0.7609	0.8446	-0.4514	1.2326
SD.	1.9740	0.3927	2.0745	1.1828	0.3444	2.7676
ID.	2.1945	-1.4787	1.7495	1.0468	1.6315	-0.1648
WY.	2.2526	-0.9171	1.5388	0.2199	0.5677	1.2529
FL.	2.2547	5.3898	-1.1710	1.3264	-0.6573	-0.2556
NM.	2.2845	-0.8603	1.0714	0.4757	1.0933	0.8488
VI.	2.3494	-1.2777	0.0793	-0.1286	-0.6164	-0.1976
ND.	2.4565	-0.0679	-1.2236	-0.3383	0.2020	0.2208
KY.	2.4756	-0.5002	0.5990	1.2804	1.2910	-2.0928
NC.	2.6596	-0.5440	-1.0604	-0.7946	-1.4318	-0.2693
MN.	2.8377	-1.3992	0.5420	1.2906	-0.5225	-0.1304
LA.	2.9395	1.4342	-1.6147	0.6644	0.8144	-1.3398
AL.	3.1377	1.1350	-1.1499	-0.1676	-0.9726	0.8465
WI.	3.1596	-1.4853	-0.7929	0.1972	-1.2346	-0.9610
UT.	3.3148	-1.6244	-0.0962	0.4173	0.6120	-1.4967
TN.	3.3995	-0.2956	-0.7969	-1.0742	-1.2294	0.0953
SC.	3.6012	-0.2287	-1.1391	-1.2085	-1.0549	0.1364
GA.	3.6288	0.0851	-1.3549	-0.8942	-0.7813	0.0943
IN.	3.6518	-2.5670	0.9561	0.9275	-0.3645	-1.5461
MS.	3.7010	-0.2940	-0.8066	-1.0075	0.1335	-0.7900
TX.	3.9072	1.4082	-2.3133	-1.1424	-0.3025	0.4463

VITA

James Gerald Cain

Candidate for the Degree of

Master of Science

Thesis: THE SPATIAL DIFFUSION OF STATE LOTTERY SYSTEMS

Major Field: Geography

Biographical:

Personal Data: Born in Omaha, Nebraska, July 8, 1961, the son of Gerald D. and Jean J. Cain.

Education: Graduated from Lewis Central High School, Council Bluffs, Iowa, in May, 1980; received the Bachelor of Science degree in Geography from Northwest Missouri State University, Maryville, Missouri, in December, 1984; completed requirements for the Master of Science degree at Oklahoma State University in July, 1987.

Professional Experience: Graduate Teaching and Research Assistant, Department of Geography, Oklahoma State University, August, 1985, to May, 1987.

Professional Societies: Member of Gamma Theta Upsilon (geography honorary society) and the American Association of Geographers.