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The impact of the Louisiana lottery on salaries in education

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THE IMPACT OF THE LOUISIANA LOTTERY ON SALARIES IN EDUCATION

by

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ABSTRACT

The study was undertaken to decide whether lottery revenues impacted teachers' salaries in Louisiana. Economic recession brought on by the collapse of the oil and gas industry, disgruntled taxpayers, and the lure of easy money prompted Louisiana legislators to pass a bill adopting a state lottery. Initially, all funds were earmarked for education. Subsequently, lottery revenues were deposited into the general fund. Yet many thought the lottery would be a significant source of money for education and teachers' salaries.

Logged annual salaries were used in models for university teachers and for elementary and secondary school teachers. Variables were incorporated to control for demographic and economic characteristics. Two theoretical models were used to show how the demographic and economic characteristics explained the variation in annual teachers' salaries.

Variables in the final model for university teachers were degree, discipline, total university experience, total years of teaching experience, rank, university, university system, regions of the state, and lottery revenues. Variables in the elementary and secondary teachers' model included classification variables for degree held, years of experience, lottery revenues,

and year. Data were collected for a five-year period before and after Louisiana began a lottery. Linear multiple regression models with a single quantitative dependent variable were used to test the empirical relationship between the independent variables and teachers' salaries.

The study failed to reject hypothesis one. Louisiana lottery revenues did not affect teachers' salaries among elementary and secondary teachers. In contrast, empirical findings rejected the second hypothesis. No significant difference existed in university teachers' salaries before and after Louisiana adopted the lottery. The rejection of the null may be attributable to model misspecification.

Education and experience were positively correlated with salaries in both models. An added dimension in university teachers' salaries was the rank of the teacher. As expected, full professors earned more than instructors, assistant professors, or associate professors. Administrators earned a premium over all other ranks.

Another notable finding was support for previous research (Ransom, 1993; Oi, 1962) that university employment violates basic wage theory. While overall experience was positively correlated with salary, tenure at a particular university reduced salaries.

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CHAPTER 1

INTRODUCTION

Education is a major issue to Americans. Families, educators, and politicians cite quality education as the solution to poverty, crime, and unemployment. President Bush focused attention on this issue when he gathered the country's governors together to "draft national education goals for the year 2000" (Walters, 1994, p. 14). The outcome of this 1989 meeting was the eventual passage of the Goals 2000: Educate America Act (1994). This act calls for sweeping reforms of schools to improve the quality of education in the United States.

The lofty ideals espoused by the Goals 2000: Educate America Act (1994) include high school graduation rates of 90 percent, adult literacy rates of 100 percent, and students who are first in the world in science and mathematics achievements. Other goals entail establishing safe, drug-free school environments that foster learning, promote citizenship, and create a highly skilled workforce able to compete in a global economy. These changes are to be accomplished by the year 2000.

In an attempt to meet the needs of the state as it moved toward the 21st century, former Governor Edwin Edwards established the Louisiana Goals 2000 Commission in July, 1994. The commission was to distribute information and help school systems establish curriculum and performance standards. Schools would then start programs to meet these standards within 6 years.

With only 3 years until the beginning of the new millennium, Louisiana's prospects of fulfilling the directives of Goals 2000 seem dim. The state is near the "bottom in national rankings of illiteracy and high-school dropouts" (Ruth, 1987, p. A-1). Since 1986, average teachers' salaries dropped from 47th to 49th place among the 50 states. This decline is more disheartening when one considers that the state ranked 27th in 1982 (Myers, 1996). These factors prompted leaders of the teachers' unions to predict that more educators will abandon the profession or move out of the state in coming years (Myers, 1995a, 1995b).

The current exodus of teachers has created concern that a severe teacher shortage is on the horizon (Myers, 1995a). One-fifth of Louisiana's 53,000 faculty members retired during the last decade. An LSU study reported that about one-third of new teachers leave the public schools within their first 2 years of teaching. Fred Skelton of the Louisiana Federation of Teachers' Educators predicted that the resulting "brain drain" would increase the number of uncertified teachers in classrooms and reduce the potential success of Goals 2000 ("State teachers again last in pay," 1995).

Dire predictions of teacher shortages and declining educational quality have not protected education from the legislative ax. The state constitution protects funding for all programs except higher education and welfare agency spending (Anderson, 1993). When severe budget shortfalls in 1987 (Wardlaw, 1987a, 1987b) and again in 1993 forced funding cuts at universities across the state, many students and administrators felt that higher education had been chosen as the legislative whipping boy (Anderson, 1993).

The precarious nature of education funding, coupled with a national movement to improve education, created an atmosphere that was conducive to seeking new ways to fund education. Pollsters found that Southerners came to view lotteries as a way to raise revenues without the increasing taxes that are anathema to local voters. The urbanization of the South helped alter traditional views of the lottery as an "abomination," a "Yankee invention that would send participants straight to ----" ("Better sin than tax," 1989, p. 28).

The image of gambling altered dramatically in the last 2 decades. The adverse effects of gambling were considered so potent that as late as 1955 baseball leagues prohibited players from spending the night in Las Vegas. In the late 1970s, many still viewed casino gambling as detrimental to good moral character. In 1995 more money was spent on legalized gambling than the combined expenditure on movies, concerts, video games, and major league baseball (Popkins & Helter, 1994). When the British revived the lottery in 1994, they earmarked 6 percent of the proceeds for charities such as the arts and theater. Survey data collected since the inception of the lottery found that the lottery adversely affected the poor because players shifted funds from charities to betting ("Redistribution to the rich," 1994). Yet, the lottery continues.

The explosion of state-sponsored lotteries began when New Hampshire adopted a lottery in 1963 (Brinner & Clotfelter, 1975). The large revenues generated have "states actually promoting gambling through such activities as spending $350 million annually to advertise lotteries" (Glentzer, 1995, p. 32). Economists estimated that gambling, including lotteries, generates $12 to $15 billion each year in tax receipts. When receipts for 1993 showed a 21 percent increase over previous years, more states adopted lotteries. A large pool of money was just the lure to attract the attention of Louisiana's charismatic governor.

Governor Edwin Edwards understood the power of his charm to persuade constituents and legislators to support his policies (Grady, 1991). According to the *Louisiana Economic Outlook*, (Scott, Richardson, & Jamal, 1995, p. 9), between 1982 and 1987, Louisiana "faced the worst recession in its recorded history." The state struggled to overcome declining revenues and the resulting budget deficits.

A state lottery, casino gambling, and one-man state budgeting were former Governor Edwards' proposed solutions to the state's fiscal woes (Wardlaw, 1987a, 1987b). Mr. Edwards convinced legislators that a lottery would painlessly raise millions of dollars (Mikesell & Zorn, 1986). He claimed that the only way to ease the economic and fiscal problems facing the state at the end of 1986 was to revise the revenue base. The recommended changes included a statewide lottery and casino gambling (Wardlaw, 1987a, 1987b). Lottery money would supplement spending on education and the elderly. Earmarking funds for these populist causes swayed public opinion and the legislature (Anderson, 1993). Edwards planted the seeds, but his endeavors did not bear fruit until worsening financial conditions prompted legislative action during Roemer's term in office.

Facing additional shortfalls in revenue, legislators looked for ways to balance the budget that did not involve higher taxes or cutbacks in services. Edwin Edwards again presented his gambling solution and suggested that before imposing more taxes voters should be allowed to vote on a lottery ("Edwards: put lottery on the ballot," 1988). Legislators began the journey that would eventually lead to a state-sanctioned lottery.

The Louisiana legislature made history on June 14, 1990. Amid great fanfares and only "fifteen seconds apart," the two houses passed legislation to amend the state constitution. The bills rescinded a 100-year-old ban on lotteries (Hill & Kernion, 1990, A-1).

Several factors contributed to the adoption of a state-sponsored lottery in Louisiana. The collapse of the oil and gas industry during the 1980s reduced revenues and strained the state's budget. Oil and gas monies declined from 48 percent to 13 percent of state revenues between 1982 and 1986. A recession and reductions in federal funding during this period further strained the resources available to fund public programs. Still voters opposed increasing income and property taxes. From 1986 to 1990, the state unsuccessfully tried to adjust its spending programs to compensate for falling oil and gas revenues. These combined factors led legislators to seek nontraditional funding sources. The state followed the lead of 32 other states by authorizing a state-operated lottery ("19th century lottery," 1990). Lawmakers embraced the lottery as "a painless tax" (Clotfelter & Cook, 1989, p. 214).

Promises of sorely needed new revenues overwhelmed concerns about the negative effects of lotteries (Vallen, 1993; Mikesell & Zorn, 1986). Legislators disregarded predictions that gambling would destroy many businesses vital to small towns in Louisiana. Evidence that returns from lotteries are often disappointing when compared with the incidences of corruption that accompanies adoption of a lottery was dismissed (Wartzman, 1995). The lure of increased money for public programs overcame the regressiveness of this "sin tax" on the participants (Clotfelter, 1979; Heavey, 1978).

To counter this negative reputation, lotteries are supposedly used constructively. For example, they have funded education and other public works projects. Several Ivy-league institutions in America owe their existence to lotteries. Yale, Harvard, and Columbia can trace the funding for building construction and other capital expenditures to lottery revenues. This source "funded the founding of Jamestown" and was used to develop the infrastructure in many areas of the United States (Clotfelter & Cook, 1989, p. 11). Clearly, a precedent existed for using lotteries to raise revenues for public works spending.

The lottery is not new to Louisiana. A state lottery flourished during the last century. Graft in the lottery commission and in the legislature created an abhorrence of lotteries comparable only to the passion associated with the temperance movement of the 19th century. Federal legislation in 1898 finally outlawed the Louisiana lottery. To reintroduce a state-sponsored lottery required passage of a constitutional amendment.

Proponents supported the lottery as a means to replace educational funding lost in the collapse of the oil and gas industry. The governor advertised enactment of the bill as the panacea for the ailing Louisiana economy and especially for the financially strapped education system. A vote for the lottery was a vote for the good of the state's children (Anderson, 1993; Doran, 1990; Wardlaw, 1987b).

Public perceptions suggested that lottery revenues would be dedicated to education and to the retirement of state debt. However, legislators allocated the monies to the general fund.[1] Clotfelter and Cook (1989, p. 239) note that

> . . . although state lotteries have grown rapidly since the early 1970s, they are not the fiscal bonanza that the public perceives them to be. The public's perception . . . is that the lottery makes a large difference in state finance.

While previous research has examined the relationship between state lotteries and funding education, Louisiana was not among the states examined. Among the issues scrutinized were whether total funding increased, what group

[1] Examples of the perceptions of the public can be found in Anderson (1993), Borg and Mason (1988), Doran (1990), Joyce (1979), Scoggins (1994), Wartzma (1995), Meinert et al. (1989), and Weigold and Schlenker (1991).

bore the burden of the lottery, and the impact on the work ethic.[2] Another way to measure its impact may be to look at teachers' salaries. The premise is that if Louisiana could afford to offer greater remuneration to its educators, the state could probably attract and keep a higher quality faculty. Long-term tenure of high-quality teachers should translate into improvements in the educational process. If the lottery has not impacted funding for teachers' salaries, then it is possible that the lottery has not met its goal -- improving the funding of government without raising taxes.

Statement of the Problem

Although the public has debated the subject, the impact of the lottery on education in Louisiana has not been subjected to statistical evaluation. If "the lottery makes a large difference in state finance," (Clotfelter & Cook, 1989, p. 239), it should impact education funding. One way to measure this impact is to decide whether lottery revenue is a factor affecting teachers' salaries. This analysis expands the body of knowledge about the impact of lotteries as a government funding source. Developing more information on

[2] For additional discussion of this aspect of the lottery see Blakey (1979), Borg and Mason (1988), Brinner and Clotfelter (1975), "Do lotteries usually make cents" (1994), Scoggins (1994), and Wells (1989).

teachers' salaries may promote changes in current personnel policies. The state could structure compensation packages and teachers' contracts to provide incentives for teachers to maintain credentials and to improve the quality of instruction.

Purpose of the Study

The study investigates and evaluates the impact of the lottery on Louisiana teachers' salaries. The purpose of this research is to develop a model that determines whether the adoption of a state-sponsored lottery has altered funding of teachers' salaries in Louisiana. The models use demographic and economic characteristics as control variables. One model attempts to evaluate the impact of the lottery on elementary and secondary teachers' salaries. A second model will attempt to measure any differences in university salaries before and since the adoption of the lottery.

Hypotheses

This study attempts to decide whether the adoption of a state-operated lottery has affected teachers' salaries. Comparing salaries for elementary and secondary school teachers before and after the adoption of the Louisiana lottery will measure any change predicated by the lottery. A second data set collected from 16 public universities in Louisiana will be used to analyze the lottery's impact on the salaries of university teachers during the same periods. The two periods studied are 1986-1990 and 1991-1995. During 1986-1990, Louisiana was adjusting to the loss of revenues from oil and gas. In 1990 the state adopted the lottery that has generated revenues to replace oil and gas monies. Comparing the salaries of elementary and secondary school teachers in the two time periods should determine whether the lottery affected salaries in education. Two hypotheses were developed to test for any change in teacher salaries related to lottery funding. The hypotheses in the null form are the following:

$H1_0$: There is no difference between the salaries of Louisiana elementary and secondary school teachers before and since the adoption of the lottery.

$H2_0$: There is no difference between the salaries of university teachers in Louisiana before and since the adoption of the lottery.

Methodology and Procedures for Collecting and Treating Data

The impact of the lottery on teachers' salaries is analyzed using 1986-1995 data collected from the 66 school systems within the state. These data sets are subjected to multivariate analyses using the SPSS system for data analysis to determine whether statistically significant differences exist between salaries from 1986-1990 and 1991-1995.

Sample

The salary and demographic information for educators in the state of Louisiana was collected for the two periods mentioned above. This information is divided into two groups. The first group consists of elementary and secondary school teachers, while university teachers from 16 Louisiana universities compose the second group. Different factors determine the salary levels of teachers within these two groups. To measure the impact of the lottery accurately, linear regression equations are used to evaluate salaries before and after the adoption of the lottery in Louisiana. Information about elementary and secondary school teachers is collected from the school system I-A mandatory salary reports and Profile of Educational Personnel (PEP) reports submitted to the Louisiana State Board of Education. Before 1993, school systems submitted the I-A reports. The state began requiring the PEP reports from local school systems beginning with the 1993-1994 academic year. Data were collected from the J-1 forms submitted to the state in the yearly budget proposals for each educational division at the university level.

Since differences exist in the way salaries are determined, two separate data sets were compiled. Parishes primarily determine elementary and secondary school salaries by degree held and additional funding unique to each parish. University salaries depend on discipline, degrees held, academic rank, years of seniority, and years of teaching experience. F-tests are used to test whether significant statistical differences exist between the two periods.

The salary data are deflated using the GDP deflator for the relevant year. The base year of comparison is 1992, which is the most recent base year calculated. These data are compiled from the Economic Report to the President for 1996. This process allows the examination of real changes in salaries. This transformation of the data allows the testing for statistically significant changes in salaries while compensating for the drift in salaries caused by inflation. The natural log of the deflated annual salary data is employed as the dependent variable in the regression equations. Using the natural log reduces potential bias that could be introduced into a regression model when the scales of the variables in the model differed greatly (Anderson, Sweeney, & Williams, 1996).

Straight-Line Linear Regression

The two data sets are subjected to straight-line linear regression. This statistical technique is often used to examine the underlying relationship between many independent variables and a single dependent variable.

Piecewise linear regression is applied to the data sets for 1986-1990 and 1991-1995. This method allows testing of stationarity of the regression models over time. Comparison of the regressions using F-tests is employed to determine whether the models exhibit statistically significant differences. T-tests are used to determine whether statistical differences exist between the same variables in the two different times.

Delimitations of the Study

A properly designed study must be conducted within a set of defined parameters. The researcher imposes some boundaries to eliminate confounding effects. Other limits are set to keep the problem manageable. Self-imposed restrictions are called delimitations. These delimitations are the fences that define the study.

The purpose of this study is to examine the impact of the lottery on Louisiana teachers' salaries. This study in no way attempts to measure the impact of the lottery on educational attainment or the quality of instruction within the state of Louisiana. It considers whether the adoption of the lottery added to education funding via teachers' salaries.

Evidence suggests that lotteries increase crime rates (Mikesell & Pirog-Good, 1990), are inefficient revenue sources (Clotfelter & Cook, 1989), and may result in higher costs to taxpayers due to increased incidences of problem gambling and bankruptcies. However, studying these areas would be too large a task for the current research. Designing a study to examine these areas is beyond the scope of this work. Since the cost and time required to collect a representative sample would be prohibitive, this research omits these areas from consideration.

Also, this study does not consider the social and economic benefits or costs of lotteries on the population as a whole, nor its influence on different socioeconomic groups within the state. Instead, it looks at teachers' salaries as a single indicator of any changes wrought by lottery revenues.

Teachers in 2-year community colleges, law schools, and medical schools in the state are omitted from the sample. Community colleges represent only a few teachers within the state. The salaries of law and medical school instructors are much higher than the average teacher's salary because they are based on market criteria not used in setting other academic salaries. Inclusion of these could unduly bias the results.

One final delimitation of this research is that vocational-technical schools are specifically excluded from this study. The credentials required to teach in these institutions vary according to the courses taught. Individuals with professional qualifications teach many courses of study (i.e., experience as mechanics, repair people, etc.) that require no formal education. The variety of technical expertise required and the corresponding variances in pay scales in these schools could skew the data and obscure the results of the study.

Limitations of the Study

The researcher cannot control some aspects of a study. These aspects are called limitations. Nevertheless, these unmanageable facets can affect the interpretation of results. The cogent investigator accounts for as many factors as possible and tries to control their effect. This section presents the limitations of this study.

This study focused on whether there is a difference in teachers' salaries before and after adoption of the lottery. The introduction of casino gambling may obscure the impact of the lottery, since this revenue source is often grouped with lottery revenues. Therefore, considering this bias, readers should interpret the results of this study with caution. This condition may limit the generalization of the findings.

Another limitation of the study is the limited time available for analysis of lottery revenues. The lottery began operations in September 1991. The five years of data available may be insufficient in a longitudinal study to determine the full impact of the lottery. This study will be conducted to examine whether statistically significant differences exist in teachers' salaries in the years lottery revenues have been collected compared to the 5 years before the lottery began.

One sample is collected from the salary and demographic information available from the Louisiana school system personnel employment profiles. The time examined is the fiscal years 1986-1990 and 1991-1995. The second sample is collected from the proposed budgets of public universities in Louisiana. Since the results of any study are only as good as the data used, the accuracy of the data limit the ability to generalize the results of this study. In particular, some university budgets list teachers in departments that are unrelated to their teaching fields. To alleviate this problem, disciplines are separated into major categories such as business, arts and humanities, and pure sciences.

Records retention statutes allow parish and city school systems to dispose of records after three years. Therefore, data are not available for every year for some school systems. To reduce the impact of this problem, data are aggregated to correspond to the six lottery revenue regions in the state. Since aggregated data are less accurate than individual records, the results may allow only narrow interpretations.

Private academies and private universities are not part of this study. Since these institutions receive little, if any, financial aid from the state, their inclusion in the analysis would not add new dimensions to the work. Further, the details in the budgets and the demographic composition of a faculty at these schools are rarely open to public scrutiny. Data collection under these circumstances is virtually impossible. Therefore, these institutions are not included in the research.

Plan of the Study

The balance of this study is organized as follows. Chapter 2 surveys the literature relevant to this study. It presents a brief history of lotteries and reviews the empirical work about lotteries. This section also addresses related empirical work on teachers' salaries. Chapter 3 describes the plan of the study, presents the hypotheses to be tested, and describes sample selection. A review of the proposed methodology concludes this section. The results of the research are reported in Chapter 4, while Chapter 5 summarizes the research, discusses policy implications, and offers suggestions for future research.

CHAPTER 2

REVIEW OF THE LITERATURE

Historical Background of Lotteries

Lotteries have been prevalent throughout the history of America and the world. Chinese, Greek, and Roman literatures have examples of the use of lotteries to distribute goods (Clotfelter & Cook, 1989; Ezell, 1960; Blakey, 1979).

The Romans used lotteries to distribute gifts and prizes to guests at banquets and feasts. Emperor Nero gave away slaves and houses in this manner. In Venice, a government monopoly in lotteries raised considerable revenues for the city's coffers (Ezell, 1960).

Even the Bible refers to the use of lots as a selection device. Raffles were used to distribute lands in Canaan (*Bible,* Numbers 26:55) and in Judah (*Bible,* Joshua 1:5). The Israelites selected Saul as king using a lottery (*Bible,* 1 Samuel 10: 17-20). Roman soldiers divided Jesus's garments among themselves by casting lots (*Bible,* Matthew 15:24, Psalms 22:18, Matthew 27:35).

Roots of the Lottery in America

Rulers and tradesmen introduced lotteries to feudal Europe during the 15th and 16th centuries (Blakey, 1979). When French citizens refused to pay additional taxes, Francis I of France established a lottery to finance the costs of maintaining his lavish court (Ezell, 1960). Italian tradesmen used lotteries to entice customers into their shops. Merchants also disposed of unsold merchandise in this manner (Blakey, 1979).

Ezell (1960) suggests that the lottery followed a remarkably consistent paradigm, a sociological order rather than a chronological sequence. Most lotteries started as charitable concerns, such as raffles to benefit churches or the poor. These lotteries funded civic projects during a period of insufficient currency supply.

In the second lottery stage, individuals applied this technique to dispose of property and merchandise. The lottery was an economic expedient required by nonexistent or rudimentary financial markets. This "laissez faire" (Ezell, 1960, p. 13) period characteristically had no government interference.

The lottery usually evolved into a large, complex business in the third stage. Government legally sanctioned some groups against operating lotteries. Ezell (1960) claims that easy money and exploitation were the goals of the lottery during this time. A dearth of ethics characterized this period. Incidents of graft and corruption appeared and then grew in number and scope. The public demanded reform, and legislation outlawed unlawful lotteries (Ezell, 1960).

As more lotteries were used to raise money, dishonesty and corruption grew. A widespread lack of regulation made the gullible prey for the unscrupulous. Common practices included awarding inferior goods as prizes and manipulating drawings so that lottery operators gave none of the valuable prizes away (Ezell, 1960, p. 18). Operators often defrauded lottery players. Many lottery promoters sold tickets then fled town before awarding prizes. The public demanded action to address these abuses. Legislation outlawed these illegal lottery activities (Ezell, 1960).

In the final stage of lottery evolution, social attitudes turned against gambling. The outcry against lotteries rose, and governments banned the practice (Ezell, 1960). Lotteries ceased to exist for a time and then reemerged as economic pressures rose.

Immature economic and financial markets made funding public works projects difficult during many periods of discovery and colonization. Limited taxing capacity and an inability to tap into large capital pools forced many governments to depend on lotteries as a financing alternative. The English, under Queen Elizabeth I, first used lottery proceeds to repair harbors throughout the country. Later, the Crown authorized the Virginia Company of America to conduct annual lotteries in the Americas during 1619 and 1620. These lotteries defrayed the cost of expeditions to colonize North America (Blakey, 1979).

The monarchy centralized economic power in England to accumulate wealth and maintain its control of the empire. "This mercantilistic approach to commerce kept the American colonies from developing economic and financial independence" (Blakey, 1979, p. 64). During the colonial period, securities markets in England and around the world were still at the developmental stages. Blakey (p. 65) reports that "the colonies were in desperate need of schools, roads, bridges, defenses, and churches." The lottery became a substitute for "conventional methods of financing" (p. 65). Gambling financed the construction of buildings on the campuses of Harvard, Columbia, and William and Mary College (Clotfelter & Cook, 1989). Lottery money built "coastal fortifications during King George's War, paid for relief at the siege of Annapolis during the American Revolution, and later funded the national defense of the new nation" (Blakey, 1979, p. 64.).

Independence freed the United States from England's mercantilism. States could determine the type and scope of taxes levied. The populace imbued state and local governments with the power to tax. However, freedom also meant the "development of banks, corporations, and securities markets for the new nation" (Blakey, 1979, p. 67). Improving the infrastructure and meeting the needs for public services for a burgeoning population kept the states and the federal government of the fledgling county dependent on lotteries for revenues.

The United States sponsored two federal lotteries. The first lottery's purpose was to fund the building of Washington, D.C., while the second lottery was to finance the construction of a canal between Maryland and the District of Columbia. Sluggish sales, accusations of mismanagement, and court clashes over the legality of lotteries resulted in dismal failures in both attempts (Blakey, 1979).

The nation expanded geographically, and population densities increased. The burgeoning populace required more public services. Underdeveloped financial markets and the lack of organizations such as the United Way and the Community Chest sorely constrained fund raising for public works. Lotteries provided a means to finance needed roads, bridges, and schools. Private citizens used the lottery to contribute to the public welfare. George Washington bought lottery tickets to promote westward expansion. He also purchased tickets to send to friends who "needed good luck" (Blakey, 1979, p. 66). This trend continued until after the Civil War (Clotfelter & Cook, 1989).

"As conventional financing methods matured and as lottery promotion became big business, lotteries fed more on greed than need" (Blakey, 1979, p. 68). During the 1830s, lotteries in eight states raised four times the amount spent by the Federal government during the same period. The vast sums earned by lotteries encouraged the development of the lottery as a business endeavor.

Without the social impetus that initially inspired the lottery, the practice evolved into an industry controlled by five or six large companies. These companies established extensive, complex channels of distribution, intense competition among agents, and the introduction of "insurance" (Ezell, 1960, p. 273.) The organization of the lottery industry ensured that lottery tickets would be available to anyone in the nation.

As the lotteries matured, instances of corruption and mismanagement grew. Many people blamed lotteries for increased rates of suicide, embezzlement, and bankruptcy. According to Ezell (1960, p. 273), the public consensus was that "the true evil of the lottery became more apparent in its effect upon the participants – their visionary and unreal expectations, debts, disdain for honest labor, and impetus toward crime."

As America's social conscience and financial markets matured, anti-lottery sentiments coalesced. Jacksonian democracy's "fight against privilege" (Blakey, 1979, p. 69) strengthened during the 19th century. By early 1827, Congress began to curtail lottery activities by banning postmasters from selling lottery tickets. Religious groups advocated bans on all gambling. Growing numbers of Methodists, Episcopalians, and Presbyterians intensified cries to end the spread of gambling. Even the judiciary entered the melee, rendering an anti-lottery opinion:

> Experience has shown that the common forms of gambling are comparatively innocuous when placed in contrast with the widespread pestilence of lotteries. The former is confined to a few persons and places, but the latter infests the whole community: it enters every dwelling; it reaches every class; it preys upon the hard earnings of the poor, plunders the ignorant and simple. (Phalen v Virginia, Note 1)

The Lottery in 19th Century Louisiana

Banking matured, and other financing sources evolved, as the 19th century waned. Governments began to levy taxes to raise revenues. Alternative financing sources eliminated the lottery's function as a financial intermediary. Thus, the end of the Civil War did not spawn a fresh wave of lotteries to fund reconstruction. However, in Louisiana, Charles T. Howard and John A. Morris began a lottery that was to change the history of lotteries for the next 100 years (Clotfelter & Cook, 1989).

Howard and Morris convinced the Louisiana legislature to exempt their company, the Louisiana Lottery Company, from taxes. They also convinced the legislature to prohibit the sale of other states' lottery tickets in Louisiana. The price of monopoly rights to charter the Louisiana lottery was 25 annual payments of $40,000 (Blakey, 1979).

The Louisiana lottery was not an immediate success. Potential players doubted the credibility of the owners and the honesty of the operation. The new business needed an "air of respectability and honesty" to grow (Blakey, 1979, p. 70). The employment of two former Confederate generals to conduct the drawings accomplished this goal. Many ticket outlets and premiums, such as free opera performances, side shows, and magic tricks also attracted new customers. The failure and/or prohibition of lotteries in other states increased the monopoly power in Louisiana. These factors contributed to the rapid growth and unparalleled success of the lottery in this state (Sullivan, 1972).

Sales and profits rocketed. Net profits reached almost $5 million per year during the height of the lottery. The corporation paid dividends of 110 percent, 120 percent, and 170 percent to stockholders in 1887, 1888, and 1889, respectively (Sullivan, 1972; Blakey, 1979). A Louisiana Lottery Company income statement printed in the *Congressional Record* (1889) during this period reported net profits of more than $8 million (Ezell, 1960).

The growth medium for the lottery was a blend of bribery, corruption, and dishonesty. Neither the legislature nor the citizenry was immune to the taint. The Louisiana Lottery Company contributed to campaigns, bribed some legislators directly, and bought votes for cash and other remunerations (Blakey, 1979). Contributions to flood relief and the building of waterworks, cotton mills, and sugar refineries firmly entrenched the lottery in the state.

When the Mississippi River flooded its banks in 1890, the Lottery Company used the disaster to promote itself in the public opinion. Governor Nicholls refused to accept a $100,000 gift from the lottery. He claimed that the Louisiana Lottery Company was trying to "obligate" the citizens to the lottery (Ezell, 1960, p. 20). Under the guise of altruism, the lottery gave cotton seed to farmers in St. Martin Parish, chartered boats to take food and money to flood victims, and rescued those who had lost their homes and were stranded by the flooding (Ezell, 1960).

Although its actions mollified the citizens of the state, the Louisiana lottery incensed the rest of the country. The Louisiana Lottery Company generated the majority of its revenues from sales to residents in other states. Huge sums of money flowed from other states into Louisiana coffers. Increasing social awareness and a heightened sense of the inequities in other monopolies (i.e., railroads) raised concern. Blatant disregard for the law brought Louisiana's lottery to national attention. States began to realize that only through cooperative efforts could all citizens be protected against this menace. The drive to eradicate the Louisiana lottery took on national prominence.

A pivotal event in the fight was the 1890 letter written by Postmaster Winemaker. Large volumes of lottery mail passed through Washington, D.C.'s post office. The postmaster felt that this was adversely affecting the efficiency, morale, and morals of the postal workers. Mr. Wanamaker appealed to President Harrison for assistance in stopping the lottery.

Encouraged by President Benjamin Harrison to "curb the game that debauched and defrauded the public" (Blakey, 1979, p. 71), Congress supplemented its 1827 ban on postmasters' selling lottery tickets. New legislation prohibited the mailing of lottery materials and authorized postal officials to seize letters to lottery agents (Ezell, 1960). Since the bill specified no fines or enforcement powers, it had no impact on the Louisiana lottery. When in 1872 Congress codified postal laws to ban illegal lotteries, Louisiana remained unscathed because the Louisiana lottery was a "legal" enterprise (Blakey, 1979, p. 71.).

Legislative death blows hammered the Louisiana lottery. Federal legislation prohibited the movement of information and prizes for lottery schemes through the postal service. Congress banned "transportation of interstate lottery materials" under the Commerce clause (Blakey, 1979, p. 71).

Although lottery managers contested both actions in court, Supreme Court decisions upheld the right of Congress to regulate what the mail carried.

Within the state, the battle over the lottery raged. The federal government appointed a tough postmaster in New Orleans to enforce the law. The lottery proponents in the Democratic party and the anti-lottery forces waged a fierce battle. Louisiana's lottery faced extinction. The Louisiana Lottery Company raised its ante to $1,250,000 per year to urge renewal of its state franchise agreement.

The end of the lottery came during the 1892 gubernatorial elections. The anti-lottery amendment passed in the legislature when the anti-lottery slate of candidates Murphy J. Foster and Charles Parlange won the election. The state legislature sealed the fate of the lottery by "passing a bill that prohibited the sale of lottery tickets after December 31, 1893" (Ezell, 1960, p. 267). The bill imposed stiff penalties for participating in the advertising or solicitation for a lottery (Ezell, 1960).

Even nature seemed to conspire to defeat the lottery. As the bill came to the floor of the legislature for a vote, one of the worst rain storms in recorded history deluged Baton Rouge. This storm prevented some lottery proponents from casting their votes. One legislator changed his vote when mysterious forces suddenly paralyzed him. Illness seemed to sweep the legislature, especially among the lottery supporters. The bill canceling the charter of the lottery passed (Ezell, 1960).

These legislative actions drove the lottery underground. Officially residing in Honduras, managers ran the Louisiana lottery from a heavily guarded building in Florida. Florida's anti-lottery law prohibited the operation of a lottery but allowed companies to handle printing, clerical work, and other lottery activities. The Louisiana lottery lived on in Florida.

Learning of its continued operation, anti-lottery factions began work on a new federal law. A blizzard of petitions and a national mail campaign prompted Congress to draft a bill banning the lottery. However, legislators gave the bill such a low priority on the legislative agenda that many doubted it would ever come to a vote (Ezell, 1960). Both the House and the Senate used delaying maneuvers to try to kill the bill in committees. The battle in the legislature was so intense that the bill passed with only ten hours remaining for its approval by President Grover Cleveland before the Congressional term expired. The President signed the bill into law only two minutes before the adjournment of Congress would have killed it. The law closed all forms of interstate commerce to lottery companies. Fines and prison terms stiffened the penalty for violation of the law. By the end of the 19th century, the people had eradicated 160 years of tradition from the land (Clotfelter & Cook, 1989; Blakey, 1979; Ezell, 1960).

Most of the federal legislation used to ban the Louisiana lottery in the late 1800s remains in force today. Bans on broadcasting lottery information and advertising were added, as media became more sophisticated during the 20th century. While state-sponsored lotteries were exempted from federal law in 1975, national lotteries are still forbidden (Blakey, 1979).

Reemergence of Lotteries in America

Several factors contributed to the reemergence of lotteries in the United States. Economic issues such as recession, high inflation, and unemployment strained the resources of states. Changes in tax laws reduced revenues. The federal government reduced its funding to state programs. Antidiscrimination laws and pollution controls mandated spending by the states. Declining math, reading, and science scores heightened public awareness and concern about education in the country. Society's view of gambling shifted from abhorrence to acceptance. Greater funding needs and a shift in social attitudes among the public laid the basis for the resurrection of lotteries.

The changing culture in the United States paved the way for the lottery and other forms of gambling. As the sexual revolution engulfed America, Lyndon Johnson's "Great Society" swept the country toward political enlightenment, social awareness, and racial tolerance ("Johnson, Lyndon Baines," 1994). As Americans became more tolerant, the long-held abhorrence of gambling dwindled.

The acceptance of the lottery in the South was the result of increased urbanization and a move to improve education. This acceptance altered the traditionally held view that the lottery is "an abomination, a Yankee invention that would send participants straight to ----" ("Better sin than tax," 1989, p. 28).

Another reason for the continued popularity and approval of lotteries in the United States is the nature of Americans – "hard working, go-getters who test all boundaries; men who act swiftly and decisively" (Keating, 1996, p. 159). People like these seek challenges, take risks, and believe in miracles.

Lotteries promise something for nothing. This idea has universal appeal. Legislators who enacted hundreds of revenue measures across the nation in the last 30 years found that increasing taxes to fund new spending was not popular with voters. "Each bill increased the burden on taxpayers and added to citizens' antagonism against new taxes" (Blakey, 1979, p. 72). In many states the lottery was presented to the voters as a way to raise revenues for education without raising taxes (Keating, 1996). This view was also popular among legislators.

As voluntary revenue generators, lotteries are often used to replace revenues from progressive taxes.

States claimed that they were meeting a pent-up demand for gambling, raising revenues, and reducing illegal gambling. Aware that the income taxes on illegal gambling revenues were difficult to collect, politicians believed that lotteries would provide a way to collect taxes on dollars spent on illegal gambling. Some even claimed that this would be a way to raise revenues while holding down taxes (Blakey, 1979).

Keating (1996), in contrast, claims that lotteries neither insulate states from higher taxes nor offer much revenue. Administrative costs and prizes absorb about 66 cents per sales dollar. When compared with the 20 cents in collection costs for other taxes, lotteries are an inefficient source of funding (Keating, 1996). In many states that adopted lotteries, taxes continue to rise.

20th Century Louisiana Lottery

Former Governor Edwin Edwards planted the seeds for the new lottery in Louisiana. The state faced the worst recession in its history from 1982-1987. The collapse of the oil and gas industry and the oil glut in the world markets forced almost 150,000 people out of work. Concurrently, the dollar appreciated in foreign markets. The chemical industry, second only to oil and gas as a revenue source for the state, lost market shares to foreign competitors. State revenues plummeted (Scott et al., 1995).

While revenues fell, spending in the state rose. With record deficits looming, state legislators cast about for new cash flows to replace oil and gas money. Louisiana's citizens will remember Edwards for his plan for "economic development based on gambling" (Wardlaw, 1991, p. 1-A). The legislature accepted this proposition that gambling would be a boon to the state's economy. Mr. Edwards suggested that the monies from the lottery and gambling be used to supplement education. This suggestion may have influenced the public to pass the constitutional amendment that reestablished a lottery in Louisiana. Researchers have not empirically tested Edwards' proposition that gambling would be a boon to the state's economy.

A $350,000 advertising campaign in late 1993 featured lottery commission president Bonnie Fussell. Mr. Fusell announced that the "legislature has guaranteed that every dollar of lottery proceeds in 1993 will go to public education" ("Lottery ad irks union," 1993, p. B4:1). This pronouncement angered school boards and the teachers' union in Louisiana. Although $140 million in lottery revenues were turned over to public education during this time, this amount represented only $32 million in additional funding. The union claimed that the remaining $108 million replaced other sources of education funding. St. Bernard Parish claimed that it had received no additional money from the lottery revenue. School board vice president Max Shunefelt contended that the advertisements were misleading the public.

Lottery Play

The tenacity and optimism characteristic of many Americans suggest one explanation for the continued popularity of lotteries (Keating, 1996). Langer (1975) found that gamblers bet because they believe they can control the outcome of the bet using lucky numbers, starbooks, psychics, etc. Moody (1975) observed that the excitement of participating drove gambling because it was an activity that simulated risk-taking behavior. The win/loss potential increased the excitement of gambling and gave more satisfaction than the monetary rewards. Introduction of the lottery brings large segments of the population into the commercial gambling zone, thereby exposing individuals to this pleasant stimulation. Gambling seems to have little to do with risk-return preferences.

Brown, Kaldenburg, and Browne (1992) examined lottery play as a function of years of education. They found that lottery play rises with years of education until the player had attained some college education. Play falls dramatically with increased educational attainment. While the absolute spending increases as income rises, the proportion of income spent on the lottery decreases. The authors concluded that lotteries "target less advantaged members of society" (Brown et al., 1992, p. 163). One explanation offered for acceptance of the regressivity of lotteries is that the entertainment value of the games offsets the burden.

Risk Preferences

Evans, Holcomb, and Chittendon (1989) examined the relationship between the amount of available information and the risk preferences of players in an experimental lottery setting. The research studied whether increased amounts of knowledge would positively influence risk reduction among players. Previous research examined the level of education of lottery players, not knowledge. Participants were asked to select among lotteries with different risk characteristics and payoffs seen in bond, option, and stock markets. Researchers supplemented this data with a questionnaire to decide and quantify the knowledge levels of the participants. An experimental design allowed the researchers to control some socioeconomic variables and provided a more objective measure of knowledge. No significant relationship between the amount of information provided and a reduction in risk aversion appeared. They also found no relationship between players' confidence in the reliability of the knowledge and risk preferences. Knowledge does not affect the risk-return preferences for investment.

Determinants of Lottery Play

Clotfelter and Cook (1989) found that whether or not the state has a state-sanctioned lottery directly influences participation in commercial gambling. They concluded that lotteries recruit people into commercial gambling. Lotteries have strong appeal for established gamblers but also recruit new gamblers.

Lotteries may recruit new gamblers in disproportionate numbers from among African Americans or lesser-educated segments of the population (Clotfelter & Cook, 1989). Clotfelter and Cook also concluded that lotteries undermine the work ethic by offering an effortless means to wealth. Promoting lottery play may encourage other gambling forms. It may also contribute to increased commercial gambling with its associated negative consequences, including compulsive gambling, financial distress, and increased crime.

Demographic characteristics and lottery play. The characteristics of lottery players and the reasons for play vary. Moody (1995) observed that gambling simulates participation in risky behavior. This controlled stimulation is pleasurable like a drug--the positive motivation behind gambling is not the money that one can win, but the thrill of playing. The potential for loss heightens the excitement of gambling.

Using data from the 1984 Maryland lottery, Clotfelter and Cook (1989) developed a Tobit model to predict the determinants of lottery expenditures. Since race was significant in the full model, the authors split the sample and reestimated the multivariate regressions. Education has a significantly negative impact on lottery expenditures for whites. The authors also found that men play more than women and that lottery play is highest among blacks who earn less than $10,000 per year.

The introduction of a lottery brings large segments of the adult population of a state into commercial gambling's sphere of influence. Using a Probit model and survey data from the 1975 *Gambling in the United States*, Clotfelter and Cook (1989) tested the likelihood of participation in a lottery. Control variables in the analysis included demographic variables such as sex, age, income, religion, education, and race. Other variables were frequency of church attendance and whether or not the participant lives in the South. Race is a significant factor affecting how much play occurs among different income levels. Further, whether the participant lives in a lottery state strongly influences lottery play.

Another finding was that people who "participated in other forms of gambling" are more likely than other groups to play the lottery. According to Clotfelter and Cook (1989), some people are inherently drawn to lotteries and other forms of gambling because of the entertainment value derived from pursuing these activities. Lotteries have great appeal to established gamblers and grow by encouraging play by new consumers of the lottery product. This appeal lends empirical support for Moody's anecdotal observation that the thrill of play is more important to players than monetary rewards.

Lottery play and the structure of advertising and marketing. Revenue maximization is the overall goal of the lottery's existence. Since it is the sole legal provider of the product, the state can swell revenues in three ways. Broadening the player base, increasing the amount wagered by each player, or product modifications that tap a new market niche will increase the number of tickets sold (Clotfelter & Cook, 1989; Haller, 1979; Grover & Rousch, 1993).

The strategies employed by lottery managers to stimulate sales usually fall into one of three areas: development of new games, increasing the payout, and increasing jackpot amounts by joining other states to increase the population base (i.e., Powerball). A positive relationship between lottery sales and the size of the jackpot or the number of rollovers would be consistent with increasing the pleasure derived from play. Clotfelter and Cook (1989) contend that lotteries seem to favor stimulating demand among established players over other ways of increasing sales.

Pressure from legislatures to maximize revenues, combined with monopoly power endowed by the state, spawns glitzy advertising campaigns that incorporate innovative marketing strategies. Lottery directors study and experiment with product design, promotion, and pricing in an attempt to target those segments of the populace that spend the largest amounts on gambling. This strategy leads to claims that lotteries unfairly target minority and low income groups. Andy Rooney (1981) asked, "How can we teach kids that hard work is the way to success if they hear a radio commercial paid for by their government suggesting the way to get rich is to bet money on a horse or a number?"

Lottery administrators manipulate four aspects of the lottery's product design to increase demand. These are play value, price, prize structure, and complexity and variety (Clotfelter & Cook, 1989). Play value is the enhanced utility derived from expanding the ways that individuals can play the lottery. Introducing thematic lottery games (i.e., Mardi Gras, Easter Parade, etc.) and allowing participants to select the numbers add play value. Experiments with pricing determined that ticket demand was price elastic.

Optimum prize structure is open to interpretation by the directors. Most lottery operators use a wide band approach--offering a variety of prize structures to appeal to different niches in the market (Pride & Ferrel, 1997). Scratch-off games provide more chances to win smaller prizes, while the weekly lotto drawing appeals to those who prefer a potential to achieve great wealth. In Louisiana, the minimum prize in the weekly game began as $1,000,000.

Thoreau's (1973) hierarchy of wants suggests that consumers become bored with routine. The flattening and declining sales level seen in most lotteries supports this claim (Clotfelter & Cook, 1989). Variety may be the key to maintaining interest and sales in the lottery. New or different games appear and disappear with startling regularity. New rules, altered prize structures, and dramatic packaging of lottery products offer variety.

Lotteries and Crime

The relationship between gambling and criminal activity has been the subject of many sermons, articles, and much vigorous discussion. Lottery proponents contend that adopting a lottery provides a substitute for illegal activities (i.e., numbers, policy). The result should be a decline in crime rates and an increase in tax revenues that go into the underground economy.

Opponents contend that state sponsorship and advertising of lottery activities promote risk-taking behavior and lead to more crime (Mikesell & Pirog-Good, 1990). This environment may attract elements of organized crime, foster a "something for nothing" atmosphere, and/or create greater disparities among income classifications. Yet empirical testing of this relationship is sparse.

Mikesell and Pirog-Good (1990) studied the impact of state lotteries on the incidence of property crimes. A Probit model was used to examine property crime data from 1970-1984. The presence of the lottery was associated with a positive and statistically significant 3 percent rise in the property crime rate. The authors concluded that lotteries may reduce players' aversion to risk-taking activities.

Early research modeled crime relationships using aggregate data. Grouped data obscure the nature of individual correlations between crime and employment. These inadequacies in previous crime relationship models bias results. Pirog-Good (1986) used simultaneous equation modeling to test individual-level relationships between crime and employment. The period of analysis and the estimating method affected empirical results. Race strongly affected the incidence of employment and criminal activity. The sample was separated by race. This separation improved estimation results of the modeling of these relationships.

Lotteries and Revenue Generation

Adoption of lotteries is supported because they provide a painless source of public revenue. The use of lotteries appears to be an easy way to raise revenues. Rosen and Norton (1966) examined the efficiency lotteries as significant revenue generators. Examining historical evidence, the authors employed economic cost-benefit analysis to lottery revenues to evaluate the significance of lottery funds in state or federal budgeting. Net revenues were negligible as a percent of total receipts. The costs of collection and administration is much greater than any other form of taxation available to public finance (Johnson & Meier, 1990; Kinsey, 1963). Lotteries are inefficient taxes whose burden outweighs any benefits.[3]

Mikesell and Zorn (1986) studied whether lottery revenues were a stable source of public finance. The authors charted the variation of revenues from lotteries in 17 states and in the District of Columbia. They concluded that lottery revenues are a limited source of government funding with doubtful merits. Lottery revenues are unstable, the costs of administration are greater than collection costs of other taxes, and the product must be aggressively marketed to produce those revenues. Further, operators often make claims

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[3] Additional evidence of the inefficiency of lotteries as revenue sources may be found in Kinsey (1963), Spiro (1974), and Heavy (1978).

about the use of lottery funds that cannot be supported by expenditure patterns (Pierre, 1991).

Educator Salaries

Demographic Characteristics

A study of business professors in Kentucky was conducted to identify those demographic attributes that influence salaries. The authors regressed the natural logarithm of the annual salary against a profile of demographic characteristics. Results supported previous work suggesting that research productivity was a primary factor in determining salaries (Webster, 1995). Previous studies corroborating this finding are Fairweather (1993); Tuckman, Gapinski, and Hagermann (1977); and Tuckman and Leahy (1975). Webster also found that the years of teaching experience and the fact that the academician held a terminal degree exhibited a positive influence on salaries.

Boyd and Boyd (1995) examined faculty salary determinants in five Louisiana universities. Their work focused on the effects of gender and race on salary. Regression analysis of cross-sectional data from the 1989-1990 school year revealed that neither gender nor race was significant in determining salary levels. The statistical significance of other variables, such as years at the university, size of the university, economic health of the community, and educational level support earlier research findings. Faculty who are willing to move and those who teach at larger universities should have higher salaries. The geographic region and the small number of schools included in the sample limit extension of the findings to universities in other regions or nationally.

The relative importance of research versus teaching on faculty pay has received wide coverage in the literature. However, the results are inconclusive. Research by Katz (1973) found that the number of publications positively affect pay, while teaching is not related to pay. In contrast, Ferber and Loeb (1974) found no relationship between pay and several performance measures. Teaching is negatively correlated with pay in Konrad and Pfeffer's (1990) work.

Gomez-Media and Balkin (1992) examined this issue using a national sample of management professors. Research productivity was posited to have more weight in determining pay, especially at doctoral-granting schools. To measure the impact of publications, this work included publication outlets (i.e., journals) as a proxy for publication quality.

Previous work was not based on theoretical grounds but on curiosity. Gomez-Media and Balkin (1992) use agency theory as the theoretical underpining for this work, contending that research gives universities prestige, helps recruiting, and garners research grants. The authors posit that measuring research quality and productivity are inexpensive assessment tools. The unstructured nature of university teaching makes direct supervision difficult. Monitoring may be counterproductive. Teaching excellence--mastering the subject--can be objectively measured by the peer-reviewed articles.

Tripathy and Ganesh (1996) surveyed finance faculty who had served on evaluation committees for tenure and promotion in U.S. business schools. The survey included both Ph.D.- and non-Ph.D.-granting schools. The purpose of the study was to examine the perceived and actual importance of teaching, research, and service in promotion and tenure decisions. A response rate of only 10 percent required careful interpretation of the results. Using parametric t-tests and nonparametric Mann-Whitney tests, the authors concluded that research is perceived as more important in obtaining promotion and tenure than is quality teaching. This result was stronger at Ph.D.-granting schools. The resources committed to research may focus emphasis on the importance of research. However, at non-Ph.D.-granting schools, faculty reported a greater desire to emphasize teaching.

Teaching and research expectations and the allocation of resources among finance faculty was examined (Tompkins, Hermanson, & Hermanson, 1996). The authors utilized a survey to collect information about teaching, service, and research expectations and the distribution of financial resources.

The study compared the responses of finance faculty from doctoral-granting, American Association of College Schools of Business (AACSB) accredited versus nondoctoral-granting, nonaccredited schools. Research was found to be of primary importance in all types of schools. Furthermore, the authors concluded that all new finance faculty are expected to conduct research to garner financial resources and services.

Discrimination in University Teachers' Salaries

Gender. A large amount of the research focused on determining whether discrimination occurred in academia. A seminal study on the impact of gender used full-time faculty at an urban university to develop salary profiles (Gordon, Morton, & Braeden, 1974). The comparison of separate regression equations for male and female faculty found that men earned about 9.5 percent more than did women with comparable qualifications. The gender bias was reported to be discipline specific. Education and business favor males, while the social sciences are biased towards women. While salary increases with educational attainment, the length of employment is negatively correlated with pay for all academicians. It is noteworthy that African Americans earned statistically more than other ethnic groups across all disciplines.

Hoffman (1976) replicated the study of Gordon et al. expanding the research to include data from a large university and employing alternative modeling techniques. Promotion rates for men and women were used to test for gender bias. Slower promotion rates for women supported the findings of previous studies that sex is a consideration in salary determination.

Lindley, Fish, and Jackson (1992) also measured the effect of gender as a determinant in raises given to the faculty at the University of Alabama between 1981 and 1985. They found that gender is significant in determining salaries. Male faculties appear to earn more than their female counterparts. One explanation offered for this finding is that women enter the academic work force later than men and have not had sufficient time to move into higher paying positions.

Many explained the salary differences as indicative of differences in the value of productivity. Hammermesh (1988) offered an alternative explanation for this finding is offered. The coefficient of variation and the relative interquartile range measured substantial inequity in the average. Over an 11-year period, disciplinary differences between men's and women's salaries were $9,000. This fact supported the discrimination claims.

Hammermesh (1988) noted that paying new hires more than senior faculty violates standard industrial relations principles and often causes disgruntled feelings among faculty. His work found found that large differences by rank and by rank within discipline also existed. The research concluded that these disparities not only exist but are increasing in some areas. Hammermesh suggested that true markets would create greater disparities in salaries because academic services for people in fine arts, history, etc. are much lower than those in finance, medicine, and law. These discrepancies are explained as an example of market failure which may be corrected by broadening the information.

Anecdotal information in a 1993 survey reported that women's salaries continue to lag behind men's salaries. Women at institutions of higher learning earn only 89 percent of male salaries.

Wage compression or dispersion. Many aspects of salary determination were studied. Several compensation theories have been posited and subjected to empirical testing. Becker (1962) contended that wages rose with seniority as workers and firms increased investments in specific human capital. A profile of rising wages is a key tenet of the theoretical explanations. As employees' tenure increases, earning capacity rises.

As espoused by Fama (1970, 1976), efficient market theory explains the security market's response to varying amounts of information. In weak-form efficient markets, investors cannot consistently outperform the market using historical data as a guide. Semi-strong efficiency suggests that investors cannot make long-term profits using publicly available information. In the extreme version of market efficiency, the market instantaneously imputes all information into valuing assets. This imputation ultimately renders investors incapable of earning excess profits.

Broadly applying this idea to the market for teachers would infer that little variation should occur among teachers' salaries in similar environments. Comparably qualified individuals should receive very similar salaries if the academic labor market is efficient in imputing changes in the supply of and demand for teachers. Langton and Pfeffer (1994) posited that the structure of academic labor markets explained salaries more effectively than financial theory. According to Langton and Pfeffer, if there is truly one well-defined market wage, then setting salaries would depend on the characteristics of comparable institutions. The institution itself would have no relevance in salary determination. The authors found that academic labor markets are not efficient.

In other professions, seniority plays an important role in determining pay. There is a strong, positive relationship between seniority and wages, despite education or skills. Three wage theories are used to explain this association. Each theory positively correlates wages to seniority.

Lazear (1981) and Becker and Stigler (1974) contend that higher wages act as incentives to keep workers' productivity at an appropriate level to meet production needs. This efficiency wage theory posits that raises prevent workers from shirking duties and losing "good jobs" (Dornbusch & Fischer, 1990, p. 259). Salop and Salop (1976) explain that a higher present value of earnings as tenure increases is a managerial selection tool. Employees' seniority is a measure of satisfactory performance and is evidence of the continued selection of the best workers.

The third explanation of the positive correlation between seniority and pay is specific human capital theory. According to Oi (1962), firms reward workers for gaining new skills and knowledge unique to a job. Higher wages deter workers from moving to other jobs. Such changes remove the human capital along with the firm's investment in the worker.

Empirical research supports these theories. Robert Topel (1991) has shown evidence that wages increase sharply with seniority. Using longitudinal data on wages, he reported a 25 percent increase in pay with 10 years seniority.

This is not so for academicians at the university level. Michael Ransom (1993) tested conventional wage theories in the academic labor market. Using a curvilinear model, Ransom examined the role of seniority in the university labor market. Samples were selected from the 1969 Carnegie Survey Data and from the individual employment records of several institutions. Age, sex, race, degrees held, field of expertise, region of the country, and city sizes were included with experience and seniority in modeling faculty salaries. While experience clearly has a positive affect on salary, seniority reduces salary. Ransom concluded that teachers with 2 years seniority earn about 7 percent more than those with 10 to 14 years. This disparity is even more pronounced at research institutions. Salaries decline about 0.5 percent per year. Faculty members with 30 years seniority earn 15 percent less than new hires.

In a more detailed examination including discipline and a proxy for productivity, Ransom found that the decline in salaries is accelerated in fields such as economics and accounting. An additional finding was that moving to a new university could increase salary by 5 to 10 percent. He concluded that this relocation factor might encourage turnover. Ransom suggested that wage discrepancy could be explained as monopsonistic discrimination. When they can discriminate, employers pay less to workers with higher moving costs.

Bereman and Legnick-Hall (1994) explored the question of pay compression in business schools. The authors studied whether pay compression occurred from 1980-1990 by comparing “high demand” academic disciplines, such as business, computer information systems, and engineering, with all other disciplines. Then they examined this issue with respect to business disciplines. A rank ratio measured pay compression among these groups.

Although Bereman and Legnick-Hall found no significant change when all disciplines were considered, business disciplines exhibited evidence of pay compression. The researchers observed that associate professors in these disciplines earned less than new assistant professors--an inversion of the rank-salary relationship observed in the past. Although small samples and no reliable measure of the standard deviation of this data suggest cautious interpretations, indications exist that this type of pay compression may be rising. As more pay compression occurs, it contributes to increased faculty dissatisfaction.

Abraham and Farber (1987) studied the seniority and earnings question. Examinations of seniority and pay again found a negative relationship between these two variables. However, the authors concluded that seniority is a surrogate for a missing variable describing the quality of work. Model misspecification resulted in the negative coefficient observed for seniority. This conflicting view indicates that additional research is warranted.

Elementary and Secondary
School Teachers

Media reports of teacher shortages abound. Darling-Hammond (1984) studied the problem to learn if a shortage did exist. She concluded that shortages do exist and that a major factor contributing to the problem is the disparity between salaries for teachers and other groups.

Bird (1985, 1986) posited that teacher shortages in Sunbelt states were the result of competition from other career alternatives. Higher pay from other careers prompt many intelligent, creative individuals to choose careers other than teaching. In these early works, Bird found that average teacher salaries should rise and that salary levels should also be a function of experience, educational training, and merit. Using census data on 12 Southeastern states, Bird (1985) developed a set of characteristics that are common to both teachers and "nonteaching, college-educated workers in the region" (p. 4). A loglinear regression equation modeled earnings as a function of sex, race, work experience, marital status, education, average weekly hours worked, urban or nonrural residence, and number of weeks worked per year. Bird found that as experience increases, salary rises at a decreasing rate. Education has a positive influence on salary. Being married, living in an urban area, the number of weeks worked, and the average number of hours worked per week all increase pay. This study supports findings in university research that males earn more than females. In contrast, race is significant in this work. African-Americans are found to earn less than other race individuals. The average salaries between teachers and nonteachers were compared. The researcher found that teachers earn statistically less than comparably qualified nonteachers.

A subsequent study by Bird and Wakemen (1986) expanded the data and refined the methodology. This study estimates beginning and average teacher salary levels needed to attract and keep high-quality teachers. Beginning teachers' salaries rose almost 14.9 percent. However, the average teacher's salary was still below the average beginning salary for other groups. Further, the author concluded that little progress has occurred to close the gap.

The demographic characteristics of Arkansas educators were studied by Womack (1992). Teachers were asked to complete a survey to determine the demographics and attitudes of teachers in a state where "expenditures for education have ranked near the bottom for many years" (Womack, 1992, p. 152). Descriptive statistics were generated from 817 respondents. The majority of Arkansas teachers were females who reported spending an average of 50 hours on school work. They also spend almost 11 days of the summer vacation renovating classrooms, putting up bulletin boards, and developing new teaching aids. Indicative of the financial pressures on most school systems is the report that teachers spent $11 per week on noncompensated purchases for school. Half the respondents would move to another phase of education or out of education if presented the opportunity. Womack (1992, p. 155) suggested that "teachers will not be adequately respected . . . until they are paid a decent salary, shown some appreciation from the public, and given a share in decision making processes in the schools."

Chapter Summary

This chapter presented the evolution of lotteries in America and described the events leading to the adoption of Louisiana's lottery. The relevant literature about lotteries was introduced and discussed. Empirical research related to teachers' salaries was also surveyed.

The next chapter shows the development and theoretical underpinning for the empirical model used in this study. Research hypotheses to be tested will be stated, the sample data will be described, and the methodology used to develop the regression equation will be described and explained. The tests that will be employed to test the hypotheses will also be presented.

CHAPTER 3

METHODOLOGY

As stated in Chapter 1, the primary focus of the study is to evaluate the impact of the adoption of the lottery on teachers' salaries in Louisiana. Since the impact of the Louisiana lottery has not yet been examined, explanatory models that tested the impact of lottery funding on teachers' salaries are developed and compared with those periods prior to the existence of the lottery as a revenue source in the state. The purpose of this chapter is to present the development and theoretical underpinning for the empirical model used in this study.

The impact of the lottery revenues on teachers' salaries after Louisiana began a lottery are compared to teachers' salaries prior to the adoption of the lottery, using multiple linear regression models that employed independent variables to control for demographic characteristics, . Indicator ("dummy") variables are used to model qualitative independent variables. Further, explanatory models are developed for two groups: elementary and secondary teachers and university teachers. These models are used to decide whether the gross lottery proceeds are significant in explaining the salaries of teachers in each group. Models from 1986-1990 are compared to models for the period 1991-1995 to test the stability of the statistical model over time.

Identification of the Problem

The related literature on salary determinants identifies several variables that are significant in predicting teachers' salaries. Rank, educational degree, gender, teaching experience, and length of employment within the current education system are regarded as relevant to predicting pay for university teachers. Years of experience and level of education are the principal factors that affect pay for elementary and secondary teachers. Minimum salaries in 1995 ranged from $11,095 for teachers with 2 years of college and no classroom experience to $26,020 for someone who held a doctorate and had taught for 25 or more years (*Annual Teacher Salary Schedule*, 1995-96, p. ii). Sixty-five of the 66 school systems within the state supplemented the minimum state salary base in the 1995-1996 school year. This statistic compares favorably with 60 systems that paid more than the minimum in 1989. Since the focus of this study is the impact of the lottery on teachers' salaries, the variations contained in parish salary data could have confounded the results. To avoid this problem, the salary data utilized are the average minimum state salaries paid each year. The researcher compiled the information from the *Annual Teacher Salary Schedules* (1986-1996) for the time periods studied.

The related literature shows that salaries of university teachers are based on criteria that differ from those used to establish the pay scales of elementary and secondary school teachers. A sample drawn from the population of all teachers in Louisiana would not have clearly reflected these differences. Therefore, the observations are separated into two groups. Multiple linear regression models are developed to measure the influence of the lottery on salaries in each group. The current study includes economic and demographic variables shown to affect teacher salaries in earlier research.

The two samples are further segregated into academic years 1986-1990 and 1991-1995. From 1986-1990, Louisiana was searching for new revenue sources to replace tax monies lost when the oil and gas industry collapsed. The state faced financial hardships, "enduring the worst recession in its history" (Scott et al., 1995, p. 9). The interval 1991-1995 represents the time since the lottery began operation in the state. This period coincides with the rebounding of the Louisiana economy. Regression results for these different time spans are compared to test for a shift in the models.

Research has examined many factors affecting a teacher's pay. Some research has focused on teacher pay in the state of Louisiana. Other research has concentrated on the impact of the lottery on educational funding. However, none of the previous research has focused on the impact of the lottery on teacher pay in Louisiana's schools.

The hypotheses addressed in this research, stated in the null form, are

$H1_0$: There is no difference between the salaries of Louisiana elementary and high school teachers before and since the adoption of the lottery.

$H2_0$: There is no difference between the salaries of university teachers in Louisiana before and since the adoption of the lottery.

Sample

Inferences drawn about population parameters based on sample statistics can be biased. Bias may result when the sample is not representative of the population. Selecting a sample that is large enough to reflect the true population alleviates this problem. Thus, the desired level of accuracy is directly related to the sample size (Sanders, 1995).

The Central Limit Theorem states that the sampling distribution of sample means will be normally distributed if the population is normally distributed. Furthermore, the sampling distribution for any population will approximate a normal probability distribution as the sample size becomes large. Samples containing 30 or more data points are considered large samples. The sampling distributions of such samples will approximate normal distributions.

Therefore, hypotheses about the means can be tested using Z-scores when n is greater than 30 whether the standard deviation (σ) is known or unknown. According to Anderson et al. (1996, p. 250): "Researchers have found that for most populations encountered in practice, a sample size of $n \geq 30$ makes the normal approximation a reasonable assumption. However, larger samples can be expected to provide better approximations."

To estimate the appropriate sample size for testing hypotheses about population means usually requires a compromise between precision and cost. Sampling error decreases as the sample size rises, but collecting larger samples increases costs. Although data collection costs are a consideration in the selection of the sample, the primary method used is described by Anderson et al. (1996, p. 818) as "... a desired level of precision was established. Then the smallest sample meeting this criterion was determined." To set the sample size when estimating the population mean, μ, the following formula should be used:

$$n = [\frac{Z_{\alpha/2} \cdot \hat{\sigma}}{E}]^2$$

where:

n = sample size
Z = standardized normal distribution value
α = level of precision desired (confidence level)
E = error of estimation
σ = standard deviation of the population

Since the population mean is being tested, the formula above is not valid if both μ and σ are unknown. The mean of the population can be estimated by using a sample mean as the point estimate of the population parameter.

Kvanli, Guynes, and Pavur (1986) suggested two ways to overcome the problem with the unknown standard deviation. A preliminary sample (a pilot study sample) can be taken, and the sample standard deviation s can be used as an estimate for the parameter σ. The second approach requires the researcher to have someone familiar with the data predict the highest and lowest values that will occur in the sample. Assume that the high value is approximately equivalent to two standard deviations above the mean and the low value is approximately two standard deviations below the mean. Then the range (H-L) is approximately 4σ. The following formula gives an estimate of σ (p. 228):

$$\sigma \approx \frac{H - L}{4}$$

where:

σ = Estimate of population standard deviation
H = Highest value predicted in sample
L = Lowest value predicted in sample

In this study the standard deviation from a preliminary sample of 155 teachers' salaries is used as a point estimator for the population parameter in determining the appropriate sample size for the sample of university teachers.

This technique is then applied to calculate the size of the sample for elementary and secondary school teachers. For a 95 percent confidence level, the $Z_{\alpha/2}$ value is equal to 1.96. For both samples the allowable error in the estimation E is set at $500. This means that the mean salary range from the sample should be within $500 of the actual average salary for teachers in each group. The resulting sample size required for the university teachers is 2,095, while the sample of elementary and secondary school teachers should contain 402 elements.

The sample for university teachers is chosen from the various J-1 budget requests submitted by universities each year to the legislature. Only full-time teachers are included in the study. The observations meeting this criteria in each budget are numbered. A random number chart is used to select observations. This results in a total sample size of 6,338 deemed large enough to allow the use of z-scores with the specified level of confidence.

Limited available data for elementary and secondary teachers requires the use of aggregated data. This data is collected from the Personnel Employment Profile (PEP) and from the I-A minimum state average salary schedules. The I-A report is also called an Equalization Report or Minimum Foundation Profile. Although individual records are available from 1993-1996, the data for earlier years is aggregated in Equalization Reports, Part I-A, by years of experience. Experience is categorized as less than or equal to 5 years, 6 to 10 years, 10 to 15 years, 16 to 20 years, 20 to 25 years, and 25 or more years experience. The data required categories to prevent the loss of observations.

When data is presented in this format, the individual values are lost (Black, 1994). This loss of individual data values necessitates the use of indicator variables to test the hypotheses. The incomplete data limits the analysis and curtails the generalization of the results. Interpretation of the results is difficult under this scenario.

Bailey (1980) used aggregate data to examine the effectiveness of the death penalty as a deterrent to murder. Using data from 1910-1962 , the author examined the relationship between homicide rates and the number of executions under different levels of certainty. Longitudinal multivariate analysis finds no deterrent value to the use of the death penalty. However, the use of composite data requires that this result be interpreted with caution.

Springer, Herlihy, Mall, and Greggs (1966, p. 162) claim that "clean, clear information is a substitute for reasoning and inference." Man's limited ability to perceive and retain information and human beings innate screening of information biases researchers toward the use of sample data to make inferences. The implication of this is that refined sampling is a requirement of this type of study. "This increases the quality of the decision process" (p. 162).

Sampling provides reliable information at lower costs to improve decisions. Small samples may be as good as a population in describing the population if collected with care. However, large samples help alleviate many interpretation problems. Therefore, the large samples collected for analysis in the elementary and secondary teachers' models (resulting in a sample of 2,160 observations) should improve the information lost by aggregating the data.

Limitations and Delimitations

To manage the model, certain constraints are imposed. Other uncontrollable limitations are addressed since they affect the interpretation of the results. Multicollinearity may exist among the independent variables within the model. The model may be misspecified. Misspecification may result in false empirical results.

This study is limited to teachers in Louisiana. Examination of the impact of lotteries in other states could require the use of other modeling techniques.

Research quality and quantity are not included in this study. Previous research indicates that this information is important in explaining teachers' salaries (Katz, 1973; Balkin, 1992). This information is not included in the available data. The prohibitive cost of collecting this information makes its inclusion infeasible.

Further, gender is not included as a determinant of salaries. While some previous literature suggest its inclusion, gender data are not available for elementary and secondary teachers. The only way that this information could be gathered for university teachers is to examine the names listed in the budgets. The potential that names would not necessarily suggest gender appears to add a dimension fraught with uncertainty. With no reliable method to determine the gender of faculty, the cost of collecting these data for a 10-year period is deemed prohibitive for the current study.

Observations in the data set have missing data. The information contained in these observations is important to gaining a representative view of the true population parameters. To alleviate the problem of losing relevant information, missing data in the dummy variables are replaced with the value of 9 suggested by *SPSS-X User's Guide* (1988).

Independent Variables

A group of economic and demographic variables thought to affect elementary and secondary teachers' salaries are selected for inclusion in the regression equation. This equation models the natural log of annual salaries as a function of degree held, years of teaching experience, lottery adoption, annual lottery revenues in region, number of teachers, time, and and year of data collection. Since all of the salary data uses the average salaries paid by the state, the region in which the teacher taught is determined to be irrelevant to the model. This variable is deleted from the final model. The variables for this model are listed in Appendix A.

The state minimum salary schedules indicate that every parish accords higher salaries based on the degree attained and the number of years of teaching experience. Education is divided into six ranks. The omitted class is a teacher without a degree. Generally, it is expected that the amount of education achieved by a teacher would be positively correlated with salary. Experience is aggregated into 5-year classes with open-ended upper and lower classes.

A group of economic and demographic variables thought to affect university teachers' salaries are selected for inclusion in the regression equation. This equation is developed to test the hypotheses about the lottery's impact on university teachers' pay. The variables included in this regression equation are degree held, university discipline, years of service at the university, years of teaching experience, university rank, university, university system, region of the state, lottery adoption, annual lottery revenues in region, and year of data collection. All of the variables except years of teaching experience and years of service at the university are qualitative variables. Indicator variables are employed to model the categories. The resulting data set consists of 49 variables shown in Appendix B.

In a study of five universities in Louisiana, Boyd and Boyd (1995) developed a salary model for business school faculties. They hypothesized that the economic well-being of the local economy, university size, years of service to the university, rank, educational level, area of teaching expertise, and number of publications would influence monthly faculty salaries. Also, included were variables for race and gender of the faculty. The authors employed a multiple linear regression model to identify those variables significantly affecting monthly salaries. The income of the community around the university was found to affect salaries significantly.

Other significant variables were size of the university, rank, educational level, and the length of tenure with the university. This last variable was reported to have a negative impact on salary, supporting the atypical place of academia in the labor market. The teaching field within the business school was not relevant in determining salary. None of the other variables improve the explanatory power of the model. The selection of variables for inclusion in the models is based on those variables discussed in the literature.

Dummy variables are "used to account for the effect that different levels of an independent variable, . . . , have in predicting" salaries (Hair, Anderson, Tatham, & Black, 1992). This section of the study describes the dummy variables created for each of the classification variables and presents a justification for inclusion.

Education

Education as a determinant of teachers' salaries affects the individual's ability to qualify for jobs in academia. In studies by Boyd and Boyd (1995), Webster (1995), and Tuckman, Gapinski, and Hagemann (1977), the education level was significant. Having a doctorate or other terminal degree is found to have a significant positive impact on the salary of academics. Overall, it is postulated that the increased amounts of education would be positively correlated with salary.

According to Evans (1977), education may also suggest an individual's future potential for success. Individuals who seek additional education may also be motivated to higher levels of achievement. In academia's competitive labor markets, salaries could be the market's means of signaling its preference for more competent and motivated workers. This preference would be reflected in larger salaries for those individuals with additional education.

University teachers' education is separated into five classes according to the type of degree. Universities require teachers to have a college degree. Therefore, the omitted class is a teacher with a bachelor's degree.

Universities have higher minimum standards for its employees than do elementary and secondary teachers. For elementary and secondary teachers a sixth group is added since some teachers in the state do not hold degrees. That class is defined as having no degree. Generally, it is expected that education would generate positive coefficients. Increased levels of education should be associated with higher salaries in both groups.

Discipline

The university discipline is considered as a surrogate for the market's value of labor productivity. Previous research by Webster (1995) and Boyd and Boyd (1995) focused on business categories. Hammermesh (1988) studied differences between rank and discipline among faculty at a large university. He found that both variables were significant in determining salaries. Salary differences among disciplines are "market valuations of . . . those fields with the highest salaries are most valuable to society (Hammermesh, 1988, p. 20)."

Discipline is divided into seven classes. Arts and humanities are the omitted class for this variable. Since segregating data into departments is difficult, colleges are used as a surrogate for discipline. The other categories include business, education, physical sciences, engineering and technology, social sciences, and other. The "other" class includes those personnel that could not be relegated to another discipline.

Rank

Rank is divided into instructor, assistant professor, associate professor, full professor, and administrator. For the administrator category, the salaries of a faculty within this classification are paid as 12-month employees. Five-sixths of administrators' annual salaries are equivalent to the 9-month salaries paid to regular university faculty.

Webster (1995) used visiting instructor, instructor, and other rankings as separate categories. These factors were later grouped into one classification in the current study. As prescribed in this and other studies (see Boyd & Boyd, 1995; Hammermesh, 1988) rank is treated as a series of indicator variables. A one is encoded if the individual holds the rank specified and a zero is encoded if the observation does not hold the rank. Other rank variables are similarly encoded. For example, if a faculty member holds the rank of an assistant professor, the ASTP variable is coded one and the other rank variables are coded zero.

It is expected that rank should significantly influence salaries. Hammermesh (1988) found a negative correlation between salary and the rank of a full professor. Webster (1995) and Boyd and Boyd (1995) found positive correlations between pay and all rank factors. Previous research presents some conflicting results. However, rank is expected to be positively correlated with teachers' salaries in the study.

Experience

Wages should rise with seniority as workers and firms increase investments in specific human capital (Becker, 1962). Higher compensation provides incentives to maintain appropriate levels of productivity to meet production needs (Lazear,1981; Becker & Stigler,1974).

Efficiency wage theory posits that raises prevent workers from shirking duties (Dornbusch & Fischer, 1990). Salop and Salop (1976) viewed employees' seniority as a measurement of satisfactory performance evidencing the continued managerial selection of the best workers. According to Oi (1962), firms reward workers for attaining new skills and knowledge which are unique to a job. Higher wages deter workers from moving to other jobs that would remove the human capital along with the firm's investment in the worker.

Abraham and Farber (1987) concluded that the positive correlation between seniority and earnings was due to a misspecification of the empirical model. Seniority erroneously measures the omitted variable representing the quality of labor. This contrasting view indicates that the coefficients for experience should be interpreted with caution.

The elementary and secondary teachers' model uses a series of dummy variables to model experience. This factor is divided into six classes: less than or equal to 5 years experience, 6 through 10 years of experience, 11 through 15 years of experience, 16 through 20 years of experience, 21 through 25 years of experience, and more than 25 years of experience.

In the university model, two quantitative variables define experience, years with the individual university (YUEX) and years of teaching experience (YEXP). This information is not available for every observation. While the LSU system's budgets does not report experience, some data are collected using catalogs from the individual universities. In other cases, these details could not be discovered. Relevant information would be lost if these observations are omitted. Rather than eliminate a large segment of the sample, the observations in which experience could not be determined are replaced with a missing data value of 99. In the regression model, these missing values are replaced by the mean value.

Lottery Adoption

Since the impact of the lottery is the main focus of this study, a dummy variable is included to show whether the lottery has been adopted. This variable, defined as LA, assumes a value of one when the lottery is in effect and a value of zero otherwise. A t-test is used to test whether there is a significant difference for this variable between the regression equations calculated for the periods 1986-1990 and 1991-1995.

Lottery Revenues

Since the focus of the study is to determine if there is a difference in teachers' salaries before and after the lottery, the revenues from the lottery could be significant in modeling the salary equations. Consequently, the model includes annual lottery revenues. The amount recorded for each observation reflects the revenues collected in the region in which the university is located. Revenue amounts are scaled to reflect millions of dollars. This reduces the bias that may be introduced by comparing variables with vastly different scales.

Region

Most parishes supplement teacher salaries. The location of the school system could affect the total salary received by elementary and secondary teachers if individual salary data are used in this study. This study utilizes average minimum teachers' salaries. Therefore, region is not relevant for this data set.

The location of the university may affect the size of salaries offered to a faculty. Urban areas offer greater access to housing, schooling, medical care, and entertainment. Increased population densities may also intensify the competition for these services. Accepting a position at a university in or near a city may result in a larger salary to compensate the faculty for the higher cost of living. This variable may be a surrogate for differences in the cost of living. The region is divided into six classes (see Appendix D) that correspond to the lottery revenue regions ("Louisiana lottery commission regions," 1995).

University System

Universities in Louisiana belong to one of three university systems. Louisiana State University in Baton Rouge, its satellite campuses in Alexandria, Eunice, Shreveport/Bossier, and the University of New Orleans belong to the Louisiana State University System. The Southern University System administers Southern University of New Orleans, Southern University of Baton Rouge, and Southern University in Shreveport. All other universities in the study belong to the University of Louisiana System. Indicator variables model the university systems. This variable is included in the regression models to control for salary differences that may be attributable to the system affiliation.

Years

A final series of dummy variables is used to control for the year in which the data is collected. Each of the 10 classes represents one academic year within the data set. The omitted class is academic year 1986-1987. Academic years correspond to the budgeted faculty salaries available from the individual universities and from the elementary and secondary teachers. Lottery revenues are reported on a fiscal year basis that end in June of each year. The fiscal year roughly corresponds with an academic year. This variable is introduced to allow computation of the regression equations for the two different periods compared in the study.

Number of Teachers

The number of teachers in each joint group is included in the elementary and secondary teachers' model. This variable counts the number of occurrences within a category. It is included to improve the predictive ability of the model using categorical data. Johnson and Wichern (1988) suggested using the square root of the counts to make the distribution more normal. Number of teachers is included in their suggested form.

Dependent Variable

A single dependent variable is measured in the study. This is the average annual salary of the elementary or secondary school teacher in Model 1. In the model of university teachers' salaries the annual salary of individual teachers is the dependent variable. In each model this variable is deflated using the annual GNP deflator (*Economic Report to the President*, 1996). Salaries are deflated to 1990 dollars to alleviate salary drift caused by inflationary pressures. Taking the natural log of the salary data reduces the bias possible when the scales of variables within a regression model differ greatly. Bowerman and O'Connell (1997, p. 928) indicate that the transformation of the dependent variable helps to make the data plots more linear and to "equalize the error variances."

Statistical Methodology

The methodology employed in the study to test the empirical relationships of teachers' salaries to the economic and demographic characteristics selected is linear multiple regression modeling. Anderson et al. (1996, p. 579) define multiple regression as "a means to study how a dependent variable is related to two or more independent variables." Hair et al. (1992, p. 7) suggest that this was the appropriate technique to use when one quantitative dependent variable is "presumed to be related to one or more metric independent variables." In this study the regression equations reflect how the natural log of annual teachers' salaries is related to a matrix of demographic and economic variables. The natural logarithm of annual salary is the dependent variable. Computation of the regression coefficients is accomplished using the multiple regression option in the SPSS-X Data Analysis System (SPSS, 1988).

"Multiple regression analysis studies how a dependent variable is related to two or more independent variables and an error term" (Anderson et al., 1996, p. 579). This broader approach allows the researcher to consider several factors and to develop a better model of faculty salaries than is possible with simple linear regression (Bowerman & O'Connell, 1997). The least squares approach selects the model that reduces the sum of the squared distance between the observed values and the values predicted by the fitted model (Kleinbaum, Kupper, & Muller, 1988). As the fit of the model improves, the deviation between the observed and predicted values decreases. This least squares solution for this research is the linear combination of those independent variables that best fits the salary data.

The multiple regression model has the general form of:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$$

where β_0, β_1, β_2, and β_n are the parameters that are estimated by the regression equation, and ϵ represents the error or variability in y that cannot be explained by the linear combinations of β_0, β_1, β_2, . . . β_n. Two regression models are proposed to test hypotheses one and two. These models are

Model 1

$$LN(ESal) = \beta_0 + \beta_1 Degree + \beta_2 Experience + \beta_3 LotRev + \beta_4 Year + \epsilon$$

Model 2

$$LN(USal) = \beta_0 + \beta_1\, Degree + \beta_2\, Discipline + \beta_3 YUEX + \beta_4 YEXP + \beta_5 Rank + \beta_6 University + \beta_7 Unvsys + \beta_8 Region + \beta_9 LotRev + \beta_{10} Year + \epsilon$$

Equations were estimated for each model. One regression estimates salaries as a function of the independent variables for the period 1986-1990 prior to the lottery's adoption. The second regression reflects the period 1991-1995, representing the utilization of the lottery to raise revenues for the state. Mann-Whitney U-tests are used to test whether there is a difference between the regression variables before and after the lottery. This test of variances of average weights as they vary across samples is used to determine if the two samples (i.e., 1986-1990 and 1991-1995) derive from the same population.

A third equation comprising all observations is also generated. This equation is estimated with and without the lottery revenues variable, and the statistical difference between the regressions are tested to determine whether the lottery impacts teachers' salaries. F-tests are used to test the hypothesis that there is a difference in teachers' salaries with and without lottery revenues. Since the lottery was not in operation until 1991, testing the significance of the reduced model versus the full model would be a valid test of the impact of the lottery revenues on teachers' salaries.

Regression Equations

The regression equation for computation of the coefficients associated with the explanatory variables for the elementary and secondary teachers model is:

Model 1

$$
\begin{aligned}
LN(ESAL) = {} & b_0 + b_1 B + b_2 M + b_3 M3 + b_4 M6 + b_5 D + b_6 ST + b_7 TF \\
& + b_8 FT + b_9 TT + b_{10} TP + b_{11} SNT + b_{12} LA + b_{13} LR1 \\
& + b_{14} Y87 + b_{15} Y88 + b_{16} Y89 + b_{17} Y90 + b_{18} Y91 \\
& + b_{19} Y92 + b_{20} Y93 + b_{21} Y94 + b_{22} Y95
\end{aligned}
$$

The university teachers' model is:

Model 2

$$
\begin{aligned}
LN(USAL) = {} & b_0 + b_1 M + b_2 M3 + b_3 M6 + b_4 D + b_5 BS + b_6 ED + b_7 PS \\
& + b_8 EN + b_9 SS + b_{10} OT + b_{11} YUEX + b_{12} YEXP \\
& + b_{13} ASOP + b_{14} ASTP + b_{15} PROF + b_{16} AD + b_{17} U2 \\
& + b_{18} U3 + b_{19} U4 + b_{20} U5 + b_{21} U6 + b_{22} U7 + b_{23} U8 \\
& + b_{24} U9 + b_{25} U10 + b_{26} U11 + b_{28} U12 + b_{28} U13 + b_{29} U14 \\
& + b_{30} U15 + b_{31} U16 + b_{32} S2 + b_{33} S3 + b_{34} R2 + b_{35} R3 \\
& + b_{36} R4 + b_{37} R5 + b_{38} R6 + b_{39} LA + b_{40} LR1 + b_{41} Y87 \\
& + b_{42} Y88 + b_{43} Y89 + b_{44} Y90 + b_{45} Y91 + b_{46} Y92 \\
& + b_{47} Y93 + b_{48} Y94 + b_{49} Y95
\end{aligned}
$$

The relevance of a group or class of indicator variables in the regression models needs to be tested before inferences could be drawn from the regression equations. The hypothesis tested is whether all coefficients for a class are equal to zero. A partial F-test determines the significance of the groups of independent variables (classes of variables).

The appropriate F-test took the form of

$$F* = \frac{SSE(R) - SSE(F)}{df_R - df_F} \div \frac{SSE(F)}{df_F}$$

where SSE(F) is the sum of squared error for the full model, SSE(R) is the sum of squared error in the reduced model, df_F is the residual number of degrees of freedom in the full model and df_R is the number of degrees of freedom in the error sum of squares in the reduced model (Neter, Wasserman, & Kutner, 1989, p. 291). The significance level is set at .05 to establish the critical value. The number of degrees of freedom for the numerator equals $df_R - df_F$ and the degrees of freedom for the denominator would be equal to df_F.

Chapter Summary

Chapter 3 presented the theoretical basis for the statistical methods used to test the hypotheses. This chapter included a discussion of sample selection, the variables used in the analyses, and the methodology employed in this study.

Certain limitations and delimitations are necessary to make the model manageable. The study is restricted to full-time teachers in Louisiana. Variables such as research productivity and gender are not included in this study of teacher salaries. Only data from the 10-year period 1986-1995 are included in the study.

A discussion of stepwise regression as a variable reduction technique is presented in Chapter 4. The results of the regression procedures and the results of tests of the normality and validity of the data are also presented in Chapter 4.

CHAPTER 4

DATA ANALYSIS AND RESEARCH RESULTS

The primary purpose of this research is to determine whether the lottery affected teachers' salaries in Louisiana. The theoretical precepts profiled in Chapter 2 and the methodology presented in Chapter 3 are combined to compute the coefficients of the regression equations developed from the initial set of independent variables. The results as they relate to the hypotheses developed in this study are presented in this chapter.

As previously reported in Chapter 3, the data used in this research are samples including 6,338 observations from university teachers and 2,160 observations from elementary and secondary teachers, respectively. The first sample is selected from the university budgets submitted to the state of Louisiana for the period 1986-1995. The elementary and secondary school data are compiled from the Personnel Employee Profile (PEP) report submitted to the state for the period 1993-1996. Individual school systems within Louisiana provided the data for years 1986-1993. Some school systems did not or could not provide data. Sixty percent (40 of 66) of the individual school systems provided the information requested.

Variable Reduction

The data sets include many variables. Appropriate modeling techniques suggest that the best models should include only those variables that are about the explanatory power of the models. One measure of the power of the linear relationship is R^2, called the multiple coefficient of determination. This statistic measures the proportion of the total variances in the natural log of annual teachers' salaries explained by the model (Black, 1994, p. 576). This measure ranges from zero to one. A larger R^2 seems desirable. However, Bowerman and O'Connell (1997) stated that:

> . . . adding any independent variable to a regression model, even an unimportant independent variable, will decrease the unexplained variation and increase the explained variation. Adding any independent variable to a regression model will increase the R^2. (p. 853)

Thus, the R^2 estimated by including more independent variables could produce biased estimates of the measure of the true linear relationship. To alleviate this potential bias, a stepwise regression procedure is carried out. Neter et al. (1989, p. 430) proposed using "this automated search method when the pool of independent variables was forty to sixty or more." This screening process could "identify a set of the most important independent variables" (Bowerman & O'Connell, 1997, p.872). The stepwise selection procedure in SPSSX (1988, p.851) "used the F-statistics (and the related p-values) to determine whether a variable entered or left the regression." A variable enters or leaves the model based on its contribution to the significance of the model. The advantage of this approach is that a variable that enters the model at one stage can later be removed if it no longer improves the explanatory power of the model. Another advantage of this method is that the order in which variables enter do not reflect their importance. Finally, use of the stepwise procedures reduces multicollinearity in regression models.

Significance levels are set at .05 to enter. An alpha of .10 or greater forces a variable to leave the model. Once a variable enters or leaves the equation, the regression is reestimated. Then all variables are "reexamined for potential removal" (p. 851). This process continues until no variables can enter or leave the equation or until the procedure reaches the maximum number of iterations allowed.

One limitation of this technique is the presumption that there is a "best subset" of independent variables. Another concern is that this method could erroneously select an optimal set of X variables because of highly correlated independent variables. Proper variable selection is founded on sound theory and the proper use of statistical testing transformation techniques. Tests for multicollinearity and other potential departures from model assumptions are incorporated into the modeling process and corrective actions are undertaken before utilizing the models to make inferences.

A backward elimination technique is also applied to the data sets. Under this procedure, all potential variables enter the regressions. Then variables whose significance is greater than .10 are removed from the equations. After each variable is removed, the regression equations are reestimated, and the evaluation process is repeated until no variables can be removed from the equations. The two procedures produce identical regression equations for both data sets (Neter et al., 1989).

The variables in the final regression models for elementary and secondary teachers are illustrated later in the chapter, as well as the variable information for the university teachers model. Also, included in these tables are estimates of the beta coefficients, the F-statistics, and the probability of greater F-values. Interpretation and discussion of the model coefficients derived from these procedures follow later in this chapter.

Outliers

Outliers are extreme values of the observations with respect to the y or x variable. These extreme values may distort the fitted least squares line and bias the regression estimates. Observations that "lay four or more standard deviations from zero" (Neter et al., 1989, p. 115) are considered outliers with respect to Y. SPSS (1988) lists outliers as any observations that are more than three standard deviations from zero. Bowerman and O'Connell (1997, p. 911) defined an observation as influential "if removal of the observation would cause a significant difference in the least squares estimates." Not all outliers are considered influential observations (Hair et al., 1992).

Leverage values are used to identify outliers with respect to the x values. These values measure how far independent variables are from the expected mean values (Anderson et al., 1996). An advantage of this measure is that it can also be used to identify those outliers that are influential. Influential observations are those observations with leverage values greater than twice the average leverage value (Bowerman & O'Connell, 1997). For the university model, any leverage value that is 0.148 or greater was deemed influential. Leverage values that exceed .0194 are considered influential outliers in the model of elementary and secondary teachers' salaries. This criterion identifies 173 outliers in the university model and 30 outliers in the elementary and secondary teachers model.

Studentized deleted residuals, d, are used to identify those observations that are outliers with respect to the y values (Bowerman & O'Connell, 1997). This statistic has a t-distribution "with n-k-2 degrees of freedom" (p. 916). The significance level, α, is set at .05 to determine the critical level for the studentized deleted residuals. Observations whose d value is greater than 1.96 or less than -1.96 are considered outliers (Hair et al., 1992, p. 75). Thirty outliers were identified in the elementary and secondary teachers' model while only 13 were found in the university teachers data.

Cook's distances measures the overall impact of an outlier on the estimated regression coefficients (Neter et al., 1989). It uses both the leverage value and the studentized deleted residuals to determine if an identified outlier unduly affects the regression estimates. Anderson et al. (1996) and Kleinbaum et al. (1988) suggest that Cook's distances greater than one warrant further study. None of the observations exceed this value. Therefore, although outliers did exist, none significantly influence the regression results.

Many researchers eliminate outliers assuming that these values represent mistakes in data collection. Examination of the data does not indicate collection errors. Neter et al. (1989, p. 115) suggested that "outliers may convey significant information" and removal of outliers is justified only if "direct evidence existed that an error in recording, a miscalculation, a malfunctioning of the equipment, or a similar type of circumstance" has occurred. This suggestion is incorporated into the analysis. No defensible justification is found to remove any of the outliers identified.

Multiple Regression Analysis

As discussed in Chapter 3, Hair et al. (1992, p. 7) suggested that this is the appropriate technique to use when one quantitative dependent variable is "presumed to be related to one or more metric independent variables." In this study, the regression equations reflect how the natural log of annual teachers' salaries is related to a matrix of demographic and economic variables.

The multiple regression model assumes the general form of:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon$$

where β_0, β_1, β_2, and β_N are parameters estimated by the regression equation. These coefficients explain how independent variables are related to the dependent variable. Epsilon, ϵ, represents the error or variability in y that cannot be explained "by the linear combinations of $X_1, X_2, \ldots, X_n$ and the error term" (Pindyck & Rubinfeld, 1991, p. 73).

The Ordinary Least Squares method (OLS) is used to estimate the coefficients of the regression equation. This method determines the equation of the line that best represents the data. The coefficients are the linear combinations of independent variables that minimize the squared distances between the actual values of the dependent variable and the predicted values (Kleinbaum et al., 1988). The estimated equation form is:

$$\hat{y} = b_0 + b_1x_1 + b_2x_2 + \cdots + b_nx_n$$

where b_0, b_1, b_2, . . . , b_k, were the estimates of β_0, β_1, β_2, . . . , β_N and $\hat{y}$ is the estimated value of the dependent variable (Anderson et al., 1996).

Valid use of the multiple regression technique is based on several assumptions about the nature of the data. Pindyck and Rubinfeld (1991, p. 73-74) and Anderson et al. (1996, p. 528) listed the following assumptions for the multiple linear regression model:

1. Homoscedasticity. The variance of the error terms ϵ is constant for all observations.

2. Uncorrelated (independent) errors. The values of ϵ are statistically independent and therefore are uncorrelated. Error terms ϵ are random variables with expected values (mean value) equal to zero.

3. Linearity. The dependent variable is a linear combination of a series of independent variables X_1, X_2, . . . , X_n and the error term.

4. Independence. The independent variables are nonstochastic and no exact linear relationship exists between two or more independent variables.

5. Normality. The error term ϵ is a normally distributed random variable.

Rarely do the regression assumptions hold exactly for real data. Neter et al. (1988) suggested that mild departures from the regression assumptions would not invalidate the use of the regression model to make statistical inferences. Bowerman and O'Connell (1997, p. 685) suggested that "only pronounced departures from these assumptions require attention." Looking for pronounced departures from the assumptions is used to assess the validity applying multiple linear regression. Both graphical means and parametric and nonparametric statistical tests are used to determine whether the assumptions are satisfied.

Tests of Model Assumptions

One way to check the fit of the model and the validity of the regression assumptions is to analyze plots of the residuals or error terms of the regression. Bowerman and O'Connell (1997) suggested plotting the residuals against the values of the independent variables and against the predicted values of the dependent variable. Johnson and Wichern (1988) also suggested creating normality plots of the residuals called Q-Q plots and plotting the residuals versus time as diagnostic techniques. To conclude that the assumptions are met, each plot only needs to approximately fit the prescribed assumptions. These procedures are applied to both models.

Neter et al. (1989, p. 122) cautioned that "graphical analysis of residuals was inherently subjective." While examination of several interrelated residual plots could detect departures from the assumptions, the authors advised supplementing this technique with more robust tests. To support residual analysis, specific statistical tests are used to test the regression assumptions.

Homoscedasticity. The error variances in the models are constant. When error terms have a constant variance, this condition is called homoscedasticity. Nonconstant error variances (i.e., heteroscedasticity) provide spurious estimates for the regression coefficients. Inferences made under this condition would not reflect the true population parameters.

Constancy of error variances is assessed from the residual plots. Residuals from the regression equations are plotted against the predicted values of the dependent variable. The pattern of the residuals plotted around zero indicate whether the variances are constant. If the residuals form a roughly horizontal band about zero, the variances are considered constant. Predicted values plotted against the residuals conform to the premise that the values could be confined to a horizontal band around zero. Departures, if they occur, have a trapezoidal shape in business data (Neter et al., 1988). Neither this pattern nor any other pattern is discernable from the residual plots. The conclusion is that the data are homoscedastistic.

The Bartlett-Box F test is used to test the assumption of equality of variances in the two data sets. This overall test is selected because it is applicable to both equal and unequal sample sizes (Neter et al., 1988). The hypothesis tested was

$$H_0 : \sigma^2_1 = \sigma^2_2 = \cdots = \sigma^2_K$$

$$H_A : at\ least\ 2\ \sigma^2_I \neq$$

A Box transformation of the Bartlett test is used to test the hypothesis because the between groups tested have only one degree of freedom. This transformed statistic follows a "F-distribution with n-1, $(n+1)/(C-1)^2$ degrees of freedom" (Neter et al., 1988, p. 620). The Bartlett-Box F-value for the elementary and secondary teachers' model indicates that the error variances are not equal. This departure is not large. However, the results of the regression equation for this model must be interpreted with caution.

In the university teachers' model, the Bartlett Box F is .0359. This small F-value leads to a failure to reject the null hypothesis. This model has equal variances.

Independent error terms. Durbin-Watson tests and residuals plotted against time are used to determine whether error terms are autocorrelated. The runs' test is also used to test for lack of randomness among residuals.

Examining the residuals plotted against time is an "effective method to see if there was any correlation between error terms" (Neter et al., 1988, p. 115). No discernible pattern is found in comparing the residuals plotted against time for the university model. The elementary and secondary teachers' model exhibits a trend for the errors to be positively correlated. Since it is difficult to determine conclusively whether this assumption is violated using a graph, the Durbin-Watson statistics are examined.

The SPSSX (1988) regression program calculated the Durbin-Watson test for autocorrelation. Doti and Adibi (1988) indicated those Durbin-Watson values (i.e., DW) of two indicated no autocorrelation. Positive autocorrelation, the most prevalent form of the departure, occurs when the DW statistic falls below two and approaches zero. The Durbin Watson statistics calculated are .7067 and 1.6621 for the school teachers and university personnel, respectively. For a .05 significance level, the calculated statistic of .7067 is below the 1.57 lower limit set for the Durbin Watson statistic. The elementary and secondary teachers' model is positively autocorrelated. If the calculated values range between .67 and 1.78 for .05 level of significance, a determination is not possible. Calculated statistics for the university teachers' model are 1.68, so the statistics are inconclusive and no determination can be made.

Several remedial measures could be employed to remedy the autocorrelation. "However, when sample sizes are large in comparison to the number of independent variables in the regression, dependency among the errors is relatively unimportant and can be ignored for most purposes" (Neter et al., 1988, p. 111). Sample sizes of 6,338 and 2,160 are considered large enough to incorporate the authors' suggestion to ignore the minor autocorrelation.

Linearity. The dependent variable should be a linear combination of the independent variables. To assess whether the linear regression equation appropriately models the independent variable, the predicted values of the dependent variable are plotted against the studentized residuals. Residual analysis tests the "goodness of fit" (Black, 1994, p. 523). Obvious patterns in a plot may suggest the need for higher order (i.e., quadratic, cubed, etc.) models or suggest the inclusion of interaction terms in the model. None of the residual plots indicate any detectable patterns. This suggests that the data could be modeled using a linear model.

Another tool used to test the linearity assumption is to view the partial regression plots. Partial regression plots graph the residuals of the predictor variable with each independent variable. The linearity assumption would be violated if one graph had a nonlinear appearance. This method is useful since these graphs tell which specific variable violate the assumption and the nature of the violation. No nonlinear patterns are observed. The inference is that the linearity assumption held.

Other measures of the linearity of the relationships are the coefficients of multiple determination R^2 and the standard errors of the estimates. The R^2 should be as close to one as possible and s should be small. For the elementary and secondary teachers' model, R^2 is .959 with a standard error of the estimate of .179. The model explains 95.9 percent of the variation of the salary data. For the second model, these statistics are $R^2 = .549$ and s =0.059. Here the regression model explains only 54.9 percent of the variability of university teachers' salaries. A linear relationship exists between the dependent variable (Sal2) and the independent variables in both models.

Adjusted R^2 is the measure of the linearity of the model considering the degrees of freedom lost by adding variables (Black, 1994). These measures indicate whether the set of independent variables in a model inflates the actual relationship. Neither model shows any significant difference between these measures and the R^2. The linearity assumption still holds.

Independence. Independent variables are assumed to be statistically independent. The conclusions of the research could be biased if multicollinearity exists in the data sets. Neter et al. (1989, p. 272) defined multicollinearity as "correlation among independent variables," especially when this correlation is very high. They noted that business research data often contains correlated, independent variables. The effect of correlation among independent variables on the regression coefficients and the explanatory power of the models must be examined.

> When independent variables are correlated, the regression coefficients reflect the partial impact of each independent variable on the response variable. This partial impact is dependent upon which other correlated independent variables were included in the model. Also, the total explanatory power attributed to any independent variable must be considered in the context of the other independent variables included in the model. (Neter et al., 1989, p. 277)

The existence of severe multicollinearity in the models makes it difficult to test the statistical significance of the regression coefficients. The size of the F-statistics may be understated while the related p-values are overstated for the individual regression coefficients. This condition would result in insignificant individual regressors. Potentially, the procedure would eliminate important independent variables from the regression equations.

Large coefficients of correlation between independent variables in the correlation matrix or estimated regression coefficients with signs that are opposite of the expected signs would be further evidence of dependence among the regressors. Other suggestions that multicollinearity exists would be statistically insignificant regressors while the overall model had a large R^2 that appears to explain a high degree of the variability of the model (Neter et al., 1988).

To examine the data for potential multicollinearity, correlation matrices are created for each sample. In these matrices, the simple correlation between two variables is calculated. Since data usually have some random correlation, only correlation coefficients greater than .4 are examined. Bowerman and O'Connell (1997) regarded correlation coefficients of .9 or higher as indicative of severe multicollinearity. Anderson et al. (1996) indicated that correlations between any two independent variables that exceed .7 showed a problem with multicollinearity. This lower level is deemed more appropriate as a screening tool. Tables 1 and 2 list the independent variables and the corresponding correlation coefficients that exhibit potential multicollinearity. In the elementary and secondary teachers' model, three occurrences warrant further attention.

One remedial measure for coping with multicollinearity is to drop one or more independent variables that are highly correlated. This measure is used when justification is sufficient.

Examination of the variables in the elementary and secondary teachers' model determine that the LA (lottery adoption) and LR1 (lottery revenues) are

TABLE 1

ELEMENTARY AND SECONDARY TEACHERS' MODEL CORRELATION COEFFICIENTS FOR SUSPECT VARIABLES

Variable 1	Variable 2	Correlation Coefficient	Significance Level
LA	LR1	0.955	.01
LA	Time	0.870	.01
LR1	Time	0.742	.01
Y92	LR1	0.530	.01
Y94	Time	0.406	.01
Y95	Time	0.522	.01

TABLE 2

UNIVERSITY TEACHERS' MODEL CORRELATION COEFFICIENTS FOR SUSPECT VARIABLES

Variable 1	Variable 2	Correlation Coefficient	Significance Level
M	D	-0.845	.01
LA	LR1	0.719	.01
S2	U4	0.407	.01
S2	U5	0.487	.01
S3	U6	0.669	.01
S3	U7	0.541	.01
S3	U8	0.389	.01
R2	U12	0.451	.01
R3	U14	0.662	.01
R3	U15	0.592	.01
R4	U16	0.797	.01
R5	U9	0.524	.01
R6	U8	0.549	.01
R6	U4	0.799	.01
U13	U10	0.648	.01
Y92	LR1	0.431	.01
YUEX	YEXP	-0.642	.01

almost perfectly correlated (.9551). This level of correlation exceeds the level at which severe multicollinearity is evident. LA is also highly related to time (.8704). Both LA and LR1 measure the lottery's impact. Since the purpose of the study is to evaluate the impact of lottery revenues on teachers' salaries, it is determined that the variables are redundant. It was decided to drop the dummy variable LA. The lottery revenues variable (LR1) is retained to assess its impact. Removal of the LA variable also eliminates the problem with time.

The LA variable also indicates high correlations with lottery revenues (LR1) in university model. Since it provides redundant information, multicollinearity is evident in the correlation matrix. LA is also removed from this model to reduce the potential multicollinearity.

The regression coefficients in the models are examined to determine if any of the variables exhibit signs opposite to those expected from theory or prior research. If important independent variables have signs that are different from those expected *a priori*, multicollinearity would be suspected.

The two experience variables, YUEX (years with a particular university) and YEXP (years of teaching experience) exhibit a positive correlation of .627. Although this correlation is high, it does not exceed the .7 values that would show severe multicollinearity. A strong relationship between these two variables exists. YEXP depends on the number of years of experience at a particular institution. Since the information contained in these variables is considered relevant to this study, both YUEX and YEXP are retained in the university model.

A significant negative correlation exists between two of the variables describing degree. A correlation of -.845 between M (master's degree) and D (doctorate) may be a cause for concern in the university model. The nature of the data seems to justify this finding. At a minimum, a master's degree is required to teach at most universities. Accreditation requirements and minimum standards set by the governing boards compel institutions of higher learning to employ individuals with terminal degrees (i.e., doctorates). Few universities acknowledge interim degrees such as masters' degree plus 30 graduate hours or a master's degree plus 60 graduate hours in determining salaries. Therefore, it would be expected that increasing the number of teachers with doctorates would lower the number of positions held by teachers with only masters' degrees.

Overall, no severe multicollinearity is detected using residual analysis. According to Neter et al. (1989. p. 384),

> The fact that some or all independent variables are correlated among themselves does not, in general, inhibit our ability to obtain a good fit nor does it tend to affect inferences about mean responses, or predictions of new observations, provided these inferences are made within the region of observations.

Calculating variance inflation factors (VIF) is a more formal and more rigorous means of detecting the presence of multicollinearity. Variance inflation factors measure the amount by which the estimated regression coefficients are exaggerated as compared with when the independent variables are correlated (Neter et al., 1989). The VIF formula for a regressor is

$$(VIF)_k = (1 - R_k^2)^{-1} \qquad k = 1, 2, \dots, p-1$$

where R_k^2 is the coefficient of multiple determination when X_k is regressed on the other X variables in the model (p.391). The largest $(VIF)_k$ of all of the independent variables is often used as the indicator of the severity of multicollinearity. A VIF greater than 10 is evidence that multicollinearity is excessively influencing the regression estimates. Tables 3 and 4 list the variables, multiple R_k^2, and variance inflation factors for each reduced model.

TABLE 3

VARIANCE INFLATION FACTORS OF ELEMENTARY AND SECONDARY TEACHERS' MODEL

Variable	R-Squared	Variance Inflation Factor
B	0.751	4.016
M	0.616	2.604
M3	0.552	2.232
M6	0.408	1.689
D	0.402	1.672
ST	0.400	1.667
TF	0.402	1.672
FT	0.405	1.681
TT	0.400	1.667
TP	0.400	1.667
SNT	0.705	3.390
LR1	0.811	5.291
Y87	0.260	1.351
Y89	0.260	1.351
Y90	0.295	1.418
Y91	0.610	2.564
Y92	0.675	3.077
Y94	0.409	1.692
Y95	0.350	1.538
AVERAGE VIF		2.229

TABLE 4

VARIATION INFLATION FACTORS OF UNIVERSITY TEACHERS' MODEL

Variable	R-Squared	Variance Inflation Factor
M	0.720	3.571
D	0.741	3.891
BS	0.106	1.451
PS	0.112	1.572
EN	0.079	1.217
ASTP	0.573	2.358
ASOP	0.579	1.395
PROF	0.662	2.985
AD	0.208	1.267
S2-LSU SYSTEM	0.317	2.155
R2-BATON ROUGE	0.370	3.049
U2-LSU ALEX	0.055	1.109
U9-LA TECH	0.143	1.441
U12-SE LA	0.299	2.110
U15-MCNEESE	0.091	1.224
U16-NW LA	0.110	1.276
YUEX	0.456	1.859
YEXP	0.409	1.709
Y87	0.146	1.171
Y90	0.096	1.106

TABLE 4 (continued)

Variable	R-Squared	Variance Inflation Factor
Y91	0.187	1.230
Y92	0.335	1.504
Y93	0.174	1.211
LR1	0.469	1.988
AVERAGE VIF		1.821

Only two of the variance inflation factors exceed 3.9 in the elementary and secondary teachers model. The average VIFs show no serious multicollinearity in the models. Since multicollinearity is not present in either model, assumption four is satisfied. Although the negative correlation coefficient for master's degrees and doctorates is large, the variance inflation factors indicate that the inclusion of these two variables would not seriously affect the regression estimates.

Normally distributed errors. Assumption five, that the error terms are normally distributed, infers that the populations from which the samples are drawn are multivariate normal distributions. In addition to graphical analysis, each sample is tested for multivariate normality using the Kolmogorov-Smirnov tests and a Mardia multivariate normality test. Bowerman and O'Connell

(1997, p. 903) suggested that "if the normality assumption holds, a histogram of the residuals should look reasonably bell-shaped and reasonably symmetric about zero." Another way to check the normality assumption is to construct and evaluate normal probability plots of the residuals.

Histograms of the models' residuals are overlaid with normal curves. The histograms of the residuals for both data sets appear to conform to the shape and symmetry of the bell curve depicted by the normal curve. Although the elementary and secondary teachers' data display some kurtosis, the departure from the normal curve is not severe.

Another tool used to assess the normality of the data is normal probability plots. These graphs are useful diagnostic tools because the data sets are moderate to large. The predicted values versus studentized deleted residuals are graphed on axes scaled into quartiles. Normally distributed data should lie almost along a straight line (Johnson & Wichern, 1988). Normal probability plots for both models are linear in appearance. The data appear normally distributed. The probability plot for university teachers indicate that some data is uniformly distributed. This violation of univariate normality means that the data will not be multivariate normal.

Hair et al. (1992) indicated that a basic test of the normality of individual variables is to calculate a z-value equal to

$$z = \frac{SKEWNESS}{\sqrt{(6/N)}}$$

The skewness measures for several independent variables exceed values of ±1.96, suggesting that the data is not multivariate normal.

An alternative measure of normality used in this study are the Mardia test and the Kolmorgorov-Smirnov (K-S) One Sample Goodness-of-Fit Test. This one-sample test (SPSSX, 1988, p. 734) compares the cumulative distribution for a variable to the normal distribution and calculates a Z-score to make the comparison. The residuals and all independent variables tested are normally distributed. The Mardia test of multivariate normality suggests that the data may not be normally distributed. The validity of this test is questionable since computer facilities limit the test to samples of 100 observations from the data sets.

While a violation of normality could have created problems in drawing inferences, two factors alleviate this concern. The Central Limit Theorem (Anderson et al., 1996) shows that the underlying sampling distribution approached normality as the sample size increased. Under the Law of Large Numbers (Johnson & Wichern, 1988), statistics derived from the samples converge to the population parameters as larger samples are used. Therefore, the large samples selected for this study allowed the author to conclude that the regression estimates could be reasonably used to make inferences about teachers' salaries.

Significance of Models

Chapter 3 provided the basis for developing regression equations to test the proposed hypotheses. To test the hypotheses, the regression results are compared for two estimations of Model 1 (Model 1A--salaries before the adoption of the lottery, 1986-1990; and Model 1B--salaries after the implementation of the lottery, 1991-1995). The model is estimated for the entire period in Model 1C to determine overall period and includes dummy variables for years to control for missing economic variables. The same procedure is used to estimate the university teachers' model. Model 2A estimates regression coefficients for the university teachers' model prior to the lottery, Model 2B modeled the period 1991-1995, and Model 2C represents the estimates for the entire period.

Mann-Whitney U tests are calculated to determine whether there are differences between the variables. To test whether the observations for pre- and post-lottery data are from the same population, Wald-Wolfowitz tests (SPSSX, 1988, p. 750) are performed on the two data sets. These tests combine all observations and rank the observations by size.

The coefficient of multiple determination, R^2, measures the strength of the linear relationship between the dependent variable and the independent variables. This coefficient's value ranges from zero to one with values closer to one representing stronger association.

The SPSSX statistical package creates Analysis of Variance tables for each regression model. Tables 5 and 6 exhibit the SPSSX output for the elementary and secondary teachers' model and for the university teachers' model. As illustrated in Table 5, the elementary and secondary teachers' model has an $R^2 = .959$, showing a strong relationship between the independent and dependent variables.

TABLE 5

ANALYSIS OF VARIANCE FOR ELEMENTARY AND SECONDARY TEACHERS

Source	Degrees of Freedom	Sum of Squares	Mean Square
Regression	19.000	77.717	4.090
Residual	2140.000	3.359	0.002
Multiple R	= 0.979	F-Value	= 2605.684
R Square	= 0.959	Probability of > F	= 0.000
Adjusted R Square	= 0.958	Standard Error	= 0.040

TABLE 6

ANALYSIS OF VARIANCE FOR UNIVERSITY TEACHERS' MODEL

Source	Degrees of Freedom	Sum of Squares	Mean Square
Regression	24.000	242.081	9.975
Residual	6313.000	198.640	0.315
Multiple R	= 0.741	F - Value	= 320.566
R Square	= 0.549	Probability of > F	= 0.000
Adjusted R Square	= 0.548	Standard Error	= 0.177

The university model had an $R^2 = .549$. This shows that the university teacher's model explained 54.9 percent of the variation in the model. Although the relationship did not represent a strong linear relationship, it does imply that the dependent variable depends on the independent variables.

However, R^2 is insufficient to determine the validity of the model. The hypotheses used to test the significance of the overall regression relations are

$$H_0: \beta_1 = \beta_2 = \beta_3 = \ldots = \beta_K = 0$$

$$H_A: \text{At least one } \beta_1, \beta_2, \beta_3, \ldots, \beta_K \neq 0$$

he appropriate test statistic for each model is the overall F-statistic. The overall F-statistic used is

$$F\ (model) = \frac{(Explained\ variation)/k}{(Unexplained\ variation)/[n-(k+1)]}$$

$$F = \frac{Mean\ square\ regression}{Mean\ square\ residual}$$

where n is the number of observations and k represents the number of individual parameters in the models. This statistic follows an F distribution with significance equal to α and k-2, n-k degrees of freedom where p is the number of independent variables and n represents the number of observations. The minimum significance level, α, is set at .010. The F-test is an upper-tail test. Therefore, if the calculated value of F is greater than the table value, one rejects the null hypothesis.

An alternative measure of the significance used is the p-value. This is defined as the area under the curve of the F distribution to the right of the calculated F-value. If the p-value was less than the predetermined significance level, the null hypothesis would be rejected. Additionally, the p-value indicates the actual level of significance. If the null hypothesis is rejected, the conclusion would be that at least one independent variable significantly explained the variation in the dependent variable and the regression function was linear. Failure to reject the null hypothesis infers that the model has no significant predictability for the dependent variable. Rejecting the null hypothesis means that at least one independent variable adds significantly to the predictability of annual teachers' salaries. If one regression coefficient is significant, the F-test would infer that the overall model is significant (Black, 1990). Therefore, the individual regression coefficients should be tested for statistical significance.

The F-statistics in both models are large. The null hypothesis is rejected in each model. The probability of larger F-values = .0000 indicate statistical significance at the .0000 levels. The linear models are appropriate to describe the teachers' salary data sets.

Regression Coefficients

Borg, Mason, and Shapiro (1990, p. 304) stated that in regression analysis the "explanation and interpretation are influenced by whether a variable is discrete or continuous." Continuous variables may be interpreted as the elasticities of the variables. The indicator variables representing a dichotomous (i.e., 0,1) distribution can be interpreted as affecting the salaries by changing the intercept of the regression line. The impact of the constant term or intercept is equal to the sum of the nonlogged coefficients of the dummy independent variables. Tables 7, 8, and 9 show the estimated coefficients for the multiple regression equations for elementary and secondary teachers. The results of the regression tests for the models of university teachers before and after the lottery are presented in Tables 10 and 11. Table 12 presents the regression coefficients for the entire model.

TABLE 7

REGRESSION COEFFICIENTS AND F-STATISTICS FOR ELEMENTARY AND SECONDARY TEACHERS PRE-LOTTERY REGRESSION MODEL 1-A (YEARS 1986-1990)

Variable	β	F-Value	Prob > F
Intercept	9.378	5352595.500	0.000
LR1	---	---	---
SNT	0.003	53.452	0.000
Education:			
ND*	--- OMITTED CLASS ---		
B	0.217	1142.991	0.000
M	0.290	3104.096	0.000
M3	0.328	4477.675	0.000
M6	0.369	8467.018	0.000
D	0.397	9955.822	0.000
Experience:			
L5*	--- OMITTED CLASS ---		

TABLE 7 (continued)

Variable	β	F-Value	Prob > F
Experience (cont'd):			
ST	0.139	1223.693	0.000
TF	0.254	3974.905	0.000
FT	0.276	4720.340	0.000
TT	0.290	5329.588	0.000
TP	0.296	5570.456	0.000
Year:			
Y86*	OMITTED CLASS		
Y87	-0.035	124.131	0.000
Y89	0.056	311.081	0.000
Y90	0.083	698.993	0.000
Y91	---	---	---
Y92	---	---	---
Y94	---	---	---
Y95	---	---	---

TABLE 8

REGRESSION COEFFICIENTS AND F-STATISTICS FOR ELEMENTARY AND SECONDARY TEACHERS POST-LOTTERY REGRESSION MODEL 1-B (YEARS 1991-1995)

Variable	β	F-Value	Prob > F
Intercept	9.468	202085.580	0.000
LR1	0.000	2.738	0.098
SNT	0.001	29.799	0.000
Education:			
ND*	--- OMITTED CLASS ---		
B	0.267	2111.203	0.000
M	0.340	5566.547	0.000
M3	0.370	8065.648	0.000
M6	0.406	12537.532	0.000
D	0.433	14387.273	0.000
Experience:			
L5*	--- OMITTED CLASS ---		
ST	0.164	2064.423	0.000
TF	0.283	6159.787	0.000
FT	0.331	8374.586	0.000
TT	0.364	10182.548	0.000
TP	0.386	11439.687	0.000

TABLE 8 (continued)

Variable	β	F-Value	Prob > F
Year:			
Y86*	— OMITTED CLASS —		
Y87	—	—	—
Y89	—	—	—
Y90	—	—	—
Y91	0.049	210.260	0.000
Y92	0.028	73.440	0.000
Y94	-0.027	67.683	0.000
Y95	-0.048	208.584	0.000

TABLE 9

REGRESSION COEFFICIENTS AND F-STATISTICS FOR ELEMENTARY AND SECONDARY TEACHERS TOTAL REGRESSION MODEL 1-C (YEARS 1986-1995)

Variable	β	F-Value	Prob > F
Intercept	9.342	8988262.600	0.000
LR1	0.018	3.010	0.083
SNT	0.002	83.725	0.000
Education:			
ND*	--- OMITTED CLASS ---		
B	0.241	2824.105	0.000
M	0.315	7339.312	0.000
M3	0.350	10534.355	0.000
M6	0.388	16995.205	0.000
D	0.415	19678.717	0.000
Experience:			
L5*	--- OMITTED CLASS ---		
ST	0.152	2652.335	0.000
TF	0.270	2652.335	0.000
FT	0.304	10475.151	0.000
TT	0.327	12250.411	0.000
TP	0.341	13313.192	0.000
Year:			
Y86*	--- OMITTED CLASS ---		

TABLE 9 (continued)

Variable	β	F-Value	Prob > F
Experience (cont'd):			
Y87	-0.034	115.488	0.000
Y89	0.055	277.692	0.000
Year:			
Y90	0.083	629.506	0.000
Y91	0.053	133.085	0.000
Y92	0.033	44.675	0.000
Y94	-0.027	55.292	0.000
Y95	-0.049	189.406	0.000

TABLE 10

REGRESSION COEFFICIENTS AND F-STATISTICS
FOR UNIVERSITY TEACHERS PRE-LOTTERY
REGRESSION MODEL 2-A
(YEARS 1986-1990)

Variable	B	F-Value	Prob> F
Intercept	10.147	424792.650	0.000
LR1 - Lottery Revenues	0.001	5.148	0.007
Education:			
B*	--- OMITTED CLASS ---		
M	-0.033	6.681	0.010
D	0.074	33.822	0.000
Discipline:			
ARTS*	--- OMITTED CLASS ---		
BS	0.192	422.550	0.000
PS	0.050	39.309	0.000
EN	0.139	91.034	0.000
Rank:			
INSTRUCTOR*	--- OMITTED CLASS ---		
ASTP	0.118	135.620	0.000
ASOP	0.208	289.277	0.000
PROF	0.336	626.405	0.000
AD	0.390	243.216	0.000

TABLE 10 (continued)

Variable	β	F-Value	Prob > F
Experience:			
YUEX	-0.002	14.343	0.000
YEXP	0.001	11.311	0.001
Region:			
R1- New Orleans*	Omitted Class		
R2	0.047	19.509	0.000
University System:			
S1- LSU System*	Omitted Class		
S2	0.119	151.595	0.000
University:			
U1- LSU Main*	Omitted Class		
U2	-0.080	6.705	0.010
U9	0.059	22.844	0.000
U12	-0.014	0.799	0.371
U15	0.013	0.934	0.334
U16	-0.037	7.229	0.007
Year:			
Y87	-0.028	12.000	0.001
Y90	0.025	7.660	0.006
Y91	---	---	---
Y92	---	---	---
Y93	---	---	---

TABLE 11

REGRESSION COEFFICIENTS AND F-STATISTICS
FOR UNIVERSITY TEACHERS POST-LOTTERY
REGRESSION MODEL 2-B
(YEARS 1991-1995)

Variable	β	F-Value	Prob > F
Intercept	10.100	304742.150	0.000
LR1 - Lottery Revenues	-0.001	1.447	0.229
Education:			
B*	--- OMITTED CLASS ---		
M	-0.029	4.393	0.036
D	0.101	52.439	0.000
Discipline:			
ARTS*	--- OMITTED CLASS ---		
BS	0.254	849.949	0.000
PS	0.071	95.381	0.000
EN	0.175	177.930	0.000
Rank:			
INSTRUCTOR*	--- OMITTED CLASS ---		
ASTP	0.131	191.860	0.000
ASOP	0.220	414.172	0.000
PROF	0.377	979.749	0.000
AD	0.417	542.342	0.000

TABLE 11 (continued)

Variable	β	F-Value	Prob > F
Experience:			
YEXP	0.000	0.895	0.344
YUEX	-0.001	4.118	0.043
Region:			
R1* - New Orleans	--- OMITTED CLASS ---		
R2	0.108	144.658	0.000
University System:			
S1* -LSU System	--- OMITTED CLASS ---		
S2	0.058	46.117	0.000
University:			
U1* - LSU Main	--- OMITTED CLASS ---		
U2	-0.080	17.967	0.000
U9	0.043	11.636	0.001
U12	-0.056	12.988	0.000
U15	-0.071	24.230	0.000
U16	-0.003	0.060	0.806
Year:			
Y87	---	---	---
Y90	---	---	---
Y91	0.065	56.542	0.000
Y92	0.043	23.261	0.000
Y93	0.026	9.815	0.002

TABLE 12

REGRESSION COEFFICIENTS AND F-STATISTICS FOR UNIVERSITY TEACAHERS TOTAL LOTTERY REGRESSION MODEL 2-C (YEARS 1986-1995)

Variable	β	F-Value	Prob > F
Intercept	10.123854	6666092.740	0.000
LR1-Lottery Revenues	0.000000	8.883	0.003
Education:			
B*	--- OMITTED CLASS ---		
M	-0.033000	11.700	0.001
D	0.086000	83.991	0.000
Discipline:			
ARTS*	--- OMITTED CLASS ---		
BS	0.225425	1237.024	0.000
PS	0.059610	122.994	0.000
EN	0.157624	259.704	0.000
Rank:			
INSTRUCTOR*	--- OMITTED CLASS ---		
ASTP	0.125744	328.832	0.000
ASOP	0.215723	704.714	0.000
PROF	0.358797	1592.801	0.000
AD	0.404890	772.993	0.000

TABLE 12 (continued)

Variable	β	F-Value	Prob > F
Experience:			
YEXP	0.001	9.439	0.002
YUEX	-0.002	16.847	0.000
Region:			
R1* - NEW ORLEANS	— OMITTED CLASS —		
R2	0.081	147.852	0.000
University System:			
S1* -LSU SYSTEM	— OMITTED CLASS —		
S2	0.085	181.416	0.000
University:			
U1* - LSU MAIN	— OMITTED CLASS —		
U2	-0.084	27.812	0.000
U9	0.047	28.849	0.000
U12	-0.043	15.024	0.000
U15	-0.029	8.400	0.004
U16	-0.022	5.149	0.023
Year:			
Y86*	— OMITTED CLASS —		
Y87	-0.027	15.024	0.000
Y90	0.027	9.807	0.002
Y91	0.068	68.369	0.000
Y92	0.049	33.364	0.000
Y93	0.027	12.550	0.000

Large positive coefficients for a variable meant that the characteristic represented by that variable is associated with increased earnings. Negative values indicate that the variable reduces the total annual salary for the teacher. Small values have little impact on the salary of teachers. Black (1994, p. 563) indicated that "the partial regression coefficients represent the percentage change that will occur in the independent variable for a one-unit change in that independent variable." In regression analysis, partial F-statistics test whether an independent variable is significant in explaining the dependent variable. Where indicator variables are employed, the partial F-statistics test whether the classification variable significantly shifts the intercept of the regression line upward or downward. Tables 7, 8, 9, 10, 11, and 12 presented these coefficients and the probability of a greater F. Appropriate hypothesis tests are

$$H_0 : \beta_1 = 0$$
$$H_0 : \beta_2 = 0$$
$$\vdots$$
$$H_0 : \beta_K = 0$$

$$H_A : \beta_1 \neq 0$$
$$H_A : \beta_2 \neq 0$$
$$\vdots$$
$$H_A : \beta_K \neq 0$$

Failure to reject the null hypothesis infers that the independent variable has no correlation with the dependent variable. All of the variables in the final models with the exception of lottery revenues are significant in the models.

The significance of the classes of variables is determined by the partial F-test for each group of independent variables. The classes of independent variables that remained in the reduced models were tested. All of the groups significantly improve the explanatory power of the model.

Elementary and Secondary Teachers Model

The model of elementary and secondary teachers is reduced from the original model using stepwise regression. The F-tests for the individual coefficients found that including variables to represent years 1988 and 1993 add no explanatory power to the model. Time was originally included as a control variable, but it was later dropped from the regression equations. As explained earlier "region" is also removed from the final model.

Mann-Whitney tests of the independent variables compared group membership. The null hypothesis is that the samples are identical versus the alternative hypothesis that the samples are not identical (Black, 1994). The test computes a U-statistic. Large values of the U statistic reject the null hypothesis. The elementary and secondary model fail to reject the null hypothesis. The observations appear to come from the same population.

A second nonparametric test to determine whether observations are from the same population is the Wald-Wolfowitz Runs (SPSSX, 1988, p. 750). Using this test, all observations in the elementary and secondary teachers' model came from the same population. Again the model indicates that the two samples come from the same population. This finding would allow the use of t-tests to examine the first hypothesis that there is no difference between the salaries of teachers before and after the lottery.

T-tests show no significant difference between the means of the independent variables before and after the lottery. The results of these tests appear to indicate that the lottery has no impact on elementary and secondary teachers' salaries. To further test this first hypothesis, the total Model 1-C is fitted for all variables with and without the lottery revenues. Since no lottery revenues existed prior to 1991, the hypothesis can be tested by examining the reduced model compared with the full model. The test statistic is the F-test presented earlier in the chapter. Using a significance level of .05, the calculated F-value is 3.006. This is less than the table value of 3.84 needed to reject the null hypothesis that there is no difference in the explanatory power of the model with the inclusion of lottery revenues. A discussion of the regression coefficients for the elementary and secondary teachers' model stem from the total set of data including the control variables for years. All dollar amounts are as 1988 dollars.

Education. Five classes are used to model the educational level of teachers. The variable uses degree held as a surrogate for education. As expected, all degree variables have statistically significant positive values. The coefficients rise for successive amounts of education (i.e., higher degrees). Having a bachelor's degree increased annual teachers' salaries by 27.25 percent or $3,108.70 over nondegreed teachers. Teachers with doctorates earned almost $6,000 per year more than nondegreed personnel. This finding supports previous work indicating that education is a key salary determinant for elementary and secondary teachers in Louisiana.

Experience. Teaching experience is the second variable used to model elementary and secondary teachers' salaries. Five classifications are used to measure the impact of different levels of experience. As expected, all classes are positive and statistically significant. Teachers with 6 to 10 years earned $14,943 per year as compared with the $11,407 earned by teachers with 5 or fewer years in the teaching field. More experienced teachers earn more. Twenty-five or more years experience earned a teacher $5,867 more per year than those who had taught for less than five years. As predicted in the salary literature, workers appear to be rewarded for not removing their human capital (Oi, 1962). This supports Lazear's (1981) and Becker and Stigler's (1974) labor productivity theory.

Years. Dummy variables are used to control for the seasonal variation in the model over time. Since 10 years of data are used in the regressions, the inclusion of this variable is deemed necessary to control for economic or environmental factors that cannot be reasonably modeled. The negative coefficient for 1987 (-.034) may be indicative of the poor economic conditions in the state during that time (Scott et al., 1995). Positive coefficients for 1989 - 1992 indicate that salaries are above the minimum average of $11,407 predicted by the model. This could reflect the growth in teachers' salaries reported by Bird (1986). The negative coefficients for 1994 (-0.027) and 1995 (-.049) could reflect the decline in teachers' salaries noted by Myers (1995a).

Number of teachers. Models for elementary and secondary teachers include a count of the number of teachers in a particular group. Entered as the square root of the count, this variable is included as an indicator of the demand for teachers to improve the predictive ability of the model with categorical independent variables. If demand is high, the coefficient should be positive, indicating that the state offered higher salaries to this group. Although the coefficient (.002) is significant, this represents no significant difference in salaries. The value of this variable is about $.20 per year.

Lottery revenues. Lottery revenues, in millions, are not a significant regressor for explaining the elementary and secondary teachers' salaries. As expected, the positive coefficient of .018 is not statistically significant at either the .01 or .05 level.

University Teachers

Several variables are removed from the university model during stepwise regression. Although a time variable was initially included in the model as a control variable to detect model shifts, this variable is subsequently removed because it makes no contribution to the model. Three of the original discipline variables are eliminated as were years 1988, 1989, 1994, and 1995. Several university indicators are also deleted from the model. The final model retains only one regional classification, R2, representing the Baton Rouge region and the university system variable for the LSU system.

Appropriate interpretation of the regression coefficients assumes that all observations are from the same population. Mann-Whitney and Wald-Wolfowitz tests of this assumption found that the data from 1986-1990 is significantly different from the 1991-1995 sample. Therefore, t-tests comparing the independent variables before and after the lottery was adopted are suspect. The difference in the samples may be due to a missing variable in the model.

To test the second hypothesis, a regression equation is fitted for the full data set, including the lottery revenues data and seasonal control variables for the year. This data is then fitted to a regression excluding the lottery revenues. The sum of squared errors for the full and reduced model are compared to test for a difference due to lottery revenues.

The F-statistic is the appropriate test to determine whether the lottery revenues make a statistically significant impact on university teachers' revenues. Because the calculated F-value of 8.87 is larger than the table value of 3.84, it may be concluded that the lottery revenues have made a significant impact on university salaries.

However, finding that the data from the two periods are not from the same population renders the regression estimates as flawed estimators. These regression results must be interpreted with great caution and may not be generalizable. The discussion of the findings of the regression equation is made from the full model including the variable for year.

Education. In the university teachers' model, the classifications for degree collapsed from six classes to two classes. Holding a doctorate increases annual salary by 8.9 percent over the average annual salary of $24,930.67 paid to university teachers. By contrast, employees who hold masters' degrees are paid about $800 less than the average. This finding may reflect the emphasis by accreditation committees and governing boards on increasing the number of personnel with terminal degrees. The collapse of the master's degree plus 30 graduate hours (M3) and the master's degree plus 60 hours (M6) into the omitted class suggests that universities do not consider these interim educational levels relevant in determining pay scales.

Discipline. Only three of the six original discipline groups affects salary more than the omitted class arts and humanities. Personnel employed in business (BS), pure sciences (PS), and engineering (EN) earn more than teachers in other areas. As expected, the largest incremental change occurs for those employed as business professors. These individuals earn 25 percent more than those working in disciplines other than physical sciences and engineering. This data supports findings by Boyd and Boyd (1995) and Ransom (1993). Those professors in engineering disciplines earn an average of $29,198 while those in pure sciences earn about $2,726 less per year.

Rank. Rank appears to be the most significant predictor for salaries in the university model. Promotion in ranks is associated with higher earnings.

Even adjusted to equivalent nine-month salaries, administrators earn about 32 percent more than similarly qualified assistant professors. This $9,000 difference may reflect compensation for increased responsibilities. The largest differentials occur between the ranks of assistant professors (0.216) and associate professors (.359) where promotion raises annual salaries $4,700. Contrary to research by Hammermesh (1988), this work does not find evidence that senior ranks are paid less than new hires.

Experience. Teaching experience does not seem valuable to universities. Each additional year of total teaching experience (YEXP) is worth about $25 per year in additional earnings. Although this increase in wages supports competitive wage labor theory, the inflation-adjusted amounts do not appear to be a significant salary determinant.

While total years experience is positively correlated with salary, experience at a particular university decreases salary. Each additional year of tenure with a university decreases salary by $50.00 per year. Teachers' salaries would be a negatively sloped line if they are based solely on experience. This negative coefficient for university tenure supports Ransom's (1993) seniority and monopsony theory in academia. Teachers whose cost of moving is high may be discriminated against in the academic labor market. This finding suggests that it may be advantageous to move from one university to another, since it would alleviate the tenure drag while capitalizing on the total experience. Teachers who move can probably negotiate for higher ranking at a new university.

University system. University system collapses to one class S2. Employment in the LSU system is associated with earning higher salaries than personnel in either the University of Louisiana system or the Southern University system. Employees in the LSU system earn on average $2,211.77 more than similarly qualified teachers in other systems in the state. One explanation for this may be that the flagship school for the state is in this system. As the premier Ph.D.-granting school in the state, LSU-Baton Rouge attempts to hire and retain professors with demonstrated research and teaching credentials. The additional money could represent pay required to attract such people. Although evidence of research productivity is not available for this study, earlier studies do show that this characteristic is important in determining salaries. The positive coefficient for S2 may reflect the missing information.

University. Only 5 of the 15 university variables are significant in this model. U2 that represents LSU in Alexandria has a negative coefficient (-0.084). Teachers at LSU-A earn about $2,000 per year less than the average salary paid to university professors. This smaller salary may be the result of LSU-A being located in a more rural area of the state and offerring only a limited number of general courses. This small university is not a Ph.D.-granting university. Research requirements may also be less rigorous. Therefore, fewer highly paid research professors are hired. U12 - Southeastern Louisiana University, U15 - McNeese State University, and U16 - Northwestern are also smaller universities in more rural areas. These universities offer fewer advanced degree programs which may be reflected in the lower salaries.

Region. Five of the six categories for the region collapse into the intercept. Only R2 representing the Baton Rouge region is significant in the model. The positive coefficient (.085) for R2 represents a $2,103 per year in additional income paid to professors in this region. This may represent the cost of living differential in an urban area.

Years. Years are included to act as a surrogate for economic variables not included in the model. Interestingly, while most of the variables for years are positively correlated with salaries, 1987 has a negative value. As stated for the elementary and secondary teachers' model, this could be an indication of the economic information not available from the other variables in the model. During this period, the state experienced the worst recession in its history (Scott et al., 1995). Since the salary data are deflated to 1988 dollars, the positive coefficients for 1990-1993 may reflect university salaries that grew at rates faster than the rate of inflation.

Lottery revenues. Lottery revenues are statistically significant at the .003 level. However, the dollar impact of this variable on university teachers' salaries is calculated to be $2.49 per year or about $.20 a month. Inferences should reflect whether the variable's contribution is relevant. Lottery revenues do not appear to be relevant to university salaries. This result could be due to some model misspecification.

Chapter Summary

The regression results support the hypothesis that lottery revenues do not significantly influence elementary and secondary teachers' salaries in Louisiana. The two samples are shown to come from the same population using nonparametric tests. Both education and experience are significant explanatory variables in this model. Positive and negative values for years may indicate economic information not included in other variables.

In the university model, tests indicate that some independent variables are from different populations. This makes inferences about the population difficult. The results should be interpreted with care.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Several factors caused the crisis in state funding in Louisiana. The 1980s crash in the oil and gas industry left the state coffers strained. Severe budget shortfalls in 1987 (Wardlaw, 1987) and again in 1993 forced funding cuts at universities across the state. Students and administrators felt that higher education had become the legislative whipping boy (Anderson, 1993). Reductions in federal funding during this period further strained the resources available to fund public programs. An exodus of teachers from the state, declining literacy rates, voter opposition to increased taxes, and a new focus on improving education forced legislators to look for innovative funding sources. These combined factors led legislators to seek nontraditional funding sources. The state followed the lead of 32 other states by authorizing a state-operated lottery ("19th century lottery," 1990). Lawmakers embraced the lottery as "a painless tax" (Clotfelter & Cook, 1989, p. 214).

Promises of sorely needed new revenues overwhelmed concerns about the negative effects of lotteries (Vallen, 1993; Mikesell & Zorn, 1986). Initially, all revenues were to go to education (Laplante, 1989). This proposal was amended to give the first $45 million to supplement pay for local government employees. By the time the lottery was in operation, the state deposited all lottery revenues into the general fund. Since the lottery's adoption was promoted to fund education, the impact of lottery revenues on teachers' salaries should be examined.

This research studies whether salaries of teachers in elementary and secondary education are different before and after the lottery was adopted. A review of the literature identifies those variables that are significant in describing elementary and secondary teachers' salaries. The literature also suggests appropriate variables for the university teachers' model.

Regression equations were developed to test the following hypotheses:

H1: There is no difference in elementary and secondary teachers' salaries before and after adoption of the Louisiana lottery.

H2: There is no difference in university teachers' salaries before and after adoption of the Louisiana lottery

A sample of 2,160 observations was collected for the elementary and secondary teachers. The university teachers' model includes 6,338 observations.

Research Results

Using stepwise regression and nonparametric tests to evaluate Hypothesis 1, the null hypothesis cannot be rejected; there are no significant differences in elementary and secondary teachers' salaries before and after Louisiana adopted the lottery. All tests show that lottery revenues do not affect wages for this segment of the population.

To test Hypothesis 2, regression equations were constructed including variables for degree, discipline, experience, rank, university, university system, the region of the state, and lottery revenues. Comparison of the variables in the two estimated regressions show statistically significant differences in salaries before and after the lottery's adoption. Because tests indicate that some variables are from different populations, a regression for the total model was fitted with and without the lottery revenue variable. The test of the statistical differences between the two regression equations again indicate that lottery revenues are significant in explaining university teachers' salaries. The second hypothesis is rejected. Lottery revenue might be a factor in university salaries. However, these results may be the result of model misspecification or violations of the model assumptions that are not detected.

Conclusions

This study found that teachers' salaries at the elementary and secondary level are positive functions of education and experience. The lottery seems to have no impact on funding teachers' salaries.

Notably, increased levels of education are rewarded with higher pay. Each additional degree earned adds about $500 to a teacher's annual compensation package. However, this amount may not be sufficient incentive to attract and keep good teachers in the school system.

Year, a variable to control for shifts in the model's parameters, may be interpreted as a measure of the economic condition during particular years. The negative coefficient for 1987 in both models may contain the impact of the recession in Louisiana at this time. Subsequent positive coefficients may reflect salary growth greater than the rate of inflation.

Increased years of experience lead to higher salaries for elementary and secondary teachers. This is also true for university teachers. However, in the university model higher salaries garnered by more experience are more than offset by the negative coefficient for tenure (YUEX).

Interestingly, salary increases due to experience are very small for elementary and secondary teachers. Louisiana caps these increases at 25 years so the average increase amounted to about 2 percent ($185) per year. The small incremental gains suggest that this may not be a sufficient incentive to keep teachers in Louisiana or teachers in education.

Discipline is found to have a significant positive impact on salaries if the university educator worked in business, pure sciences, or engineering.

The university model has an $R^2 = .549$. Omission of variables measuring publication quality and quantity may account for the low explanatory power. Another variable that may be missing from this model is the gender of the teachers. Inferences made from this model may contain larger errors than indicated. One extension of this work would be to gather publication and gender data for the samples and re-estimate the equations. This may improve the explanatory power of the model.

Contrary to research by Hammermesh (1988), this work does not find evidence that senior ranks are paid less than new hires. This finding may be due to differences in methodology or some misspecification in the university model.

The timeliness of this information is particularly important in the current dynamic environment. Policy makers need up-to-date information to make decisions regarding funding education and teachers. This study could provide information for estimating funding needs in education, for "those who do not learn from history are doomed to repeat it" (Santayana, 1905). The cost of failure may be to forfeit the future.

Recommendations for Future Research

Since the Louisiana lottery has been in operation for only 5 years, little if any empirical work has been done on this topic. This study presents empirical evidence that the lottery revenues have no impact on the funding of elementary and secondary teachers' salaries, but it does affect university salaries. Other forms of gambling are not included in this study although these other revenue sources may be relevant in explaining salaries. The effect of this missing information may have misspecified the model. Future research should include video poker and casino gambling to learn the overall impact of gambling on teachers' salaries.

The full costs of gambling should be included in a future study to measure the impact accurately. Developing variables that measure social and economics costs and creating a model that would relate these variables to teachers' salaries would be an improvement over the current research. This expanded model would provide more comprehensive measures of the true value of the lottery to the state. It would provide stronger results for use in policy decisions.

Investigating organized crime's influence on gambling in Louisiana is another area for research. News articles about video poker suggest that the Mafia has infiltrated this gambling arena and is exploiting the public. This impact could be factored in as a cost to the state.

Another logical avenue to explore with this research is the agency theory aspect of teachers' salaries. The database developed for this study is unique. It could be employed to study equity issues in salary differences based on gender or to test for salary compression among different groups of teachers. The study could include tests of incentives on productivity and quality of education. A recent focus on competency-based education suggests that schools employ incentives to ensure that teachers (as the agents of the education system) act in the best interest of the state (principals).

If legislators link teacher pay and promotion to some quantified measures of students' academic achievement, teachers should be more concerned about student welfare, increase innovation in the classroom, and give students a better educational experience. Meeting these goals could justify teacher pay raises and prompt a revision of the tenure system, while improving the perception of teaching as a profession. Exploring these incentive issues may be useful in setting policy, establishing curricula, and evaluating personnel.

One explanation for differences in salaries in the LSU system is that faculty at doctoral-granting schools must meet more stringent research requirements. This explanation has not been subjected to empirical testing in the state of Louisiana. Researchers could supplement the current database with a search of on-line research services to measure the number and quality of research produced by university faculty. This model would test the importance of the number or quality of research documents produced to influence salary, tenure, and promotion.

Altered perceptions about the acceptability of gambling should positively affect the profitability of the firms that provide gaming devices. A cross-sectional study of gaming firms during the last 10 years should show whether the adoption of legalized gambling in different states has affected the expected returns.

One cannot ignore the moral issues surrounding gambling since costs are associated with these issues. The social costs of gambling in Louisiana as a function of police activity, compulsive gambling, the number of bankruptcies, and increased crime costs could be estimated and compared with the benefits derived by these revenue sources. A cost-benefit analysis could then be used to decide whether gambling has a positive or negative impact on the state. This work could be used to test Hraba, Mok, and Huff 's (1991) hypothesis that lottery play is a predictor of future gambling behavior.

Louisiana is just one of many states to adopt gambling in recent years. Research including states that have recently begun tapping gambling as a revenue source would expand knowledge about the impact of gambling on the nation. The tax incidence of gambling on varying socioeconomic groups within the state would provide information for tax planners on the state and local level.

Impacts of gambling on Louisiana's tourism, crime, lifestyles, and the environment are other areas that extensions of this research might address. Such studies would be of interest to entrepreneurs, city planners, government agencies, and the public. This research would extend that done by Canedy and Zeiger (1991) on gaming's impact on tourism and quality-of-life issues. Uncovering the negative and positive impacts of gambling will determine additional regulation and may even provide evidence for public decisions relative to banning or promoting gambling activities.

Both models show evidence of some autocorrelation. One way to correct this problem in future research may be to add variables to the model. In the university model, variables for gender, per capita income, and publications are suggested by earlier research. The addition of more observations from the individual parishes and the use of nonaggregated data may also improve the predictive ability in the elementary and secondary teachers model.

Principal components' factor analysis could be a natural extension of this work. The independent variables are linear combinations of the original independent variables (Neter et al., 1989, p. 400). This approach should be applied to a full model of all variables in both data sets to decide which factors would then be used in the multiple regression model.

APPENDIX A

VARIABLES IN MULTIPLE REGRESSION EQUATIONS (ELEMENTARY AND SECONDARY TEACHERS MODEL)

Variable	Variable Label
DEGREE:	
ND	Nondegreed*
B	Bachelor's Degree
M	Master's Degree
M3	Master's + 30
M6	Specialist , Master's Degree + 60, ABD
D	Doctorate
EXPERIENCE:	
L5	5 or less years experience
ST	6 through 10 years experience
TF	11 through 15 years experience
FT	16 through 20 years experience
TT	21 through 25 years experience
TP	More than 25 years experience
TEACHERS:	
NT	Number of teachers within a category
LOTTERY REVENUES:	
LR1	Annual lottery revenues for the indicated region In millions of dollars
LOTTERY ADOPTION:	
LA	0 = Lottery adopted -NO*
	1 = Lottery Adopted - Yes

Variable	Variable Label
TIME:	
T = 1	If year is 1986-1987
T = 2	If year is 1987-1988
T = 3	If year is 1988-1989
T = 4	If year is 1989-1990
T = 5	If year is 1990-1991
T = 6	If year is 1991-1992
T = 7	If year is 1992-1993
T = 8	If year is 1993-1994
T = 9	If year is 1994-1995
T = 10	If year is 1995-1996
YEAR:	Year of Data Collection:
Y86	1986-87*
Y87	1987-88
Y88	1988-89
Y89	1989-90
Y90	1990-91
Y91	1991-92
Y92	1992-93
Y93	1993-94
Y94	1994-95
Y95	1995-96
SAL2	Natural log of average annual salary for an elementary and secondary teacher deflated by the GNP deflator

* Designates the omitted class for the indicator (dummy) variables.

APPENDIX B

VARIABLES USED IN MULTIPLE REGRESSION EQUATIONS (UNIVERSITY MODEL)

Variable	Variable Label
DEGREE:	
B	Bachelor's Degree*
M	Master's Degree
M3	Master's + 30
M6	Specialist , Master's Degree + 60, ABD
D	Doctorate
DISCIPLINE:	
AH	Arts and Humanities*
BS	Business
ED	Education
PS	Physical Sciences
EN	Engineering & Technology
SS	Social Science
OT	Others
EXPERIENCE:	
YUEX	Years of Tenure with a University:
YEXP	Total Years Teaching Experience
RANK:	
IN	Instructor*
ASOP	Assistant Professor
ASTP	Associate Professor
PROF	Full Professor
AD	Administrator

Variable	Variable Label
LOTTERY ADOPTION	
LA	0 = Lottery adopted -NO*
	1 = Lottery Adopted - Yes
LOTTERY REVENUES:	
LR1	Annual lottery revenues for the indicated region In millions of dollars
UNIVERSITY :	
U1	Louisiana State University - main campus*
U2	Louisiana State University - Alexandria
U3	Louisiana State University - Eunice
U4	Louisiana State University - Shreveport
U5	University of New Orleans
U6	Southern University - Baton Rouge
U7	Southern University - New Orleans
U8	Southern University - Shreveport
U9	Louisiana Tech University
U10	Grambling State University
U11	Northeast Louisiana University
U12	Southeastern Louisiana University
U13	Nicholls State University
U14	University of Southwestern University
U15	McNeese State University
U16	Northwestern State University
UNIVERSITY SYSTEM:	
S1	University of Louisiana System*
S2	Louisiana State University System
S3	Southern University System
REGION:	
R1	New Orleans Region*
R2	Baton Rouge Region
R3	Southwest Region of Louisiana
R4	Central Region of Louisiana
R5	Northeast Region of Louisiana
R6	Northwest Region of Louisiana

Variable	Variable Label
YEAR	Year of Data Collection:
Y86	1986-87*
Y87	1987-88
Y88	1988-89
Y89	1989-90
Y90	1990-91
Y91	1991-92
Y92	1992-93
Y93	1993-94
Y94	1994-95
Y95	1995-96
SAL2	Natural log of annual salary for a university teacher deflated by the GNP deflator

* Designates the omitted class for the indicator (dummy) variables

APPENDIX C

PARISH SCHOOL SYSTEMS BY REGION

New Orleans Region 1
Jefferson Parish
Lafourche Parish
Orleans Parish
Plaquemines Parish
St. Bernard Parish
St. Charles Parish
St. John Parish
St. Tammany Parish
Terrebone Parish
Washington Parish
City of Bogalusa

Baton Rouge Region 2
Ascension Parish
Assumption Parish
East Baton Rouge Parish
East Feliciana Parish
Livingston Parish
Iberville Parish
Pointe Coupee Parish
St. Helena Parish
St. James Parish
Tangipahoa Parish
West Baton Rouge Parish
West Feliciana Parish

Southwest Region 3
Acadia Parish
Allen Parish
Beauregard Parish
Calcasieu Parish
Cameron Parish
Evangeline Parish
Iberia Parish
Jefferson Davis Parish
Lafayette Parish
St. Landry Parish
St. Martin Parish
St. Mary Parish
Vermillion Parish

Central Region 4
Avoyelles Parish
Catahoula Parish
Concordia Parish
Grant Parish
LaSalle Parish
Natchitoches Parish
Rapides Parish
Sabine Parish
Vernon Parish
Winn Parish

Northeast Region 5
Caldwell Parish
East Carroll Parish
Franklin Parish
Jackson Parish
Lincoln Parish
Madison Parish
Morehouse Parish
Ouachita Parish
Richland Parish
Tensas Parish
Union Parish
West Carroll Parish
City of Monroe Schools

Northwest Region 6
Bienville Parish
Bossier Parish
Caddo Parish
Claiborne Parish
DeSoto Parish
Red River Parish
Webster Parish

APPENDIX D

UNIVERSITIES BY REGION

Region 1 New Orleans
University of New Orleans
Nicholls State University
Southern University - New Orleans

Region 2 - Baton Rouge
LSU - Main Campus
Southern University - Baton Rouge
Southeastern Louisiana University

Region 3 - Southwestern La
McNeese State University
University of Southwestern Louisiana
LSU- Eunice

Region 4 - Central La
Northwestern State University
LSU - Alexandria

Region 5 - Northeast La
Northeast Louisiana University
Louisiana Tech University
Grambling State University

Region 6 - Northwestern La
LSU - Shreveport
Southern Univ -Bossier/Shreveport

APPENDIX E

GLOSSARY

Term	Definition
Elementary school	Schools whose students include kindergartners through seventh graders.
Gambling	Activities in which money or something of value is bet on the outcome of some uncertain possibility.
Handle	Gross proceeds from lottery sales.
Hold	Gross revenues from gambling operations.
Insurance	Purchase of part of a lottery ticket at a discount.
Jackpot	Grand prize amount in lottery or other game of chance.
Lottery	A scheme that distributes prizes to winners who have paid for the chance to win usually by matching tickets with numbers to a random drawing.
Lotto	A variation of the original lottery in which participants bet on personally selected numbers.
Numbers	Players bet on three digit numbers from zero to 999. Some scheme such as the day's pari-mutuel winners at the race track determines the daily winning number.

Term	Definition
Play value	Simulated sense of player participation.
Policy	Lottery variation in which the numbers 1-78 are placed in a little wheel. Twelve of the numbers are drawn out. Players bet that they can select three, four, or five of the numbers. The odds of winning are 199:1, 399:1, and 1999:1, on the respective number groups. Players can buy tickets for a fraction of the face value and may be bought on credit from the seller. Usually illegal operation.
Powerball	Lottery in which states form a consortium to create large prize pools by combining monies.
Probit models	Statistical units of measure of probability based on the deviations from the mean of a normal frequency distribution.
Problem gambling	Losing excess amounts of money through gambling activities.
Revenue lottery	Lottery designed with the objective of maximization of revenues to the public.
Rollover	Practice of adding undistributed prize monies to the pool of potential winnings.
Scratch-off game	Gambling products in which the participants scratch or rub a thin coating from the face of tickets to expose combinations of numbers or symbols.
Secondary school	Schools that include students in grades 8 through 12.
Sin tax	Levy designed to discourage activities considered detrimental to society.

Sumptuary lottery	Lottery designed to meet the demand for gambling within the population while using a high tax rate to discourage player excesses.
Takeout ratio	The percentage of lottery revenues removed before awarding prizes.
University	Four-year public degree-granting institutions.
University faculty	Teachers in the university system whose time is allocated to instruction at least 60 percent of the time.
Win	Amount kept by casinos after paying bets but before paying interest and other expenses.[4]

[4] Sources for definitions included Clotfelter and Cook (1989), Ezell (1960), Colander (1993), and *Webster's Third New International Dictionary*.

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