The Lottery and Income Inequality in the States*

Elizabeth A. Freund, *University of Maryland*
Irwin L. Morris, *University of Maryland*

Objective. Since the early 1970s, income inequality in the United States has increased dramatically. We examine the impact of state lotteries on income inequality in the American states from 1976–1995. *Methods.* We use cross-sectional time-series data to evaluate the effect of lotteries as well as those of other state tax policies, redistributive programs, and demographic factors on income inequality. *Results.* We find that state lotteries foster income concentration. Ceteris paribus, states with lotteries have higher levels of income inequality than those states without a lottery. We also find that additional demographic and policy factors have an impact on income inequality in the states. *Conclusions.* One of the most important policy-oriented determinants of income inequality is the lottery and a significant portion of the increase in income inequality over our two-decade time period is attributable to the increasing prevalence and popularity of state lotteries.

After two decades of rising incomes and falling income inequality, income disparities began to increase in the early 1970s. Over the last 30 years, rising incomes have coincided with a dramatic increase in income inequality. In real terms, the wealthiest segment of the American population has grown significantly wealthier while those in the middle class have seen no more than a marginal increase in wealth (Smith, 2001); these patterns also manifest in income levels (Danziger and Gottschalk, 1995). The poorest segments of the population have experienced a decline in real income (see Danziger and Gottschalk, 1995:53).

Explanations for this increase in income inequality fall into two broad categories: (1) structural economic changes and (2) policy changes. Since the early 1970s, the American economy has undergone a structural transformation. Our manufacturing economy has become an information economy and this transformation has implications for the types of jobs that are available and the types of skills and experience that the marketplace rewards. The increased internationalization of trade may also have influenced the

*Direct correspondence to Irwin L. Morris, Department of Government and Politics, University of Maryland, 3140 Tydings Hall, College Park, MD 20742 ⟨imorris@gvpt.umd.edu⟩. The authors will share all data and coding materials upon request for purpose of replication. The authors thank participants at sessions of the 2004 Public Choice and 2004 American Political Science Association meetings, the editor, and anonymous reviewers of this journal for their useful comments and suggestions on previous drafts of this article.

SOCIAL SCIENCE QUARTERLY, Volume 86, Number 5, December 2005

earnings potential of workers and job seekers. Scholars have associated certain public policies—economic development strategies, transfer payments of various types, and, to a somewhat lesser extent, tax policy—with levels of income inequality. The literature indicates that the impact of redistributive policy initiatives on income inequality is quite limited (see Barrileaux and Davis, 2003; Langer, 2001; Lenz, 2003).

At the same time that aggregate income inequality was rising in the United States, there was considerable diversity in the movement in income inequality across the individual states. Although most states saw an increase in inequality, some did not (e.g., Alaska, Arkansas, Maine, and Utah). Even in states where income inequality grew, the pattern of growth varied considerably, from small, subtle changes (e.g., South Dakota and Washington) to dramatic changes (e.g., Montana, New York, and New Mexico). Research on the change in state-level income inequality over time—particularly research dealing with policy explanations—is limited.[1] This is particularly true for the relationships between state-level tax policy and income inequality. On the broader issue of the relationship between implicit taxes—such as lotteries and various forms of gambling—and income inequality, there is no research at all.[2]

In this article, we examine the impact of various tax policy choices on income inequality in the American states over the 1976–1995 time period. We are particularly interested in the income-concentrating effect of state lotteries. We also examine the extent to which other state tax policy choices, various benefit-oriented redistributive programs, and demographic factors prominent in the literature lead to either an increase or decrease in income concentration over time. In a surprising departure from the literature, we find that state-level tax policies have an important impact on income inequality. More specifically, we find that state lotteries foster the growth of income disparities.

Background and Theory

The extent of income inequality is often attributed to a wide range of governmental and nongovernmental factors. These factors include the structure of the economy, the skill sets of the working-age population, the fluidity of the class system, the domestic and international macroeconomic environment, and specific governmental policies having both direct and indirect economic consequences.[3]

[1]Langer (2001) is an important exception.

[2]Two of the most recent surveys of the literature on government's role in income inequality—Barrileaux and Davis (2003) and Lenz (2003)—do not mention lotteries or any other type of gambling at all.

[3]See Danziger and Gottschalk (1995), Hibbs and Dennis (1988), and Lenz (2003) for useful overviews of this extensive literature.

One of the most prominent explanations for the significant increase in income concentration during the 1980s and 1990s is the transformation of the American economy. Danziger and Gottschalk (1995) emphasize the significance of labor market changes for understanding the increase in income concentration, and in his review essay, Lenz concludes that "changes in the labor market were the primary source of rising inequality of family income observed since 1973" (2003:2). From the 1950s to the 1970s (a period of declining income concentrations), the American economy was still largely an industrial economy. Though unemployment rose precipitously during the 1970s, during the 1950s and 1960s relatively well-paying manufacturing jobs were prevalent. From 1970 to the mid-1990s, these types of jobs were primarily replaced with lower-paying service industry occupations. Only a small portion of the labor market was able to move from the manufacturing sector to higher paying positions in the technologically advanced information sector and the state-level loss of manufacturing jobs is strongly associated with an increase in state-level income concentration (Bernard and Jensen, 1998).

Scholars have also attributed the increase in income inequality to the internationalization of trade—a phenomenon related to the shift from a manufacturing economy to an information/service economy—though the evidence is mixed (Danziger and Gottschalk, 1995). The demographic transformation of the labor force may also have fostered the growth of income inequality. Dramatic increases in the immigrant population (particularly the undocumented immigrant population) may have had a dampening effect on wages—particularly at the lower end of the income scale—due to the increase in the labor supply. Likewise, the concomitant growth of the nonwhite population might have produced greater income inequality. Hero and Tolbert (1996) argue that racially structured political dynamics lead to inferior socioeconomic outcomes in communities with large nonwhite populations. Looking specifically at the relationship between the size of the African-American population and income concentration, both Al-Samarrie and Miller (1967) and Levernier (1999) find a significant direct effect.

In contrast to factors directly associated with changes in the labor market and related demographic factors, public policy choices play a relatively small role in the research on income inequality. There is, at best, conflicting evidence that the policies most likely to influence wage levels—such as minimum wage laws—had any influence on income concentration (Bernard and Jensen, 1998). The evidence of a relationship between policies more indirectly related to wage levels (such as education spending) is even weaker (see Barrileaux and Davis, 2003; Lenz, 2003). Likewise, in one of the most thorough recent studies, there was little evidence that state welfare policies were associated with income concentration, and to the extent there was a relationship, it indicated that welfare spending is counterproductive (Barrileaux and Davis, 2003). As Barrileaux and Davis conclude:

> These results provide little evidence that the redistributive policies pursued by American state governments affect changes in income concentration among their citizens. When state government redistributive policies do have effects, they are associated for the most part with widening gaps . . . we see only very limited evidence of any effect of income redistribution policies on changes in the concentration of income across the states during the years 1978 to 1990. (2003:293)

Though analyses of state-level income concentration have incorporated a variety of tax (or tax-related) measures,[4] none have examined the impact of the prevalence of state lotteries on income concentration. Lottery expenditures can be interpreted as tax payments and state lottery income may be viewed as tax revenue.[5] Two factors that make state lotteries particularly good candidates for explaining the increase in income concentration are (1) their highly regressive character and (2) the dramatic growth in their popularity and prevalence.

The ''lottery tax'' is clearly regressive (Hansen, Miyazaki, and Sprott, 2000) and, depending on the type of lottery, these taxes can be some of the very *most* regressive state taxes (Clotfelter and Cook, 1987; Hansen, Miyazaki, and Sprott, 2000; Price and Novak, 1999).[6] In their presentation of Suits indices—an indicator of regressivity—for various state taxes, Price and Novak (1999) show that previous research indicates that various types of lotto, numbers, and instant games from five different states (and Canada) are all regressive. In fact, each of these games—except for the Colorado instant game—is more regressive than the next most regressive tax. Add to the overall regressivity of the lottery tax the fact that these tax effects are magnified in the African-American and Latino communities (Price and Novak, 1999)—groups traditionally overrepresented in the lower income categories—and the deleterious effect of lotteries on income concentration becomes even more likely.

Another reason to expect that lotteries played a role in the increase of income concentration during the time period of our analysis is that the *number* of lotteries and the *amount* of lottery expenditures both increased significantly during this time period. From 1964 (the year in which they were legalized) to 2000, the number of state lotteries grew from 0 to 37; during the 1980s and 1990s, lottery revenues grew at well more than 10 percent a year (Hansen, Miyazaki, and Spratt, 2000). Clearly, lotteries have gone from nothing (literally) to very big business in a relatively short period of time—the same period of time during which income concentration experienced a sizable increase.

[4]These measures range from per-capita tax revenue, taxes as a percentage of income, sales-tax reliance, and income-tax reliance in Dye (1969) to tax effort in Barrileaux and Davis (2003).

[5]See Borg and Mason (1988), Borg, Mason, and Shapiro (1991), Clotfelter and Cook (1987, 1989), Hansen, Miyazaki, and Sprott (2000), and Price and Novak (1999) for examples of tax-based treatments of lottery finances.

[6]See Miyazaki, Hansen, and Sprott (1998) for a useful overview of this literature.

Lotteries might generate an increase in income concentration through a variety of mechanisms. These mechanisms may impact income inequality directly or indirectly, with the indirect effects almost certainly dwarfing the size of the direct effects.

Lotto—or Powerball—type lottery games—those with multimillion dollar payouts—almost certainly have a direct impact on income inequality. The direct effect of this type of lottery is to transfer some portion of personal income from a large group of people (some paying more, some paying less) to a single person (or a very, very small number of persons). This mechanism clearly takes broadly distributed resources and concentrates a portion of these resources (after accounting for administrative costs and state revenue) into income for, at most, a very small group of individuals. The extent to which this direct effect influences state-level income inequality depends on a variety of factors (income distribution of players, the magnitude of administrative costs and state revenue relative to payout,[7] number of winners, timetable for payout, percentage of payers and winners from outside the state, etc.).

Lotteries, when viewed as taxes, may also have an indirect effect on income. As regressive taxes, lotteries foster an increase in net income concentration.[8] Indirectly, the net income effect produces a future effect on gross income. Differences in net income result in differences in the amount of resources available for investment. Differences in first-period investment result in differences in second-period gross income. So, first-period net income inequalities will, ceteris paribus, manifest in second- (and subsequent) period gross income inequalities. If we are willing to further assume that invested resources are subject to decreasing marginal returns,[9] first-period net income inequalities will actually be magnified in second- (and subsequent) period gross income inequalities.

According to Clotfelter and Cook (1989), one type of player—the *Investor*—views the lottery itself as an investment instrument. Clearly, some lottery bets are riskier than others and, in some cases, the lottery may not be an especially bad bet (Chernoff, 1981). Conversely, some players may realize that the lottery is a poor bet from the standpoint of expected value, but they play the lottery for a chance—albeit quite small—to dramatically improve their standard of living, to effectively change classes. Clotfelter and Cook call

[7]Some state lotteries keep 40 percent or more of the gross as revenue.

[8]Unfortunately, due to the lack of state-level yearly data on net income (where lottery expenditures are explicitly defined as taxes), it is not possible for us to estimate the magnitude of this effect on income concentration.

[9]It is likely that the first dollars invested go toward the development of personal capital (i.e., training and education) and work expenditures (i.e., transportation) These investments open up significant earnings streams that are otherwise unavailable. Alternative uses for these same dollars are very unlikely to generate anything like a comparable return, so there is at least some reason to think that investments do—particularly at the low end—evidence significant diminishing marginal returns.

these players *Plungers*, and they quote Friedman and Savage's insightful description of this type of player.

> An unskilled worker may prefer the certainty of an income about the same as that of a majority of unskilled workers to an actuarially fair gamble that at best would make him one of the most prosperous unskilled workers and at worst one of the least prosperous. Yet he may jump at an actuarially fair gamble that offers a small chance of lifting him . . . into the "middle" or "upper" class even though it is far more likely than the preceding gamble to make him one of the least prosperous unskilled workers. Men will and do take great risks to distinguish themselves, even when they know what the risks are. (as quoted in Clotfelter and Cook, 1989:75–76)

Note that both *Investors* and *Plungers* have some understanding of the risks associated with their wagers and that these wagers are not necessarily irrational. However, some lottery participation is based on grossly inaccurate assessments of the risks and likely return. Research in behavioral economics over the past two decades suggests that humans do not assess or evaluate risk in a manner consistent with expected utility theory. In particular, if prospect theory aptly characterizes orientations toward risk, and individuals grossly overestimate the likelihood of statistically rare events, then these players misperceive lotteries as profitable investment options (see Kahneman and Tversky, 1979, 1984). Lottery popularity is partially attributable to the fact that "people are often risk-seeking in dealing with improbably gains and risk averse in dealing with unlikely losses" (Kahneman and Tyversky, 1984:345).

A segment of lottery players—Clotfelter and Cooks's (1989) *Believers*—also misunderstand the character of lottery games. They see lotteries as games of skill—thus the popularity of "lucky numbers" books—and so they "believe" that they can increase their own odds of winning by smart betting. As Clotfelter and Cook note:

> The voluminous advice on how to improve the odds of choosing winning numbers finds a receptive audience among lottery players who are willing to believe that effort and skill will be rewarded in this endeavor as in most others. The effect is to give believers an exaggerated sense of the value of a lottery ticket, and thus to stimulate play . . .. (1989:80)

In each of these cases, lottery players overinvest in the lottery (at least from the standpoint of net expected income).[10] The lottery's highly regressive nature ensures that this overinvestment will be most deleterious for those in the lowest income brackets. So, because of the inverse relationship between first-period income and first-period overinvestment in the lottery, second-period income concentration, ceteris paribus, will be higher than first-period income concentration.

[10]This is true for all except the very most skilled *investors*, and these players are a very small number of all players.

Even if the lottery is viewed as pure entertainment, the addictive behaviors often associated with gambling could lead to increased income inequality. Again, we know that, relative to income, those in the lowest income groups have the highest lottery participation rate. Assuming addictive tendencies are constant across income groups, the addictive behaviors will be most problematic—from a future income standpoint—in the lowest income groups. Addictive gambling in time Period 1 restricts investment capital, which leads to increased income inequality in Period 2.

In the analysis section of our article we examine the state-level impact of lotteries on income concentration. In that section, we address the following questions.

1. Do states with lotteries tend to have higher income concentrations?
2. Do states with lotteries tend to have higher income concentrations when controlling for other conventional explanatory factors?
3. If lotteries do influence income concentration, what is the magnitude of their substantive effect on income concentration?

The next section of the article describes the data and the methods used to analyze the data. In the following section, we present our results, and in the final section of the article we discuss our findings, offer several conclusions, and identify potentially productive avenues for future research.

Data and Methods

We analyze data from all 50 states for the years 1976 through 1995.[11] Though its use is not universal, the most common measure of income inequality is the Gini coefficient.[12] The Gini coefficient measures the concentration of income within a given jurisdiction. The scores range from 0, which indicates perfect income equality, to 1, which indicates maximum income concentration. For all the regression models, the Gini coefficient is used as the dependent variable. To more easily interpret the regression coefficients, the Gini coefficient was multiplied by 1,000, changing the variable's range from 0 to 1 to 0 to 1,000. As with the original measure, the value of the Gini coefficient increases as inequality increases. Our Gini coefficient is based on data from the Census Bureau Current Population Survey.[13]

The primary explanatory variable is lottery, a dummy variable coded 1 if the state has a lottery in a given year.[14] We might also have used a lagged

[11]We limit ourselves to this time period because our source for Gini coefficients does not provide data for the years after 1995.

[12]See Barrilleaux and Davis (2003) and Langer (1999) for applications of this measure in the United States.

[13]The Gini data were supplied by Laura Langer. See ⟨http://www.u.arizona.edu/~llanger/replication_datasets.htm⟩.

[14]In preliminary analyses we included a dummy variable for states in which lottery revenue went solely for education. This variable was not significant and was dropped from subsequent analyses.

lottery variable, given the focus—in the theoretical section of the article—on the impact of lottery expenditures in time period t on income concentration in time period $t + 1$. Though it is our expectation that the time period in which the lottery effect occurs is far shorter than a year—it could easily be a month or less—we are constrained by the available data to year-long time periods. It is also important to note that replacing lottery with a lagged lottery has no substantive impact on the results.[15]

Prior research suggests a positive relationship between the relative size of the minority population and income inequality (Levernier, 1999; Braun, 1988).[16] Although past studies of income inequality have focused on the impact of the size of the African-American population (Barrilleaux and Davis, 2003), we also include indicators of the size of the Latino and Asian populations. We expect to find a positive relationship between the size of the African-American population and income inequality, but we have no a priori expectations for the other minority population variables since previous research provides no definitive guidance.

State sales tax and income tax data are included as controls for the non-lottery level of state tax policy regressivity. Unemployment and the proportion of jobs in manufacturing are also included in our models. Previous work suggests that income inequality is inversely related to the overall employment rate as well as to the percent employed in manufacturing (Braun, 1988; though see also Levernier, 1999). We include a dummy variable for the South (coded 1 for states of the former confederacy and 0 otherwise)—where income inequality has tended to be highest—in all models.[17]

We also test for the effect of welfare policy on income inequality. The "income-maintenance" variable measures national government transfers to the states consisting largely of funding for supplemental security income payments; earned income tax credits; family assistance payments; general assistance payments; expenditures for food under the Women, Infants, and Children Program; and food stamp payments. Previous research on the impact of redistributive policies such as these on income inequality is mixed. Where Hibbs and Dennis (1988) find an inverse relationship between redistributive efforts and income inequality, Barrileaux and Davis find "little evidence that the redistributive policies pursued by American state govern-

[15]The very high correlation between lottery and lagged lottery (> 0.90) precludes their joint inclusion in any of our models.

[16]See the Appendix for a more detailed listing of the sources of all explanatory variables.

[17]Our definition of "South" is standard in the literature on southern politics. We have chosen this definition instead of the Census definition (which includes states such as Maryland and Delaware) because the economic and political circumstances of the states of the former confederacy are more comparable than the larger set of states designated by the Census as the "South." In supplemental analyses, we also incorporated other regional variables (northeast, midwest, or west), but these variables were often insignificant, resulted in greater multicollinearity, and had little effect on our substantive results (i.e., the lottery is still strongly associated with income inequality, the southern states still have greater income inequality, etc.), so they were dropped from the final analysis.

TABLE 1

Descriptive Statistics for Independent and Dependent Variables

Variable	Observations	Mean	*SD*	Minimum	Maximum
Dependent Variable					
Gini (*1000)	1000	407.692	25.575	343.000	494.000
Independent Variables					
Lottery	1000	0.459	0.499	0	1.000
South	1000	0.220	0.414	0	1.000
% African American	1000	9.443	9.226	0.169	36.537
Ln % Latino	1000	0.872	1.105	−0.901	3.644
Ln % Asian	1000	0.846	0.627	−2.996	4.165
Unemployment	1000	6.564	2.100	2.200	18.000
Manufacturing	1000	14.758	6.204	2.716	29.114
Food tax exemption	1000	0.540	0.499	0	1.000
Sales tax	1000	0.900	0.300	0	1.000
Income tax	1000	0.860	0.347	0	1.000
Sales tax revenue per capita	950	259.716	139.446	0	835.961
Income tax revenue per capita	950	228.308	156.448	0	873.369
Sales and income tax revenue	950	488.024	196.745	0	1354.450
Per-capita personal income	1000	13127.180	2248.398	8360.281	21173.990
Per-capita income maintenance	1000	164.891	58.720	46.012	428.478

ments affect changes in income concentration among their citizens" (2003:293). We include a broad measure of income maintenance to assess the impact of welfare spending in the context of our models.

We employ a time-series cross-sectional framework to estimate our models.[18] Thus, we use a simple OLS regression with a lagged dependent variable[19] and panel-corrected standard errors (see Beck and Katz, 1995, 1996) to estimate the relationships of interest.[20] Descriptive statistics for all variables are presented in Table 1.

[18]Note that we are precluded from estimating a fixed-effects model because of the incorporation of several dummy variables in our model.

[19]We include the lagged dependent variable because autocorrelation was a serious problem in models without it. As far as the substantive results are concerned, whether or not it is included makes little difference.

[20]We have no a priori rationale for the inclusion of a trend line. The nature of the Gini coefficient is not such that it must increase from year to year (as a deterministic trend would imply); in fact, in a small number of states, the Gini coefficient *decreases*. In this context, the artificial addition of a trend line is neither theoretically nor methodologically appropriate.

Results

In simple descriptive terms, there is an obvious relationship between the presence of a lottery and the level of income concentration. See Figure 1, where we have two line graphs—one for states that had no lottery during the full time range of our analysis and one for states that had a lottery during each year of our analysis. The increase in the level of income concentration is markedly higher in the "all-lottery" states than it is in the "non-lottery" states. Though the non-lottery states had significantly higher income concentrations at the beginning of the time period of the analysis, by the end of the analysis, the all-lottery states had higher income concentrations. The increase in the Gini coefficient in all-lottery states was more than 40 percent greater than the increase in the Gini coefficient in the non-lottery states.

The same dynamic manifests in those states that instituted a lottery *during* the time period of our analysis. See Figure 2. In these states, the Gini coefficient rose significantly faster than after the establishment of a lottery than it did before the lottery. Again, lotteries are clearly associated with significantly higher Gini coefficients.

These findings are illustrative; however, the "lottery effect" might plausibly be attributable to other factors. To examine this possibility, we estimate

FIGURE 1

Mean Gini * 1000 Scores of Lottery Versus Non-Lottery States, 1976–1995

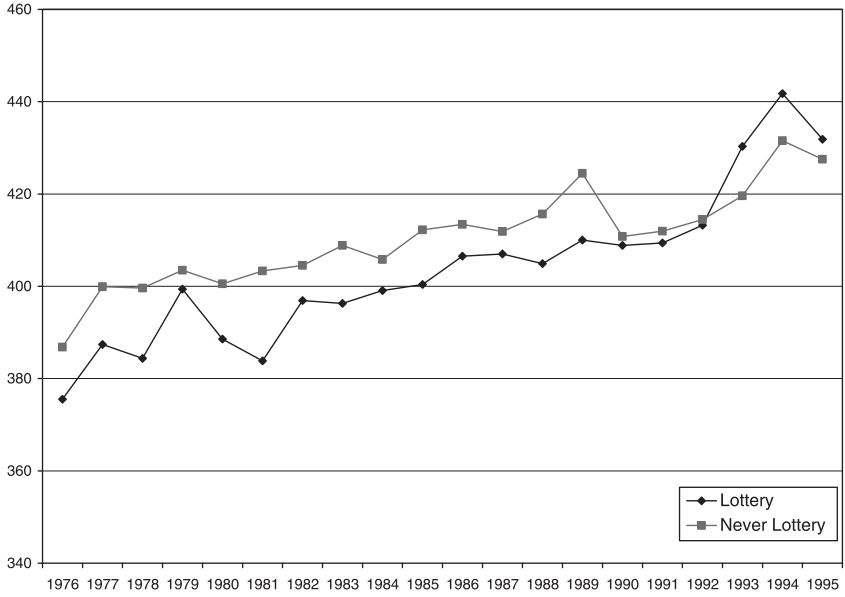
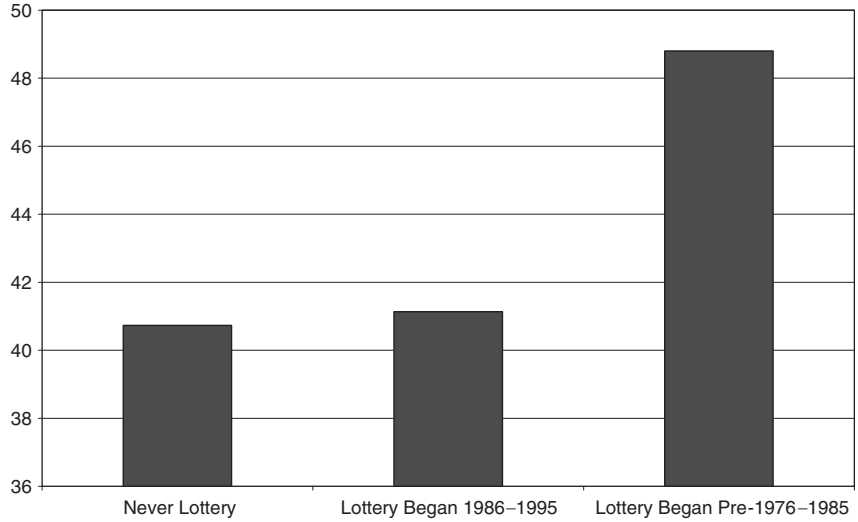


FIGURE 2

Mean Gini * 1000 Change Between 1976 and 1995



three multivariate models and report out results in Table 2.[21] The sample on which the analysis is based includes data from all 50 states for the 1977 to 1995 time period.[22] The results show that the presence of a state lottery is significant and that it is positively related to income inequality. The magnitude of the effect is sizable. For example, the lottery effect is nearly comparable to a full standard deviation change in manufacturing employment, and given the fact that average sales-tax and state income-tax revenues are a multiple of average lottery revenues (Clotfelter et al., 1999), the per-revenue-dollar impact of the lottery on income inequality is significantly greater than the per-revenue-dollar impact of either the sales or income tax.

A number of control variables also influence income concentration. As expected, an increase in the African-American population is related to an increase in income inequality. The size of the Asian-American population, on the other hand, is inversely related to income concentration, while there appears to be no relationship between the size of the Latino population and income concentration.

Labor market dynamics also impact income concentration, though not in exactly the manner we expected. When manufacturing employment falls,

[21]VIF estimates indicate the level of multicollinearity is not problematic.

[22]Data for 1976 are dropped because of the inclusion of a lagged dependent variable. Also, the exclusion of Alaska—a state with a unique funding system and no lottery, sales tax, or income tax—has no impact on the substantive results.

TABLE 2

OLS Regression Results with Gini (*1000), 1976–1995

	Model 1	Model 2	Model 3
Lottery	3.392**	3.422**	3.397*
	(0.009)	(0.009)	(0.011)
Gini (*1000)$_{t-1}$	0.576**	0.586**	0.586**
	(0.000)	(0.000)	(0.000)
South	11.132**	9.552**	9.661**
	(0.000)	(0.000)	(0.000)
% African American	0.152^{+}	0.224**	0.221**
	(0.068)	(0.006)	(0.007)
Ln % Latino	0.872	0.832	0.861
	(0.103)	(0.141)	(0.130)
Ln % Asian	−3.863**	−4.418**	−4.360**
	(0.006)	(0.004)	(0.004)
Unemployment	0.273	0.165	0.167
	(0.462)	(0.650)	(0.646)
Manufacturing	−0.702**	−0.621**	−0.625**
	(0.000)	(0.000)	(0.000)
Per-capita personal income	0.000	0.000	0.000
	(0.294)	(0.930)	(0.967)
Per-capita income maintenance	0.084**	0.084**	0.083**
	(0.000)	(0.000)	(0.000)
Sales tax	4.294*		
	(0.016)		
Income tax	4.745*		
	(0.015)		
Food tax exemption	−2.230*	−1.925^{+}	−1.854^{+}
	(0.047)	(0.061)	(0.061)
Sales-tax revenue per capita		0.008*	
		(0.049)	
Income-tax revenue per capita		0.007	
		(0.113)	
Sales- and income-tax revenue per capita			0.007^{+}
			(0.052)
Constant	153.769**	159.033**	159.201**
	(0.000)	(0.000)	(0.000)
Adjusted R^2	0.681	0.678	0.678
Observations	950	950	950

NOTE: Coefficients are unstandardized ordinary least squares (OLS) with panel-corrected standard errors (PCSE) regression values; *p* values are in parentheses, $^{+}$significant at 10%; *significant at 5%; **significant at 1%.

income inequality increases, but unemployment appears to be unrelated to income concentration.

The relationship between sales and state income taxes and income inequality is, however, more complicated. The results from Model 1 in Table 2 suggest that both sales tax and income tax are associated higher levels of

income inequality. Since sales taxes tend to be significantly more regressive than most income taxes, this is an intriguing result. We examine this finding further in the second model by replacing the sales- and income-tax dummy variables with the per-capita total sales-tax and income-tax revenue for each state.[23] The change in the measure of the tax figures increases the size of the lottery coefficient, and the income-tax-revenue variable is insignificant. Overall, this provides stronger support for a lottery effect and prevents us from drawing any firm conclusions about the relationship between state-level income taxes and income inequality.[24] Although the significance of income-tax revenue drops out in the second model, sales-tax revenue is still positively associated with an increase in income inequality.

Each model also includes a measure of welfare policy and, in both cases, an increase in welfare spending is associated with an increase in income inequality. These results are similar to those found in other recent research on the impact of welfare policies on income inequality, and are plainly consistent with Barrilleaux and Davis's contention that "[w]hen state government redistributive [i.e., welfare] policies do have effects, they are associated for the most part with widening gaps" in income (2003:293). Finally, we see—in Model 3 of Table 2—that our nontax results do not depend on the distinction between sales taxes and income taxes. Although we think it is important to separate their effects (as Model 2 indicates), the other results are not an artifact of this modeling decision.

Discussion and Conclusion

It is clear from the results presented above that state lotteries have a sizeable impact on state-level income concentration. All else equal, states with lotteries have much more unequal income distributions than states without lotteries. The magnitude of the effect is also quite significant. In per-dollar terms, it is far greater than the effect of sales or state income taxes on income concentration. The lottery effect is also comparable to nearly a full standard deviation change in the percentage of manufacturing jobs. Efforts to explain the rise in income inequality since the mid-1970s can no longer ignore the lottery effect.

We have focused on the impact of the lottery on income concentration, but our analysis also has implications for our understanding of the relationship between racial/ethnic composition and income inequality as well as for the impact of economic factors (such as the size of the manufacturing sector) and other policy variables (other types of tax policy and income support policies) on income inequality. The distinctive effects of the size of

[23]These figures are CPI adjusted.

[24]Since the federal income tax constrains the use of state income taxes for redistributive purposes (see Barrilleaux and Davis, 2003), this finding is not surprising.

the African-American population and the size of the Asian-American population on income concentration certainly deserve further research. The positive relationship between welfare spending and income concentration also deserves a more substantial investigation.

We consider this a "first-cut" at the relationship between state-level tax policy—broadly conceived—and the movement in income inequality over time. As we move forward in our examination of this relationship, we plan to do the following:

1. Evaluate the impact of other types of *gambling* or *gaming* activities on income concentration. What impact, for example, does pari-mutuel betting or the presence of casino gambling have on income concentrations?[25]
2. Incorporate a more fully specified political model into our analysis. Though we found little evidence of a direct effect of citizen ideology, government ideology, or mobilization on income inequality, they may well have an important indirect impact.[26]
3. Reexamine the existing explanations for the establishment of state lotteries. Berry and Berry (1990) provide an excellent analysis of the politics and economics of the growth in the number of state lotteries, but nearly half of all state lotteries have been established since the end of the time period of their analysis, and it is quite possible that the political and economic dynamics have changed somewhat in the past 15 years.

The rise of income inequality has been difficult to explain in purely economic terms, but compelling political explanations have also been elusive. In this article, we show that a broadly defined conception of tax policy may prove useful in understanding the role government played in the increase in income concentration. More specifically, we see that, whatever the revenue benefits of state lotteries, they clearly have costs for those concerned with substantive equality.

REFERENCES

Al-Samarrie, Ahmad, and Herman P. Miller. 1967. "State Differentials in Income Concentration." *American Economic Review* 57:59–72.

Barrilleaux, Charles, and Belinda Creel Davis. 2003. "Explaining State-Level Variations in Levels and Change in the Distribution of Income in the United States, 1978–1990." *American Politics Research* 31:280–300.

[25]There are more than a half-dozen other categories of gaming—from video gambling, to bingo, casino games, to sports betting. Our preliminary analyses suggest that the impact on income inequality varies across the different games. A more definitive statement will require considerably more study.

[26]Results not reported, but available from the authors.

Beck, Nathaniel, and Jonathan N. Katz. 1995. "What to Do (and Not to Do) with Time-Series Cross-Section Data." *American Political Science Review* 89(3):634–47.

———. 1996. "Nuisance vs. Substance: Specifying and Estimating Time-Series Cross-Section Models." *Political Analysis* 6:1–36.

Bernard, Andrew B., and J. Bradford Jensen. 1998. *Understanding Increasing and Decreasing Wage Inequality*. NBER Working Paper 6571. Cambridge, MA: National Bureau of Economic Research.

Berry, William D., and Francis Berry. 1990. "State Lottery Adoptions as Policy Innovations: An Event History Analysis." *American Political Science Review* 84:395–415.

Borg, Mary O., and Paul M. Mason. 1988. "The Budgetary Incidence of a Lottery to Support Education." *National Tax Journal* 41:75–85.

Borg, Mary O., Paul M. Mason, and Stephen L. Shapiro. 1991. *The Economic Consequences of State Lotteries*. New York: Praeger.

Braun, D. 1988. "Multiple Measurements of U.S. Income Inequality." *Review of Economics and Statistics* 70:398–405.

Chernoff, Herman. 1981. "How to Beat the Massachusetts Numbers Game: An Application of Some Basic Ideas in Probability and Statistics." *Mathematical Intelligencer* 3(4):166–72.

Clotfelter, Charles T., and Philip J. Cook. 1987. "Implicit Taxation in Lottery Finance." *National Tax Journal* 40:533–46.

———. 1989. *Selling Hope: State Lotteries in Americ*a. Cambridge, MA: Harvard University Press.

Clotfelter, Charles T., Philip J. Cook, Julie A. Edell, and Marian. Moore. 1999. *State Lotteries at the Turn of the Century: Report to the National Gambling Impact Study Commission*. Paper prepared for the National Gambling Impact Study Commission. Available at ⟨http://govinfo.library.unt.edu/ngisc/reports/reports.html⟩.

Danziger, Sheldon, and Peter Gottschalk. 1995. *America Unequal*. Cambridge, MA: Harvard University Press.

Dye, Thomas R. 1969. "Income Inequality and American State Politics." *American Political Science Review* 63:157–62.

Hansen, Ann, Anthony D. Miyazaki, and David E. Sprott. 2000. "The Tax Incidence of Lotteries: Evidence from Five States." *Journal of Consumer Affairs* 34:182–203.

Hero, Rodney, and Carolyn Tolbert. 1996. "A Racial/Ethnic Diversity Interpretation of Politics and Policy in the States of the U.S." *American Journal of Political Science* 40:851–71.

Hibbs, Douglas, and C. Dennis. 1988. "Income Distribution in the United States." *American Political Science Review* 82:467–90.

Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* 47:263–91.

———. 1984. "Choices, Values, and Frames." *American Psychologist* 39:341–50.

Langer, Laura. 1999. "Measuring Income Inequality Across Space and Time in the American States." *Social Science Quarterly* 80:55–67.

———. 2001. "The Consequences of State Economic Development Strategies on Income Distribution in the American States, 1976 to 1994." *American Politics Research* 29:392–415.

Lenz, Gabriel. 2003. *The Policy-Related Causes and Consequences of Income Inequality*. Working Paper. Russell Sage Foundation Literature Review. Available at ⟨www.russellsage.org/programs/other/inequality/reviews/document_view⟩.

Levernier, W. 1999. "An Analysis of Family Income Inequality in Metropolitan Counties." *Social Science Quarterly* 80:1334–45.

Miyazaki, Anthony D., Ann Hansen, and David E. Sprott. 1998. "A Longitudinal Analysis of Income-Based Tax Regressivity of State-Sponsored Lotteries." *Journal of Public Policy and Marketing* 16:1–20.

Price, Donald I., and E. Shawn Novak. 1999. "The Tax Incidence of Three Texas Lottery Games: Regressivity, Race, and Education." *National Tax Journal* 52:741–52.

Smith, James P. 2001. "Why Is Wealth Inequality Rising?" In Finis Welch, ed., *The Causes and Consequences of Increasing Inequality*. Chicago, IL: University of Chicago Press.

Appendix: Data Code Book

% African American: Estimated African-American population in 1,000s. Source: Current Population Reports. State Politics & Policy Quarterly Data Resource. ⟨http://www.unl.edu/sppq⟩.

Gini (*1000): Gini index of income concentration originally scaled from 0 to 1 and transformed to range from 0 to 1,000. Source: Data for state income inequality are from Langer (1999).

Gini (*1000) $_{t-1}$**:** Gini coefficient, lagged one year.

Ln % Asian: Log of estimated Asian population in 1,000s. The original population data is from the Census Bureau. Since these data are not available for every year, a regression analysis was used to estimate the Asian population for all years. Because this estimated variable, which should be bound by [0,1], is below 1 in some cases, it was transformed to make it fit this range. This estimate was highly skewed so the log of the estimate is used.

Ln % Latino: Log of estimated Latino population in 1,000s. Original population data from the Census Bureau. Since these data are not available for every year, a regression analysis was used to estimate the Latino population for all years. This estimate was highly skewed so the log of the estimate is used.

Lottery: Dummy variable for if the state has a lottery. Source: National Conference of State Legislatures ⟨http://www.ncsl.org/programs/econ/lotto.htm⟩.

Per-Capita Income Maintenance: Consists mainly of supplemental security income payments; earned income tax credits; family assistance payments; general assistance payments; expenditures for food under the Women, Infants, and Children Program; food stamp payments; and other assistance payments. Estimates are CPI adjusted with a 1982–1984 reference base. Source: Bureau of Economic Analysis.

Per-Capita Personal Income: Personal income divided by mid-year population estimates of the Bureau of the Census yields a per-capita measure for that type

of income. Estimates are CPI adjusted with a 1982–1984 reference base. Source: Bureau of Economic Analysis.

Manufacturing: Percent manufacturing by total employment. Employment is measured as the average annual number of jobs, full time plus part time; each job that a person holds is counted at full weight. Source: Bureau of Economic Analysis.

South: Dummy variable for if the state is in the South.

Taxes: Income tax, sales tax, and food tax exemption. Figures are CPI adjusted with a 1982–1984 base. Data was not available for every year and missing years were linearly interpolated. Source: Federation of Tax Administrators ⟨http://www.taxadmin.org⟩. Tax revenue figures from Book of the States.

Unemployment: Unemployment rate, measured as percentage of states labor force that is out of work. Source: Geographical Profile of Employment and Unemployment. Bureau of Labor Statistics. State Politics & Policy Quarterly Data Resource. ⟨http://www.unl.edu/sppq⟩.