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Brad R. Humphreys

Victor Matheson
*College of the Holy Cross*, vmatheso@holycross.edu

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Department of Economics
College of the Holy Cross
Box 45A
Worcester, Massachusetts 01610
(508) 793-3362 (phone)
(508) 793-3708 (fax)

http://www.holycross.edu/departments/economics/website

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# Booms, Busts, and Gambling: Can Gaming Revenues Reduce Budget Volatility?

Brad R. Humphreys[†]
University of Alberta

and

Victor A. Matheson[††]
College of the Holy Cross

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**Abstract**

Over the past 20 years, state and provincial governments in North America have expanded legal gambling opportunities to consumers. One of the primary policy goals of this expansion of gambling opportunities has been to increase government revenues. Gambling is an attractive source of new government revenues because consumers are relatively insensitive to the implicit "tax" rate imposed on gambling activities and gambling is a voluntary activity; only those who chose to gamble are subject to this implicit tax. In this paper, we document the contribution that gambling revenues make to state and provincial tax receipts, and the extent to which variation in gambling revenues contributes to the volatility of tax revenues over time. We adopt an approach from the finance literature. In finance, the relationship of the return to an individual stock to total return in a portfolio, or total return the entire stock market, is often summarized by a "Beta" which can be estimated from actual returns on portfolios and individual stocks. We investigate the contribution of gambling revenue, and revenue from other sources, to variation in total government revenues, by estimating a beta for various government revenue sources in states and provinces in North America over the period 1989-2009. The estimated betas for gambling revenue in many provinces and states are negative, indicating that variation in gaming revenue has negative correlation with variation in own source revenues, reducing the variation in total state and provincial revenue over time.

**JEL Classification Codes**: L83, H27, H71

***Keywords:*** gambling, lottery, public finance

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[†]Chair in the Economics of Gaming, Department of Economics, University of Alberta, 8-14 HM Tory, Edmonton, AB T6G 2H4 Canada, 780-492-3406, brad.humphreys@ualberta.ca

[††]Department of Economics, Box 157A, College of the Holy Cross, Worcester, MA 01610-2395, 508-793-2649 (phone), 508-793-3708 (fax), vmatheso@holycross.edu

## Introduction

Legalized gambling provides a small by important contribution to state and provincial government finances. In 2006, state lotteries provided $16.92 billion in net revenues to states while amusement taxes, which cover wagering at casinos, added another $5.54 billion, and pari-mutuel taxes contributed just over $300 million to state coffers. While this amount represented only 2.36% of total state government general revenues in the U.S. in 2006 (excluding revenue transfers from the federal government), the combined $22.76 billion exceeds the revenue collected at the state level from such common public finance mechanisms as alcohol or tobacco excise taxes, sales of hunting, fishing, or motor vehicle licenses, estate and gift taxes, and severance taxes (Statistical Abstract of the United States, 2009). Gambling revenues provide a similar percentage of provincial revenues in Canada.

While government gaming revenues are modest in a relative sense, this paper explores the question of whether lottery and gambling revenues can serve an important function in diversifying the tax "portfolio" utilized state and provincial governments. In other words, can gaming revenues serve to cushion government budgets in during economic downturns? The paper begins with a brief history of gambling in the United States and Canada followed by an overview of the pros cons associated with the use of gambling as a source of government tax revenue. The paper then turns to an analysis of whether gaming revenues can indeed serve to reduce budget volatility and then concludes with recommendations to policy makers.

## Historical Background

State and provincial lotteries have been a common form of public financing for much of

the history of modern government in North America. As noted by Grote and Matheson (2008), early public works such Boston's Fanieul Hall as well as several of the first universities in the United States, including Harvard and Princeton, were financed, at least in part, by lotteries. In the United States, state-sponsored lotteries remained popular until the early to mid-1800s, after which time a general public backlash against gambling, coupled with concerns about corruption in gambling, led to the demise of state-authorized lotteries. By 1860 only Delaware, Missouri, and Kentucky still sponsored lotteries (Dunstan, 1997). The closure of the Louisiana Lottery in 1894 ushered in a 70-year period during which no state in the country operated a lottery game.

While other forms of legalized gambling existed in the United States in the first half of the 20th century, notably charitable bingo, horse racing, and casino gambling in Nevada, state sponsored lotteries returned in 1964 with the introduction of the New Hampshire Lottery. New York became the second state to offer a state lottery in 1967 followed by New Jersey in 1970. By the end of the 1970s, 14 states offered lotteries, another 17 states plus the District of Columbia added games in the 1980s, and 6 more states instituted lotteries in both the 1990s and 2000s bringing the total number of states with state sponsored lotteries to 43.

Government-sponsored lotteries in Canada resumed in 1968 in Montreal with the introduction of the "voluntary tax," where players could "donate" money to the city government to pay for debts associated with the 1967 World's Fair in exchange for a chance to win prizes. While this "voluntary tax" was ultimately declared illegal by the courts, Canadian federal law was changed in 1969 to allow for state-sponsored lotteries, and Quebec became the first province to offer such a game in 1970. The rest of the provinces followed suit between 1974 and 1976.

Casino gaming and pari-mutuel betting also have a long history in the United States and

Canada that parallels that of state-sponsored lotteries. Racetracks and gambling houses existed early in the colonial days. The first organized horse racetrack in the colonies was constructed on Long Island in 1665 while inns and roadhouses commonly had gaming rooms. As with lotteries, concerns about corruption and morality led to a decline in legalized gambling throughout the 1800s, although westward expansion provided opportunities for gambling to flourish in the lightly regulated saloons of the boomtowns in the "wild west." By the early 1900s, casino gaming and pari-mutuel betting had been largely eliminated from the United States only to start to return during the Great Depression in the 1930s. Bingo was decriminalized in numerous states, beginning with Massachusetts in 1931 in order to provide opportunities for charities to raise much needed funds, and horse tracks were re-established in 21 states by the end of the 1930s. By 2010, 41 states offered pari-mutuel betting at either horse or dog tracks.

Casinos were reintroduced into the U.S. when Nevada legalized essentially all forms of gambling in 1931, eventually leading to Las Vegas becoming the unofficial gambling capital of the country. While Nevada maintained a virtual monopoly on casino gaming for over 40 years, in 1976, New Jersey became the second state to legalize casino gaming and an Appellate Court ruling in Florida in 1979 gave Native American tribes in the U.S. wide latitude to operate casinos on Indian reservations, a right that was solidified in 1988 with the passage of the Indian Gaming Regulatory Act. These pivotal decisions ushered in a tidal wave of casinos across the United States so that by 2010, 42 states had casinos operating within their borders. Similarly, gambling in Canada has witnessed a significant increase since over the past three decades. Casinos currently legally operate in all Canadian provinces. See Figure 1 for a description of current availability of gambling in U.S. states.

**Economics of Lotteries and Gaming Taxes**

Typically, public finance economists examine a variety of factors in determining whether or not a specific tax is desirable. In no particular order, some of these factors include efficiency, vertical equity, horizontal equity, and user-pays principle. Gambling revenues earn a decidedly mixed review when measured by these criteria.

In term of efficiency, gambling revenues clearly have their plusses and minuses. Administrative costs are high, at least for operating state lotteries. Typically, administration costs alone for state-operated lotteries average in excess of 10% of the funds collected and in 2008, total operating costs for state-run lotteries in the United States averaged 13.1% of net revenue raised excluding payments to retailers. Including payments to retailers, the administrative costs of state lotteries are closer to one-third of all revenues raised. On the other hand, the deadweight loss associated with lotteries is likely to be low since consumers are relatively insensitive to the implicit "tax" rate imposed on gambling activities and since gambling is a voluntary activity. Given the fact that only those who choose to gamble are subject to this implicit tax, the presence of the lottery should be a welfare increasing activity rather than a welfare decreasing one.

It should also be noted that money spent by consumers on gambling and lottery tickets is money that is not available to be spent elsewhere in the economy. Since spending on other goods may be subject to sales tax or other revenue mechanisms, tax revenue generated by casinos and lotteries may simply substitute for tax reductions elsewhere in state government. (Fink, Marco, and Rork, 2004) This is not only true within states and provinces but also between states. As noted by Garrett (2006) the presence of a neighboring state with a lottery is a significant

influence on whether a state itself adopts a lottery. The presence of casinos in nearby states is also frequently mentioned as a prime reason to adopt casino gaming.

Vertical equity deals with the appropriate rate of taxation across income levels. It is here that lotteries and gambling revenues face their fiercest critics. By essentially any measure, lotteries are regressive in nature, with the poorest income groups spending a higher proportion of their income on these games than richer ones. In their examination of U.S. lottery games, Clotfelter and Cook (1988) note that "implicit tax [for lottery games] is regressive in virtually all cases. Vaillancourt and Grignon (1988) come to a similar conclusion for Canadian lotteries. While they conclude that Canadian lotteries were somewhat less regressive than their American counterparts, they still determined that lotteries are the most regressive form of taxation in Canada with the exception of taxes on cigarette. More recent literature such as Price and Novak (1999; 2000) and Rubenstein and Scafidi (2002) comes to similar conclusions. Combs, Kim and Spry (2008), for example, find that all seven lottery games they examine in Minnesota are highly regressive. Indeed, Oster (2004) is notable for predicting that at certain jackpot levels the multi-state Powerball lottery could actually become progressive, the only such instance documented in the academic literature.

The progressivity and regressivity of casino and pari-mutuel gambling taxes is subject to more question. In his seminal study, Suits (1977) used national survey data to ascertain that nationwide casino gambling was an activity mostly engaged in by the rich. Of course, at the time of the study, only Nevada offered casino gaming, so gambling required extensive travel on the part of participants. Borg, Mason, and Shapiro's (1991) follow-up study examines the gambling patterns of people who live in close proximity of casinos and finds that when only local residents

are considered, gambling is highly regressive. Considering the widespread expansion of casinos across the U.S. and Canada, is it likely that taxes collected on casino gaming have become significantly less progressive and more regressive over the past two decades.

A tax is horizontally equitable if the tax paid is similar for all individuals of the same income level. Obviously, the participation rates and levels for lotteries and gaming vary widely across the population. Given the voluntary nature of participation in such activities, however, most persons would not classify the lack of horizontal equity as a failing for lottery and gaming taxes.

The user pays principle suggests that it is advantageous to design taxes systems such that the users of particular government services pay for those services through taxes dedicated directly to individual government programs. For example, in the United States, road and highway construction and maintenance is funded through taxes on motor fuels. Therefore those drivers using the most fuel, and theoretically using the most roads and highways, pay larger amounts into the highway fund.

Lotteries and gaming taxes do not directly qualify as "user pays" taxes, but the proceeds from many state lotteries are designated towards specific programs such as education or the environment. Of the 43 U.S. states (plus the District of Columbia) that provide lottery games, over half earmark all lottery profits for a specific purpose, usually education, and another quarter reserve a portion of lottery revenues for a designated government program. Of course, the existence of a dedicated revenue source for, say, education, makes it easier for lawmakers to redirect other non-directed revenue sources away from education.

The empirical evidence does, in fact, suggest that lottery revenues are quite fungible. For

example, Garrett (2001) finds that the presence of earmarked lottery funds in Ohio did not lead to a statistically significant increase in per-student expenditures on education. Similarly, Novarro (2005) uses time series panel data for all 50 states and finds that states with lottery proceeds designated to education increase spending on education by approximately 79 cents for every $1 in lottery profits, while each dollar in non-earmarked lottery profits tends to increase education spending by only 43 cents on average suggesting partial but not complete fungibility.

The last aspect of gaming revenue that is to be considered is its variability as a revenue source. Szakmary and Szakmary (1995) have performed the most rigorous analysis of the variability of lottery revenues their relationship to other revenue sources. In contrast to prior studies they find that, "lottery revenues do not destabilize total state revenues, because the low correlation of lottery revenues with revenues from other sources offsets the high stand-alone risk of lottery funding." Szakmary and Szakmary utilize portfolio theory to test the covariance between fluctuations in lottery revenue and fluctuations in other tax sources. A similar technique will be used in this paper but extended to cover the fifteen years since their work and the Canadian provinces will be added to the analysis.

**Data**

Canadian data come from the Provincial and Territorial Government Revenue and Expenditures program operated by Statistics Canada. This annual census of provincial and territorial governments contains detailed data on revenues and expenditures based on the published financial reports of the various provincial governments. The data are consistent with the Financial Management System developed by Statistics Canada and are available over the

period 1989-2008 as CANSIM Table 385-0002.

Our measure of provincial revenue is Own Source Revenue, an aggregate measure of provincial government revenues that includes income taxes, consumption taxes, property and related taxes, health and drug insurance premiums, contributions to social insurance plans, the sales of goods and services, and investment income. We subtract provincial revenues derived from health and drug insurance premiums and contributions to social insurance programs from Own Source Revenues in order to identify revenues generated from specific discretionary provincial sources. Sales of goods and services includes goods like water, land, and used structures; services sold include court and probate fees, tolls for transportation, admissions to public museums and recreational facilities, and educational services. Investment income includes natural resource royalties, interest income and gains and losses on other securities. The revenue variable excludes transfers from other levels of government.

Table 1 summarizes the share of own source revenues accounted for by a selected group of provincial government revenue sources. This is not a comprehensive list of revenues sources, so the shares do not sum to 100%. On Table 1 "—" indicates that the province does not collect taxes on this source; 0.0% means that the province collects a very small amount of revenue from this source. Personal income and general sales tax revenues are generally the two largest sources of provincial tax revenues. The exception to this is Alberta, which has no provincial sales tax and gets significant revenues from investment income, primarily from oil and gas royalties. Saskatchewan and British Columbia also derive significant revenues from investment income.

Remitted gaming profits make up a relatively small share of Own Source revenues in Canadian provinces, between 2.2% and 3.7%. However, remitted gaming profits are a larger

share of own source revenues than alcohol and tobacco taxes in most provinces, and are close to the share from motor fuel taxes in some provinces.

US data come from the State Tax Collections (STC) program operated by the Bureau of the Census. This program collects detailed sate tax revenue data for 25 categories of tax revenues; data are available back as far as 1950 through 2006. Like the Canadian data, we include tax revenues from a number of important sources, but do not analyze a comprehensive list of tax revenue sources.

The STC program does not include remitted gaming profits as a separate category of tax revenues, so we must construct a variable from other data sources. Gaming tax revenues appear in four distinct variables in the STC data: net lottery proceeds, pari-mutual tax revenues, amusement tax revenues, and amusement license revenues. Net lottery proceeds are funds returned to the state after prizes and administrative costs have been paid. Pari-mutual taxes are collected on wagers on horse racing, dog racing, jai-lai and other events and include "breakage" revenues from rounding on payouts. Amusement taxes include taxes on casino gambling. Revenues for gaming licenses issued to race tracks and casinos fall under amusement licenses. The amusements category also contains license revenue and taxes from non-gaming activities like movie theatres, athletic events and video game machines, so some portion of these revenues are not related to gambling. Since casino and race track betting are not as common as lotteries, we use two gaming revenue variables: net lottery proceeds and gaming revenues, which is the sum of all three categories of gaming revenues.

Table 2 summarizes the share of own source revenues accounted for by each revenue source in the US states that operated a lottery for at least 10 years. The "years" column shows

the number of years over which these revenue shares were calculated. Nevada, which does not operate a state lottery but does allow casino gambling, has also been included in this table. Like the Canadian provinces, personal income taxes and general sales taxes account for the majority of tax revenues collected by U.S. states. Five states (Florida, Nevada, South Dakota, Texas and Washington) do not collect personal income taxes and four states (Delaware, Montana, New Hampshire and Oregon) do not collect sales taxes.

Gaming revenues and net lottery proceeds do not account for a large share of own source revenues, except in Nevada (21%) which has by far the loosest restrictions on gambling in the U.S. Gambling revenues are more modest but also relatively high in states such as New Jersey (4.6%) and South Dakota (5.7%) that have legalized casino gaming in specific cities in the state (Deadwood in South Dakota and Atlantic City in New Jersey), and revenues are also high in states such as Connecticut (4.3%) that have major Native American casinos that have worked out revenue sharing agreements with the state. A few states (Georgia, Maryland, South Dakota and West Virginia) get more than 3% of their own source revenues from net lottery proceeds. Like Canadian provinces, many U.S. states collect as much or more tax revenues from gambling as from alcohol and tobacco taxes.

**Empirical Model and Results**

This paper borrows from the finance literature to estimate the relationship between gambling tax revenues and other revenues collected by state and provincial governments. In finance the *beta* ($\beta$) of a stock or portfolio is a number measuring its returns to those of an alternative portfolio usually defined as the market as a whole. A beta of zero denotes no

relationship between the idiosyncratic returns of a particular asset and the return earned by the overall market while a positive beta implies that an asset's value is likely to rise along with other assets in the market. A negative beta means that the asset generally decreases in value as the market as whole rises. Beta is calculated as

$$B = \text{Cov}(r_a, r_p)/\text{Var}(r_p) \quad (1)$$

where $r_a$ measures the rate of return of the asset and $r_p$ measures the rate of return of the portfolio. As noted previously, typically the portfolio used in most calculations of beta is the portfolio of all assets in the market as whole.

Beta can be estimated for any individual asset with regression analysis using the rate of return of the individual asset as the dependent variable and the rate of return for the market as a whole as the lone independent variable.

To assess the relationship between variation in specific sources of tax revenues and total own source revenues, we estimate a "beta" for each of the revenue sources. In order to transform the statistic from finance to one that can be used in this application, we interpret the percentage change in own source revenues as each province or state's market return and the percentage change in revenues from each revenue source as the return on specific "assets." Based on these assumptions, the beta for each revenue source, like the beta in finance, can be estimated from a linear regression

$$r_{s,t} = \alpha_s + \beta r_{OS,t} + e_{s,t} \quad (2)$$

where $r_{s,t}$ is the percentage change in annual tax revenues from source $s$ in year $t$, $r_{OS,t}$ is the percentage change in own source revenues in year t, and $e_{s,t}$ is an unobservable equation error term. We assume that $e_{s,t}$ is distributed with mean zero and constant variance $\sigma_e$. $\beta$ is the beta

for revenue source *s*, and measures the sensitivity of variation in own source revenues to variation in revenue source *s* over time.

Table 3 contains the beta estimates for each of the revenue sources in each Canadian province over the period 1989-2009. Each regression had 21 observations and the beta estimates were generally significantly different from zero at conventional levels. Recall that positive beta estimates identify revenue sources that vary with total own source revenues and negative betas identify revenues sources that vary inversely with total own source revenues. Put another way, revenue sources with positive betas increase the variation in own source revenues over time and revenue sources with negative betas reduce the variation in own source revenues over time.

The estimated betas from different revenue sources in Canadian provinces show wide variation with many positive and negative betas. Corporate income taxes have the largest betas, indicating that this source of tax revenue has the largest variation over time. Garrett (2009) reported similar results for US states. In general, income general sales tax, general property tax, sales of goods and services, and investment income betas tend to be positive, indicating positive co-movement between these revenue sources and total own source revenues. Income and general sales taxes contribute to the variation in own source revenues over time.

The negative betas are primarily in alcohol and tobacco taxes, motor fuel taxes, and remitted gaming profits. The beta for remitted gaming profits is negative in six of the ten provinces; the beta for alcohol and tobacco taxes is negative in five provinces. A negative beta indicates that revenues from this source increase when total own source revenues decrease, contributing to stability in total own source revenues over time. The betas on Table 3 indicate that variation in gaming revenue over time helps to reduce overall variation in provincial

revenues; Szakmary and Szakmary (1995) reported a similar result for US states in the 1980s and 1990s. However, from Table 1, remitted gaming profits represent a relatively small fraction of own source revenues, limiting the extent to which variation in gaming revenue can offset variation in own source revenues over time in Canadian provinces.

Note that the betas for Alberta differ from many other provinces. In Alberta, the betas on property taxes, investment income, and the sale of goods and services are all relatively large. From Table 1, these revenue sources make up about 50% of provincial own source revenues. This implies considerable variation in own source revenues in Alberta over time, implying a relatively unstable provincial revenue stream.

Table 4 contains the beta estimates for each of the revenue sources in each US state. The number of observations in each of these regressions is the number of years appearing shown on Table 2, the number of years that each state operated a lottery and reported net lottery revenues in the STC data. The beta estimates were all generally significantly different from zero at conventional levels. An estimated beta of 0.0 on Table 4 means that the estimate was 0.004 or smaller.

The estimated betas for US states shown on Table 4 are similar to those from Canadian provinces. The betas for personal income taxes, corporate income taxes, and general sales taxes tend to be positive, indicating that variation in these revenues sources are positively correlated with variation in total own source revenues and are more volatile than total own source revenues. Alcohol and tobacco taxes, and motor fuel taxes do not have as many negative betas in US states as in Canadian provinces, suggesting that these revenue sources contribute more to total own source revenue variation in the US than in Canada.

Like in Canadian provinces, the estimated betas for gaming revenues and lottery revenues contain many negative values. 14 of the gaming betas are negative, and ten of the lottery betas are negative in the 39 US states in the sample. However, the gaming and lottery betas are not uniformly negative in US states, and some are large and positive, like in Florida, South Dakota, and Maryland. In these sates, variation in gaming and lottery revenue over time enhances the variability of state total own source revenue over time. Variation in the gaming and lottery betas in US states, and Canadian provinces, is probably related to the specific mix of gaming and lottery products in place in each province or state. For example, the beta for gaming revenue in Indiana, a state with a number of riverboat casinos, is negative, while the beta on net lottery returns is positive. Net lottery revenues in Indiana rise and fall with total own source revenues, while revenues from the riverboat casinos do not.

**Conclusions**

The results provide evidence that gaming revenues and revenues from lotteries reduce overall variability in state and provincial revenues over time. The estimated betas for gaming revenues are often negative, and the positive values tend to be smaller than the betas for commonly used alternative revenue sources such as sales or income taxes suggesting that gaming revenues do not fall significantly in the face of declines in other revenue sources. Variation in gaming revenues tends to offset variation in other revenue sources in provinces and sates. However, gaming and lottery revenues tend to be small relative to other revenue sources like sales and income taxes, limiting the ability of variation in gaming revenues that are negatively correlated with total own source revenues to offset declines in total own source revenues.

A majority of the revenue source betas on Tables 3 and 4 are positive, indicating significant positive correlation among revenue sources in provinces and states. This positive correlation means that total own source revenue will vary substantially over time, potentially leading to severe budget shortfalls when these revenue sources all fall together. Unfortunately, unlike private investors who can construct portfolios of assets with both negative and positive betas to smooth out market variation, provinces and states must construct revenue streams with other properties in mind such as efficiency and equity. Revenues from many relatively equitable and efficient taxes appear to have significant positive correlation over time, placing provincial and state decision makers in a bind when attempting to smooth out variation in tax revenues over time.

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Table 1: Share of Total Provincial Revenues, Selected Sources 1989-2009

| Revenue Source | ALB | BC | MAN | NB | N&L | NS | ONT | PEI | QUE | SASK |
|---|---|---|---|---|---|---|---|---|---|---|
| Personal Inc. | 23.5% | 26.0% | 28.3% | 26.6% | 27.1% | 33.8% | 35.7% | 25.9% | 39.3% | 22.3% |
| Corporate Inc. | 8.8% | 5.5% | 4.3% | 4.5% | 4.2% | 5.3% | 9.6% | 4.2% | 5.2% | 4.0% |
| General Sales | -- | 16.3% | 17.0% | 21.9% | 25.6% | 23.8% | 21.9% | 24.2% | 15.6% | 13.6% |
| Alcohol/Tobac. | 2.4% | 2.6% | 2.5% | 2.0% | 5.3% | 3.1% | 2.5% | 5.3% | 1.9% | 2.4% |
| Motor Fuels | 3.2% | 4.4% | 4.0% | 5.6% | 5.5% | 5.8% | 4.9% | 5.6% | 3.8% | 5.7% |
| Gaming | 3.7% | 2.3% | 3.5% | 2.4% | 3.3% | 3.1% | 2.0% | 2.0% | 2.5% | 3.0% |
| General Prop. | 4.7% | 6.6% | 3.6% | 7.6% | 0.1% | -- | 0.1% | 7.9% | 0.0% | 0.0% |
| Sale Gds/Serv. | 3.5% | 3.2% | 3.3% | 4.3% | 5.8% | 6.1% | 3.8% | 8.4% | 4.2% | 4.9% |
| Investment Inc. | 41.9% | 21.9% | 19.0% | 16.8% | 12.8% | 9.6% | 4.6% | 9.7% | 7.0% | 27.2% |

Table 2: Share of Total US State Revenues, Selected Sources and Years

| State | Pers. Inc. | Corp. Inc. | Gen. Sales | Alc. & Tobac. | Motor Fuels | Gaming | Lottery | Prop. | Gds. Serv. | Inv. Inc. | Years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **AZ** | 20.0% | 4.9% | 36.5% | 2.2% | 6.1% | 1.3% | 1.2% | 3.7% | 1.1% | 4.3% | 25 |
| **CA** | 32.9% | 8.0% | 26.0% | 1.3% | 3.4% | 1.4% | 1.2% | 3.8% | 4.2% | 3.8% | 21 |
| **CO** | 3.2% | 3.0% | 19.7% | 1.6% | 6.4% | 1.6% | 1.1% | 0.1% | 0.6% | 6.8% | 24 |
| **CT** | 16.0% | 8.1% | 30.1% | 3.1% | 5.6% | 4.3% | 2.3% | --- | 1.5% | 5.4% | 34 |
| **DE** | 26.1% | 6.2% | --- | 1.7% | 3.8% | 3.4% | 3.2% | --- | 2.2% | 8.7% | 31 |
| **FL** | --- | 4.2% | 46.0% | 3.9% | 5.3% | 3.7% | 3.3% | 2.1% | 0.1% | 4.0% | 19 |
| **GA** | 35.7% | 4.3% | 27.8% | 1.6% | 4.0% | 4.3% | 4.3% | 0.3% | 0.1% | 2.3% | 13 |
| **IA** | 26.7% | 3.2% | 22.6% | 1.9% | 6.0% | 2.2% | 0.7% | 0.0% | 1.9% | 3.9% | 21 |
| **ID** | 27.8% | 4.1% | 25.4% | 1.4% | 6.8% | 0.8% | 0.8% | 0.0% | 2.4% | 7.5% | 17 |
| **IL** | 24.9% | 6.7% | 25.3% | 2.6% | 5.3% | 3.6% | 2.3% | 0.9% | 0.3% | 5.1% | 32 |
| **IN** | 26.5% | 6.0% | 26.3% | 1.4% | 5.3% | 3.4% | 1.4% | 0.0% | 0.0% | 4.8% | 17 |
| **KS** | 27.4% | 4.7% | 27.3% | 2.6% | 6.0% | 0.9% | 0.8% | 0.8% | 0.1% | 3.8% | 19 |
| **KY** | 24.5% | 4.0% | 20.9% | 1.0% | 4.8% | 1.7% | 1.5% | 4.5% | 0.0% | 5.2% | 18 |
| **LA** | 15.5% | 3.0% | 20.6% | 1.5% | 5.5% | 3.7% | 1.3% | 0.4% | 0.5% | 9.8% | 15 |
| **MA** | 38.7% | 8.4% | 15.4% | 3.2% | 4.0% | 3.5% | 3.0% | 0.0% | 0.7% | 5.3% | 34 |
| **MD** | 32.1% | 3.7% | 18.6% | 1.9% | 5.7% | 3.8% | 3.5% | 2.3% | 2.2% | 4.2% | 34 |
| **ME** | 23.5% | 3.8% | 25.4% | 4.7% | 6.4% | 1.2% | 1.0% | 2.0% | 4.0% | 6.5% | 33 |
| **MI** | 24.2% | 9.9% | 23.9% | 3.1% | 5.1% | 2.7% | 2.4% | 3.6% | 3.9% | 4.0% | 34 |
| **MN** | 33.1% | 4.8% | 22.7% | 1.8% | 4.1% | 0.8% | 0.5% | 0.9% | 0.0% | 3.7% | 17 |
| **MO** | 29.2% | 3.2% | 26.8% | 1.5% | 5.8% | 2.4% | 1.3% | 0.2% | 0.4% | 6.2% | 21 |
| **MT** | 22.8% | 4.3% | --- | 2.0% | 8.5% | 2.3% | 0.4% | 9.3% | 3.1% | 12.5% | 19 |
| **NE** | 26.5% | 3.6% | 26.1% | 1.8% | 7.1% | 0.7% | 0.5% | 0.1% | 0.6% | 5.2% | 13 |
| **NH** | 2.7% | 12.1% | --- | 5.7% | 8.5% | 3.6% | 1.9% | 4.0% | 23.3% | 11.4% | 34 |
| **NJ** | 20.2% | 7.3% | 22.7% | 3.3% | 3.9% | 4.6% | 2.9% | 0.7% | 6.0% | 5.2% | 34 |
| **NM** | 15.2% | 3.1% | 25.1% | 1.1% | 3.9% | 0.8% | 0.4% | 0.7% | 5.1% | 13.0% | 11 |
| **NV** | --- | --- | 39.9% | 3.1% | 6.3% | 21.0% | --- | 2.9% | 7.3% | 5.1% | 33 |
| **NY** | 40.3% | 6.9% | 17.1% | 2.6% | 2.1% | 2.5% | 2.0% | 0.0% | 17.2% | 5.4% | 34 |
| **OH** | 24.4% | 4.7% | 24.2% | 2.8% | 6.3% | 2.9% | 2.7% | 0.7% | 3.8% | 3.2% | 32 |
| **OR** | 43.4% | 3.9% | --- | 2.3% | 4.9% | 2.6% | 2.6% | 0.1% | 3.8% | 10.2% | 22 |
| **PA** | 20.6% | 7.4% | 23.5% | 3.3% | 5.2% | 2.7% | 2.6% | 0.8% | 4.8% | 3.4% | 34 |
| **RI** | 23.1% | 4.4% | 21.4% | 3.3% | 4.7% | 3.5% | 3.0% | 0.5% | 2.7% | 10.8% | 33 |
| **SD** | --- | 3.2% | 32.4% | 2.4% | 8.1% | 5.7% | 5.5% | --- | 0.3% | 15.3% | 19 |
| **TX** | --- | --- | 35.7% | 3.0% | 7.1% | 2.9% | 2.8% | --- | 0.2% | 5.7% | 14 |
| **VA** | 34.2% | 2.7% | 14.3% | 0.9% | 5.1% | 2.0% | 2.0% | 0.1% | 2.0% | 5.2% | 18 |
| **VT** | 21.7% | 3.6% | 12.0% | 3.3% | 4.6% | 0.9% | 0.9% | 5.9% | 3.6% | 7.7% | 29 |
| **WA** | --- | --- | 48.0% | 3.0% | 5.3% | 1.0% | 0.9% | 11.9% | 2.9% | 3.0% | 24 |
| **DC** | 22.8% | 5.3% | 15.2% | 0.6% | 0.9% | 1.8% | 1.8% | 23.4% | 3.7% | 2.5% | 20 |
| **WI** | 32.9% | 4.4% | 22.3% | 2.0% | 5.7% | 1.1% | 1.1% | 0.6% | 0.1% | 4.9% | 18 |
| **WV** | 19.6% | 5.7% | 22.4% | 1.3% | 6.0% | 3.4% | 3.1% | 0.1% | 1.6% | 5.0% | 21 |

Table 3: Revenue Source Beta Estimates - Canadian Provinces

| **Revenue Source** | **ALB** | **BC** | **MAN** | **NB** | **N&L** | **NS** | **ONT** | **PEI** | **QUE** | **SASK** |
|---|---|---|---|---|---|---|---|---|---|---|
| Personal Income | -0.22 | 1.31 | 1.54 | 1.22 | 0.51 | 1.59 | 0.96 | 1.61 | 1.20 | 0.01 |
| Corporate Income | 0.82 | 1.87 | 2.16 | 7.67 | 2.59 | 0.81 | 3.09 | 1.07 | 0.60 | 0.54 |
| General Sales | ---- | 0.68 | 0.09 | 0.83 | 0.74 | 0.66 | 0.57 | 0.30 | 1.11 | 0.14 |
| Alcohol,Tobacco | -0.13 | -0.29 | -0.74 | -0.59 | 0.27 | 2.67 | -0.53 | 0.26 | 1.54 | 0.08 |
| Motor Fuels | 0.03 | 0.17 | 0.29 | 0.53 | 0.03 | -0.15 | -0.12 | 1.11 | -0.43 | -0.12 |
| Gaming | 0.18 | -0.33 | -0.32 | -0.26 | -0.64 | -3.13 | 0.32 | 0.84 | -0.15 | 5.96 |
| General Property | 1.47 | 0.31 | -0.09 | 0.28 | 0.81 | ---- | 19.09 | 0.58 | 11.43 | 0.38 |
| Sale Goods, Serv. | 6.56 | -0.47 | 0.23 | 0.37 | 0.30 | 1.25 | 2.20 | 2.10 | -0.54 | -0.09 |
| Investment Inc. | 1.86 | 1.59 | 1.50 | 0.73 | 4.09 | 1.30 | -0.06 | 1.18 | 3.33 | 1.80 |

Table 4: Revenue Source Beta Estimates - US States

| State | Pers. Inc. | Corp. Inc. | Gen. Sales | Alc. & Tobac. | Motor Fuels | Gaming | Lottery | Prop. | Gds. Serv. | Inv. Inc. |
|---|---|---|---|---|---|---|---|---|---|---|
| **AZ** | 0.87 | 1.55 | 1.04 | -0.08 | 0.80 | 0.48 | 0.38 | 0.46 | 0.02 | 4.15 |
| **CA** | 1.92 | 1.44 | 0.34 | 1.23 | -0.34 | -0.05 | -0.07 | 0.86 | 0.46 | 0.90 |
| **CO** | 1.04 | 3.13 | 0.87 | 1.59 | 0.81 | -0.43 | -1.10 | 3.30 | -1.16 | 1.45 |
| **CT** | 5.84 | 1.63 | 0.69 | 0.00 | 0.41 | 1.56 | 2.02 | -1.13 | 3.46 | 0.21 |
| **DE** | 0.74 | 2.50 | --- | -0.17 | -2.03 | -0.31 | 0.92 | --- | 4.89 | 0.70 |
| **FL** | --- | 0.97 | 0.78 | 0.05 | -0.77 | 6.15 | 10.37 | 2.67 | -2.08 | 1.09 |
| **GA** | 1.29 | 2.28 | 0.75 | 0.64 | 0.57 | 2.16 | 2.16 | 0.09 | 4.54 | 0.96 |
| **IA** | 1.50 | 3.06 | 1.36 | 0.56 | 0.96 | -0.80 | 2.65 | --- | -0.90 | 0.88 |
| **ID** | 1.37 | 3.03 | 0.66 | 0.74 | 0.07 | -2.28 | -2.39 | -22.90 | -0.17 | 0.33 |
| **IL** | 1.51 | 2.40 | 0.62 | -0.25 | 1.50 | 0.48 | 0.57 | 25.44 | 4.85 | 2.06 |
| **IN** | 0.25 | 1.88 | 0.24 | 0.34 | -0.10 | -1.30 | 0.07 | -0.75 | 1.88 | 0.80 |
| **KS** | 1.46 | 2.84 | 0.71 | -0.29 | 0.44 | 3.55 | 2.74 | -0.01 | 1.06 | 2.72 |
| **KY** | 1.88 | 3.91 | 0.79 | 3.09 | -0.12 | -1.26 | -1.15 | 0.29 | 1.05 | 1.72 |
| **LA** | 1.00 | 2.05 | 0.53 | -0.26 | -0.11 | -0.39 | 0.55 | 0.06 | 7.92 | 1.32 |
| **MA** | 1.23 | 1.40 | 1.23 | -0.04 | 0.26 | 0.23 | 0.67 | -53.64 | 5.23 | 1.69 |
| **MD** | 0.99 | 2.32 | 1.10 | -0.06 | 0.52 | 2.85 | 5.45 | 1.13 | 0.71 | 3.69 |
| **ME** | 0.40 | 1.53 | 0.36 | 0.31 | 0.25 | 1.77 | 3.31 | 19.21 | 0.10 | 0.46 |
| **MI** | 1.76 | 3.07 | 1.02 | 0.42 | 0.52 | 0.52 | 0.79 | 1.11 | 0.11 | 0.67 |
| **MN** | 1.45 | 3.03 | 0.62 | 2.93 | 0.13 | -3.02 | -3.17 | -154.75 | 0.13 | 3.74 |
| **MO** | 1.51 | 2.26 | 0.39 | 0.58 | 1.81 | 1.82 | 0.34 | -0.02 | 9.15 | 2.50 |
| **MT** | 0.40 | 1.44 | --- | 0.17 | 0.29 | 1.30 | 1.95 | 5.44 | 0.37 | 0.47 |
| **NE** | 0.61 | 1.64 | 1.46 | 1.14 | 0.12 | -0.53 | -0.89 | -2.36 | 0.48 | -0.36 |
| **NH** | 0.00 | 0.47 | --- | 0.13 | 0.18 | -0.03 | 0.48 | 782.26 | 0.42 | 0.30 |
| **NJ** | 9.00 | 1.69 | 0.28 | 0.12 | -0.04 | 0.63 | 0.89 | 0.39 | 2.21 | 0.61 |
| **NM** | -0.18 | 3.18 | 0.86 | 0.01 | 0.02 | 2.29 | 1.66 | -0.56 | 3.37 | 1.37 |
| **NV** | --- | --- | 1.92 | 0.34 | 0.93 | 0.37 | --- | 0.29 | -0.83 | 1.53 |
| **NY** | 1.20 | 1.94 | 0.45 | 0.45 | -0.06 | 0.80 | 2.34 | -6.94 | -0.87 | 1.71 |
| **OH** | 1.70 | 1.01 | 1.20 | -1.35 | 0.44 | 1.47 | 1.98 | -1.31 | 0.42 | 0.99 |
| **OR** | 1.43 | 1.31 | --- | 0.28 | 0.90 | 1.77 | 1.51 | 133.43 | -0.46 | 2.58 |
| **PA** | 1.37 | 1.99 | 0.26 | 0.04 | -0.64 | 1.12 | 1.38 | 1.60 | 0.08 | 0.40 |
| **RI** | 1.34 | 1.63 | 0.46 | -0.68 | 0.17 | -1.06 | -0.63 | 0.99 | 2.64 | 2.40 |
| **SD** | --- | 1.11 | 0.96 | 0.43 | -0.02 | 4.57 | 4.69 | --- | 1.11 | 1.88 |
| **TX** | --- | --- | 0.73 | 0.35 | 0.02 | -0.25 | -0.25 | --- | 4.26 | 3.05 |
| **VA** | 1.89 | 5.12 | 0.44 | 2.06 | 0.16 | -1.47 | -1.47 | 3.49 | 0.32 | 1.25 |
| **VT** | 0.60 | 0.77 | 0.57 | -0.95 | 0.24 | 1.38 | 3.19 | 64.62 | 0.24 | 0.42 |
| **WA** | --- | --- | 1.06 | 0.21 | 0.87 | 1.81 | 1.80 | 0.87 | 0.07 | 3.08 |
| **DC** | 0.77 | 0.45 | 0.96 | -0.50 | -0.46 | 0.09 | 0.09 | 0.99 | 1.07 | 3.26 |
| **WI** | 1.86 | 1.09 | 0.30 | 0.28 | 0.72 | -0.35 | -0.39 | 1.06 | -43.22 | 0.73 |
| **WV** | 1.07 | 1.51 | 2.12 | 0.13 | 0.79 | 0.31 | 1.72 | -0.86 | 1.38 | 0.45 |