



*"Working together to
fund Washington's future"*

Seeing the big picture

Interactive data visualizations

Kim Davis, Washington State Department of Revenue
September 26, 2017

We have lots of data

Our challenge is to:

- ✓ Collect data
- ✓ Provide the information to decision makers
- ✓ In a simple, but useful form, that can be understood by a broad audience

Our customers include:

- ✓ Legislators and legislative staff
- ✓ Local governments
- ✓ Lobbyists
- ✓ General public

Data visualizations

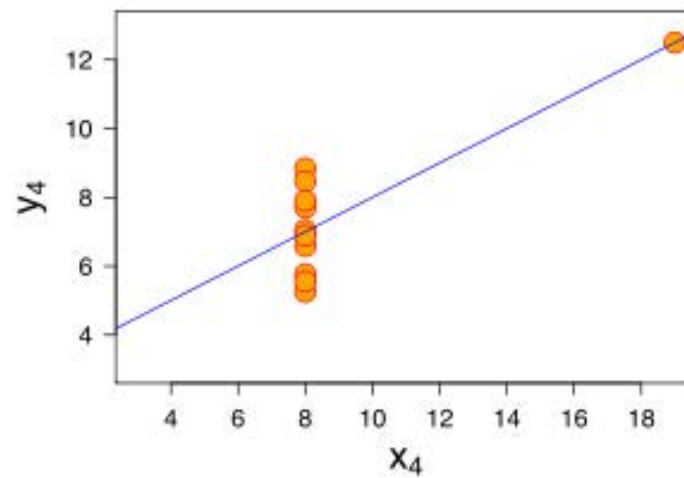
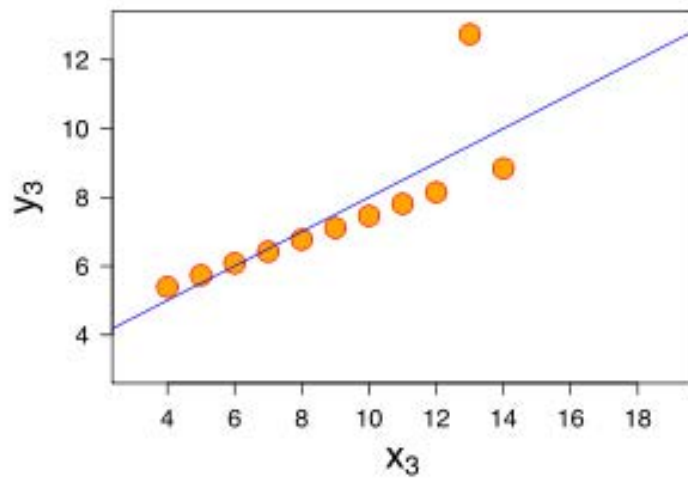
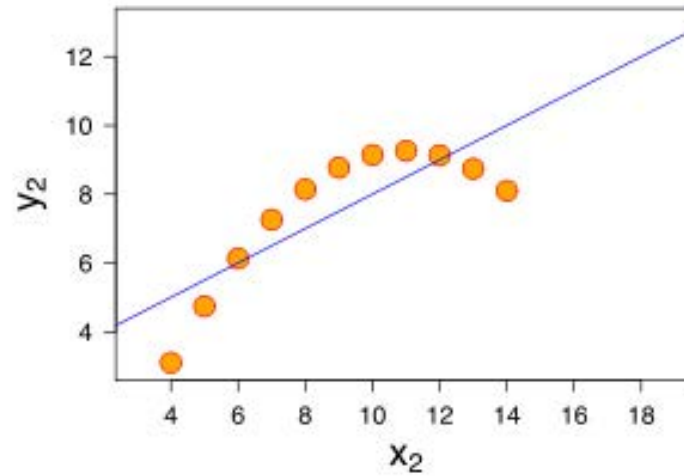
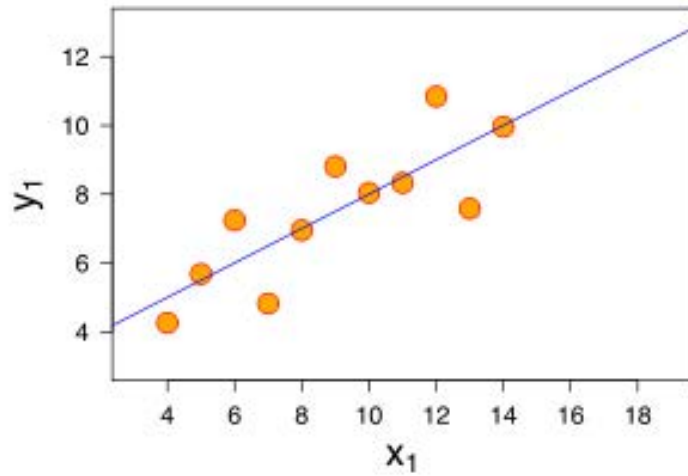
- Consolidate data into a picture or graphic format.
- Help broader audiences understand complex data.
- Make it easy to see:
 - patterns
 - trends
 - correlations
 - anomalies
- Allow users to formulate their own questions and find the answers.

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Anscombe's quartet

<i>Data Set A</i>		<i>Data Set B</i>		<i>Data Set C</i>		<i>Data Set D</i>	
X	Y	X	Y	X	Y	X	Y
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89

Anscombe's quartet



Interactive data

Making data interactive

The Department uses Tableau, a software that renders data into easy-to-use, interactive visual dashboards.

Interactive data visualizations give users the power to quickly view large amounts of data and drill down into the information they are looking for.

Selecting the data

- ✓ What data do we already provide on our website?
- ✓ Is it provided in a way that is useful to our customers?
- ✓ What are the frequently asked questions concerning the data?
- ✓ Are there questions we are currently unable to answer?
- ✓ Do we need to combine additional data to reduce questions?
- ✓ What data do users find most confusing?
- ✓ Is there a better way to present our current data?

Data from our website

Public Disclosure Reports

Certain tax preferences require the business claiming them to file either an Annual Report or Annual Survey. The information contained in the **Annual Report** is disclosable to the public. It is mostly employee wage and benefits data and does not include the dollar value of the tax preference claimed. The **Annual Survey** contains the dollar value of the tax preference claimed in addition to employee wage and benefit data. However, only the dollar value of the tax preference is publically disclosable. A business may ask the amount not be disclosed if it is less than \$10,000.

IMPORTANT

All information is originally supplied by the business and has not necessarily been verified by the Department through audit or other direct examination of the business's books and records. The information contained in some of the Surveys and Reports may change each time the data is published as the Department reviews and validates the submitted information.

Starting in 2017, it is the Department's intent to publish this information three times per year as follows:

- June 30 for surveys submitted by the May 31 deadline.
- September 30 to include surveys submitted during an approved 90 day extension period.
- December 31 to coincide with the publication of the annual *Descriptive Statistics for Select Tax Incentives*.

Annual Surveys

- 2016
- 2015
- 2014
- 2013
- 2012
- 2011
- 2010
- 2009
- 2008
- 2007
- 2006
- 2005
- 2004

Annual Reports

- 2016
- 2015
- 2014
- 2013
- 2012
- 2011
- 2010
- 2009
- 2008
- 2007
- 2006
- 2005
- 2004

- ✓ The Department has 13 years of survey data for businesses taking certain tax preferences.
- ✓ There is broad interest in this data.
- ✓ We receive questions from the media, Legislature, lobbyists, and general public about this data.
- ✓ You can open one year of data at a time, so its difficult to analyze over time.

Data from our website

TRN	Business Name	Non-Disclosure Requested	High Technology Business & Occupation Tax Credit	Rural County Sales & Use Tax Deferral* (Cumulative Projects Totals)	Rural County Sales & Use Tax Deferral** (Annual Amount)	High Technology Sales & Use Tax Deferral* (Cumulative Projects Totals)	High Technology Sales & Use Tax Deferral** (Annual Amount)	Fruit and Vegetable Business B&O Tax Exemption
036-002-642	BATTELLE MEMORIAL INSTITUTE	No				4,717,973.00	589,746.63	
041-000-061	BLUE STAR GROWERS INC	No						
042-000-052	TROUT-BLUE CHELAN-MAGI INC	No						
048-000-160	NORTHERN FRUIT COMPANY	No						
065-002-678	PUD #1 CLARK COUNTY	No						
065-011-931	COLUMBIA VISTA CORPORATION	No						
066-001-132	PORT OF CAMAS-WASHOUGAL	No						
081-001-326	BUKER RAYMOND H	No						
113-001-191	P U D #1 FRANKLIN COUNTY	No						
141-003-192	ANDERSON & MIDDLETON LOGGING COMPANY	No						
141-004-575	OCEAN SPRAY CRANBERRIES INC	No		1,038,480.00	129,810.00			252,902.84
141-007-033	TIKKA CONSTRUCTION CO INC	No						
145-001-198	VAUGHAN CO INC	No		2,978.00	372.25			

When open, you get a large table of data.

<https://fortress.wa.gov/dor/efile/MyAccount/TaxIncentivePublicDisclosure/SurveyPublicDisclosure.aspx?TaxYear=2016>

Setting up the data

Reformat data from column to row oriented table. In this example add:

- Incentive Program
- Year
- Amount of Benefit

Incentive Program	Tax Registration	Business Name	Year	Amount of Benefit
Timber Industry B&O Reduced Rates	603610445	KAPSTONE KRAFT PAPER CORPORATION	2016	4147.61
Timber Industry B&O Reduced Rates	603610485	KAPSTONE CONTAINER CORPORATION	2016	236.75
Timber Industry B&O Reduced Rates	603611215	CEDAR RIVER FOREST PRODUCTS LLC	2016	162.87
Timber Industry B&O Reduced Rates	603613138	CALDWELL TIMBER INC	2016	33.41
High Technology Sales & Use Tax Deferral (Cumulative Projects)	603615894	APTEVO THERAPEUTICS INC	2016	639521
High Technology Sales & Use Tax Deferral (Annual Amount)	603615894	APTEVO THERAPEUTICS INC	2016	79940.13
Aerospace FAR Part 145 Reduced B&O Tax Rate	603620539	PACIFIC AERO TECH LLC	2016	7541.23
Aerospace Preproduction Expenditures B&O Tax Credit	603620904	SYNCRONESS INCORPORATED	2016	1024.11
Aerospace Product Development Reduced B&O Tax Rate	603620904	SYNCRONESS INCORPORATED	2016	780.94
Timber Industry B&O Reduced Rates	604001347	FORKS FIBER INC	2016	858.11
Timber Industry B&O Reduced Rates	604003630	JS SAWMILLING LLC	2016	14.76
Timber Industry B&O Reduced Rates	604004945	IFG SALES CORP	2016	15766.5
Timber Industry B&O Reduced Rates	604012261	WISS JOHN R	2016	630.98
Aerospace Product Development Reduced B&O Tax Rate	604013923	MAESTRO ENGINEERING LLC	2016	359.84
Aerospace Product Development Reduced B&O Tax Rate	604014325	DATABASED SOLUTIONS INC	2016	465.42
Timber Industry B&O Reduced Rates	604016670	NIPPON DYNAWAVE PACKAGING CO	2016	250072.91
Hog Fuel Sales & Use Tax Exemption (by facility)	604016670	NIPPON DYNAWAVE PACKAGING CO	2016	89145.02
Aerospace Manufacturers Reduced B&O Tax Rates	604022339	HARTWELL CORPORATION	2016	18164.95

Picking the right chart



Do you want to:

- ✓ Analyze data over time?
- ✓ Compare values and rank?
- ✓ Understand the correlation between value sets?
- ✓ See the distribution of your data, and help find outliers?
- ✓ Show how individual parts make up the whole?
- ✓ Present geographic data?

More than one type of chart may work for your analysis. Tableau lets you quickly view your data in different chart types.

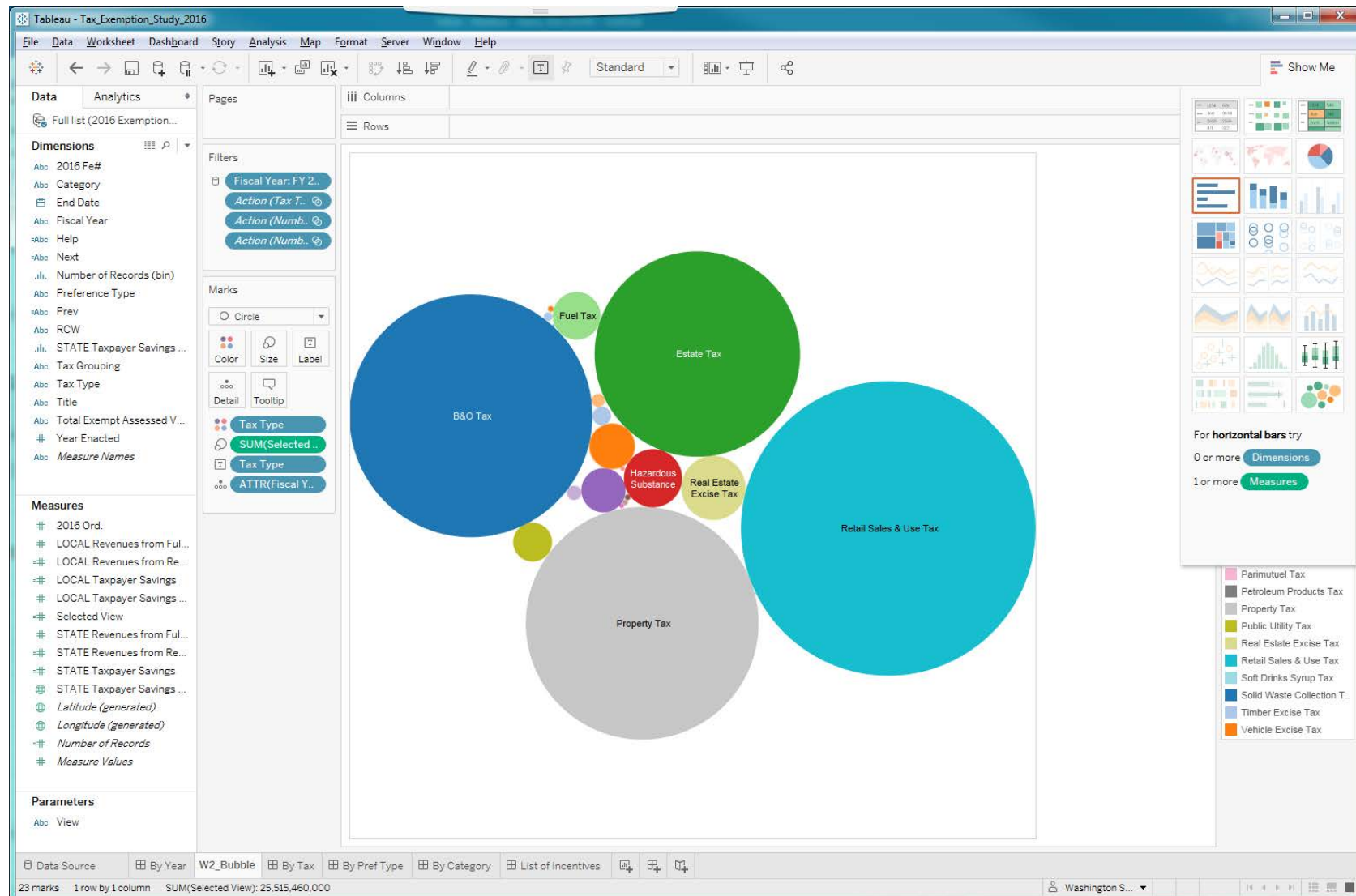
Data as a table in Tableau

The screenshot displays the Tableau interface for a data source named 'Full list (2016 Exemption...'. The main view is a table with the following data:

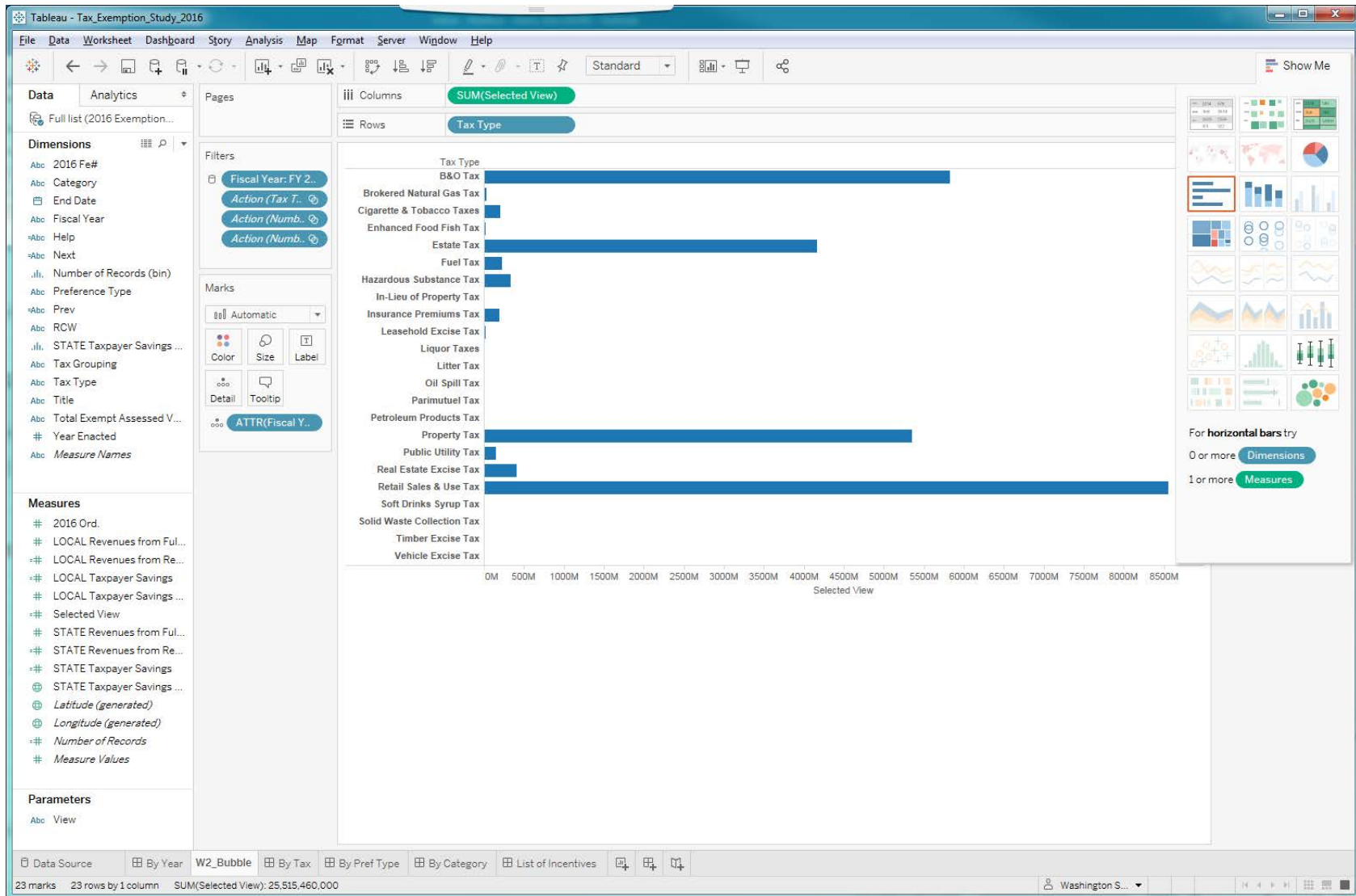
Tax Type	Value
B&O Tax	5,827,148,000
Brokered Natural Gas Tax	33,920,000
Cigarette & Tobacco Taxes	206,200,000
Enhanced Food Fish Tax	17,637,000
Estate Tax	4,165,950,000
Fuel Tax	225,655,000
Hazardous Substance Tax	334,269,000
In-Lieu of Property Tax	2,370,000
Insurance Premiums Tax	193,687,000
Leasehold Excise Tax	20,965,000
Liquor Taxes	3,069,000
Litter Tax	3,281,000
Oil Spill Tax	2,109,000
Parimutuel Tax	6,000
Petroleum Products Tax	0
Property Tax	5,347,940,000
Public Utility Tax	150,076,000
Real Estate Excise Tax	407,779,000
Retail Sales & Use Tax	8,561,689,000
Soft Drinks Syrup Tax	0
Solid Waste Collection Tax	399,000
Timber Excise Tax	7,950,000
Vehicle Excise Tax	3,361,000

The interface also shows a sidebar with dimensions (e.g., 2016 Fe#, Category, End Date) and measures (e.g., SUM(Selected View), ATTR(Fiscal Year)). A 'Show Me' panel on the right provides visualization options, including a note: 'For horizontal bars try 0 or more Dimensions, 1 or more Measures'.

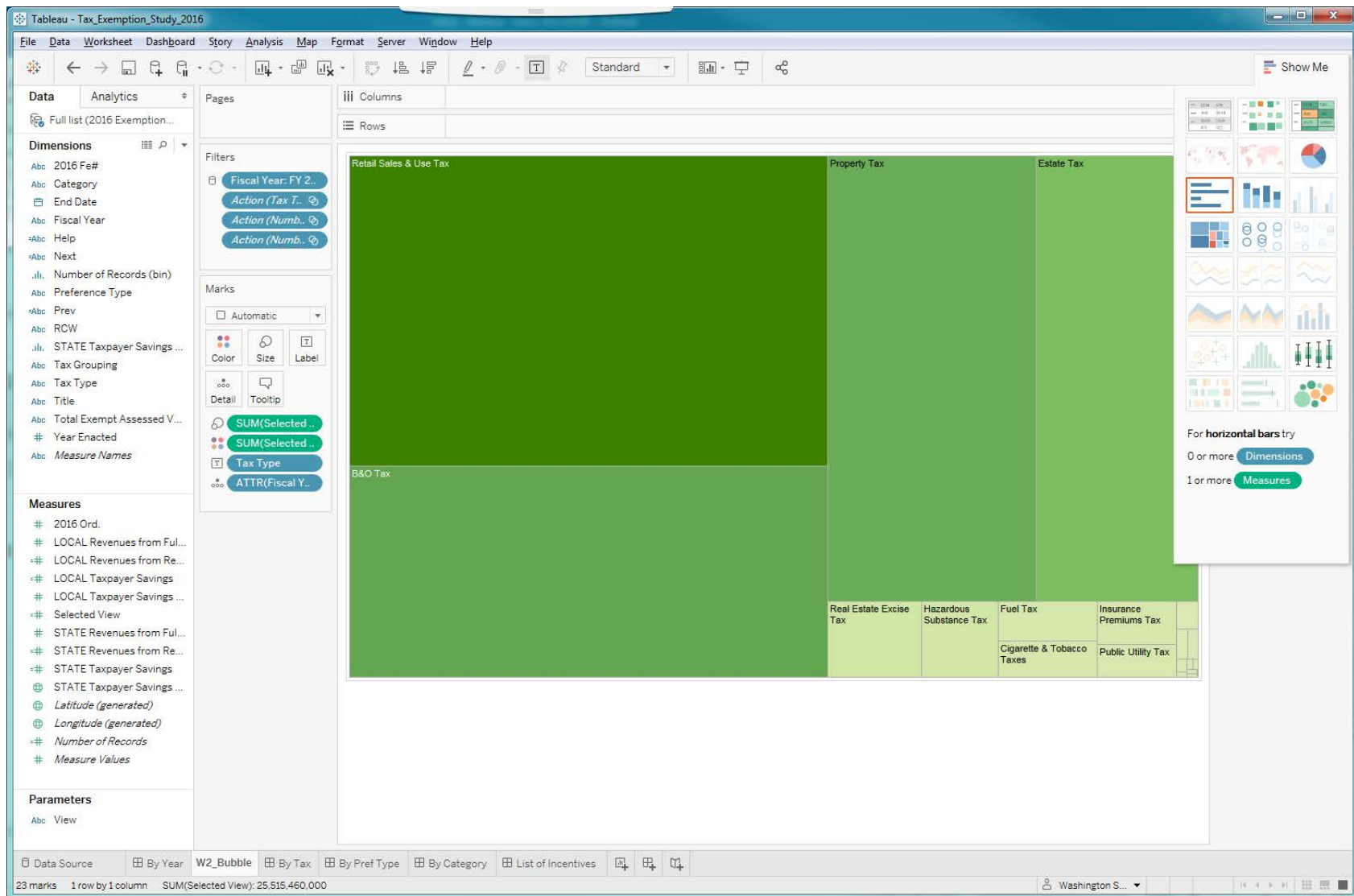
One click to show data as bubbles



Another click for a bar chart



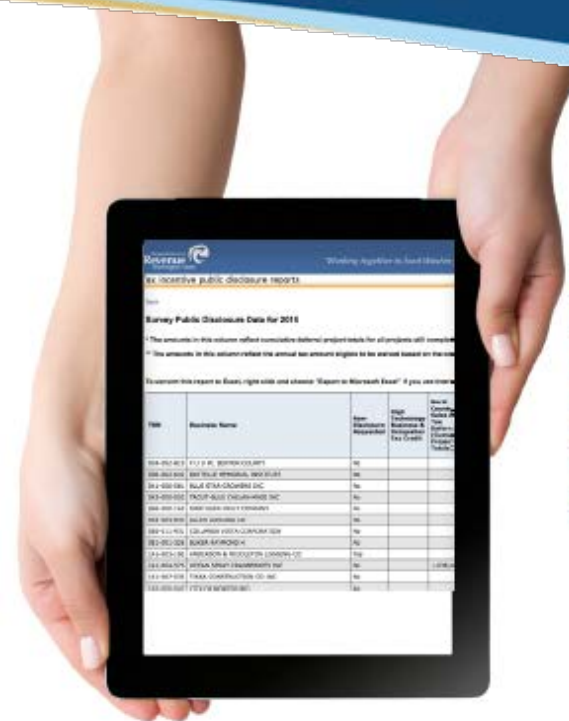
Yet one more click to see a tree chart



The results

Users can apply different filters to see:

- Total benefit of specific tax incentives.
- All businesses that have taken a particular tax incentive.
- Which businesses saw the greatest tax benefit in a given year.
- All tax preferences taken by a specific business.



Click the image to see how users previously had to navigate the tax preference information provided in the annual survey format, sorting through 1,862 rows of names and 49 columns of tax preferences.

<https://fortress.wa.gov/dor/efile/MyAccount/TaxIncentivePublicDisclosure/SurveyPublicDisclosure.aspx?TaxYear=2015>

Click the image to see how users navigate tax incentive data now, using Tableau software.

<https://public.tableau.com/profile/revenue#1/>



What we have learned

While visualizations boost the value of the data and reports for customers, we have learned:

- ✓ Some types of data and statistics do not fit well into visualizations.
- ✓ When developing a visualization, work with data experts to draw out the most compelling information.
- ✓ An education and outreach strategy is important when unveiling new visualizations.
- ✓ Data visualizations do not replace data tables. Instead, they provide another way to view the data.



User praise

The Tax Exemption Study visualization grabbed the attention of policy think tanks, legislators, tax professionals and other state agencies, who were impressed that it was so easy to use and boosted tax data transparency.

"These visualizations are a fantastic tool that boost government transparency. They make it so easy to sift through reams of data and find quick answers to important tax questions that help guide policy decisions."

— *Drew Shirk*
Governor's office

"Ultimately, if government is going to live up to the promise and potential of big data, that data — and the way it is presented — has to be accurate, relevant and easily understandable. Revenue's data visualization work is a great example of all of those, and of how Revenue is helping lead the way forward."

— *Rich Roesler*,
Results Washington

"I would like to see other agencies put energy and resources into doing these visualizations. Prior to having this visualization, you went to the report and had to click on 10 hyperlinks to really find all the information. Having the visualizations is very user-friendly for people."

— *Jason Mercier*,
Washington Policy Center

"With its exciting and innovative data visualization efforts, Revenue is leading the way for the rest of state government. The department's visualizations are providing fast and easy-to-understand access to mountains of tax and revenue information."

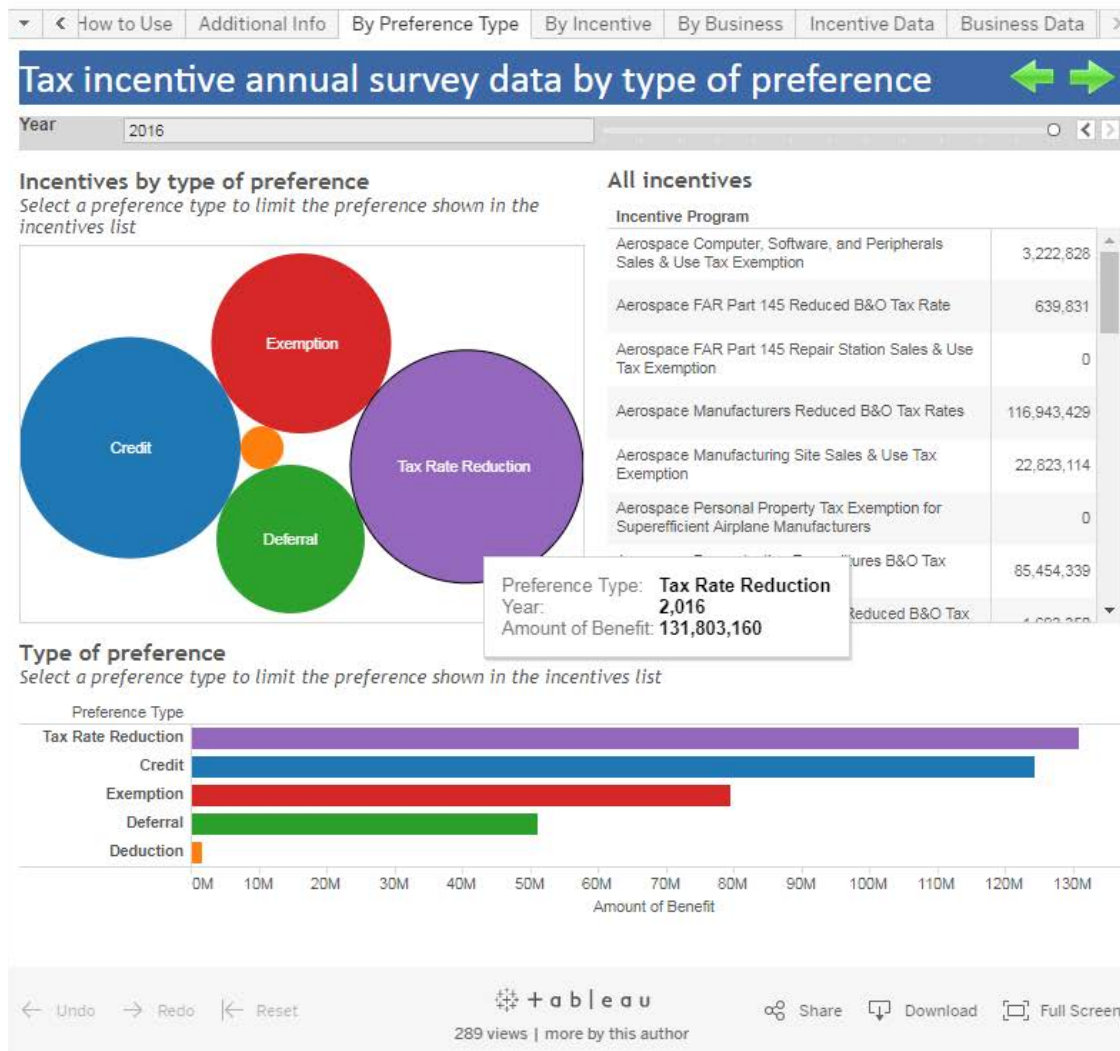
— *David Schumacher*,
Office of Financial Management

"@WASateDOR 2016 report outlines 694 tax exemptions. Good data to inform the public."

— *Senator Reuven Carlyle via Twitter*

Examples

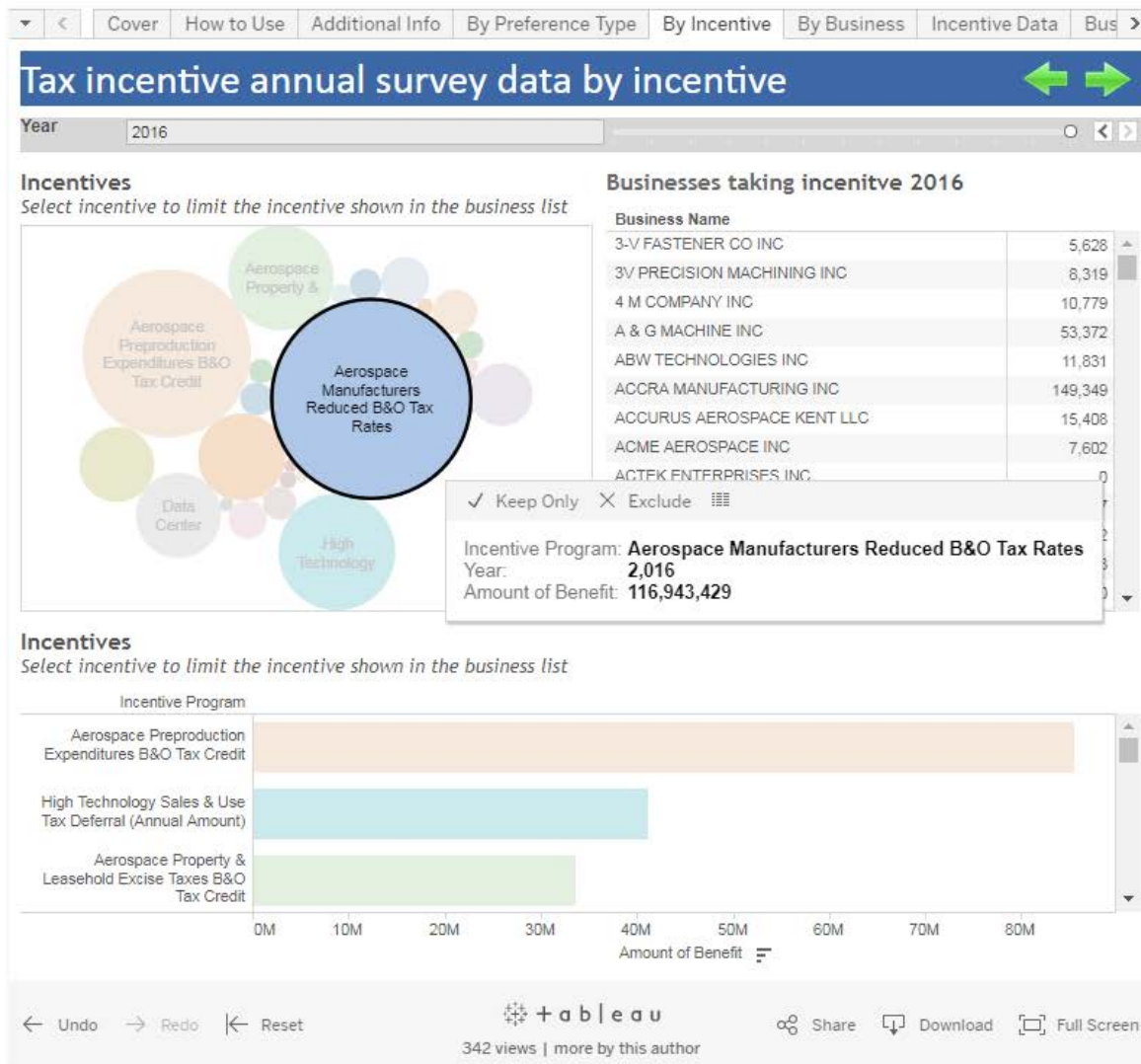
Tax incentive data by preference type



Users may:

- ✓ Change year to view
- ✓ Hover over bubbles and bars to see more information
- ✓ Click on a bar or bubble to filter incentive programs for a specific type of preference.

Tax incentive data by incentive

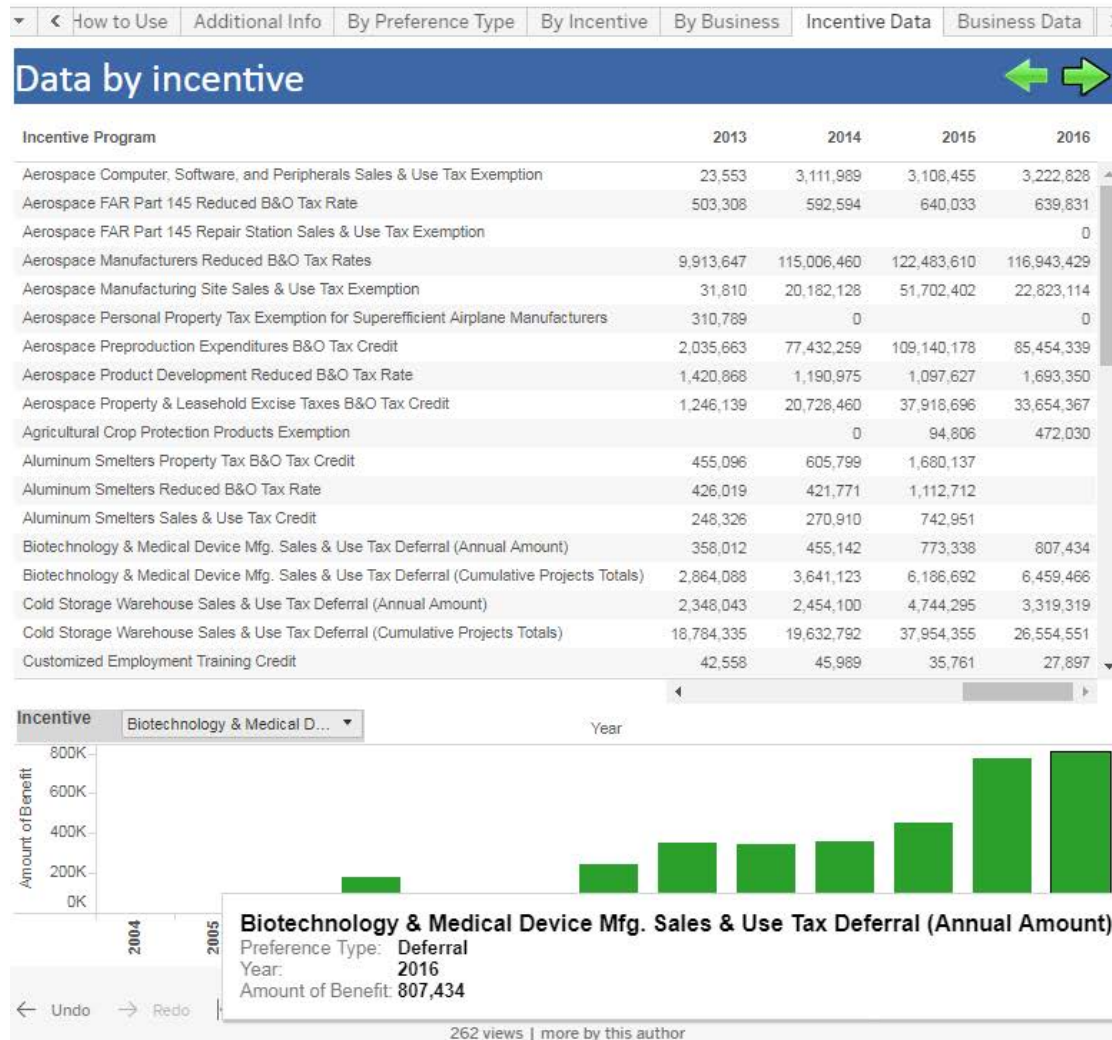


Users may:

- ✓ Change year to view
- ✓ Hover over bubbles and bars to see more information
- ✓ Click on a bar or bubble to filter incentive programs for a specific type of preference.

Note: In this screen shot the blue bubble was clicked on. This fades out other bubbles and bars, and filters the businesses to just list the businesses taking that incentive and the amount of benefit received.

Tax incentive data by year

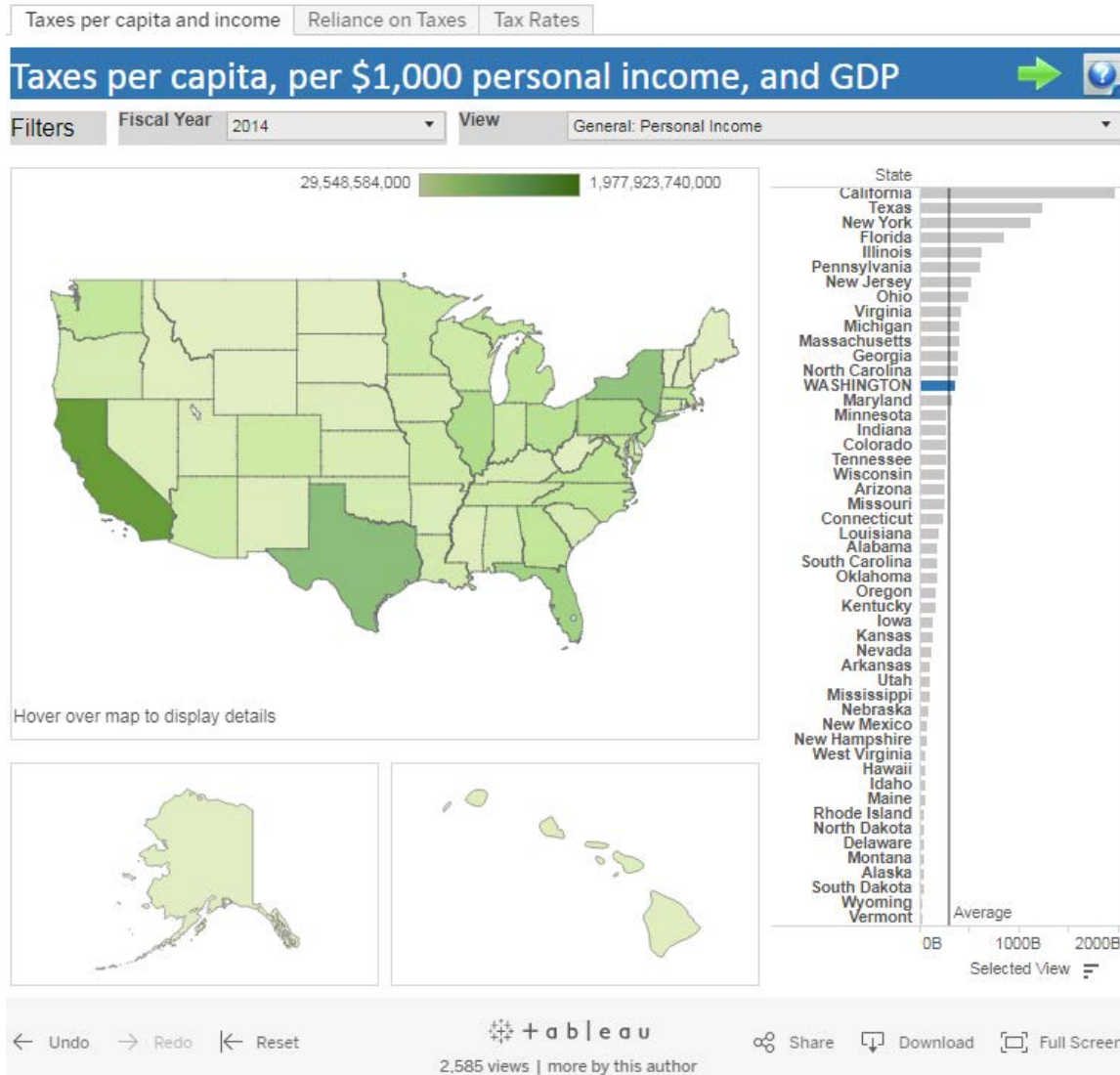


This view provides a view of all of the summarized data.

It is less interactive, however users may:

- ✓ Select a specific incentive to view
- ✓ Hover over the bar chart to view additional information

Compare state and local taxes by state

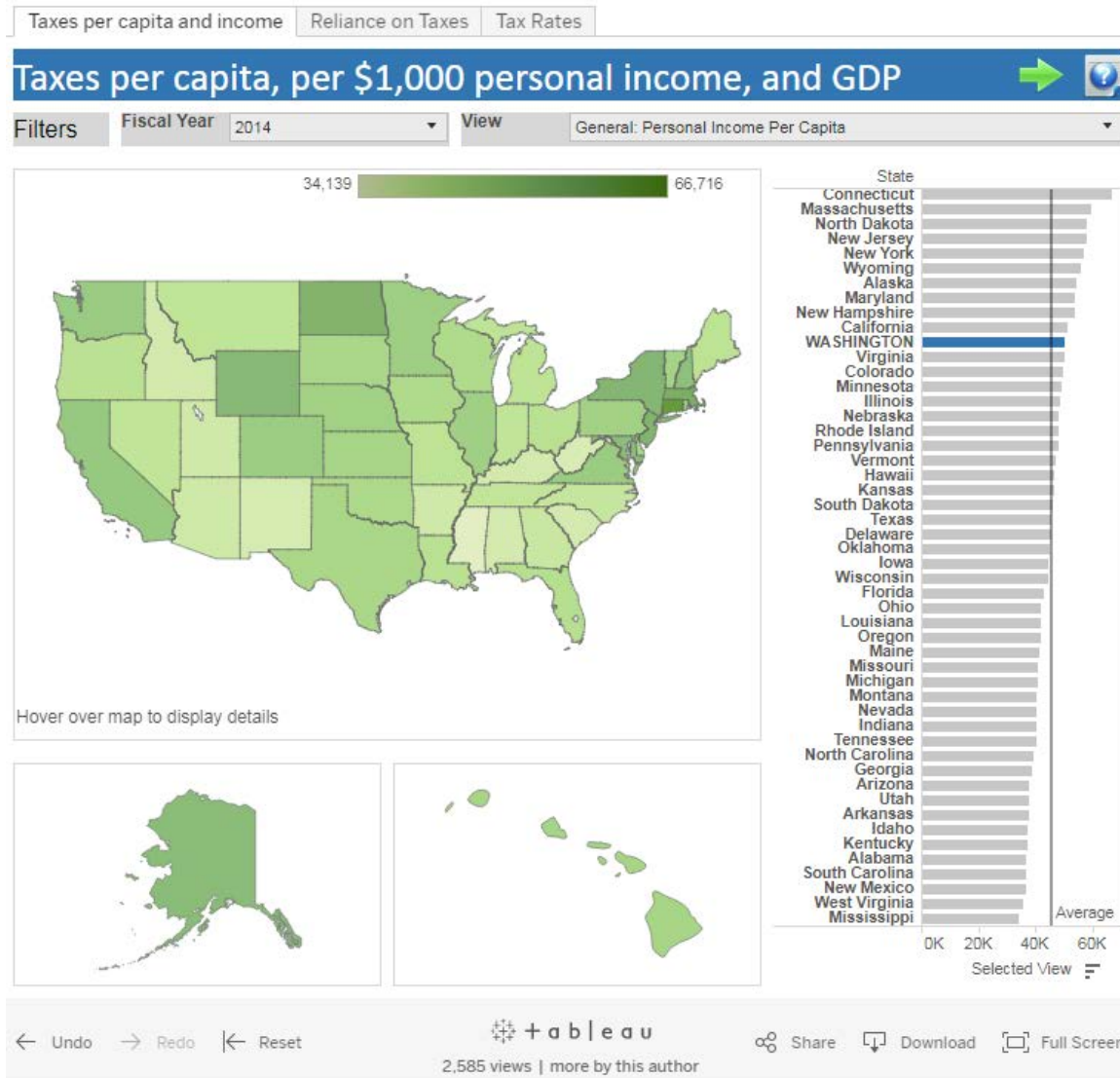


The visualization allows users to compare taxes across the 50 states.

This view shows personal income by state.

California is ranked #1.

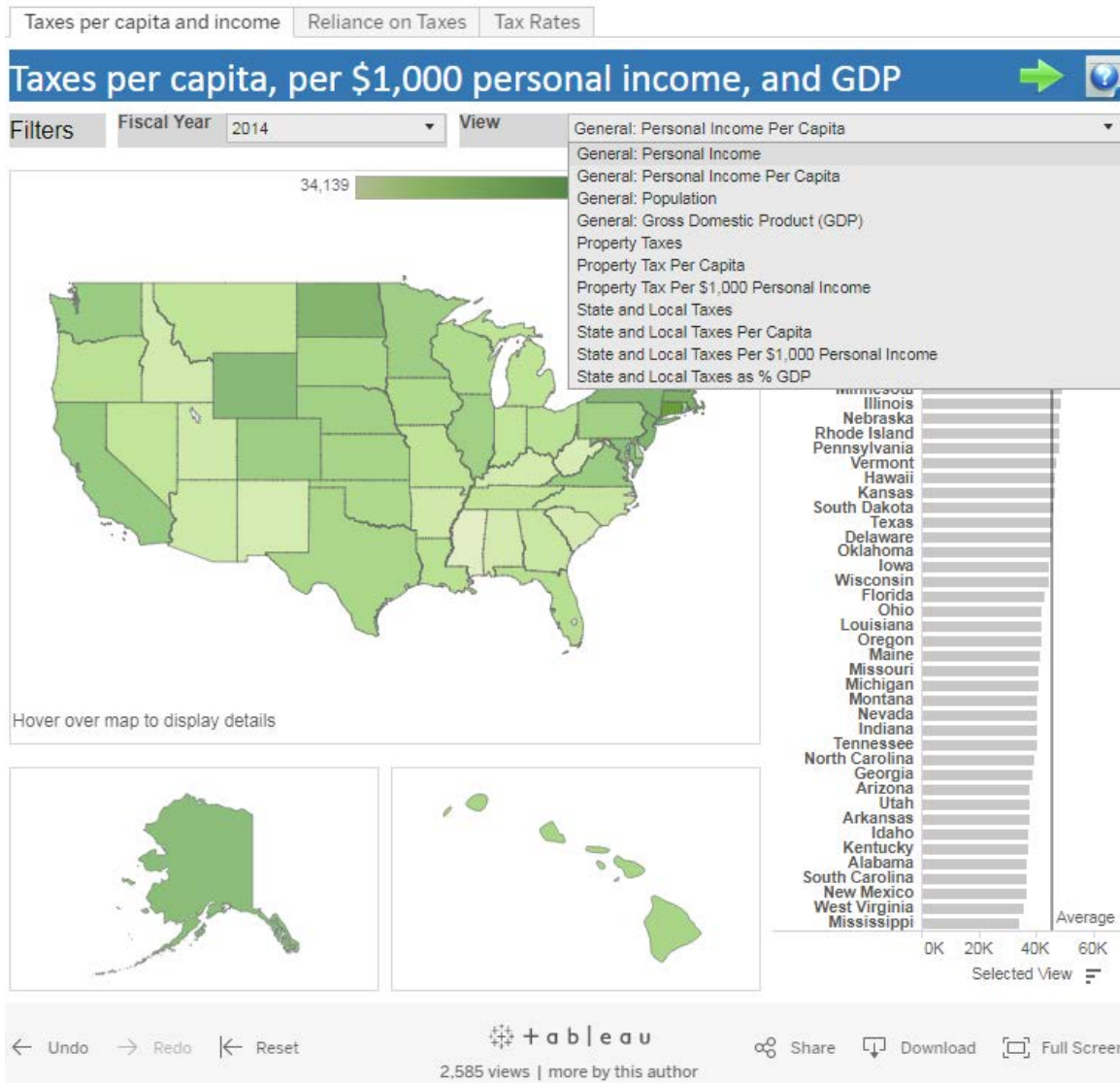
Compare state and local taxes by state



By adding population to our data, we allow users to also look at personal income per capita by state.

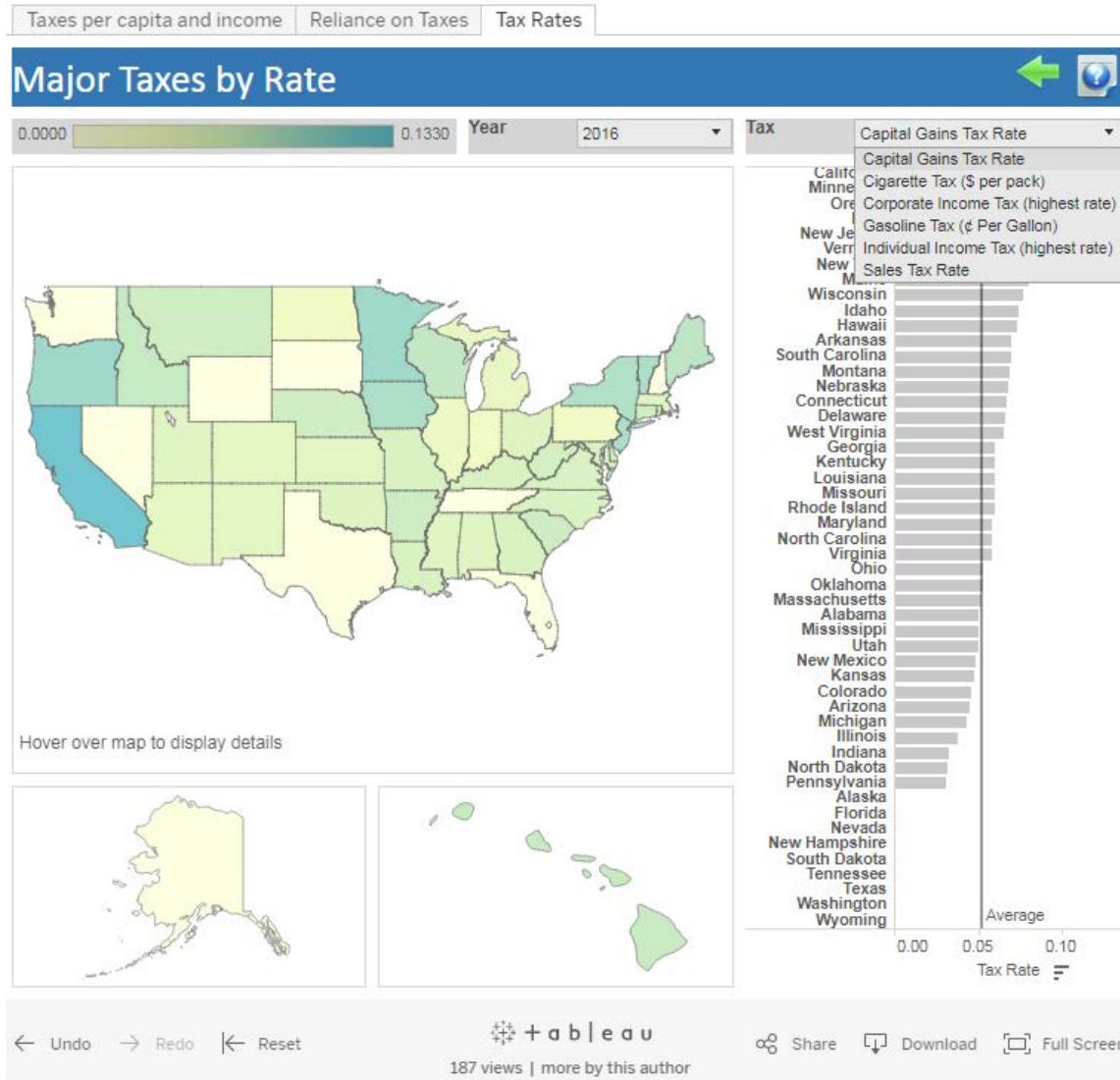
Connecticut is now ranked #1.

Compare state and local taxes by state



Including filters in the visualization allows users to quickly change views, and compare what they find of interest.

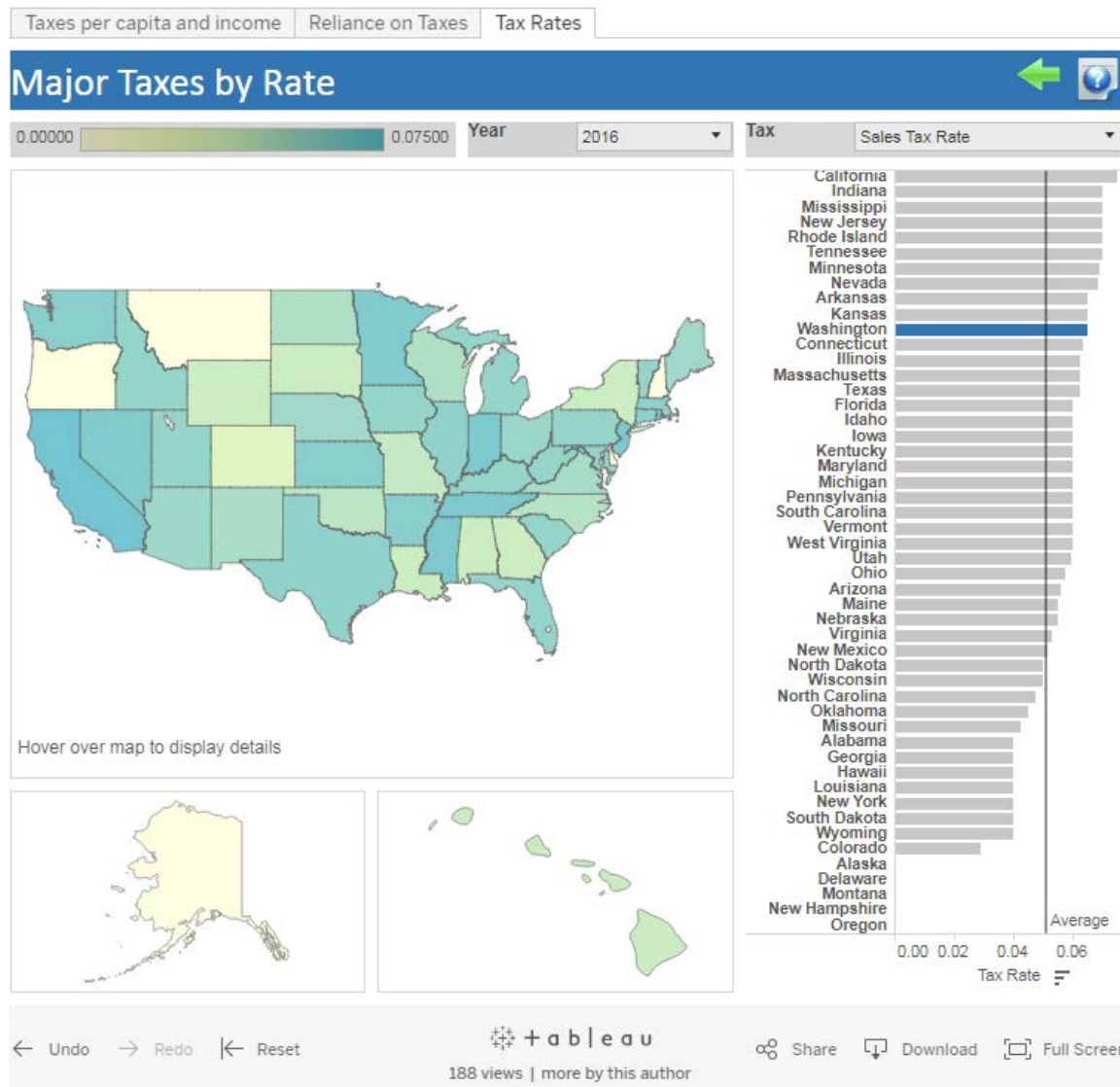
Compare state and local taxes by state



On the *Tax Rates* tab users can compare tax rates for the following taxes:

- ✓ Capital gains tax
- ✓ Cigarette tax
- ✓ Corporate income tax
- ✓ Gasoline tax
- ✓ Individual income tax
- ✓ Sales tax

Compare state and local taxes by state



This view is for Sales Tax rates.

The bar chart allows a user to quickly see how many states do not have a sales tax.

The map allows the user to easily compare their state to states around them.

History of Washington taxes

Year	Public Utility	Gasoline	Cigarette and Tobacco	Alcoholic Beverages	Inheritance and Gift
Early History		1921, tax of 1¢ per gallon.			1901, inheritance tax: Class A, 1% (\$10,000 exempt); Class B, 3% - 6%; Class C, 6% - 12%. 1917, increased rates for each class; \$1,000 family allowance. 1923, rates increased.
1929		Rate increased from 1¢ to 2¢.			Exemption for each Class A descendent. All maximum rates lowered.
1931		Rate increased from 2¢ to 4¢.			Adjustment in Class B tax rates.
1933	Occupation tax: 3% basic rate; gas 2%; vessels and transit 0.5%; all others 1.5%.	Rate increased from 4¢ to 5¢. Refunds for off-highway use.		1934, beer excise tax: \$1.00/barrel.	
1935	Public utility tax separated from B&O. 1933 rates retained.	Fuel oil tax of 1/4 cents per gallon.	Cigarette tax of 1¢ per package.	10% tax on sales of liquor by Control Board. 10¢ per gallon on wine.	Revision of rates and tax brackets. Exemptions for first \$40,000 of paid insurance and \$1,000 for Class B.
1937			(1939) Rate increased from 1¢ to 2¢.		
1941		Use fuel tax, 5¢/gallon on diesel, etc.			Gift tax enacted, rates are 90% of inheritance tax schedule.
1943				10% war liquor tax (20% total).	Minor rate adjustment in Class A.
1944		18th Amendment earmarked tax for roads.			
1949		Rate increased from 5¢ to 6.5¢. Repeal of fuel oil tax (1947).	Rate increased from 2¢ to 4¢.	Repeal of both 10% liquor taxes. 15% discount for Class H.	
1951	Surtax of 10%.			10% liquor excise tax.	
1955	Increase of surtax to 20% (1957).		Rate increased from 4¢ to 5¢.		

We receive a lot of questions about:

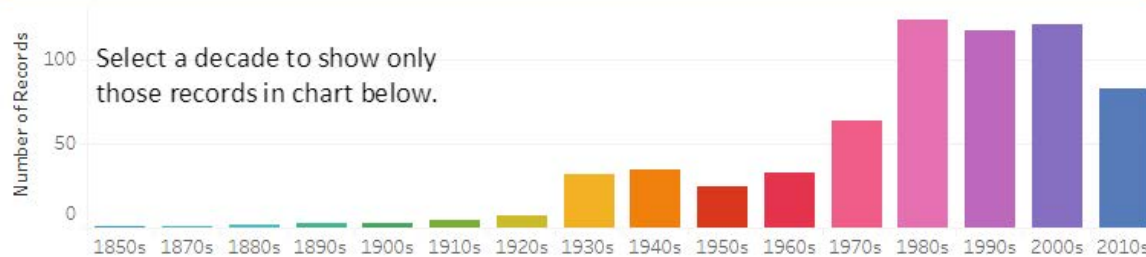
- ✓ When a tax first imposed
- ✓ Rate changes over time
- ✓ Collections over time

While we had this information in a spreadsheet, it does not read like data.

History of Washington taxes

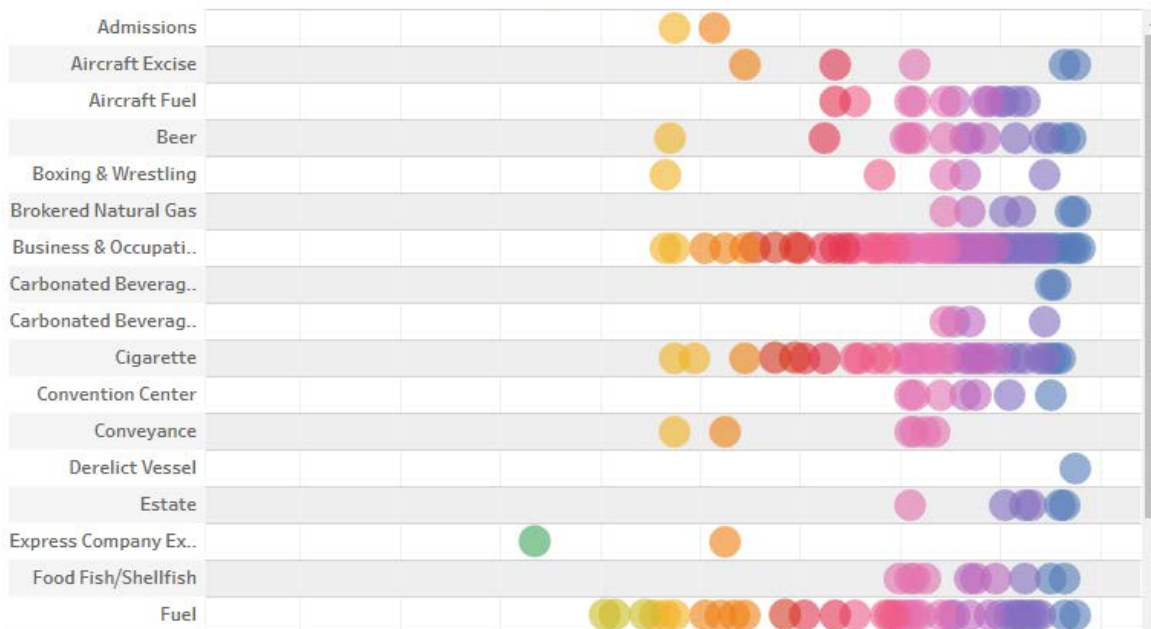
Tax History Tax History Table

History of Washington taxes



This visualization allows the user to hover over a colored circle for any tax to read about the selected tax change.

Hover over a circle to read about the tax change.



History of Washington taxes

Tax History Tax History Table

Tax list

Type of Tax	Year	
Beer	(All)	
Beer	1934	Beer tax enacted at \$1.00 per barrel.
	1965	Rate increased to \$1.50 per barrel for canned and bottled beer.
	1981	Combined the \$1.00 and \$1.50 rates and increased to a basic rate of \$2.60 per barrel.
	1982	Surtaxes added, increasing the overall rate to \$2.782 per barrel.
	1983	The surtaxes were made permanent July 1, 1983.
	1989	Adopted an additional temporary tax of \$2.00 per barrel for drug programs.
	1993	Established an additional tax of \$0.96 per barrel for health care. This tax automatically increased to \$2.39 per barrel in 1995 and \$4.78 per barrel in 1997. Microbrewers beer tax exemption for 1st 60,000 ..
	1994	Temporary tax created in 1989 made permanent.
	1997	Beer tax rate reduced to \$1.30 per barrel from \$2.60 per barrel and the 7 percent surtax was repealed.
	2003	Strong beer (more than 8 percent alcohol by weight) shifted from the liquor sales tax and made subject to the beer tax.
	2009	A portion of the tax was earmarked for the violence reduction/drug enforcement account and the health services account. These dedicated revenues were eliminated.
	2010	Additional tax of \$15.50 per barrel imposed on breweries that produced over 60,000 barrels. The excise tax on beer increased from 26 to 76 cents per gallon but the additional tax did not apply to the sale of t..
	2013	Additional per barrel and per gallon taxes imposed in 2010 expired.
	2014	A day spa permit created, allowing day spas to serve customers one glass of beer or wine free of charge.

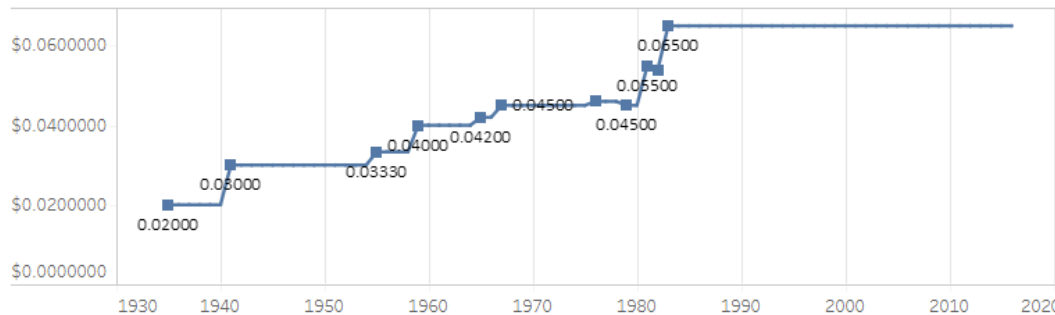
The *Tax History Table* tab allows a user to view all taxes, or select a specific tax, and quickly read through all the major changes to the tax.

History of Washington taxes

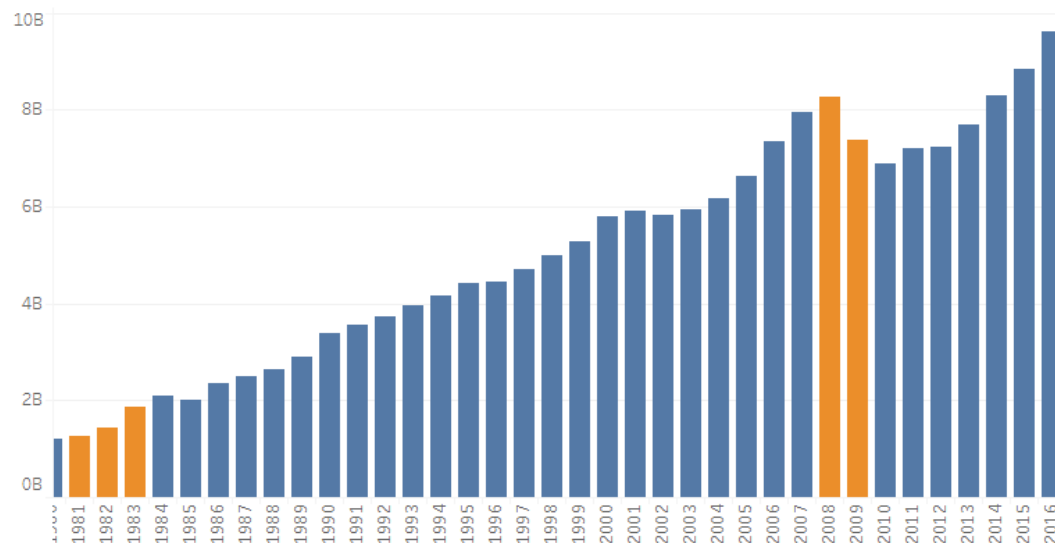
Tax rate and collection history of selected state taxes

Tax Sales & Use

Sales & Use Tax per dollar on amount of sale



Sales & Use Collections by Fiscal Year (July 1 through June 30)



We also provide a visualization of the tax rate and collection history of numerous taxes.

All of the data is also provided in a new spreadsheet format.

However, a simple chart often provides the most impact.

History of Washington taxes

Year	Type of Tax	Collections
1982	Real Estate Excise	59,777,000
1983	Real Estate Excise	73,071,000
1984	Real Estate Excise	94,594,000
1985	Real Estate Excise	94,538,000
1986	Real Estate Excise	95,439,000
1987	Real Estate Excise	131,047,000
1988	Real Estate Excise	141,050,000
1989	Real Estate Excise	177,082,000
1990	Real Estate Excise	265,170,000
1991	Real Estate Excise	209,620,000
1992	Real Estate Excise	209,387,000
1993	Real Estate Excise	223,650,000
1994	Real Estate Excise	279,160,000
1995	Real Estate Excise	255,116,000
1996	Real Estate Excise	275,633,000
1997	Real Estate Excise	301,444,000
1998	Real Estate Excise	382,213,000
1999	Real Estate Excise	428,006,000
2000	Real Estate Excise	435,088,000
2001	Real Estate Excise	434,310,000
2002	Real Estate Excise	432,910,000
2003	Real Estate Excise	513,996,000
2004	Real Estate Excise	615,618,000
2005	Real Estate Excise	823,110,000
2006	Real Estate Excise	1,010,457,000
2007	Real Estate Excise	1,159,670,000
2008	Real Estate Excise	716,680,000
2009	Real Estate Excise	426,048,000
2010	Real Estate Excise	411,871,000
2011	Real Estate Excise	379,748,000
2012	Real Estate Excise	422,360,000
2013	Real Estate Excise	573,943,000
2014	Real Estate Excise	662,132,000
2015	Real Estate Excise	808,977,000
2016	Real Estate Excise	959,492,000

This table shows the real estate excise tax collections.

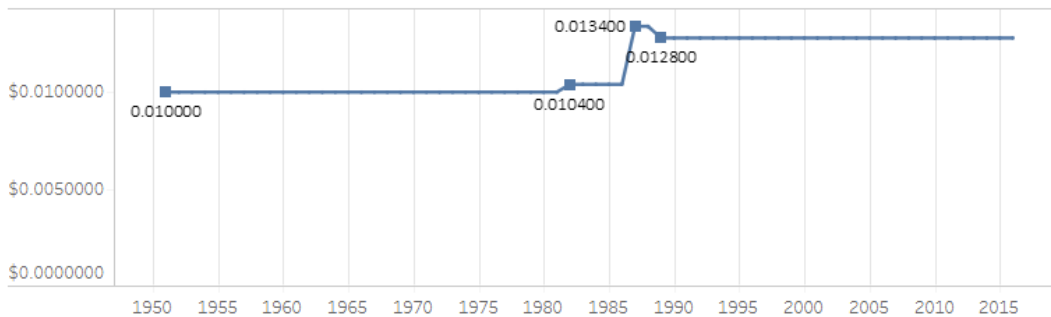
- ✓ You need to look at each number compared to previous to determine whether collections were increasing.
- ✓ You would need to add another column to calculate percent growth to understand how much the change is.

History of Washington taxes

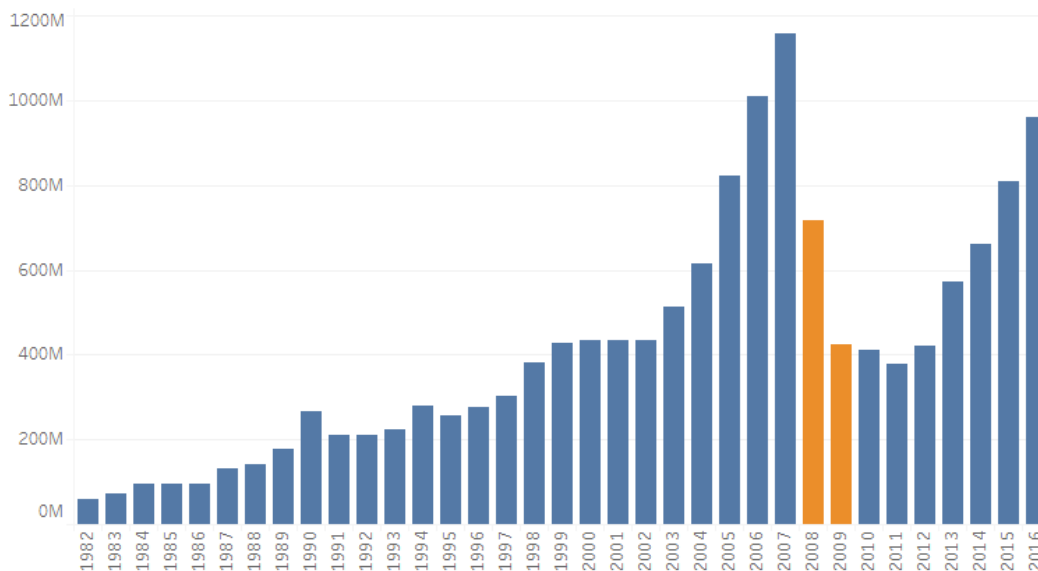
Tax rate and collection history of selected state taxes

Tax: Real Estate Excise

Real Estate Excise State tax per dollar of value on sale of real estate



Real Estate Excise Collections by Fiscal Year (July 1 through June 30)



With the simple chart:

- ✓ A large increase in collections stands out from 2005 through 2007
- ✓ The impact of the Great Recession on real estate excise tax collections is quickly noticed.
- ✓ You can see that as of 2016, collections have not rebounded to pre-recession amounts.

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Questions?

