

Tax Reform Gears Kansas for Growth: A dynamic analysis of additional revenue and jobs generated by tax reform

Executive Summary

An analysis of Kansas' historic tax reform legislation that goes into effect on January 1, 2013 published by the Kansas Legislative Research Department (KLRD) predicts \$2.4 billion in deficits through FY 2018. That analysis has caused considerable speculation that the resulting revenue decline will cause major cutbacks in essential state services. Fortunately, deeper analysis shows that that should not be the case.

A static analysis, which is the standard form used by Kansas government, assumes that only one variable — in this case, tax revenue — will change. By design, it ignores other changes that are likely to occur as individuals and employers react to a significant reduction in the tax burden. Using dynamic analysis, we can reasonably predict the additional economic and revenue effects of a significant income tax cut. This Policy Brief also explains several other mitigating circumstances that put the true impact of tax reform in perspective.

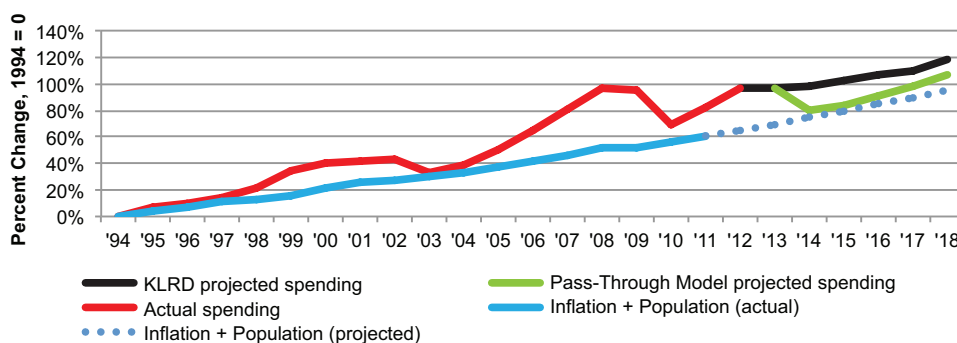
The traditional static analysis makes no allowance for spending adjustments that would be required to comply with Kansas' balanced budget requirements or the statutorily required 7.5% General Fund ending balance. By doing so, a static analysis can artificially inflate spending in future years.

The Beacon Hill Institute at Suffolk University used its Kansas State Tax Analysis Modeling Program (KS-STAMP) to analyze the effects tax reform would have on the state economy as well as the changes to state and local tax revenue collections. We use two variations of KS-STAMP in this analysis. The Standard Model treats changes to the individual tax structure as only impacting individual taxpayers. The Pass-Through Model treats estimates of pass-through income that will be exempt under the legislation as business tax reductions in order to simulate the design of the legislation.

The four main takeaways of this paper, all of which apply to the period FY 2013 through FY 2018, are:

- 1. There will be significant economic benefits due to tax reform.** The Pass-Through Model predicts 33,430 new jobs created, \$307 million more business investment and \$1.6 billion in additional disposable income. The Standard Model predicts 41,690 new jobs created, \$85 million more business investment and \$1.8 billion in additional disposable income.
- 2. There will be significant government revenue benefits of tax reform.** The Pass-Through Model identifies \$533 million in additional state revenue and local government would collect \$395.9 million in new revenue. The Standard Model identifies \$611.8 million in additional state revenue and local governments would collect \$322.9 million in new revenue.
- 3. Tax reform will not result in multi-billion dollar deficits.** A spending reduction will be necessary but a one-time adjustment of approximately 8.5% would be sufficient to meet all statutory and constitutional budget provisions and quite likely allow real spending growth (inflation-adjusted) in future years.
- 4. Even following a one-time adjustment, spending will continue its trend of outpacing inflation and population growth since 1994.** FY 2011 actual spending was 82% higher than FY 1994, while the combined growth in inflation and population was only 61%. If inflation and population continue at their same pace, the combined measure would be 95% higher in FY 2018 than in FY 1994, while spending in both dynamic models would be 107% higher than in 1994.

Chart 1: General Fund Spending Outpaces Inflation and Population Growth



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Introduction

Tax reform arrived in Kansas on Tuesday, May 22, 2012 when Governor Sam Brownback signed the Senate Substitute for House Bill 2117 into law (hereinafter HB 2117). The law makes several changes to the state individual income tax and the state severance tax starting in Tax Year 2013.

Specifically, it collapses three individual income tax brackets into two and cuts the rate to 3.0% for income under \$15,000 for single taxpayers and \$30,000 for married-filing-jointly taxpayers. All income above these levels will be taxed at 4.9%, down from the former top rate of 6.45%. The standard deduction will rise from \$4,500 to \$9,000 for head-of-household tax filers and from \$6,000 to \$9,000 for married households filing jointly. Moreover, the law is intended to exempt certain non-wage pass-through income (excluding capital gains, interest, dividends and gain from the sale of business assets) reported by limited liability companies, S-corporations and sole proprietorships reported on the state individual income tax form.

Another provision of HB 2117 repeals the severance tax exemption on all “new pool” gas production and “new pool” oil production in excess of 50 barrels per-day, per-well if the initial production occurs after June 30, 2012.

The law eliminates many existing tax credits available to individuals but the Earned Income Tax Credit is among those retained. Personal deductions are intended to be unchanged, as are brackets, rates and credits pertaining to C-corporations.

The Kansas Legislative Research Department (KLRD) prepared an analysis of HB 2117 using a historical methodology based on information provided by the Administration.¹ KLRD obtained revenue estimates from the Kansas Department of Revenue (KDOR) predicting that the individual income provisions of HB 2117 will result in revenue losses of \$848 million in Fiscal Year (FY) 2014 — the first year of implementation — rising to \$1.013 billion in FY 2018. KDOR estimates that the severance tax changes will increase revenues by \$45 million in FY 2014, rising to \$80 million in FY 2018.²

The KLRD analysis is a form of ‘static’ analysis, which assumes that the only variable changing is the one under consideration. A static analysis ignores how individuals and employers react to changes in tax rates. For example, if your tax bill was reduced by \$200 per month, a static analysis would only reflect that government revenue would decline by that amount. It does not account for how you might use that extra money. A dynamic analysis, however, uses historical data to

predict how your use of that extra \$200 will affect the economy and other government revenues.

If you decide to spend some of your extra money dining out more frequently or buying more taxable goods, state and local governments would collect extra sales tax. Now think about the extra demand that will be created when hundreds of thousands of Kansans have more money to spend. Businesses will hire more workers, add extra worker hours, purchase supplies and make other investments in order to meet the increased demand. Government will then collect more income tax from those new hires and a myriad of other taxes as those businesses and new hires start spending more money.

By capturing additional investment, wages and employment that will be created from increased economic activity and the ensuing additional tax revenue, dynamic scoring also serves to minimize the effect of government spending adjustments in reaction to a tax decrease.

The Economic Effects of Changes to Sales and Income Taxes

A higher sales tax increases the cost of a product, and like any other price increase, prompts customers to purchase that product elsewhere (even across state lines) at a lower price or cut back on other purchases to offset the price increase. Either way, state retailers suffer an economic loss that impacts their employees and customers; lower profits reduce the amount available to compensate employees and/or may result in a price increase in an attempt to offset the lost income.

An increase in income tax reduces individual taxpayers’ disposable income and therefore has a negative impact on their other economic activity. From an employer standpoint, the income tax increases the cost of labor compensation for products and services rendered by companies and individuals in the state. The personal income tax also reduces the return on interest, dividends and capital gains made on investments made by residents of the state.

The more money that must be spent on taxes, the less there is available to be spent in the economy. Conversely, a reduction in state income and sales taxes generates a significant boost to the state’s private sector economy — leading to an increase in non-governmental employment, disposable income and investment. Higher employment also generates additional income tax, increased consumer demand and more sales tax revenue.

A reduction in the sales tax will reduce the cost of final consumption, and therefore increase the amount of goods purchased in the state. Retailers in the state will

¹ Email received from KLRD on July 16, 2012.

² Revised estimate received from KLRD via email on May 22, 2012.

benefit from this growth in consumption, as will other companies involved in the production of those goods and services. These firms will respond by expanding their businesses to meet the increase in consumption.

A reduction in the individual income tax will decrease the cost of producing in the state, since it will reduce the cost of labor and saving/investment over time. Allowing individual taxpayers to keep more of their income will also increase demand for goods and services. This will boost the supply of labor in the state and increase the share of income allocated to savings. Thus, employment, investment and income all increase.

The degree to which the sales and income tax changes affect the state economy depends on the price elasticity of demand, which is a measurement of how (or whether) price changes cause an increase or decrease in demand for a product or service (including labor). It also depends on how much of the state's production is consumed in state and how much of it is exported.

Dynamic Economic and Fiscal Effects of HB 2117

The Beacon Hill Institute at Suffolk University used its Kansas State Tax Analysis Modeling Program (KS-STAMP) to analyze the effects HB 2117 would have on the state economy as well as the changes to state and local tax revenue collections.

The STAMP model is designed to simulate the effects of increases and decreases in tax rates on individuals and corporations. Kansas' unique exemption on most non-wage income of those businesses taxed under individual income tax rates prompts us to run a pass-through variation of the model (explained below) in addition to the standard scenario. The Standard Model of KS-STAMP treats reduces income tax rates according to HB 2117, which the model interprets as applying only to individuals. However, while non-wage pass-through income is reported on the individual income tax form, the economic effect is more likely to reflect a business tax cut. Therefore, in the Pass-Through Model we treat it as a cut in the corporate income tax, using estimates of pass-through income provided by the Kansas Department of Revenue (KDOR).

The Pass-Through Model actually decreases anticipated job creation and increases business investment (with other resulting economic benefits). If the income tax reduction only applied to individuals, the Standard Model would correctly simulate the jobs that would be created to accommodate the appropriate amount of increased consumer demand. But since KDOR estimates that about 17% of tax reduction will go to pass-through employers, demand-related job creation will be somewhat lower. Business investment will increase as it takes more than additional labor to meet rising demand.

Since the exact amount of tax reduction attributable to pass-through income going forward is not known, we use the results of the Standard and Pass-Through models to create alternate views of estimated job creation, tax collections and other economic measures. Both models are run for fiscal years 2013 through 2018.

Economic Effects of HB 2117

The dynamic economic effects of HB 2117 are measured against a "baseline economy" with the current income tax policies in place. Table 1 shows the anticipated economic effects as the incremental change in each measurement (jobs, investment, etc.) over the period rather than total amounts.

Table 1: Dynamic Economic Effects of HB 2117

	FY 2013 – FY 2018 Gain (Loss)	
	Pass-Through Simulation	Standard Simulation
Net Employment		
Private sector	41,287	47,957
Government jobs	(7,857)	(6,267)
Net employment gain	33,430	41,690
Population	28,516	34,907
Annual gross wage rates (\$)	277	364
Investment (\$ millions)	307	85
Disposable Income (\$ billions)	1,618	1,845
Disposable Income per Capita (\$)	210	237

Both models show that HB 2117 will have a positive effect on the Kansas economy. The Standard Model shows a net gain of 41,690 additional jobs created between FY 2013 and FY 2018 and 34,907 more state residents than would exist in the baseline economy. The Pass-Through Model, which assumes more business investment and less consumer demand, shows a net gain of 33,430 additional jobs and population gain of 28,516. The stronger economic conditions in the state, shown partially by the positive employment effects, lead to more competition for labor, driving annual gross wages up by \$277 per-person by FY 2018 in the Pass-Through Model and \$364 in the Standard Model.

These higher wages combined with the lower taxes paid by the average households lead to an increase in real disposable income of \$1.618 billion, or \$210 per person through FY 2018 in the Pass-Through Model; the Standard Model shows real disposable income gains of \$1.845 billion or \$237 per person.

The income tax reduction leads to decreases in the after-tax cost of capital, explaining the increase in business investment of \$85 million through FY 2018 in the Standard Model and \$307 million in the Pass-Through Model. The numbers are rather modest due to the severance tax increase, but more importantly the capital markets are global and most of the household savings increase that result from the tax changes enter the major stock and bond markets, which are outside Kansas.

Economic Effects of the Sales Tax Reduction

While not part of HB 2117, it should also be noted that a scheduled reduction in the sales tax rate will occur on July 1, 2013. The rate decline from 6.3% to 5.7% will have a positive economic effect that is not accounted for here as this analysis is strictly focused on the dynamic effects of HB 2117.

Revenue Effects of HB 2117

There will still be a large net decline in state revenue but the amount will be less than anticipated as a result of additional economic activity created by HB 2117. Local government will actually gain sales, property and other tax revenue due to the additional economic activity (a fact that is completely ignored by static revenue analysis of state changes). Table 2 compares the dynamic revenue effects of HB 2117 to static revenue projections released by KLRD.

According to the KLRD static analysis, income tax revenues will fall \$4.887 billion between 2013 and 2018, while severance tax revenues will increase \$348 million, resulting in a \$4.5 billion net decline in revenues. KLRD’s static analysis does not consider whether there would be any other state or local revenue impacts.

The Pass-Through Model predicts income taxes will be \$147 million higher as a result of additional job creation and business activity. Increased consumer demand is also predicted to generate an extra \$279.3 million in sales tax. Severance taxes are expected to be slightly less than the KLRD estimate, in anticipation that a higher tax will result in less production. Additional consumer and business activity is also predicted to bring in \$113 million more in other taxes and revenue, including taxes on tobacco and alcohol. Collectively, the Pass-Through Model predicts state general fund revenue will be \$533 million higher than the KLRD static analysis.

Local government will also benefit from increased consumer spending and business investment, collecting an extra \$395.9 million in sales, property and other tax revenues.

The Standard Model anticipates additional income tax revenues of \$165.2 million over the period. That is

**Table 2: Dynamic Revenue Effects of HB 2117
FY 2013 through FY 2018 Gain (Loss) in millions**

	KLRD Static Analysis	KS-STAMP Dynamic Analysis		Dynamic Gain Over Static	
		Pass-Through	Standard	Pass-Through	Standard
State General Fund					
Income tax	\$ (4,887.1)	\$ (4,740.1)	\$ (4,722.0)	\$ 147.0	\$ 165.2
Sales tax	\$ -	\$ 279.3	\$ 320.0	\$ 279.3	\$ 320.0
Severance taxes	\$ 348.0	\$ 341.8	\$ 342.6	\$ (6.3)	\$ (5.4)
Other taxes and revenue	\$ -	\$ 113.0	\$ 131.9	\$ 113.0	\$ 131.9
SGF total	\$ (4,539.1)	\$ (4,006.1)	\$ (3,927.4)	\$ 533.0	\$ 611.8
Local taxes					
Sales tax	\$ -	\$ 115.8	\$ 132.7	\$ 115.8	\$ 132.7
Property taxes	\$ -	\$ 185.9	\$ 79.4	\$ 185.9	\$ 79.4
Other taxes and revenue	\$ -	\$ 94.2	\$ 110.8	\$ 94.2	\$ 110.8
Local total	\$ -	\$ 395.9	\$ 322.9	\$ 395.9	\$ 322.9
Total HB 2117 revenue change	\$ (4,539.1)	\$ (3,610.2)	\$ (3,604.5)	\$ 928.9	\$ 934.6

somewhat higher than the Pass-Through Model because the Standard Model attributes all income tax reduction to individuals, which, as noted earlier, would create more jobs as a result of higher consumer demand. For the same reason, the Standard Model estimates greater dynamic effects for all taxes and revenues. Collectively, the Standard Model predicts state general fund revenue will be \$611.8 million higher than the KLRD static analysis.

Local government revenues will increase \$322.9 million under the Standard Model, somewhat less than the Pass-Through Model due to lower expectations of consumer demand and business investment.

State General Fund Spending Effects of HB 2117

As noted in Table 3, the KLRD static analysis of HB 2117 anticipates cumulative deficits (listed as Ending Balance) totaling \$2.4 billion through FY 2018, using adjusted spending estimates based on the Governor’s Budget Report Volume No. 1.³ The implication of such massive deficits has generated public speculation that HB 2117 would cause significant reductions in primary services. Some spending adjustment will certainly be necessary but the impact will be much less than that feared as a result of such speculation.

The standard static methodology does not take spending adjustments into account that would be required under the state’s balanced budget requirements and it also does not allow for the statutorily required 7.5% ending balance in arriving at the deficit projections. By doing so, a static analysis artificially increases spending in outlying years.

³ Ibid; Governor’s Budget Report Volume 1 FY 2013, page 40; available at http://budget.ks.gov/publications/FY2013/FY2013_GBR_Vol1-3-8-2012.pdf.

**Table 3: Kansas Legislative Research Department (KLRD)
Static Analysis of HB 2117 (millions)**

	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	6-Yr Total
Beginning Balance	466.0	490.5	(233.9)	(878.8)	(1,442.0)	(1,896.1)	466.0
KLRD Final Revenue	6,162.8	5,427.7	5,641.9	5,857.1	6,086.9	6,325.3	35,501.7
KLRD Spending	6,138.3	6,152.1	6,286.8	6,420.3	6,541.0	6,807.5	38,346.0
Ending Balance	490.5	(233.9)	(878.8)	(1,442.0)	(1,896.1)	(2,378.3)	(2,378.3)

Source: KLRD as revised on May 22, 2012; revenue decline in 2014 includes scheduled sales tax reduction

**Table 4: Pass-Through Model Dynamic Analysis of HB 2117
with Balanced Budget Requirement (millions)**

	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	6-Yr Total
Beginning Balance	466.0	508.8	420.3	429.4	445.6	463.5	466.0
KLRD Final Revenue	6,162.8	5,427.7	5,641.9	5,857.1	6,086.9	6,325.3	35,501.7
Dynamic revenue	18.3	87.1	92.6	101.0	110.7	123.3	533.0
Dynamic-adjusted Revenue	6,181.1	5,514.8	5,734.5	5,958.1	6,197.6	6,448.6	36,034.7
Spending (7.5% ending bal.)*	6,138.3	5,603.3	5,725.4	5,941.8	6,179.8	6,429.8	36,018.5
Ending Balance	508.8	420.3	429.4	445.6	463.5	482.2	482.2
Revenue change (over prior)	-3.5%	-10.8%	4.0%	3.9%	4.0%	4.0%	
Spending change (over prior)	0.2%	-8.7%	2.2%	3.8%	4.0%	4.0%	
Ending Balance % of Spending	8.3%	7.5%	7.5%	7.5%	7.5%	7.5%	

*KLRD standard methodology does not account for adjustments necessary to meet balanced budget requirements or the statutorily required 7.5% ending balance.

**Table 5: Standard Model Dynamic Analysis of HB 2117
with Balanced Budget Requirement (millions)**

	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	6-Yr Total
Beginning Balance	466.0	517.6	422.3	430.8	446.7	464.4	466.0
KLRD Final Revenue	6,162.8	5,427.7	5,641.9	5,857.1	6,086.9	6,325.3	35,501.7
Dynamic revenue	27.1	108.1	110.2	114.7	122.3	129.5	611.8
Dynamic-adjusted Revenue	6,189.9	5,535.8	5,752.1	5,971.8	6,209.2	6,454.8	36,113.5
Spending (7.5% ending bal.)*	6,138.3	5,631.0	5,743.6	5,955.9	6,191.5	6,436.4	36,096.7
Ending Balance	517.6	422.3	430.8	446.7	464.4	482.7	482.7
Revenue change (over prior)	-3.3%	-10.6%	3.9%	3.8%	4.0%	4.0%	
Spending change (over prior)	0.2%	-8.3%	2.0%	3.7%	4.0%	4.0%	
Ending Balance % of Spending	8.4%	7.5%	7.5%	7.5%	7.5%	7.5%	

*KLRD standard methodology does not account for adjustments necessary to meet balanced budget requirements or the statutorily required 7.5% ending balance.

Tables 4 and 5 put spending adjustments in realistic perspective. Both tables adjust the KLRD static analysis by adding additional dynamically-generated revenue to the KLRD revenue assumptions and by making annual spending adjustments to avoid deficits and allow for the statutorily-required 7.5% ending balance. It is also assumed in both tables that no spending adjustments would be made in FY 2013 in anticipation of full implementation of HB 2117 and that the full amount of

necessary spending adjustment would be made in FY 2014. There are obviously many different ways legislators could choose to implement the necessary adjustments (including spreading the adjustment over more than a single year).⁴

Table 4 is based on the Pass-Through Model and shows that a one-time spending reduction of 8.7% in FY 2014 would be sufficient to avoid deficits and maintain the statutorily required 7.5% ending balance. Spending

⁴ Extending the spending adjustments beyond FY 2014 could temporarily result in an ending balance less than the statutorily required 7.5% level, which would require a statutory suspension of the ending balance requirement as legislators have routinely done.

could then increase by 2.2% in FY 2015 and thereafter essentially increase at the same percentage as revenues. The Standard Model estimates similar results in Table 5, with a one-time spending reduction of 8.3%; spending could then increase by 2.0% in FY 2015 and thereafter essentially increasing at the same rate as revenues.

Based on these circumstances, the one-time spending reduction would be \$535.0 million under the Pass-Through Model or \$507.3 million under the Standard Model. Some perspective on how a half billion dollar spending reduction could affect the state’s ability to fund essential services can be gained from comparing spending levels of other states.

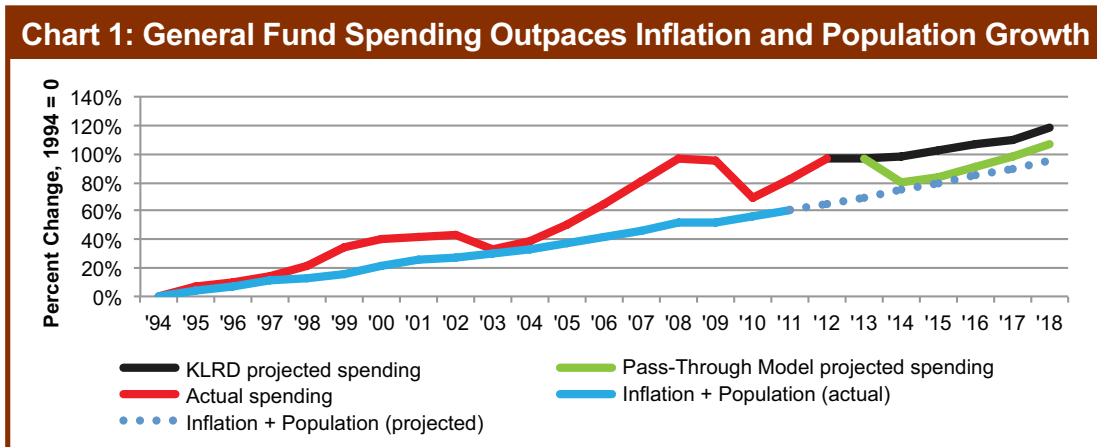
According to the most recent actual spending data from the National Association of State Budget Officers (NASBO), 24 states spent less per-resident on General Fund expenditures than did Kansas in FY 2010.⁵ In fact, the \$1,843 per-resident that Kansas spent was 16% higher than the average of the nine states without an income tax. Kansas General Fund spending was \$5.268 billion in FY 2010; with FY 2013 spending up to \$6.138 billion just three years later, it’s quite likely that Kansas is still spending well above the per-resident level of many states (all of which provide primary services with no evidence that outcomes are affected by lower spending levels).⁶

It may also be instructive to put Kansas General Fund spending in some historical perspective. The roughly half billion dollar spending decline anticipated in Tables

4 and 5 is significant but the approximately \$5.603 billion in FY 2014 spending is considerably more than was spent in FY 2010 and nearly the same as in FY 2011.

General Fund spending increased 16.3% between FY 2010 and FY 2012, but that isn’t the only time Kansas had unusual spending increases. Chart 1 compares General Fund spending with the combined change in inflation and population, actual spending for FY 2011 and prior, and separate spending projections from KLRD and the more conservative Pass-Through Model.⁷ Inflation for FY 2012 and beyond is projected using the average annual increase from 1994 to 2011, which allows inflation to increase annually by 2.38%. Population growth is also projected using the Pass-Through Model and is expected to increase by an average rate of 1.01%, which is slightly higher than the baseline assumption of 0.85%. The combined inflation-plus-population growth rate for FY 2013 through FY 2018 is 3.39%.

Inflation and population grew at a combined 61% between 1994 and 2011, while General Fund spending increased 82% over the same period. According to both the Pass-Through and Standard Models, spending is expected to remain above the combined rate of inflation and population. If inflation and population continue at their same pace, the combined measure would be 95% higher in FY 2018 than in FY 1994. By comparison, spending in both the Pass-Through and Standard Models would be 107% higher than 1994.



⁵ State Expenditure Report: Examining Fiscal 2009 – Fiscal 2011 State Spending available at <http://www.nasbo.org/publications-data/state-expenditure-report>. Spending amounts converted to per-resident using Census data.

⁶ K-12 spending, which comprises more than 50% of Kansas’ General Fund spending, is a well-researched area where it has been repeatedly shown that higher spending levels does cause achievement levels to rise or conversely, that lower spending is associated with lower achievement levels. See *Schoolhouses, Courthouses and Statehouses: Solving the Funding-Achievement Puzzle in America’s Schools*, Princeton University Press by Eric A. Hanushek and Alfred A. Lindseth.

⁷ Spending per various issues of the Governor’s Budget Report available at <http://budget.ks.gov/gbr.htm>; inflation per average annual Consumer Price Index, Bureau of Labor Statistics, All Midwest Urban Cities, current series, not seasonally adjusted; population per Census Bureau.

Conclusion

While it is clear that there are significant differences between the KLRD analysis and the dynamic models used herein, the authors wish to make it clear that they do not mean to imply that KLRD was inaccurate in its analysis. The Kansas Legislative Research Department provides general information and support services for the Kansas Legislature and responds to specific legislative requests. As noted earlier, KLRD says their analysis was prepared using a historical methodology based on information provided by the Administration.

It should also be noted that the anticipated economic and revenue effects of HB 2117 in both dynamic models are based on historic patterns. No allowance is made for possible material circumstantial differences between past and future years. For example, given that HB 2117 will make Kansas more competitive relative to neighboring states, it is possible that there could be even greater dynamic effects going forward than the models indicate.

Regardless, HB 2117 will unquestionably produce better economic and revenue outcomes than shown in the traditional static analysis. Tens of thousands of additional jobs will be created, nearly \$2 billion in additional disposable income will be generated and local governments will benefit by at least \$323 million. State spending will have to decline somewhat but a one-time adjustment would likely provide per-resident General Funding spending at much higher levels than many states and will be able to grow at the same pace as revenue thereafter. Further, if recent historic patterns for changes in inflation and population continue, General Fund spending will continue to remain well above inflation-and-population-adjusted levels.

Methodology

To identify the economic effects of the tax discounts and understand how they operate through a state's economy, BHI utilized its STAMP (State Tax Analysis Modeling Program) model. STAMP is a five-year dynamic CGE (computable general equilibrium) model that has been programmed to simulate changes in taxes, costs (general and sector specific) and other economic inputs. As such, it provides a mathematical description of the economic relationships among producers, households, governments and the rest of the world.

A CGE tax model is a computerized method of accounting for the economic effects of tax policy changes. A CGE model is specified in terms of supply and demand for each economic variable included in the model, where the quantity supplied or demanded of each vari-

able depends on the price of each variable. Tax policy changes are shown to affect economic activity through their effects on the prices of outputs and of the factors of production (principally, labor and capital) that enter into those outputs.

A CGE model is in "equilibrium," in the sense that supply is assumed to equal demand for the individual markets in the model. For this to be true, prices are allowed to adjust within the model (i.e., they are "endogenous"). For instance, if the demand for labor rises, while the supply remains unchanged, then the wage rate must rise to bring the labor market into equilibrium. A CGE model quantifies this effect.

Finally, a CGE model is numerically specified ("computable"), which is to say it incorporates parameters that are believed to be descriptive of the actual relationships between quantities and prices. It produces estimates of changes in quantities (such as employment, the capital stock, gross state product and personal consumption expenditures) that result from changes in prices (such as the price of labor or the cost of capital) and that result from changes in tax policy (such as the substitution of an income tax for a sales tax).

Because it consists of a large number of interrelated equations, a CGE model ordinarily requires the application of a nonlinear computational algorithm, typically some variation on Newton's method. STAMP requires and utilizes the development and application of a sophisticated computer program for the solution of its equations.

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