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Council
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MEMORANDUM

February 6, 2006

TO: Interested Persons

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SUBJECT: Issues in Dynamic Modeling

This memorandum is in response to your request for information on the feasibility of dynamic modeling in Colorado. A number of states have investigated and/or tried dynamic modeling. While a few states are continuing to use the models, the results in those states and others suggest that dynamic modeling is unlikely to provide beneficial information for making policy decisions in Colorado, especially relative to its cost. This should not, however, be construed as an unwillingness on the part of staff to undertake the project or to generate the best possible solution and results. It is simply an indicator that there is a 15-year history of dynamic modeling in other states that has proved futile in many cases and of limited value in the few surviving cases.

Staff has organized the concerns found through researching dynamic modeling in the following bullet points.

- ◆ **Marginal impacts/size of dynamic effects.** It is frequently misunderstood that gains from dynamic impacts have to occur on the margin, especially at the state level where a balanced budget must be maintained. The margin is the difference between the economic activity generated from the tax cut compared with the economic activity generated by government spending. While all of the arguments about economic growth that occur when businesses or individuals have more revenue to spend in the economy are true, they are offset by the loss of state spending in the economy.
 - ▶ A dynamic analysis of a tax reduction in Colorado today would need to contemplate the loss of economic activity that occurs from a reduction in highway construction. This is due to the current law implications of any reduction in revenue reducing transfers to the Highway Users Tax Fund through the Senate Bill 97-1 mechanism. In some instances the multiplicative (dynamic) impact of this loss could be greater than the impact of the private

sector gain. If not, it is still only the *marginal amount* that private sector investment is more productive than state investment in roads that would lead to a smaller fiscal note from a dynamic assessment.

- ▶ Another factor that tends to mute the impacts of dynamic analysis is "*leakage.*" The private sector, while arguably more productive, generally has greater leakage of revenue and investment outside of the state than the public sector. An example of possible leakage would be providing a tax break to multi-state, multi-national, or publicly held corporations that may result in money leaving the state as profits or being reinvested outside of the state rather than inside the state.

- ▶ **Actual results** from other states that have completed dynamic analysis have found that dynamic effects are fairly small. The largest impacts found in a few situations were around *15 percent*. Most results have been *below 10 percent*. Both California, with a computable general equilibrium model, and New Mexico, with a REMI Input-Output model, found income tax relationships to be *1 percent or less*. These types of results would likely have little influence on the direction of the state's tax policy. One comprehensive report found that "Again, the marginal benefits of a state contracting to build an expensive custom-built CGE model appear to be small."¹ In fact, the study pointed out limitations and result expectations that lead staff to believe that the cost-benefit analysis for dynamic modeling in Colorado is negative.

- ◆ **Timing.** The dynamic impacts of proposed tax legislation, good or bad, do not take effect immediately. In many cases, the dynamic impacts occur five or more years after passage of the legislation. Forecasting long term is impossible even on a static basis because of the exponential effects of error magnification. Therefore, it is impossible to have valid outputs from a dynamic model far enough into the time horizon to reach the new equilibrium point after the passage of a bill. Dynamic models are created to assess the change caused by an adjustment in tax policy from the time a bill passes to the time the policy change reaches a new equilibrium point. Unfortunately, "the models are not very good at estimating how long it will take to get from point A to point B, or how the changes will progress along this time period."²

- ◆ **Short-term costs.** The state has to deal with the fiscal impact of a bill immediately, whether or not the dynamic aspects of the legislation would eventually create a situation of no revenue loss or even a revenue gain in the future. Therefore, it is unlikely that the state would vary from its historical pattern of enacting tax cuts when revenue reached a sufficient point and refraining from

¹Charney, Alberta H., PHD, and Marshall J. Vest, Modeling Practices and Their Ability to Assess Tax/Expenditure Economic Impacts, Economic and Business Research, The Eller College of Business and Public Administration, prepared for the Auber Conference, New Orleans, October 2003.

²"Dynamic Revenue Estimating: A State Perspective", Jay Wortley, Michigan Senate Fiscal Agency

passing tax cut legislation during difficult financial times, even with dynamic analysis.

- ◆ **Need for data is greater than what is available.** Dynamic models require significantly greater and more detailed amounts of data than static models. Unfortunately, much of the needed data at the state level is not available, and data that is available, such as state personal income data, is prone to major revisions and cannot be deemed reliable for long-term dynamic analysis. Furthermore, the lack of viable data is even more pronounced when attempting to apply dynamic modeling to social programs, such as the impact of early childhood education on future incarceration rates.
- ◆ **Expectations.** Many states have had significant problems with expectations far exceeding both the abilities of the models and the results. This has led to the models no longer being used and to the modeling agencies being considered incompetent and/or biased.
- ◆ **Dynamic output and revenue forecasting.** Many recommendations indicate that, due to the much greater errors created by dynamic modeling, the results should not be used in the revenue forecasting process even after the passage of legislation. If this is the case, how can the results be considered valid enough to use as a tool in the legislative process? In Colorado, staff always builds the fiscal impact of passed legislation into future revenue estimates.
- ◆ **Voter-approved items.** Colorado has a more complex and difficult-to-forecast tax system than most states, due to the interaction of the legislatively-created tax system with voter-approved items such as TABOR, Gallagher, Amendment 23, Referendum C, and the constitutionalization of the Arveschoug-Bird limit. Therefore, the ability of a dynamic model to be prepared and successful in Colorado is even lower than in most other states. This also limits the ability of Colorado to use "off-the-shelf" models.
- ◆ **One model does not fit all tax changes.** A Michigan study found that "Dynamic models are best suited for broad changes in the structure of the major taxes. Relatively small, narrowly focused tax changes are probably not going to be easy to adapt to the model. Besides, for many of these types of tax change proposals, it is very difficult even to come up with a respectable static estimate, let alone a dynamic estimate built off of the shaky static estimate."³
- ◆ **Outside impacts.** Dynamic results are frequently eroded by outside impacts in the nation and world. For example, other states' changes in tax policies could change the dynamic impacts of Colorado's tax policy changes.

³"Dynamic Revenue Estimating: A State Perspective", Jay Wortley, Michigan Senate Fiscal Agency

- ◆ **The Congressional Budget Office (CBO) and the Joint Committee on Taxation (JCT).** Despite the fact that the federal government currently has an atmosphere friendly to tax cuts, no balanced budget amendment, and significantly more resources than Colorado that could be invested in dynamic analysis, both the CBO and the JCT testified before Congress that the difficulties of dynamic modeling would not improve the reliability of budget estimates and would open the producing entity to criticisms of bias.⁴
- ◆ **Counter to the standard results.** Minnesota prepared a REMI Input-Output model that was well received by the legislature and business leaders in 1993. Still, Minnesota no longer prepares dynamic analyses.

Theory versus reality. In conclusion, while the theory that using a dynamic approach would provide better estimates of the actual tax impact of a given tax policy change is true, it has been found that, in practice, the dynamic approach is overly complicated and difficult to conduct. There is no consensus opinion on how "dynamic" tax changes really are at the state level, there are significant data limitations, and expectations are generally out of line with results.

⁴Kobes, Deborah, and Jeff Rohaly, Dynamic Scoring and Budget Estimations, June 11, 2002.