

“All models are wrong, but some models are useful”

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This quote from George Box, a former statistician, illustrates the difficulty in forecasting economic changes as a result of legislation or new regulations. No one could reasonably expect an economic model to *exactly* predict how millions of individual consumers and businesses modify their behavior in response to Senate Bill 58.

In this paper, I discuss some rather fundamental problems that, in my opinion, prevent prudent reliance on the Dynamic Energy Economic Policy Simulation (DEEPS) model¹ developed by the Center for Resilience at The Ohio State University for purposes of evaluating the effects of the types of reforms that are contained in Substitute Senate Bill 58 (SB 58). More specifically, portfolio mandate reform opponents have pointed to a summary of results which they attribute to the DEEPS model which they claim show that the current mandates added \$160 million to Ohio’s economy in 2012 and added thousands of jobs between 2008 and 2012.² In addition, the reform opponents have claimed that the type of reforms proposed in SB 58 will cost Ohio electric consumers over \$3.6 billion through 2025 as a result of the higher electricity prices predicted by the DEEPS model.

The claims made by the reform opponents are certainly bold. While it would be unfair to expect the DEEPS model to get any final numbers exactly right, it is reasonable to ask if the energy policy advocacy that is based on the DEEPS model is based on economically sound assumptions. Unfortunately, as both Dr. Lesser’s and my separate report confirm, the DEEPS model is not useful in this particular context.

What determines whether a model is useful? Milton Friedman, a former Nobel-prize winning economist at the University of Chicago wrote

“The question whether a theory is realistic “enough” can be settled only by seeing whether it yields predictions that are good enough for the purpose in hand.”³

¹ DEEPS was developed by OSU for the State of Ohio, in collaboration with the Consortium for Energy, Economics and the Environment at Ohio University, with funding and guidance from the Ohio Department of Development, and in partnership with the Public Utilities Commission of Ohio and the Ohio Environmental Protection Agency. Further information about the DEEPS model is available at www.OhioEnergyResources.com.

² http://www.ohiomfg.com/wp-content/uploads/2013-10-04_lb_energy_deeps_sept25_2013_model_results.pdf

³ Milton Friedman, 1953, Some Implications for Economic Issues

Therefore, and at the request of the Industrial Energy Users-Ohio, I examined whether the predictions from the DEEPS model might be “good enough.” As Dr. Lesser, President at Continental Economics, explains in his report, he recently downloaded the DEEPS model and ran the model. As a result he found that “it is possible to model a carbon constraint in DEEPS which results in total Ohio carbon emissions that are less than zero, which is impossible, while at the same time creating millions of new Ohio jobs.” This output from the DEEPS model is clearly wrong and raises other questions and doubts around using the DEEPS model to simulate the effect of energy policy on Ohio’s economy.

Based on my analysis, the fundamental flaw in the reform opponents’ reliance on the DEEPS model stems from the decision to use a particular form of a production function which is specified within the DEEPS model. The production function is the heart of an economic model such as the DEEPS model as it is what predicts changes in outputs that occur with different input assumptions. For example, a production function calculates the changes in output when an electric distribution utility (EDU) hires additional workers or buys additional capital equipment. The result of this production function reflects how policy changes affect job growth, tax revenue growth, prices, and other variables in our economy.

Essentially, the production function is the engine of the economy. Many of the components of a car do not have to work for a car to be useful. If the radio, the air conditioning unit, or even the odometer do not work, then driving a car is less enjoyable, but the car is still useful. However, if the wrong or a misfiring engine is placed in the car, then the car is no longer useful for its intended purpose.

Some of the assumptions in the DEEPS model are wrong, but they fail in the sense that a broken odometer fails in a car. For example, the very first assumption in the model description is that all births happen at the first of the year. We know this assumption is wrong; however, the DEEPS model makes this assumption to facilitate the computations taking place with the DEEPS model. While this particular assumption is wrong, the predictive value of the DEEPS model may, nonetheless and considering this one error alone, still be “good enough” across an extended time period.

However, there are much deeper and more fundamental problems with the DEEPS model.

The production function used in the DEEPS model is called a Cobb-Douglas production function. The DEEPS model uses labor and capital as the main production factors. Cobb-Douglas production functions have been used in the economics discipline for decades because of their relative simplicity. They are easy to solve in large-scale macroeconomic models.

Unfortunately, one of the characteristics of the models like DEEPS that rely on the Cobb-Douglas production function is that they do not “fit” well when it comes to certain sectors of our economy like the electric industry. Cobb-Douglas production functions assume that any changes in the relative prices of inputs will be matched by a proportional change in the expenditures on the inputs.⁴ This intuitively means that if the price of labor decreases, firms will substitute labor for capital. If wage rates are low, a utility will hire workers rather than purchase a machine to do the same type of work, and vice versa. Machine automation makes economic sense when the cost of workers is higher than the cost of capital. However, there are clear limitations or bounds to a utility’s ability to substitute labor for capital. Certain

⁴ Technically, the elasticity of substitution is 1.

tasks (reliability related tasks for example) can only effectively be performed through capital investment for technological and safety reasons. For example, adding workers to an EDU's workforce in Ohio does not increase the amount of generation capacity that is needed to reliably satisfy demand in Ohio. Also, as Dr. Lesser explains in his report, the multi-state functions performed by PJM, a regional transmission organization, require an energy policy perspective that encompasses a much larger area than Ohio. Before capital can be invested to augment the generation supply and transmission network, there is often a need to secure regulatory approvals such as that required from the Ohio Power Siting Board.

These examples of real world limitations or bounds mean that the heart of the DEEPS model or the Cobb-Douglas production function will invariably suggest conclusions that are not "good enough" or reliable for purposes of evaluating energy policy choices. This is not a new or novel observation about the Cobb-Douglas production function that is so critical to the DEEPS model.

For example, researchers in the Congressional Budget Office (CBO) have also found that "for analysis of policies affecting factor returns, such as taxes on capital and labor income ... the Cobb-Douglas specification is too restrictive."⁵ The compliance cost recovery aspect of the current electricity usage reduction mandate causes the cost to be paid by Ohio electric consumers through their electric bills. For purposes of economic analysis, the imposition of mandate compliance cost on Ohio consumers functions as tax on capital. As a result of the "too restrictive" specification of the Cobb-Douglas production function, researchers at the CBO recommend not using the Cobb-Douglas production function in a model for this type of analysis.

In conclusion, while no one should expect an economic model to be perfect, it nevertheless should still be useful. My analysis supports the conclusions reached by Dr. Lesser in his report. Using the DEEPS model in the fashion described by the mandate reform opponents to analyze macroeconomic changes, not only leads to wrong conclusions, but also useless ones. Any claims that opponents of SB 58 make, *which rely on the DEEPS model*, should be set aside.

⁵ <http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/94xx/doc9497/2008-05.pdf>