Comments of Ocean State Policy Research Institute on Modeling for this Docket

Introduction

A debate has unfolded in Docket 4185 that moves OSPRI to enter these comments on economic models that can help inform whether the Power Purchase Agreement (PPA) being reviewed will provide "economic development benefits", as required by the recently amended version of §39-26.1-7.

Arguments about the scope of inquiry on this question have been delivered by legal memoranda filed under our status as intervenor, however our ability to present substantive rebuttal testimony regarding alternative model runs to those discussed in the EDC Advisory Opinion was limited by our late identification of a witness.

Unfortunately, this failure on our part leaves the only model results presented in evidence as those of the IMPLAN multiplier model. There is extensive qualitative testimony in rebuttal, and models are by no means the definitive way to establish economic development benefits given their imprecision.

In this Docket the error is compounded by a blindspot in the models used. Testimony under crossexamination by both Seth Parker for EDC and Dr. Mazze for Toray and Polytop indicated that this model does not contemplate the spending of ratepayers, the actual buyers under this PPA, in assessing economic effects. Thus no attempt is made to model with IMPLAN whether the economic benefits for the PPA are actually net positive.

Beacon Hill CGE Model results for amended PPA

Through consultations with the Beacon Hill Institute at Suffolk University, Ocean State Policy Research Institute was able to gain access to a "computable general equilibrium" or "CGE" model that predicted the economic development effect of the power purchase agreement if approved would be a net loss of 700 jobs. This is based on a 2.2% increase in powers costs.

To our knowledge this is the only quantitative research on this PPA that predicts the effects resulting not only from spending by the sellers of the power, but from spending by the buyers of this energy, i.e. the ratepayers. Of particular note is the fact that this model tracks spending across all classes of ratepayers. Thus, the economic impact in the aggregate of what has been represented as modest monthly costs to individuals can be accounted for, as well as the more stark effects testified to by larger energy dependent businesses such as Toray and Polytop who have intervened in this docket.

Existence of Computable General Equilibrium Models

Under crossexamination, EDC's consultant Seth Parker testified he was unaware of "computable general equilibrium" models that would take into account both new utility

spending associated with the power purchase agreement that would incorporate costs, however Deepwater counsel objected that no evidence for the existence of such models existed in this docket. While we understand that this comment is not presented as evidence, we trust, at least on the point of the existence of such models, that the Commission may take notice of public materials readily available on the Beacon Hill website, a short portion of which is attached hereto as to the model's existence, as well as the fact that the precise phrase "computable general equilibrium" had 1,230,000 hits on Google today.

Indeed, to ask if computable general equilibrium models exist, or to imply they do not, is to reveal a lack of familiarity with the landscape of economic literature, not surprising for a lawyer, but more noteworthy in someone delivering economic testimony as an expert. Indeed the distinctions between the multiplier and CGE approach is recognized as modestly analogous to the distinction in economic theory between Keynesian and general equilibrium theory. The predominate debate between these schools of thought is the appropriateness of government (often deficit) spending to spur employment in economic downturns.

On the other hand, consultants working on project promotion who have supervised others more than once and less than ten times in the application of models might be tendant toward the multiplier approach, as it is the predominate quantitative defense of government infrastructure spending that may take the form of deficit spending, tax increases, special interest tax credits, or levies on ratepayers or customers through regulatory mandates.

Limitations

We understand that, without entry as direct testimony and subjecting the foregoing to crossexamination, we are not at liberty to allege in any evidentiary fashion that the Beacon Hill STAMP model in particular, for State Tax Analysis Modeling Program, or CGE models in general are more accurate than the IMPLAN model used. Of course the reality of crossexamination being conducted through lawyers and the truncated docket schedule means that no accessible debate over the myriad minutiae of elasticities that underlie even a simpler model like IMPLAN was engaged before the Commission either.

Our point regarding the CGE is that the approach is more comprehensive in modeling the "economic development effects" of an agreement by tracing the resultant spending by both the buyers and sellers under the agreement, whereas the IMPLAN model only traces spending by the sellers.

We are not supremely confident in models, and recognize the limitations of the STAMP model. Indeed we will take pains to stress limitations imposed by the time constrained generic application of this model and to cite criticism of the STAMP model. Rather than maintaining that this study is gospel, we simply think that citation to it provides a reasonable indication that options were readily available to assess the "economic development benefits" of the PPA contemplating the economic effects that flow from

spending changes for both the buyers and the sellers under the contract.

In any event, the Commission through its charge of purpose in RIGL § 39-1-1 and its experience in administering its duties cannot but take notice of the truism that increasing electric rates will have a negative economic development consequence that must be balanced against whatever necessity or public policy is sought to be advanced by raising rates.

Further Discussion

Dr. Mazze testified that multiplier models such as IMPLAN are principally suited to promoting a positive view of the effects of spending for a particular project.[1] Commission Counsel poignantly asked him whether the models could in effect be made to say that the floods of last march were a good thing because they caused a great deal of spending on construction and remediation.

This is reminiscent of Bastiat's quintessential parable of the broken window told in his 1850 monograph, That which is seen and That which is not seen:

> Have you ever witnessed the anger of the good shopkeeper, James Goodfellow, when his careless son happened to break a pane of glass?
>
> . . .
>
> Suppose it cost six francs to repair the damage, and you say that the accident brings six francs to the glazier's trade—that it encourages that trade to the amount of six francs—I grant it; I have not a word to say against it; you reason justly. The glazier comes, performs his task, receives his six francs, rubs his hands, and, in his heart, blesses the careless child. All this is that which is seen.
>
> But if, on the other hand, you come to the conclusion, as is too often the case, that it is a good thing to break windows, that it causes money to circulate, and that the encouragement of industry in general will be the result of it, you will oblige me to call out, "Stop there! Your theory is confined to that which is seen; it takes no account of that which is not seen."
>
> It is not seen that as our shopkeeper has spent six francs upon one thing,

---

[1] Mazze confirmed having used such a model himself at an earlier stage RFP for Bluewater, when the level of pricing for these projects had not been clearly established. Indeed, Madison Milhous appended to his 12/10/09 Docket 4111 Testimony, as Exhibit 4, a worksheet comparing the evolution of the Deepwater proposal that showed the imputed price for 2013 of their RFP submission as $175/MWh.

> he cannot spend them upon another. It is not seen that if he had not had a window to replace, he would, perhaps, have replaced his old shoes, or added another book to his library. In short, he would have employed his six francs in some way, which this accident has prevented.

This point is by no means new, nor is the temptation of the legislature to ensure that glaziers, or windmill builders, have guaranteed employment despite the fact that someone must pay for that employment. The question of whether the legislature decreed in this case that windmill builders shall be employed regardless of cost is one of statutory interpretation.

But the question of whether there is a model that would account equally for the shopkeepers loss of 6 francs as it does for the glaziers gain of 6 francs is one for analysts such as Ocean State Policy Research Institute. We must apologize for the time constraints of the docket preventing us from entering the results of such modeling as evidence in this case. But through this comment give background to the appropriateness of models chosen by the EDC consultants and indicate the kind of results that consideration of the costs of this project might have resulted in.

Like the multiplier models, the CGE model uses a complex set of nonlinear equations representing demand elasticities, *i.e.*, what people and business will buy if they have more money. But what the CGE approach also models is where this additional money came from. So while some participants in this modeled economy have more money, others have less. And the same complex of nonlinear elasticities determines what they won't buy because they are spending more on electricity.

As with the multiplier model, the CGE applies to some circumscribed portion of the economy. In the United States, this most often corresponds to State boundaries. So the model considers what of this spending effect would take place in the state and outside the state.

This model results in a net effect in state and out of state, and, by so doing, also predicts employment changes in the state. While this is a time of concern about unemployment, it should be stressed that, as the field of economics applies cost/benefit analysis, employment is a cost and not a benefit. While in light of our current concerns about employment this may seem odd in the extreme, one must recall that productive efficiency is an important concept in economics. The more goods you can produce with less employment, the more labor efficient is your product.

Of course the cost of other inputs, say purchased wind turbines, do have an impact such that simply producing energy with a small workforce, if it includes the purchase and installation of expensive generation equipment, is not necessarily economically efficient.

Most other forms of generation employ more workers per Kwh and must pay for fuels as well, and yet they cost much less than renewables. Thus, renewables are remarkably efficient in employment, ironically making them a very poor choice for subsidized

spending if the purpose of the spending is job creation. And as parsimonious as they are at delivering jobs they are profligate in capital costs making them economically inefficient, which is why they need the subsidy in the first place.

Against this backdrop of concern, Ocean State Policy Research Institute contacted the Beacon Hill Institute at Suffolk University in Boston that maintains a computable general equilibrium model under the acronym of STAMP, for State Tax Analysis Modeling Program.

This model, as briefly described, in the attached explanation accounts for cashflows within a state, and into and out of the state. The model identifies exogenous factors, meaning generally policy changes that would affect spending in one area considered by the model, and endogenous changes, spending that responds to the exogenous inputs according to models of economic behavior.

Once the model is constructed, because it takes in the operation of the entire economy of the subject region, it is fairly easy in different runs to change factors which have been endogenous to exogenous and vice versa.

While the Beacon Hill STAMP model is designed in particular to test the effects of increases or decreases for various taxes, and thus the most common exogenous variable in operating the model would be proposed changes in tax levies, it can be readily adapted to testing the equilibrium that would result from changes in other spending, say electric utility rates.

The model is first run for the status quo and obviously is built and tested with its ability to predict the status quo. Then exogenous input "shocks" the model with an increase or decrease in spending in the sector where change is proposed. The model then rebalances based on its multiple non-linear elasticities to predict the results in other sectors of the changes in spending in the exogenous variables.

These results are net, because, for instance, an increase of taxes would show up as a decrease of money for private spending but an increase of government spending[2]. Likewise an increase in utility rates which shows less spending by ratepayers in other sectors shows an increase in spending by utilities.

Based on the predicted spending of these various individual, business and government sectors in response to this shock and changes to flows across the state border, the model can predict the effects on employment numbers in the subject state as well as payroll change.

---

[2] But see attached criticism of Alberta H. Charney: *Comparison of US, REMI and STAMP Simulations of Tax/Spending Increases*, arguing that the STAMP model may presume too much "government savings", *i.e.*, the balance of tax collected over funds expended by the government – and see generally Beacon Hill Institute response also attached.

In determining the size of shock to electric rates to model, OSPRI began with Madison Milhous' testimony in the earlier Docket 4111 on the $390 million overmarket costs identified on page 131 of his 12/10/09 direct testimony and his more generalized comments in his 7/15/10 direct testimony in the present Docket 4185 on page 8 where he identifies Grid's estimate of the costs to ratepayers as approximately 1.7%.

We adjusted the Milhous estimate because it does include the cost to ratepayers of Grid's incentive payment of 2.75% of the entire contract, approximately $20 million. Nor does the Grid figure consider the cost of the underwater cable from Block Island which had not been allocated at that time. The new legislation provides that it shall be "socialized" to all ratepayers and thus can be attributed to this project representing an additional $100 million with capital recovery costs applied to the estimate price of some $42 million. Bearing in mind that the costs to some businesses are in excess of the Grid estimate for residential ratepayers of 1.7%, Toray provided us with an estimate of 2.7% for their business, and the cable and incentive costs we were comfortable that a fair conservative estimate of the average real increase is 2.2%.

When Beacon Hill used its STAMP program to model a 2.2% increase in electric rates in a state economy of the size of Rhode Island, the results showed a net loss of employment of 700 jobs. That would have included a gain of jobs in the electric utility sector but a loss of jobs elsewhere. While some of these job losses would be due to direct costs imposed on business, this model would be one of the only ways of capturing how the modest amounts per month to be billed to ratepayers will also contribute to employment losses, because, in the aggregate, those increases require consumers to cut back elsewhere.

A significant limitation that affects our assessment of the range of error around the 700 jobs figure is that this model was not tailored specifically to Rhode Island's current economic circumstances. Given time and resources, Beacon Hill can highly tailor its models to the state involved, but it also maintains an average model of numerous states that it can adjust quickly to the size of any state's economy for a quick scan of the impact of policy changes. This means that the elasticities are not adjusted to reflect peculiarities in the specific state, for instance if a state produces some of its own fossil fuel resources, it will import less than a state that produces no fossil fuel resources, the mores significant of a manufacturing base a state has the more of its value added purchases of goods would take place in the state. This concept can be applied across all economic sectors to even more precisely predict reactions in an individual state.

As noted above, both the demands of time and the lack of additional monetary resources did not permit these more subtle state specific adjustment to be made and, as noted above, even within these limitations Ocean State Policy Research Institute was not able to produce the results of this modeling and identify a witness to present them until a (business) day after the deadline.

We have identified in footnote 2 some criticism of the STAMP model in a white paper by Alberta H. Charney, Ph.D. from Eller College of Management that took a comparative

approach to the results of a REMI and STAMP run each examining the likely results of a billion dollar proposed sales tax increase in Arizona as compared to spending cuts.

Of interest in regards to the current docket is that the University of Arizona researchers actually ran the REMI model separately to model the loss of economic activity and jobs in the private sector as a result of these increased tax collections. Multiplier models, which include both REMI and IMPLAN, can be used to model the impacts of the loss of certain businesses as opposed to their gain. The article does not define the assumptions that were used to estimate the more disparate losses associated with an increase in the sales tax to many people.

Dr. Charney had some other technical criticisms, mostly high import tendencies related to higher instate costs and that the STAMP model didn't account for federal matching funds. It should be noted that she had written several articles earlier touting the tax increase, and that Beacon Hill Institute responded extensively to her criticism (also attached). But we felt it incumbent to point to reasoned disagreement in the field.

Our point is not that we have the right number, but that we tried to account for the economic effects of taking some $500 million in excess costs from the ratepayer. Economic modelers are largely familiar with how to account for costs and to do so either within a more complicated CGE or, according to Dr. Charney, using several runs of a multiplier program tracking different changes. CGE is a generic term. There are many CGEs to choose from.

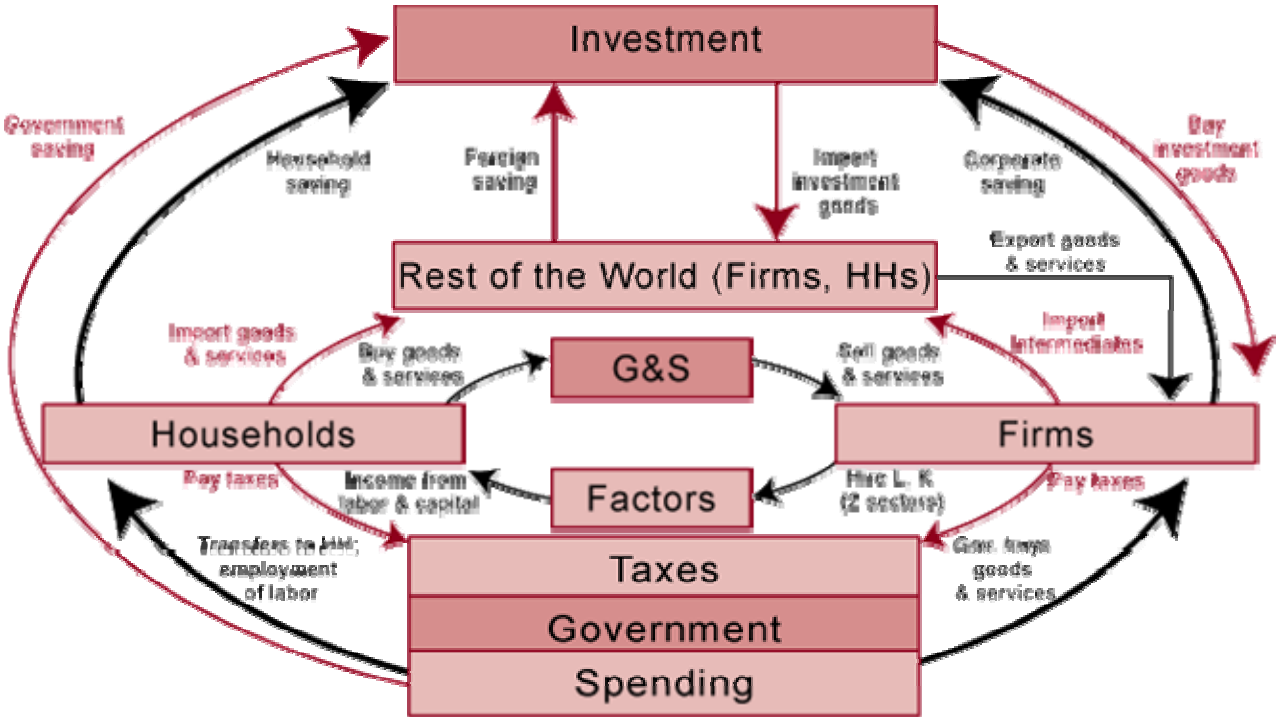
There are no disagreements that the monies used to pay for the Deepwater Project will come from the Rhode Island economy. And Seth Parker recognized in applying IMPLAN the import/export factor that means 75% of the direct construction spending will go outside of Rhode Island. The real approach that could have predicted the "economic development benefit" of the amended PPA was to estimate whether the ratepayers likely alternative used of that money would create more economic development.

This approach is followed in a number of studies emerging from Europe that compare the job creation efficiency of the balance of the marketplace to the renewables energy sector. No study of this sort was provided in evidence in the docket, and the Beacon Hill data produced for Ocean State Policy Research Institute is the closest that we have.

Thus, while it does not augment the evidentiary record, it may certainly serve as illumination of what is lacking there in order for proponents to maintain the a rebuttal proposition has been established that the PPA will provide economic development benefits.

We are disappointed that the EDC choose consciously, or otherwise, to avoid discussing the obvious elephant in the kitchen that has animated opposition to this project.

How STAMP works



STAMP and LAMP are CGE (computable generalized equilibrium) models that account for and analyze the economic effects of tax policy changes. A CGE model is "computable" in the sense that it requires the solution of a system of nonlinear simultaneous equations for each policy simulation. It is "general" because it allows for the interdependence and interaction of all markets, their prices and their quantities. It is in "equilibrium" because supply is assumed to equal demand in each market.

This means that there are no "Keynesian" elements in the model. STAMP/LAMP is a market-clearing model. Tax policy changes are shown to affect economic activity through their effects on the prices of outputs and of the factors of production (labor and capital) that enter into those outputs.

In building the model, we first construct a "baseline" scenario in which we solve the model for five years into the future on the assumption that current tax law remains unchanged. This scenario provides the basis for an Excel spreadsheet, provided to the user, in which the user can enter hypothetical, alternative tax-law changes. The spreadsheet executes an order (received over the Internet by the BHI server) to re-solve the model for the indicated tax-law changes. The effects on the model's variables are then displayed on the spreadsheet. The user can use the spreadsheet on any computer that uses a recent version of Microsoft Windows and that has access to the Internet.

- The model provides values of the following variables for both the baseline and the tax-change scenario:
- ·Gross State or Area product, by expenditure type consumption, gross investment, government purchases and net exports to the rest of the world;
- ·Savings, by type;
- ·Aggregate income, by type (wages and capital income);
- ·Tax revenues and government expenditures, by type;
- ·Employment, by sector;
- ·Private capital stock, by sector;
- ·Net investment, by sector;
- ·Wages and capital income, by sector of origin;
- ·Intersectoral flows of final and intermediate goods.

SECTORS

Industrial Sectors

Agriculture, forestry and fishing
Mining
Construction
Food and tobacco products
Textiles and apparel
Paper and publishing
Chemicals, petroleum, rubber, plastics
Building materials and furniture
Primary and fabricated metal
Industrial machinery and equipment
Electronic and electrical equipment
Transportation equipment & misc.
Transportation
Communications
Electricity, gas, sanitary
Wholesale trade
Retail trade
Banking
Insurance
Real estate
Hotels, amusements, motion pictures
Personal and repair services
Business services
Health services
Eating, drinking, misc., services

Household Sectors

(Annual income per household)
<$10,000
$10,000 - 24,999
$25,000 - 49,999
$50,000 - 74,999
$75,000 - 99,999
$100,000 - 149,999
$150,000 and up

Factor Sectors

Labor
Capital

Investment Sectors

Rest of the world Sector

Government Sectors

Federal Government Receipts
Social security
Federal personal income tax
Federal corporate income tax
Other federal taxes

Federal Government Expenditures
Federal non-defense spending
Federal defense spending

State & Local Government Receipts
Sales tax
Gross receipts tax
Tax on motor fuel
Motor vehicle tax
Franchise tax
Corporate income tax
Tax on oil and gas production
Tax on tobacco
Insurance premium tax
Tax on alcohol
Personal income tax
Inheritance tax
Fees, licenses, permits
Workers' compensation and disability

State & Local Government Expenditures
Spending on education
Spending on health & welfare
Spending on public safety
Spending on infrastructure
Spending, other

The Beacon Hill Institute

BHI FaxSheet

Information and Updates on Current Issues

April 2010

The Beacon Hill Institute's Tax Analysis Modeling Program: A Response to Charney

Introduction

Alberta H. Charney of the University of Arizona Economic and Business Research Center recently issued a critique of an analysis published by the Goldwater Institute of a proposed 1¢ increase in the Arizona sales tax. [1]

The Goldwater Institute's analysis was based on worked performed by the Beacon Hill Institute at Suffolk University in Boston. [2] That work was, in turn, based on the Institute's STAMP (Tax Analysis Modeling Program) model, which it has applied to tax policy issues as they have arisen over the last several years in more than 25 states.[3]

The purpose here is to correct the record as provided by Dr. Charney in her remarks. We proceed by breaking her remarks into major topics. Then, for each topic, we provide, first, her comment or criticism and, second, our rebuttal.

BHI's STAMP Model

The Charney Comment

"There are many similarities between the IMPLAN input-output model used by UA and the STAMP model. Both are used for impact/policy analysis."

BHI's rebuttal

Although this seems like an innocent enough statement, it betrays a fundamental misunderstanding on Dr. Charney's part – one that pervades her comments about our work. Although both IMPLAN and STAMP are used for policy analysis, both are not "impact models." An impact model is commonly seen as one that utilizes Keynesian multipliers to estimate the impact of some proposed tax or spending change on the economy. STAMP is not, by this standard, an impact model. Rather, it is a policy simulation model that avoids any use of Keynesian multipliers and that utilizes instead a "general equilibrium" framework in which prices adjust to clear markets.

---

[1] Alberta H. Charney, "Comparison of UA, REMI, and STAMP Simulations of Tax/Spending Increases," Articles and Updates, Economic and Business Research Center, (March 2010) http://ebr.eller.arizona.edu/research/articles/2010/compare_ua_remi_stamp_simulations.asp; (accessed April 22, 2010).

[2] Goldwater Institute, "Lawmakers Consider Sending One-Cent Sales Tax Increase to Voters," (February 2010) http://www.goldwaterinstitute.org/article/4364 (accessed April 22, 2010).

[3] For a more detailed explanation of STAMP, see http://www.beaconhill.org/STAMP_Web_Brochure/STAMP_IntroductionMS.html.

Different economists will have different views on which of these approaches is better – Keynesian or general equilibrium. The current economic downturn has returned some luster to the very tarnished Keynesian approach. We nevertheless believe that our approach is superior for long-run policy analysis, particularly when undertaken at the state level, where the principal Keynesian policy tool – deficit spending – is not generally available as a policy option. At the end of the day, a Keynesian defense of tax hikes at the state level depends for its justification on the notion (identified in textbooks as "the balanced-budget multiplier") that the government spending made possible by new taxes will exert a positive effect on the economy that outweighs the negative effect exerted by the higher taxes. This line of argument makes no sense in light of the fact that states compete with each other for residents and business and that state taxes negatively affect state competitiveness.

The Charney Criticism

"A thorough search of the Beacon Hill website does not reveal a report for Arizona or a discussion of the model used for Arizona. The only report available was a description of the STAMP (State Tax Analysis Modeling Program) built for Pennsylvania. Most of the following comments are based on that 40 page report. It must be noted that the PA STAMP model report is difficult to follow because many of the variables and notation used in the report are not carefully defined."

BHI's Rebuttal

We, in fact, clearly define all variables and notations used in PA STAMP on pages 37-39 of the Pennsylvania report.[4] If, however, Dr. Charney found our documentation inadequate for her purposes, she should have done what academics commonly do in such instances, i.e., she should have asked us directly about what she needed. Indeed, a more careful critic would, in the spirit of academic discourse, have requested this documentation before charging ahead with criticisms that turn out to be wrong and, in at least several instances, predicated on a misunderstanding of how STAMP works.

The Charney Criticism

"The 5,260 employment figure for $1 billion of government expenditures is extraordinarily low …. That's lower than the direct impact (excluding the multiplier effects) of $1 billion in expenditures on general merchandise, in which no goods sold are produced locally and only the retail margin is retained in the state. This is absurd. Governments produce or buy mostly services, which result in far more jobs per $1 billion than 5,260. No other studies produce government expenditure impacts that low – not REMI, not IMPLAN, or any other."

[4] Beacon Hill Institute, "PA STAMP: A Complete Tax Model for Pennsylvania State," (2009) http://www.beaconhill.org/BHIStudies/PA-STAMP2009/PA-STAMP2009.pdf (accessed April 22, 2010).

BHI's Rebuttal

Dr. Charney seems to assume that the sales tax increase will raise $1 billion in revenue to fund an equal amount of new spending. If this is the case, she ignores a central purpose of the STAMP model, or of any model of tax policy that recognizes economic fundamentals, which is to capture the negative dynamic effects of a rise in taxes on the tax base and on economic activity. STAMP shows that a tax that raises $1 billion in revenue through a static analysis, in which there are no negative effects on the tax base, will raise something less than that when consideration is given to the negative effects that are unavoidably created. Dr. Charney may want to ignore these effects because she wants to operate in a Keynesian world where higher tax rates and their effects on economic incentives, and on competitiveness, don't matter. But those effects are present in the real world and must, we argue, be accounted for.

Her most egregious error lies, however, in her back-of-the-envelope calculation, whereby we vastly underestimate the number of public jobs that another billion dollars in government spending would create. Sure, if the government did collect another billion dollars and if it did spend that entire amount hiring public workers it could (even given the high pay received by those workers) hire more than 5,260 new workers. But our model does not make the absurd assumption that this would in fact occur. Rather, it allows that a large portion of the new revenue would find its way back to households, which would in turn spend the money and, in that process, "create" new jobs in the private sector.

There are other problems with the "job creation" fixation of the Keynesian approach. Governments spend, presumably, not to create jobs but to provide services, the provision of which requires not just the creation of jobs but also the purchase of materials and capital investment. It is this fixation itself, however, that leads Dr. Charney astray in her criticism of STAMP.

The Charney Criticism

"First, not all government revenue is necessarily spent in the STAMP model. Specifically, an equation for government savings is defined as the residual between government income and government spending. The half-page table that was linked to the Goldwater Institute's press release did not indicate the change in government savings as a result of the tax increase. It is very likely that government savings increases in the simulation so not all tax revenue are spent."

BHI's Rebuttal

In our simulation of the sales tax increase, government savings are fixed and government spends *all* the new tax revenue. If Dr. Charney had wished, she could have easily found this out without suggesting, wrongly, just the opposite.

The Charney Criticism

"Second, the STAMP model explicitly prevents some government spending from responding to a change in tax revenues: 'Some government spending is assumed to remain unchanged even if tax revenues vary; the rest of spending is endogenous, in that it responds to the availability of funds (p.25).' It is difficult to imagine which components of government spending remain unchanged when there are zero funds. Elsewhere in the PA STAMP report states "The purchases of goods and services by some government sectors are considered to be exogenous to [determined outside of] the model (p.31)." This whole concept is absurd and results in a) an increase in government savings and b) a very low job response to an increase in tax revenues because a portion of government spending continues on, no matter how revenues change. The whole point of the present study and this discussion is to compare economic impacts of raising taxes by $1 billion and increasing government spending by $1 billion. In the STAMP model, when taxes are increased, not all of the revenue increase is spent, and portions of government remain unchanged "even if the tax revenues vary." No wonder so few government jobs are affected by a tax increase of $1 billion in the STAMP model."

BHI's Rebuttal

Dr. Charney has not read our report carefully. On page 26, we clearly state that state and local government spending "are endogenous in the model." Thus a change in state spending, in fact, responds completely to the change in sales tax revenues. It is only federal government spending that is exogenous and that therefore does not respond.

The Charney Criticism

"Third, the STAMP model specifies government spending in ways that will automatically result in low economic impacts of government spending. The major arguments of why government spending has larger economic impacts than household spending are because a) governments buy more goods and services locally (in-state) compared to households, b) governments spend mostly on services, and c) service sectors have high direct jobs/$million expenditures. In STAMP, the model structure prevents government spending to generate those comparatively larger impacts than household spending. For example, rather than healthcare expenditures in STAMP directly affecting health-related jobs (doctors, hospitals, nurses, long-term care facilities), this important government expenditure is treated as a transfer payment to low-income households (PA STAMP, p. 11). If portions of government spending are treated as household income instead of direct spending, then (by design) the job impact of government spending will be extremely low."

BHI's Rebuttal

It is not clear that governments spend a larger share of their funds locally than households do. But let's give Dr. Charney the benefit of the doubt on this and see where her reasoning would take her. The answer is clear: In order to expand the economy, the state should divert as much money as possible from the private sector, which spends less, to the public sector, which spends more. After all, if spending is the goal, then certainly government has a better track record at this than do households and businesses. Here again, Dr. Charney gets twisted up in the Keynesian paradigm, in which only spending matters and in which saving is a vice, not a virtue.

But let's go to her comments about transfer payment. The reason we call Medicaid payments "transfer payments" is that they are so categorized by the U.S. Bureau of Economic Analysis in their National Income and Product Accounts. But the name doesn't matter. If Medicaid pays $100 for a private-sector doctor to treat a poor person, the job-creation effect of that payment is exactly the same as it would be if the government hired its own doctor to provide the treatment. Thus tax money that we allocate to households goes into spending (and job creation) as effectively as it would if we allocated it to government to provide the same services.

The Charney Criticism

"Finally, there is no explicit link in the STAMP model between state expenditures and the level of intergovernmental (federal matching) revenues. Thus the $442.5 million in federal matching funds associated with state government funding were not considered in the Goldwater Institute's press release. Not assessing the loss of federal matching funds is really not a failure of the STAMP model; rather it is the fault of the Goldwater Institute's use of the STAMP model when they neglected to incorporate those additional dollars."

BHI's Rebuttal

We thank Dr. Charney for absolving us of this "failure." But while she's providing absolution, she should consider the implication of her argument: which is that Arizona should raise taxes high enough to maximize in the inflow of federal dollars. This amounts to a policy of pushing a part of the burden of increased Arizona taxes onto taxpayers in other states. It also confuses the discussion of the effect that the higher tax, in and of itself, would have on the state economy. If Arizona wants the federal money badly enough, the state can get it by raising taxes but only at the cost of a shrunken state economy. The purpose of STAMP is to identify this cost. Because Dr. Charney sees only benefits, not costs, of expanded government spending, she ignores this tradeoff.

The Charney Criticism

"What is unclear, however, is how Arizona's transaction privilege tax was interfaced with the STAMP model. In particular, price appears in every relationship in the CGE model, including the demand for industrial inputs and consumer demand, by category. However, Arizona's transaction privilege tax does not apply to most industrial inputs. All inputs that are directly incorporated into the manufacture of a product are not taxable in Arizona. In addition, there are exemptions for equipment used in the production process. Further, most services (telephone and utilities are exceptions) are not taxed for either consumers or businesses."

"Since the STAMP model structure is the same for all states and since there is no description of which prices the sales tax applies to in the PA STAMP model, the obvious question arises: When sales taxes are increased in the STAMP model, does it impact the purchase of all inputs and the purchase of all consumption categories? Just how state-specific is the stamp model structure for Arizona? There is absolutely no way of telling from the PA STAMP write-up."

BHI's Rebuttal

It is true that different states have different sales tax structures and that a tax increase in one state will have different effects than a similar increase in another state. It is not true that the STAMP model structure is the same for all states. A STAMP model accounts for the relevant state's sales tax exemptions in the different sectors of the state it models. That is why we modeled proportional sales tax increases in five different states to calculate the average percentage change in each economic variable that we then applied to Arizona. It is interesting that Dr. Charney would say that it is not clear whether the tax falls on inputs or not, considering that we explicitly write the tax rates into the formulas that she claims to have read and analyzed. In our simulation we assume that the sales tax falls only on final goods consumed in the state.

The Charney Criticism

"Although there may be price effects on domestic vs. imported input purchases, the parameters needed to determine the size of those effects are simply unknown, so they are set arbitrarily and by assumption in the STAMP model."

BHI's Rebuttal

In her very next sentence, Dr. Charney writes that "the PA STAMP description said that the import elasticities were taken from the literature and referenced an article and a book." We rely on the economic literature to parameterize our model. There is nothing arbitrary about the values we assign to elasticities.

The Charney Criticism

"The STAMP model assumes import price elasticities much larger than this – 1.50 – for producers' purchases of intermediates, indicating that producers have a very strong response to in-state price changes, reducing their purchases of in-state produced inputs and choosing instead to import inputs. Thus the builders of the STAMP model have chosen to incorporate into its structure very large import responses to changes in prices."

BHI's Rebuttal

Again, the elasticities used throughout the model are provided by the literature. We do not specifically choose them to be large, but rather take the values we find there.

The Charney Criticism

"Further, and even more objectionable, the STAMP model applies those same 1.50 import elasticities of demand to most of the economic sectors in the model, despite the fact that the referenced elasticities were estimated for manufactured goods and mining commodities, i.e., items that are typically transported. But STAMP applies import elasticities to all sectors and sets most of them at the very high level of 1.50. Some of these make no sense at all. For example, they apply a 1.50 import elasticity of demand to construction, implying that if domestic construction costs increase, industries will "import" more construction, which is nonsensical. Industries will reduce the amount of construction they undertake because of the increase in price (both the UA study and STAMP apply a price elasticity of one). But STAMP assumes that not only will they purchase less construction overall, they will import more and buy less of it in-state. It just doesn't make any sense. According to STAMP, industries will change their in-state vs. import shares of utilities, banking services, real estate services, insurance services, and communications if domestic prices increase, all with the same 1.50 import elasticities of demand that were estimated for manufactured goods and mining commodities."

BHI's Rebuttal

The reason for the uniformity of the elasticities of imports across sectors is that we could not find more detailed estimates in the literature. At the same time, we can point out that, though the elasticity of imports may be high for sectors like construction, one must also consider the import share of total spending in those sectors. Taking construction as an example, only 9% of total spending in construction is on imports. Even though the actual elasticity may be smaller than we allow for in this sector, a given change in the sales tax will not lead to a large increase in imports.

BHI's Conclusions

Dr. Charney's dispute with us is not about elasticities or imported inputs. It is about methodology. She apparently subscribes the school of thought whereby it is always better for government to spend a dollar than for an individual or business to spend the same dollar, if the government, in spending that dollar, will have a bigger "impact" on the economy. By this (Keynesian) logic, it is always a good idea to raise taxes as long as there remains a private sector to tax.

Our methodology is different. In our world view, government, in raising a dollar, creates distortions in economic incentives that exert negative effects on the economy. In the case of a sales tax, this distortion consists of raising the price of a good above the cost of producing it and thereby reducing consumer demand for the good, with resulting negative effects on production and employment. Yes, the new money will permit government to provide additional, perhaps well-needed services. And, in spending or distributing the money, government will cause some new jobs to be created.

At the end of the day, however, there will be less production and fewer jobs – less production because of the negative effect of the tax on consumer demand and fewer jobs because the reduction in private sector production will always exceed the increase in production that the new government spending brings about. Here, though, the effect on jobs is seen as it should be, as the consequence of a shrunken economy, not of some artificial "stimulus" provided by government.

It may well be that voters or policy makers will find the shrinkage in the economy that results from raising taxes to be a price worth paying, considering the new services that government will be able to provide with the new revenue that it raises. But it is the job of the economist to identify this shrinkage, not to mask it with rhetoric about fictitious spending multipliers and the like.

The Beacon Hill Institute

The Beacon Hill Institute at Suffolk University in Boston focuses on federal, state and local economic policies as they affect citizens and businesses. The institute conducts research and educational programs to provide timely, concise and readable analyses that help voters, policymakers and opinion leaders understand today's leading public policy issues.

THE BEACON HILL INSTITUTE
FOR PUBLIC POLICY RESEARCH
Suffolk University
8 Ashburton Place
Boston, MA 02108
Phone: 617-573-8750 Fax: 617-994-4279
bhi@beaconhill.org
http://www.beaconhill.org

Comparison of UA, REMI, and STAMP Simulations of Tax/Spending Increases

March 30, 2010

By Alberta H. Charney, Ph.D.

UA Estimates of Tax/Expenditure Impacts Compared to those of the Goldwater Institute (prepared by Beacon Hill) and REMI

The Goldwater Institute (GI) issued a press release indicating that a $1 billion increase in government revenue from a sales tax increase in Arizona would cut 14,415 private jobs from the economy, add 5,260 to the government sector for a net negative job impact of 9,155. The present study estimated a net positive job impact of 13,128 (20,510 due to government spending less 7,383 due to the tax increase).

The results of the two studies are somewhat difficult to compare. The UA study computes the negative impacts of the $918 million sales tax increase (net of the portion paid by tourists), not the $1 billion in taxes (all paid by Arizona residents) in the Beacon Hill (BH) study.The UA study then separately computes the positive economic impacts associated with the increased government expenditures, while the BH study has built in a link between tax increases and government expenditures. The UA study results also include the economic impact associated with the federal matching money that will be lost to the state as a result of expenditure cuts. The BH study does not remove the portion of sales taxes paid by tourists and does not attempt to measure the impact of the federal dollars that will be lost to Arizona's economy.

The following table compares the economic impacts referred to by the Goldwater Institute and compares them to the UA study and REMI simulations done by ASU. In **Table 1**, the results of the three studies have been normalized to $1 billion in a tax increase and consequently a $1 billion increase in government expenditures.

Table 1
UA, Beacon Hill, and REMI Estimated Economic Impacts of a Tax Increase, Normalized to $1 Billion and Excluding Portion Paid by Out of State Visitors

	Estimated Net Job Impact of $1 B Sales Tax Increase and Corresponding Increase in Government Spending
UA Study	8,026
REMI*	8,384
Beacon Hill STAMP	(9,155)

***Estimate computed by simulations done by ASU in February 2009.[1]**

The computation of net job impacts is necessary for comparing model results because of differences in the concepts of presentation. In the BH presentation of results, the impacts of both the tax and government spending increases are divided into private and public sector jobs. The UA and REMI results estimates the total (public and private) negative impact for the tax increase and the total (public and private) impact of government expenditures. For comparison, the impact figures in Table 1 have been normalized to a $1 billion increase in taxes associated with a $1 billion increase in government expenditures. Therefore, none of the net impacts shown in Table 4 include the federal matching dollars associated with certain components of government spending.

From Table 1, the BH net job impact estimates are negative 9,155 jobs (representing a loss of 14,415 jobs in the private sector and a gain of 5,260 jobs in the public sector), while both the UA study and the REMI results show positive net job impacts of a tax/government spending impact of over 8,000. The remainder of this study identifies some of the reasons why the BH model results are so different than both the UA IMPLAN estimates and REMI.

It must be noted that there is no Beacon Hill report available for Arizona. Rather, the Goldwater Institute's press release[2] links to an unexplained half-page table, labeled "A $1 billion increase in transaction privilege use and severance tax revenue (Scenario 1): A 13% increase in current transaction privilege use and severance tax revenue." The values in Table 4 come from that table. A thorough search of the Beacon Hill website does not reveal a report for Arizona or a discussion of the model used for Arizona. The only report available was a description of the STAMP (State Tax Analysis Modeling Program) built for Pennsylvania[3]. Most of the following comments are based on that 40 page report. It must be noted that the PA STAMP model report is difficult to follow because many of the variables and notation used in the report are not carefully defined.

Before discussing Table 1, it is important to point out that the Goldwater Institute inexplicably simulated a 13% increase in both the transaction privilege (sales) and the severance tax, but the proposed sales tax increase will not increase the severance tax.

Why the BH Government Spending Impacts are Low Compared to UA and REMI

The BH net job loss figure of -9,155 is the residual from a -14,415 private sector job loss and a positive 5,260 public sector job gain. The 5,260 employment figure for $1 billion of government expenditures is extraordinarily low, so that value will be discussed first. That's lower than the direct impact (excluding the multiplier effects) of $1 billion in expenditures on general merchandise, in which no goods sold are produced locally and only the retail margin is retained in the state. This is absurd. Governments produce or buy mostly services, which result in far more jobs per $1 billion than 5,260. No other studies produce government expenditure impacts that low ---- not REMI, not IMPLAN, or any other.

Careful reading of the PA STAMP report reveals why the positive impact of government spending is so low. In the STAMP model, government spending is supposed to be linked with revenues. The PA STAMP model description indicates that government revenues are summed and spent by governments and, in the case of transfer payments, by households. But there are several problems with their approach.

First, not all government revenue is necessarily spent in the STAMP model. Specifically, an equation for government savings is defined as the residual between government income and government spending. The half-page table that was linked to the Goldwater Institute's press release did not indicate the change in government savings as a result of the tax increase. It is very likely that government savings increases in the simulation so not all tax revenue are spent.

Second, the STAMP model explicitly prevents some government spending from responding to a change in tax revenues: "Some government spending is assumed to remain unchanged even if tax revenues vary; the rest of spending is endogenous, in that it responds to the availability of funds (p.25)." It is difficult to imagine which components of government spending remain unchanged when there are zero funds. Elsewhere in the PA STAMP report states "The purchases of goods and services by some government sectors are considered to be exogenous to [determined outside of] the model (p.31)." This whole concept is absurd and results in a) an increase in government savings and b) a very low job response to an increase in tax revenues because a portion of government spending continues on, no matter how revenues change. The whole point of the present study and this discussion is to compare economic impacts of raising taxes by $1 billion and increasing government spending by $1 billion. In the STAMP model, when taxes are increased, not all of the revenue increase is spent, and portions of government remain unchanged "even if the tax revenues vary." No wonder so few government jobs are affected by a tax increase of $1 billion in the STAMP model.

Third, the STAMP model specifies government spending in ways that will automatically result in low economic impacts of government spending. The major arguments of why government spending has larger economic impacts than household spending are because a) governments buy more goods and services locally (in-state) compared to households, b) governments spend mostly on services, and c) service sectors have high direct jobs/$million expenditures. In STAMP, the model structure prevents government spending to generate those comparatively larger impacts than household spending. For example, rather than healthcare expenditures in STAMP directly affecting health-related jobs (doctors, hospitals, nurses, long-term care facilities), this important government expenditure is treated as a transfer payment to low-income households (PA STAMP, p. 11). If portions of government spending are treated as household income instead of direct spending, then (by design) the job impact of government spending will be extremely low.

Finally, there is no explicit link in the STAMP model between state expenditures and the level of intergovernmental (federal matching) revenues. Thus the $442.5 million in federal matching funds associated with state government funding were not considered in the Goldwater Institute's press release. Not assessing the loss of federal matching funds is really not a failure of the STAMP model; rather it is the fault of the Goldwater Institute's use of the STAMP model when they neglected to incorporate those additional dollars.

In contrast, the UA study and the REMI simulations spend all the revenues from the tax increase. Further, the UA study carefully allocates all government spending listed in the FY2011 Conditional Enactments to appropriate NAICS and IMPLAN categories for impact analysis, based on detail data in the State of Arizona FY2010 Appropriations report.

Why BH Impacts of Tax Increases are Large Compared to UA Study

There are many similarities between the IMPLAN input-output model used by the UA and the STAMP model. Both are used for impact/policy analysis. The STAMP model is a Computable General Equilibrium (CGE) model that starts with the same type of data contained in an input-output model and many of the same underlying assumptions, then changes the nature of some of the relationships. The construction of the STAMP model (and a number of other CGE models) utilizes the IMPLAN database.

CGE models are more complex than I-O models, requiring additional data and additional assumptions. For a simulation of an increase in the transaction privilege (sales) tax, the assumptions regarding prices are critical. In an input-output model, there are no price effects, other than what the model user assumes. For the increase in the sales tax, the UA impact study assumed price elasticities of one and zero cross price elasticities, thereby reducing consumption of all taxable categories by the amount of the tax, but having no effect on the purchase of other items. These identical assumptions are incorporated into the CGE model via the consumption function outlined in the PA STAMP model (p. 15).

What is unclear, however, is how Arizona's transaction privilege tax was interfaced with the STAMP model. In particular, price appears in every relationship in the CGE model, including the demand for industrial inputs and consumer demand, by category. However, Arizona's transaction privilege tax does not apply to most industrial inputs. All inputs that are directly incorporated into the manufacture of a product are not taxable in Arizona. In addition, there are exemptions for equipment used in the production process. Further, most services (telephone and utilities are exceptions) are not taxed for either consumers or businesses.

Since the STAMP model structure is the same for all states and since there is no description of which prices the sales tax applies to in the PA STAMP model, the obvious question arises: When sales taxes are increased in the STAMP model, does it impact the purchase of all inputs and the purchase of all consumption categories? Just how state-specific is the stamp model structure for Arizona? There is absolutely no way of telling from the PA STAMP write-up. If the transaction privilege tax is specified to impact all industrial inputs and all consumption categories in STAMP, then the 13 percent increase simulation of the tax would result in an extremely overstated negative impact of the tax.

Whether or not the STAMP CGE model results in reasonable estimates also depends on the realism and reasonableness of the added layer of assumptions required for the CGE model. A major difference between IMPLAN and the BH model is how imports/exports to the state are specified. In IMPLAN, imports/exports are determined by regional purchase coefficients (RPCs) that represent the portion of

local demand that is supplied locally for each sector. RPCs do not change with price in an input-output model and therefore do not change with an increase in the sales tax rate. In STAMP, the same RPCs are combined with STAMP's import "elasticities" to create domestic share elasticities for each industry. Import elasticities of demand measure how domestic prices affect industries'mix of purchases between in-state produced inputs and out-of-state produced products. When domestic input prices increase, the price elasticity of demand for imports determines how much businesses shift from buying in-state inputs to inputs purchased somewhere else in the world. Although there may be price effects on domestic vs. imported input purchases, the parameters needed to determine the size of those effects are simply unknown, so they are set arbitrarily and by assumption in the STAMP model.

The PA STAMP description said that the import elasticities were taken from literature and referenced an article and a book[4]. This author did not review the referenced book, however the import elasticities with respect to domestic prices estimated and presented in the article by Reinert, et. al. ranged from .02 to 3.49, with a mean of 0.91. One-third of the estimated import elasticities were not reported in the article because they were estimated to be negative, a finding which is inconsistent with economic theory. If the negative estimates are set to zero (the lowest values consistent with theory), the mean import elasticities would be approximately 0.61. The STAMP model assumes import price elasticities much larger than this -- 1.50 -- for producers'purchases of intermediates, indicating that producers have a very strong response to in-state price changes, reducing their purchases of in-state produced inputs and choosing instead to import inputs. Thus the builders of the STAMP model have chosen to incorporate into its structure very large import responses to changes in prices.

Further, and even more objectionable, the STAMP model applies those same 1.50 import elasticities of demand to most of the economic sectors in the model, despite the fact that the referenced elasticities were estimated for manufactured goods and mining commodities, i.e., items that are typically transported. But STAMP applies import elasticities to all sectors and sets most of them at the very high level of 1.50. Some of these make no sense at all. For example, they apply a 1.50 import elasticity of demand to construction, implying that if domestic construction costs increase, industries will "import" more construction, which is nonsensical. Industries will reduce the amount of construction they undertake because of the increase in price (both the UA study and STAMP apply a price elasticity of one). But STAMP assumes that not only will they purchase less construction overall, they will import more and buy less of it in-state. It just doesn't make any sense. According to STAMP, industries will change their in-state vs. import shares of utilities, banking services, real estate services, insurance services, and communications if domestic prices increase, all with the same 1.50 import elasticities of demand that were estimated for manufactured goods and mining commodities. These import elasticities are extremely unrealistic for most of these sectors. For example, if in-state utility prices increase, most businesses can't just choose to import more of their electricity and natural gas from out of state. They are stuck buying utilities from local utility companies. A handful of sectors -- wholesale, retailing, health, other services, and something labeled ENTRHO (variable undefined) -- are arbitrarily assigned lower import elasticities of demand of 0.50 in STAMP. Most should have been set close to zero.

There are numerous other elasticities in STAMP that are set by the model builders' "professional judgement." Few of them are documented. For STAMP to become an acceptable model alternative to REMI or IMPLAN, the model should be fully described, simulated for sensitivity of each of the assumed elasticities in the model, and be subjected to the referee process of publishing such a model.

Summary of Discussion of BH Model

The STAMP model structure allows for model builders to affect model outcomes depending on how taxes are specified , on how the parameters (elasticities) are set, and how the resulting revenues are spent..

The underlying model structure effectively minimizes the effects of government spending.

- Governments save a portion of revenue increases, thereby not allowing that revenue to have an impact.
- Part of the government is specified to be exogenous (determined outside the model), so that even if revenues fall to zero it remains unchanged.
- Important government spending categories are treated as transfer payments, thereby not creating direct (public or private) jobs and having the same (comparatively low) impact of household spending.

We don't know how Arizona's transaction privilege (sales) tax is incorporated into the STAMP model, i.e., we don't know which prices are affected when the sales tax rate changes. In Arizona, most inputs are not taxed (particularly for export industries) and most services are not taxed.

- If all industry input prices are increased as a result of the tax, the estimated impact will be too large.
- If all industry export prices are increased as a result of the tax, the estimated impact will be too large.
- If all consumer prices are increased as a result of the tax, the estimated impact will be too large.

The elasticities that are assumed in the STAMP model essentially pre-determine that tax increases will create large impacts.

- The import elasticities for producer manufactured and mined inputs are much larger than those estimated in Reinert, et.al.
- The import elasticities that are estimated for manufacturing and mining commodities are applied to most other economic sectors.

Both the model structure and the parameter assumptions suggest that the STAMP model was both designed and specified in a way that biases the results toward the findings of very low impacts of government expenditures and very high impacts of tax increases.

Related artilces:

What Will It Cost If Arizona Voters Reject the One-Cent Sales Tax Hike On May 18, 2010? Alberta H. Charney, Ph.D. 3/30/2010

Sales Tax Expenditure vs. Expenditure cuts: an Economic Impact Study. Alberta H. Charney, Ph.D. 3/19/2010

Find more research and data on Arizona Fiscal Issues .

Notes:
1. Computation based on findings of Hoffman and Rex, "The Economic Effects of Government Spending Reductions Relative to Other Options: A Report from the Office of the University Economist." Feb 2009, W.P. Carey School of Business, Arizona State University. Computation assumptions: a) REMI results are approximately linear, so they can be scaled and b) REMI results are approximately symmetrical so that the results of a tax cut and tax increase are equal but opposite.
2. http://www.goldwaterinstitute.org/article/4364
3. PA STAMP (State Tax Analysis Modeling Program), A Complete Tax Model for Pennsylvania State, The Beacon Hill Institute at Suffolk University, 2009. http://www.beaconhill.org/BHIStudies/PA-STAMP2009/PA-STAMP2009.pdf
4. The article was K.A. Reinert and D.W. Roland-Holst. "Armington Elasticities for United States Manufacturing Sectors." Journal of Policy Modeling. 14, no. 5 (1992): 631-639. The book was: D.W. Roland-Holst K.A. Reinert, and C.R. Shiells. "A General Equilibrium Analysis of North American Economic Integration." Modeling Trade Policy: Applied General Equilibrium Assessments of North American Free Trade. Cambridge University Press (1994): 47-82.