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Backgrounder

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The Economic Effects of Proposed Cap-and-Trade Legislation on the State of Florida

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Foreword

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When the U.S. House of Representatives voted in June of 2009 to approve the "American Clean Energy and Security Act," better known as the Waxman-Markey cap-and-trade bill, the media reacted with a flurry of analyses and commentary. Unfortunately, most of what was published and/or broadcast was woefully superficial.

In retrospect, that is not surprising; it is difficult to dissect legislation of that length – more than a thousand pages, with scores of amendments – in the brief time typically allotted for reports on TV newscasts or in the limited space available in most of the print media.

Moreover, much of the mainstream news media – usually so eager to be critical in their self-appointed role as watchdogs ever alert for governmental mendacity — welcomed this legislation with expressions of praise and relief. Much of the commentary was along the lines of "at long last the U.S. is doing something about global warming and climate change."

As a result, except in the Wall Street Journal and a few other news outlets, there was relatively little of the usual reporting about the influential role that special interests and their lobbyists played in shaping this legislation in committee. Worse, discussion of Waxman-Markey soon was almost totally eclipsed by the headline-grabbing nationwide debate about health care.

Meanwhile, a key committee in the U.S. Senate has passed its own version of cap-and-trade legislation. That bill, co-sponsored by Sens. John Kerry and Barbara Boxer, includes features that are arguably more problematic than Waxman-Markey. However, it is widely expected that the better known House version is likely to be the baseline for whatever eventually emerges from a House-Senate conference.

Inasmuch as this landmark legislation is also likely to be a turning point for energy policy and, thus, for the U.S. economy, it is likely that entire books eventually will be written about its long-term impact for good or ill. Will it spare us a climate catastrophe or cause an economic disaster? The jury is still out.

Meanwhile, *before* Congress takes final action – and *before* individual states such as Florida take similar action on their own – this approach's potential impact deserves a much more detailed analysis than the media have provided thus far. That is what this concise study by Beacon Hill Institute scholar Paul Bachman endeavors to provide. Using well-accepted computer modeling methodology, Mr. Bachman outlines the potential economic impact on the nation as a whole and to Florida in particular. It is a sobering analysis.

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The Economic Effects of Proposed Cap-and-Trade Legislation on the State of Florida

President Obama and several members of Congress have proposed legislation to reduce greenhouse gas (GHG) emissions in the United States. The Waxman-Markey Bill, which passed in the U.S. House of Representatives in June but has not been acted upon in the Senate, aims to bring GHG emissions, and hence carbon emissions, below 2005 levels in steps:

3 percent below those levels by 2012

20 percent below 2005 levels by 2020,

42 percent below 2005 levels by 2030, and

83 percent below 2005 levels by 2050.[1]

Waxman-Markey would create a "cap-and-trade" system, under which U.S. producers would receive tradable permits to emit greenhouse gasses. Producers buying the permits would, in effect, pay a tax for the privilege of emitting greenhouse gasses currently emitted without charge. The resulting "carbon tax" would have an effect on production and employment similar to an explicit excise tax on production.

In this report, the Beacon Hill Institute (BHI) uses two computer modeling capabilities to estimate the economic effects of this tax on the Florida economy. The first of these is the "DICE" (Dynamic Integrated Model of Climate and Economy), a model developed by William Nordhaus of Yale University.[2]

The second is the Beacon Hill Institute STAMP® (State Tax Analysis Modeling Program). We used the DICE model to estimate the implicit carbon tax that Waxman-Markey would impose on U.S. producers and the STAMP model to estimate the resulting effects on the Florida economy.[3] Table 1 displays the results.

"Producers buying the permits would, in effect, pay a tax for the privilege of emitting greenhouse gasses currently emitted without charge."

We find that the cap-and-trade system would impose a tax of $25.32 per metric ton of CO_2 in 2020 in order to reach the 20 percent emissions reduction goal. The cost would rise to $195.08 in 2050

"The proposal would cost each Florida household $816 a year in 2020 and $4,550 a year by 2050."

to reduce emissions by 83 percent below 2005 levels. These CO_2 taxes would cost the residents of Florida $7.14 billion dollars in 2020 and $62.591 billion by 2050 through increased energy prices. The proposal would cost each Florida household $816 a year in 2020 and $4,550 a year by 2050.[4]

As the term indicates, global warming is a global problem. Policies intended to reduce GHG emissions at the national or sub-national level are problematic for two reasons: (1) the reductions efforts are diluted because only a portion of total global emissions are effected and (2) the costs are borne solely by the national or sub-national entities while the benefits accrue to the entire world. In economics, this is referred to as a "free rider" problem.

For example, the United States emitted 7,230.1 million metric tons of CO_2 equivalents in 2004, which represents only 14.8% of the 49,000 million metric tons of CO_2 equivalents emitted globally that year.[5] Therefore, the 42%, and 83% emissions reductions proscribed in Waxman-Markey for the United States would translate into a global reduction of GHG emissions of only 6.2% and 12.2% respectively. However, these calculations assume that the U.S. portion of global emissions remain at 2004 levels, which is unlikely, given the probability that the emerging economies will grow faster than the United States and therefore increase their share of future global emissions.

The problem is even more acute when considering a single state, such as Florida. According to Florida's Energy and Climate Change Action Plan, Florida emitted 336.6 million metric tons of CO_2 equivalents in 2005, or only 0.69% of 2004 global emissions.[6]

Table 1: The Economic Impact of Waxman-Markey on Florida (2009 $)

Cost of Carbon	2020	2050
Net Equivalent Tax on carbon dioxide (current $/metric ton)	25.32	195.08
Total net cost to Florida ($ billions)	7.14	62.59
Total net cost per Florida household ($)	816	4,550
Economic Variables		
Net Employment (Jobs)	-49,214	-570,748
Gross Wage Rate ($/person/year)	-189.82	-1,662.93
Investment ($ millions)	-63.04	-5,522.43
Real Disposable Income ($ millions)	-6,192.37	-54,248.09
Tax Revenues		
State Funds ($ millions)	-508.44	-4,454.17
Local Funds ($ millions)	-403.10	-3,531.30
Total Funds ($ millions)	-911.53	-7,985.47

Therefore, if Florida were to recue its GHG emissions by 20% and 83%, as proscribed in Waxman-Markey, global emissions would only drop by 0.14% and 0.57% respectively.

The Waxman-Markey legislation would presumably reduce both global GHG emissions and the global temperature increase associated with said emissions. The benefits from the lower global average temperatures would accrue to the entire world population. However, the costs would be borne directly by the U.S. economy.

These increased energy prices would inflict significant harm on the Florida economy. The state economy would shed 49,214 jobs by 2020 and 570,748 by 2050. The decrease in labor demand, as seen in the job losses, would cause gross wages per person to fall by $189.82 per capita annually by 2020 and $1,662.93 by 2050.

The job losses and price increases would combine to reduce real incomes as firms, households and governments spend more of their budgets on energy and less on other items, such as home goods, entertainment, and clothing. As a result, real disposable income would fall by $6.19 billion per year by 2020 and $54.25 billion by 2050. Furthermore, annual investment in the state would fall by $63.04 million by 2020 and $5.522 billion by 2050.

State and local government tax collections would also suffer from the economic damage. By 2020, the state of Florida can expect annual tax revenues to fall by $508.44 million, while local governments would lose $403.10 million in tax revenue, for a combined state and local revenue loss of $911.53 million. By 2050, the state and local government tax revenue losses would swell to over $7.99 billion, with the state losing $4.45 billion and local governments losing $3.53 billion.

Table 2 shows how cap-and-trade would affect energy prices in Florida. The policy would push up the price of gasoline by 29 cents/gallon by 2020 and by $1.94/gallon by 2050, and raise the retail price of electricity produced from natural gas by 1.11 cents/kWh by 2020 and 7.64 cents/kWh by 2050.

Electricity produced from coal would experience a 2.48 cent/kWh increase by 2020 and a 16.93 cent/kWh increase by 2050. Additionally, bituminous coal would increase in cost by $40.63 /ton by 2020 and $277.89 /ton by 2050, while lignite coal would increase by $71.69/ton by 2020 and $490.29/ton by 2050.

Furthermore, under the proposed legislation, every state would be required to implement a Renewable Electricity Standard (RES) in which suppliers would be required to supply a mix of renewable energy according to annual requirements. Because of its lack of cheap renewable resources, Florida prudently has remained among the 17 states yet to approve a state RES. If the bill were to pass, Florida would be badly positioned relative to other regions such as the Northwest and Midwest regions — regions that have abundant sources of renewable energy such as wind and hydro-electric power.

As these renewable resource regions would be able to meet their "carbon quotas" under cap-and-trade, Florida could see a transfer of wealth. Consequently, Florida would need to buy permits, or Renewable Energy Credits (REC), from

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these renewable-resource-rich regions.

Florida's unique geographical location exacerbates the situation, since it would be extremely difficult and expensive to import renewable energy from other regions and transmit it to the heavy population centers in the central and southern portions of the state. CRA International estimates that by 2020 the REC costs in the southeastern United States alone will amount to $1.350 billion (2009 dollars).[7]

Methodology

To reduce GHG emissions, a cap-and-trade system seeks to change the behavior of economic agents such as producers, consumers, and governments. It does so by changing the incentives, both negative and positive, faced by all three when consuming GHG producing energy. BHI deployed the DICE model developed by William Nordhaus of Yale University to estimate the carbon tax needed to achieve the GHG reduction mandated by Waxman-Markey. We then used these results to calculate the effects on fossil fuel prices that would result from reducing GHG emissions and to measure the effects on the economy of Florida.

Although full details of the DICE model are set out clearly in Nordhaus (2008), and the computer code is freely available, it is useful to sketch the essential components here.

The model consists of 19 dynamic equations and rests on 44 non-trivial parameters. The objective is to maximize the present value of the utility that consumers get over time from consumption. Emissions of CO2 accumulate in the atmosphere and the oceans, and these accumulations reduce output via a damage function. Spending on emissions abatement is costly, and so there is a tradeoff: More abatement eats into

Table 2: Effects of Waxman-Markey on Energy Prices in Florida

Energy Source	2008 Retail Price	Energy Price Increases 2020	Energy Price Increases 2050
Gasoline retail price ($/gal)	3.29	0.29	1.94
Natural gas residential price ($/'000 cu ft)	21.29	1.75	10.66
Electricity retail price: natural gas (¢/kWh)	10.33	1.11	7.64
Electricity retail price: coal (¢/kWh)	10.33	2.48	16.93
Coal, bituminous, market price ($/ton)	41.4*	40.63	277.89
Coal, lignite, market price ($/ton)	16.5*	71.69	490.29

*2008 national price

Sources: Energy Information Agency.

For coal: http://www.eia.doe.gov/cneaf/coal/page/acr/table31.html

For natural gas: http://tonto.eia.doe.gov/dnav/ng/hist/n3010us3m.htm

For electricity: http://www.eia.doe.gov/cneaf/electricity/epm/table5_3.html

For gasoline: http://www.eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html

Conversion factors from "Carbon tax", Wikipedia..

consumption directly but limits damage by avoiding further warming that would indirectly have cut consumption. In principle there is a level and time pattern of emissions reductions that maximize utility, which is referred to as the optimal path. This may be compared to the "baseline" case of no emissions controls for 250 years.

The model allows one to specify abatement targets – for example, a maximum allowable rise in global temperature, or a maximum atmospheric concentration of CO2, or a given proportionate reduction in emissions. The model then determines how much to save and invest, and how much to spend on abatement. It also generates the carbon taxes that would be needed to yield these outcomes efficiently. We used the results of the DICE model to calculate the changes in fossil fuel prices that would result from reducing GHG emissions and to measure the effects on the economy of Florida.

The cap-and-trade policy would increase the price of energy, and subsequently goods and services. Standard economic theory shows that price increases of a good or service leads to a decrease in overall consumption, and consequently a decrease in the production of that good or service. This is especially true in periods of economic decline as we are now facing. As producer output falls, the decrease in production results in a lower demand for labor. We assume that the federal government opts for the free permit model under its cap-and-trade program, thus forgoing a substantial amount of revenue.

BHI utilized its STAMP (State Tax Analysis Modeling Program) model to identify the economic effects and understand how they operate through a state's economy. 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. It is general in the sense that it takes into account all the important markets, such as the capital and labor markets, and flows. It is an equilibrium model because it assumes that demand equals supply in every market (goods and services, labor and capital). This equilibrium is achieved by allowing prices to adjust within the model. It is computable because it can be used to generate numeric solutions to concrete policy and tax changes.[8]

"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."

BHI calculated the impact of the fossil fuel price increases on the price level for each of the (27) sectors of the economy within the STAMP model. Using the Energy Information Agency's (EIA) national data on GHG emissions by the residential, commercial, industrial, and transportation sectors; we allocated the national emissions to the STAMP sectors.[9] We then used data from the U.S. Census Bureau's Economic Census as a proxy for the size of each industry in each state relative to the national data.[10] We applied the cost of carbon, adjusted to be equivalent to 3.67 metric tons of CO2, to GHG emissions in each sector, which gives us our total cost to the economy. We converted these price increases in dollars into percentage changes based on the annual value of production in each sector.

> *"A cap-and-trade proposal such as Waxman-Markey would therefore inflict large negative impacts on the economy of Florida."*

We simulated these changes in the STAMP model as a percentage price increase on fuel to measure the dynamic effects on the state economy. The model provides estimates of the proposals' impact on employment, wages and income in Florida. Each estimate represents the change that would take place in the indicated variable against a "baseline" assumption about the value of that variable for a specified year in the absence of the cap-and-trade policy.

Conclusion

Cap-and-trade legislation is aimed at reducing the consumption of fossil fuels by increasing their prices and thus, in turn, the prices of energy and of all goods and services. A cap-and-trade proposal such as Waxman-Markey would therefore inflict large negative impacts on the economy of Florida. The state would experience significant declines in employment, wages, disposable income and investment upon implementation of the policy. Specifically, by 2050 there would be 570,000 fewer jobs in Florida, which would lead to a $1,600 per capita annual wage cut and $54 billion less in disposable income for Floridians.

There is, moreover, no offsetting benefit to the other states that would offset the harm suffered by Florida. In other analyses, we have shown that Waxman-Markey would inflict harm on the U.S. economy as a whole equivalent to what it would inflict just on the state of Florida.[11] No proposal to institute cap-and-trade should go forward without regard to these findings.

Endnotes

1 *American Clean Energy and Security Act of 2009*, HR 2454, 111st Cong. 1st sess. *Congressional Record* 155 (July 26, 2009): H7624-H7674. Also available at http://thomas.loc.gov/cgi-bin/bdquery/z?d111:H.R.2454.

2 William Nordhaus, *A Question of Balance* (New Haven: Yale University Press, 2008).

3 For a description about the model see www.beaconhill.org.

4 U.S. Census Bureau, Population Projections, State Population Estimates, and State Quick Facts, Internet, available at http://www.census.gov/population/projections/

SummaryTabA1.xls, http://www.census.gov/popest/states/tables/NST-EST2008-01.xls, and http://quickfacts.census.gov/qfd/states/12000.html. The compound annual growth rate for the Florida population estimates from 2000 to 2030 were used to estimate the state population to 2050. The growth rates were then use to grow the 2000 household estimate to 2020 (8,753,075) and 2050 (13,756,275.81).

5 U.S. Environmental Protection Agency, 2009 Greenhouse Gas Inventory Report, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007, Internet, available at http://www.epa.gov/climatechange/emissions/usinventoryreport.html. and Intergovernmental Panel on Climate Change, Climate Change 2007: Synthesis Report, Summary for Policy Makers, Internet, available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf, p. 5

6 Florida's Energy and Climate Change Action Plan, Chapter 2-Inventory and projections of Florida GHG Emissions, Internet, available at http://www.dep.state.fl.us/climatechange/actionplan_08.htm, p. 2-4

7 Michael Neimeyer, Scott Bloomberg, and Ken Ditzel, "The Merits of Combining a Renewable Electricity Standard with a Greenhouse Gas Cap-and-Trade Policy: An Analysis of the American Clean Energy and Security Act of 2009 (H.R.2454)" in *Dialogue* 17 No. 2 (August 2009), United States Association of Energy Economics.

8 For a clear introduction to CGE tax models, see John B. Shoven and John Whalley, "Applied General-Equilibrium Models of Taxation and International Trade: An Introduction and Survey," Journal of Economic Literature 22 (September, 1984): 1008. Shoven and Whalley have also written a useful book on the practice of CGE modeling titled *Applying General Equilibrium* (Cambridge: Cambridge University Press, 1992).

9 U.S. Department of Energy, Energy Information Agency, American Energy Outlook 2009, Table 18: Carbon Dioxide Emissions by Sector and Source, Internet, available at www.eia.doe.gov/oiaf/servicerpt/stimulus/excel/aeostimtab_18.xls.

10 2002 Economic Census, Summary Statistics by 2002 NAICS, United States, Internet, available at http://www.census.gov/econ/census02/data/us/US000.HTM.

11 We will provide the results on request.

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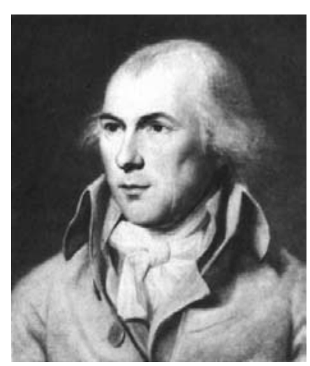

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