Climate Change Legislation: Job Creator or Job Killer?

Summary and Conclusions

Laws to prevent global warming could be a big help in solving our current unemployment problems, or they could be a big job killer, ***depending on the details of how the laws are written.*** If we really care about the jobs problem, we ***will go ahead*** with these laws – but we will be very strict about getting the details right for the economy.

Because of partisan politics and the complexity of the jobs issue, most of the readable reports out there are basically biased. Some try to sell climate change by suggesting that all climate bills would create lots of green jobs. Some try to attack action on climate by suggesting that all possible bills would reduce jobs and cost $2 trillion per year to the economy. This is misleading in both cases. This paper tries to get past those biased simplifications, and summarize what we can learn from a more careful examination of all the sources available, including the best available technical economic and engineering studies.

There are two different ***types*** of law to help prevent global warming. There are laws which control greenhouse gas (GHG) emissions ***directly,*** through cap-and-trade or charging a simple fee on GHG emissions or through complex actions like those allowed under the Clean Air Act (CAA). Examples of ***direct*** laws are the Kerry-Boxer bill reported out by the Environment and Public Works (EPW) committee, Titles III-V of the Waxman-Markey Act as passed by the House, and the "CLEAR" act under development by Senator Cantwell. There are also ***indirect*** or ***sectoral*** laws, like Title I and Title II of Waxman-Markey, which proposes new standards for building and appliances and for renewable energy, and like my proposal for more effective action to reduce our dependence on oil imports (http://www.werbos.com/oil.htm).

Both types of law can create more jobs than they kill, ***if they are designed right.***

Putting a price on carbon – either through cap-and-trade or a simple direct emissions fee – would certainly be better for the economy than old-style command-and-control regulation, as CAA requires if we do not pass new legislation. Two types of job loss are possible: (1) **competitive** loss – for example, if we end up importing more steel from China because US steelmakers have to pay for emission allowances or fees that Chinese steel-makers do not; and (2) **fuel-switching** loss – for example, the job loss in coal mines if climate laws force less use of coal, above and beyond the job loss already occurring because of other historical trends. The first type of loss can be nearly eliminated by rational, efficient **border adjustments –** the best of which would be a simple set of import tariffs calibrated to create a level playing field "as if" producers in China had to pay the same carbon price as producers in the US. The second type of loss could be eliminated if we moved as effectively as possible on **Carbon Capture and Re-Use (CCR),** a new lower-cost alternative to CCS which is likely to become available much sooner than commercial CCS, if we do our best to make it happen. In sum, the job loss could be reduced to near-zero, if we get these details right.

Putting a price on carbon could also have substantial job creation benefits, which are not properly accounted for in many otherwise authoritative economic studies. Most of those studies do not account for the fact that the US now has huge, valuable underused human resources in the construction, automotive and steel industries. It is **not** a "free lunch" to say that more work can result in more product – if we put more of these people back to work. The biggest job benefits from putting a price on carbon would result from immediate larger new investments in the electric power sector – new generation, new transmission, and new CCR projects to clean up emissions. These would immediately result in more construction and more use of steel, as well as the creation of some new industries. The electric power sector itself has told us what is needed to maximize these new near-term investments: **greater certainty** , especially about prices and regulation. In testimony to Congress, they have said that the status quo – with multiple state and local rules, with fuzzy uncertainty about what EPA will do, and deep uncertainty about what or whether Congress will ever act (and how) – is the worst of all possible worlds for

investment and jobs. The best (the greatest job creation!) would come from what Exxon has called for – a simple carbon fee, published at least ten years in advance, superseding all other direct GHG regulation of stationary sources. Next best would be a simple (predictable) cap-and-trade system, also superseding CAA for GHG, with a firm and clear long-term price collar, perhaps starting at $20 floor and $30 ceiling, with a ceiling to rise to $50 by 2050, and an exclusion of allowance trading by third parties. **The more certainty for investors**, the more jobs.

Sectoral measures could magnify the net job benefits many times over, while making it easier to reduce overall GHG faster and better and at lower cost. The American Council for an Energy-Efficient Economy has done credible multisectoral economic modeling showing how the conservation measures which result from a **combination** of a carbon price and sectoral measures could create a million new jobs by 2030. Even more – a new oil independence bill with strong tax incentives for new cars and trucks and new refueling stations would have jobs benefits similar to "cash for clunkers," many times over. Recent reports say that cash for clunkers and tax incentives for first-time home buyers have increased demand in the private sector in the US far more than an ordinary tax break of the same size. **If we really want to maximize job creation (especially in construction, steel and automobiles – the sectors where help is needed most) we will build on that experience, instead of just recycling the old "300,000 foot" ideas in the older literature**. We could pay for those incentives either from the new revenue that a carbon fee could generate, or even by offsetting the new tax breaks with offsetting (modest) increases in the gasoline tax, a tax which has more impact on the OPEC economies than on the US economy. In that way, we could substantially ease our unemployment problem and the economic risks from oil dependence, without any net increase in the federal deficit **or in the total level of federal taxes**.

2. Observations on Types of Laws

Both for border adjustments and for putting a price on carbon, economic theory tells us it is normally inefficient to **combine** old-style regulation with a market-based system.

For example, some environmentalists would argue that we would reduce CO2 more by **combining** CAA regulation with cap-and-trade. But how does this square with the idea that the CO2 reductions are **fixed** in cap-and-trade, at the same numbers, without or without that additional regulation? If CAA regulation were combined with a certain carbon fee, that would reduce CO2 more than the carbon fee alone; however, economics tells us that we could usually get that same additional reduction in CO2 at a lower cost, by using a higher carbon fee to get it and letting the market figure out how to make the reductions. This is due to an essential concept called "Pareto optimality."

Sometimes there are specific market failures which change the story here. That's why "sectoral measures" can be so powerful, when they are based on in-depth understanding of the nature of market failures. That's also why it was very appropriate for Senator Specter to ask the Administrator of EPA for **specific** enumeration and analysis of specific market failures, and what it would take to address them, so that the CAA could be superseded by very specific "sectoral measures' to be added to the new bill. EPA's work on regulation of mobile sources has received bipartisan support, for example, and Senator Murkowski has rightly called for that specific authority under CAA to be continued even as other CAA authority over GHG is superseded. It is possible to argue that market failure may cause electric utilities to build new plants which **waste the energy in coal or natural gas,** using older designs instead of more efficient new combined-cycle technology; a sectoral measure to address that issue of energy waste might have merit, as an addition to new legislation, **but it is hard to see how simple use of CAA would do a good job of plugging that kind of hole**. The (debatable) market failure here is the undervaluation of coal and natural gas in the ground, due to interest rates and risk effects and limits of financial markets to fully value scarcity rent ("Hotelling rent"); it's not a matter of CO2 as such, which is already handled by putting a price on emissions.

Likewise, with border adjustments, it is less efficient to combine border tariff adjustments with free emission allowances. The "Inslee-Doyle" notion of output-based free allowances was originally conceived as an

alternative to border tariffs, which would: (1) hopefully reduce problems with WTO; and (2) also help industries exposed because of competition in their **export markets**. But the latter has not materialized, and will not be such a big problem if we make arrangements with Europe and Japan at least. The first does not seem to be working nearly as well as we thought. Free allowances are **inherently** a form of subsidy, exactly what WTO was designed to prevent. China has made it clear it would tie them up in court in many ways. Also, they are not a very direct way to create a level playing field between domestic and foreign industry (what WTO was set up to enforce). And they expire with time. Because of their limitations, Waxman and Markley had to add a border tariff section anyway, to get through.

If border adjustments were limited to border tariffs, and if the executive branch were required by law to make as level a playing field as possible, there would be no need for an expiration date, and less chance of real trouble with WTO. They should apply of course, only to other nations which charge a lower carbon fee or emissions price than the US, or which exempt many of their emitters over the 25,000 tons/year level. If we expanded our goals in Copenhagen, to include **discussion of a common global floor price on carbon**, we could openly aim for a treaty which would nullify the border adjustments (for nations ratifying such a price to apply to them).

3. Maximizing Jobs From Putting a Price on Carbon

First, let's review what's "out there" in the usual literature.

There are many, many "green jobs" studies which are largely collections of anecdotes and future hopes of small companies. They do not address the issue of job loss, or job creation in areas like building new transmission lines. The National Coalition on Energy Policy did a recent study cited as unusually credible in Senate testimony in November 2009, but is not easy to find on the web. Skip Laitner of the American Council for an Energy Efficient Economy has done what some view as the best recent study on the investment effect of energy conservation, discussed at http://www.eesi.org/110609_economics.

More highly cited at present is testimony by CBO, dated 10/14/2009, available at www.cbo.gov. That testimony said that putting a price on carbon would probably not add or subtract jobs in the long-term – but would probably lead to large job losses, especially in the short-term and in certain regions. It is important to note that this prediction was not based on any new quantitative analysis or on econometric modeling of any kind. It was based on a very insightful view of past fundamental transitions in the US economy. That kind of historical thinking is a very valuable contribution, but it is important to consider its limitations. In those past transitions, we were basically going from a time of full employment in established industries to a period where they disappeared; here, we are started from massive unemployment in the established industries of construction, automobiles and steel; comparisons which simply forget about that unemployment do not do justice to what we are facing today. Without that unemployment, jobs would not be such a huge issue today.

On page 16, CBO also cites the seven quantitative studies which it considered when forming its views. It does not say which of the seven it believes. It does not offer a critique or evaluation. It mainly notes that the numbers are very different from different studies.

Two of these studies (Heritage House and Black Chamber of Commerce) come from well-known advocates of canning cap-and-trade. Two others (EPA and EIA) are voices of the Administration, which have stated that the cost of the Waxman-Markey Act would be "less than a postage stamp per day." Of the three more independent studies – from Resources For the Future (RFF), Brookings and MIT, RFF provides the most comprehensive detail and review of *other* work on the same issues.

The four "advocacy" sources are worthy of further discussion, though I will not say so much about them here. To assess the job impacts, it is really crucial "to be aware that the steel and auto industries actually exist;" those four models are at a more aggregate level, without that particular kind of detail[1]. The Black Chamber of Commerce model appears to be based on using a special dataset descended from the same one that we at EIA used back in the 1970's, in producing a study of fuel switching in boilers; however, that data really did not fit certain kinds of neoclassical assumptions, and would not in any case cover the kinds of detail needed for this jobs analysis.

The RFF report stated that there are only three truly multisectoral models available now, with the level of resolution needed to do justice to the issues at hand here. (Their report came out before the new Laitner work, which also uses a multisectoral model. It is very unfortunate that the old Wharton Annual Energy Model, which was the best mutisectoral model available in the 1980's, was discontinued.) They provided great detail on their use of the recent Adkins model, developed to assess international competitiveness issues. They did not actually have year-by-year predictions in this work; rather, they had a "short term" set of predictions which assumed no investment, and a "long-term set" which represents a new equilibrium **after** investment has been completed. The model did not in any way account for how investment itself might occur in the near-term future, and generate jobs.

The RFF "long-term' analysis gives an interesting and valuable insight into the competitive and fuel-switching effects. Of course, the competitive effects in the US market would be zero, if border tariffs resulted in no net competitive effect working against US industry. (If US industry uses less energy per dollar of output than Chinese industry, then a level playing field would actually benefit US industry temporarily – but as China catches up, and replaces old inefficient plants, it goes to zero effects.) But the competitive effects in industries like steel would be only something like 1% job loss, even with no border adjustments, by 2050; that is far, far less than the unemployment being experienced today. With coal, they project more like 20% less jobs by 2050. **But that projection depends critically on the assumptions about technology.** If the technology for CCR and CCS is not there, even at $100 per ton allowance prices, then the Waxman Act would indeed force a great cutback in coal; thus the EPA forecasts show a much deeper reduction in coal by 2050 than RFF does! But if we feel reasonably confident that a price between $30-$50 would let us clean up half or all of the flue gas from coal plants, then we have a good chance of seeing no reduction in coal jobs at all from cutbacks in those coal plants.

To judge these forecasts – it is crucial, for example, to have a good idea of what it takes to build a new nuclear power plant. Exelon – which actually operates more nuclear plants than anyone else in the US, and tracks its investment options very closely – has a better idea of the real costs than any of these economic models. In testimony to EPW this month, they stated that new nuclear plants would require an allowance price of $75 per ton. If we have a ceiling of $30-$50 per ton for emission prices or allowance prices, we can be reasonably sure that CCR will be able to beat demolition of coal plants and construction of new nuclear plants to replace them.

What if the technology is not there? In that case, a $30-$50 price ceiling will at least guarantee that the cost of cap-and-trade will be bounded.

To assess the prospects of CCR, it is necessary, in principle, to consider the prospects of dozens of promising new companies, converting CO2 in flue gas to mineral products, or to hydrocarbons like feedstocks for refineries and chemical plants, or to protein sources like fish food. However, an "existence proof' of two very promising examples is enough to justify great optimism. Consider Calera, for example. (www.calera.biz and http://pangea.stanford.edu/people/cv_nav.php?personnel_id=1019) Calera has proven out a suite of new chemical processes; for example, instead of storing CO2 in the ground, one might convert CaO or MgO (or HgO?) to the

[1] EIA has at times used the "GEM" family of models, from Dale Jorgenson of Harvard, which is multisectoral, but does not contain the kind of investment-to-construction effects or sectoral unemployment effects required to get a grip on the issues here. See also http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=5322851.

minerals CaCO3, MgCO3 or HgCO3 – much stabler and more compact than CO2 as such! After a tough business plan analysis, they conclude that there is enough market for such materials in the building sector to take up half the CO2 in all the flue gas in the US at an emission price of $20 per ton. At a higher price – it would not even be necessary to sell the minerals. As another example, Aurora (www.aurorabiofuels. com) has already successfully demonstrated its new technology for growing algae from CO2 in flue gas, to make a mix of "crude oil" and fish food, which are also massive markets. New technologies for bioreactors to process flue gas are also very promising.

On the investment side, again, the largest set of new jobs would come from the electric utility sector and their suppliers. They are ready to make very massive new investments, now, when we most need them. Both in Congressional testimony, and in discussions with the IEEE (the world's largest professional society, which includes, for example, the Power and Energy Society as a member), they have made it clear many times over that certainty – especially price certainty –is what they need most in order to make those large investments. Companies like Exelon and Duke Energy have made it clear many times over that they need this. GE's enthusiasm for cap-and-trade can be explained in large part by the large new orders they would get for generators and electrical equipment of all kinds, if we pass legislation which sets a price on carbon.

Real economic modelers know that we really need to use simple arithmetic sometimes, to get a feeling for the bounds of our uncertainty. That is especially true when estimates of the cost of carbon regulation vary all over the map. In the Waxman-Markey Act, there is no limit on the price of emission allowances; that is why some analysts can project very high total costs, simply by assuming high allowance prices. In the Kerry-Boxer bill reported out of EPW, there is a soft upper limit rising to about $300 per ton in 2050; if you multiply that by the 6 billion tons of emissions we had in the most recent data (DOE/EIA-0573(2007)), that gives a very crude upper limit of $1.8 trillion dollars per year of carbon fees or costs – and even more because it's not a hard upper limit. The main effect of making it a soft upper limit is to open the door to a possible cost of more than $1.8 trillion per year. But if we had a hard upper limit of $30 per ton (in 2009 dollars), that would give an upper limit of $180 billion per year; in the near term, if half of that gets recycled to households and half goes to new construction, the real economic cost would probably be less than half of what EPA projects, and quite possibly a net benefit instead of a net cost, not even counting the environmental benefits. If we do things right, the effect on jobs would be a strong net benefit, and the short-term effect on GNP would be a small cost or a benefit.

4. Sectoral Measures and Sectoral Effects in Job Creation

It is common for many economists to think in purely "macro" terms. In order to create jobs, they would try to increase aggregate demand in the economy. They would say that a dollar of government spending creates x dollars of demand (directly and indirectly), which generate X jobs. A dollar of tax breaks creates y dollars of demand, and Y jobs. They argue a lot about what the numbers x and X and y and Y actually are. But when the US government has reached the limits of how much deficit spending it can afford, and when monetary policy is as loose as we can safely get, then they all start to become very worried. They are basically helpless.

To break out of this feeling of helplessness – **the key point to remember is that a dollar of stimulus creates different effects depending on which sector of the economy it goes to**. A dollar of demand sent to the auto industry, this year, in its depressed state, creates a dollar of additional production and brings unemployed workers back to work. It propagates back to create more demand for steel, which is still the biggest material component of a new car. But a dollar of demand sent to a sector already in full employment, like health care, is more likely to result in inflation rather than new jobs. At least, compared to automobiles. The government needs to be careful not to overdo the emphasis on specific sectors, because there are times when a sector is over built, and needs to be phased out in the long term. But in the case of autos and houses – Americans will not be needing only half as many cars or half as many houses in the long-term future as they do now; we can be reasonably sure that the present levels of unemployment in automobiles, construction and steel are an anomaly which really needs to be

corrected. The sooner, the better, because there is unnecessary suffering and waste of human resources every day right now.

As an example – consider tax breaks. A comprehensive oil independence bill should include new and extended tax breaks for plug-in hybrid cars and fuel flexible cars and refueling stations, and the like. Each dollar of tax break in those sectors should increase demand very effectively, as "cash for clunkers' demonstrated. Equally important – that demand goes to the auto and construction industries, which consume steel – the sectors where new demand is needed most. If we pay for that new tax break with a rise in gasoline tax, for example, the NET TOTAL level of taxes and deficit would not change; it would be a case of trading one tax for another. But a large part of gasoline expenditures end up stimulating the economies of OPEC, which is not a sector of the US economy at all! The demand ADDED by the tax breaks would be much larger than the demand LOST by the offsetting tax to pay for it. This makes it possible to increase net demand and jobs without having to increase net deficits or taxes at all. Engineers responsible for controlling complex systems have known for years that this kind of multivariable strategy, like "vector thrusting" or "nonholonomic control," is really essential sometimes. Our jobs problem today is one of those times.

Of course, tax breaks for new cars could be paid for by revenues from cap-and-trade or carbon emission fees, instead of a gasoline tax. That is a policy decision. Leading makers of hybrid cars have said that a simple **extension** of the existing tax incentives now on the books, to extend for ten years or more, would have a huge effect in spurring on their industry. Would we need more revenue to pay for these tax incentives, if it's just the same incentives? **Yes** -- because the extension would cause a ramp up in the production and sales of those cars; even if it is the same tax incentive per car, there would be more of those cars. To minimize uncertainty, the ideal method would be to say that the amount of the national gasoline tax will rise automatically to cover any increase in total incentive payments under sections 30B and 30C of the internal revenue code, as modified and extended.

Some economists would ask: what about three years from now? For now, the extra demand and jobs in these sectors would be a godsend, but when normal demand recovers, wouldn't this then start to overstimulate the economy? Probably not, for several reasons. First of all, some of the current drop in demand now seems to be permanent. The surprise and anxiety generated by the September 2008 crash, as well as the retrenchment of credit, seems to have shifted the savings rate overall. Three to ten years from now, these new tax incentives will not be likely to have the same effect on overall automotive demand as they would now. These incentives **would** continue to raise demand in construction and steel, but that is necessary to offset the loss in demand due to a return to normal in the real estate sector (which was overinflated up to September 2008). The new tax incentives still remain desirable, in an efficient economic equilibrium, because they represent the "externality value" of greater national security, of exerting America's market power in the world oil market, and of improving our balance of payments – another deficit just as important as the government deficit.

At a hearing in November of the Senate Finance Committee, a witness representing the modeling of the National Association of Manufacturers (NAM) argues that we should sooner believe her dire forecasts of cap-and-trade, based on an aggregate model, versus projects from "the commerce people using input-output models, which predict a million or more new net jobs." (Unfortunately, the testimony did not cite the specific study she was arguing against.) She argued that the input-output people themselves admit that input-output models do not account for structural changes in the economy which would result from changes in energy prices. What she didn't say is that substitution effects almost always **improve** the economic outcome. When businesses substitute one input for another, they generally do so in order to reduce costs and improve overall economic efficiency. A multisectoral model which **also** accounts for substitution effects and dynamic effects reasonably well would be more reliable than either of the two alternatives she describes. The Wharton Annual Energy Model of the 1980's was such a model – and it generally showed better GNP response to energy price shocks than simple input-output models, which are also multisectoral. In summary – the input-output runs she described would probably **understate** the net benefits of a well designed climate bill. But a badly designed bill might well lead to the very high costs she warned about.