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001. biography	Biography of Cecil E. Roberts, Jr. [partial] [PII] (1 page)	00/00/0000	b(6)
002. biography	Biography of Peter B. Lilly [partial] [PII] (1 page)	08/00/1997	b(6)

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EPI [Economic Policy Institute] Study - [Climate Change]

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FOR IMMEDIATE RELEASE
September 17, 1997

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U.N. Treaty on Global Warming Will Devastate U.S. Economy, Study Finds

Labor-Management Group releases study showing staggering job losses and steep increases in consumer prices if proposed U.N. treaty is signed

Washington – More than 1.5 million American jobs will be lost and the prices consumers pay for gasoline and electricity will skyrocket under a proposed United Nations treaty on global warming, according to a study released today in Washington, DC.

In December, the U.S. and other countries will meet in Kyoto, Japan to consider a U.N. treaty to reduce greenhouse gas emissions that some scientists believe causes global warming. According to the study, conducted by the leading independent economic forecasting firm of Data Resources, Inc. (DRI), the proposed treaty will cost at least 1.7 million American jobs by the year 2010. Particularly hard hit will be the mining industry as well as the energy and manufacturing industries. Every industrial sector and every region of the country will experience job losses.

In addition, the study found that staggering increases in the cost of energy and consumer goods will result from the treaty. The cost of gasoline alone will increase 43 percent by the year 2020 while electricity costs will rise 94 percent, costing the average American family potentially thousands of dollars every year.

Citing the DRI study results, Cecil Roberts, the President of United Mine Workers of America - BCOA, and Peter Lilly, the President of Peabody Holding Company, on behalf of the UMWA-BCOA Labor Management Positive Change Process (LMPCP) today cautioned the Clinton Administration not to agree to any treaty in Kyoto that will lead to such widespread economic devastation.

"The proposed treaty currently being considered will throw a record-shattering number of American families out of work and these are jobs that will never be replaced. This proposal represents all pain and no gain for American workers, American consumers and our entire nation." Cecil Roberts said.

Peter Lilly added, "As Americans, we owe it to our children and future generations to find a way to achieve a cleaner environment without bankrupting the U.S. economy and consigning millions of Americans to a life of unemployment and poverty."

The Economic Policy Institute (EPI), a Washington-based think tank, has reviewed the DRI study and its economic assumptions. EPI concluded that additional negative impacts will occur beyond the DRI results, including further wage erosion among American workers and significant increases in the American trade deficit if the treaty is signed as proposed.

In the August 1996 negotiations arising from the reopener provisions of the 1993 National Bituminous Coal Wage Agreement Negotiations the UMWA-BCOA agreed to use existing labor-management organizations to work together on the issues arising from international global warming initiatives.

The LMPCP, which is jointly administered, was given an additional task of developing material on the global warming issue. The LMPCP was established in the 1993 Agreement to help foster a cooperative labor/management environment at individual coal mines.

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Background on Global Warming

Introduction

For more than a decade, the nations of the world have been discussing the issue of global warming. Through a series of United Nations sanctioned negotiations over the past five years, the U.S. and other nations of the world have moved to the brink of a policy that could have devastating consequences on the American worker and consumer, with little or no climate change benefit.

The Rio Treaty

In 1992, the United States and other nations signed the U.N. Framework Convention on Climate Change (FCCC) in Rio de Janeiro. The framework convention, also known as the Rio Treaty, established the long-term goal of stabilizing concentrations of greenhouse gases at a level that would prevent dangerous human interference with the climate system. It was agreed that 36 industrialized nations such as the United States, the OECD except Mexico, and the Former Soviet Union would aim to return greenhouse gas emissions such as carbon dioxide to 1990 levels by a date left uncertain. Because the remaining 129 "developing nations" including India, China, Mexico, Brazil and South Korea claimed they needed more time to allow their economies to grow, a vague clause in the agreement simply required these nations to pursue "sustainable development."

The Berlin Mandate

In 1995, the parties to the Rio Treaty met in Berlin to review progress in meeting treaty objectives and to discuss emission goals for both industrial and developing nations. The parties found that despite efforts undertaken since the Rio Treaty, the United States and most other industrialized countries would not meet the 2000 emissions target.

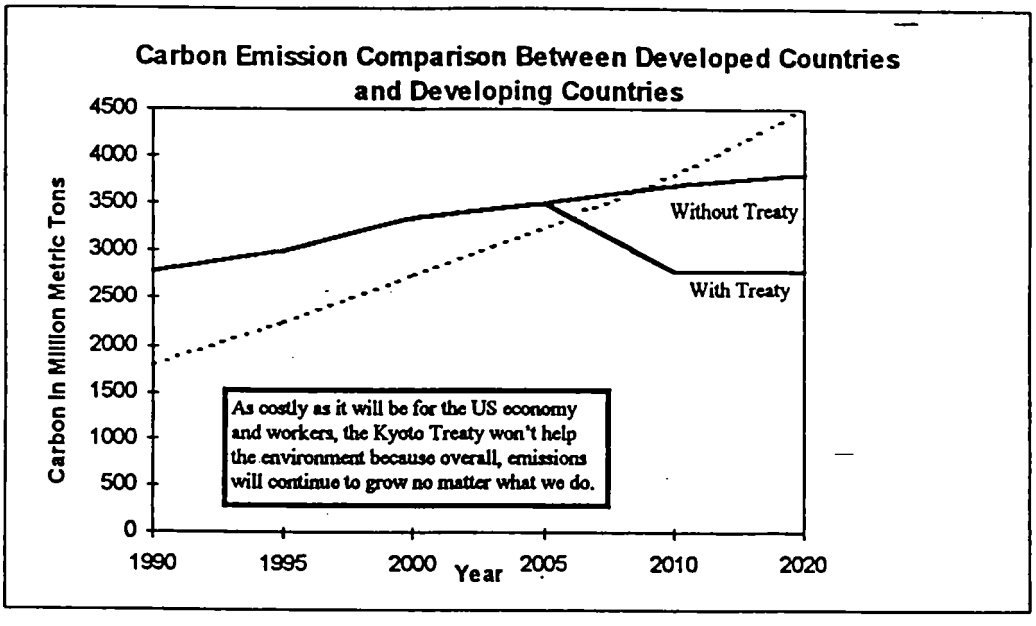
Despite this, the parties agreed to the Berlin Mandate. The Berlin Mandate called for negotiating a legal protocol for establishing new commitments to limit greenhouse gas emissions by developed countries only, with a goal of adopting a treaty in December, 1997, in Kyoto, Japan.

The Berlin Mandate specifically exempted all developing nations from any new commitments. Therefore, developing nations were given the greenlight to continue emitting greenhouse gases even though those emissions are known to be rapidly increasing and are expected to surpass the emissions of the U.S. and other OECD nations by 2015 or earlier.

The Kyoto Treaty

The Kyoto Treaty, currently being negotiated for signing in early December 1997, would require binding targets and time tables for greenhouse gas emission reductions for only 36 developed countries. Developing nations would be exempted from making emission reductions. The negative impact on the U.S. from such a treaty would be immense.

First, if developing countries are allowed to continue emitting greenhouse gases, the very problem the treaty was meant to address will not be solved. Even if developed nations reduce their carbon dioxide emissions to meet 1990 levels, developing nations will more than double their amount of emissions. U.S. efforts to reduce carbon emissions will be rendered useless and overwhelmed by emissions from the developing world.



United States and Other Developed Countries

Developing Countries

Second, a general consensus exists among economists studying this issue that, in all likelihood, companies located in industrialized countries that wish to avoid emission control requirements will simply move their operations to countries not subject to the provisions of the proposed Kyoto Treaty. This will increase American dependence on foreign energy sources, increase American dependence on manufactured goods made in competing developing nations, and send hundreds of thousands of jobs overseas.

Third, policies currently being considered by the United States that will determine the magnitude of the requirements of the Kyoto Treaty are equivalent to an increased energy tax on carbon fuels several times larger than all current state and federal energy taxes

combined. The impact on the U.S. trade, agriculture, employment and economy will be devastating.

Several studies completed in the U.S. by both independent and government research groups to determine the impact of various carbon mitigation strategies on the U.S. economy bear this out.

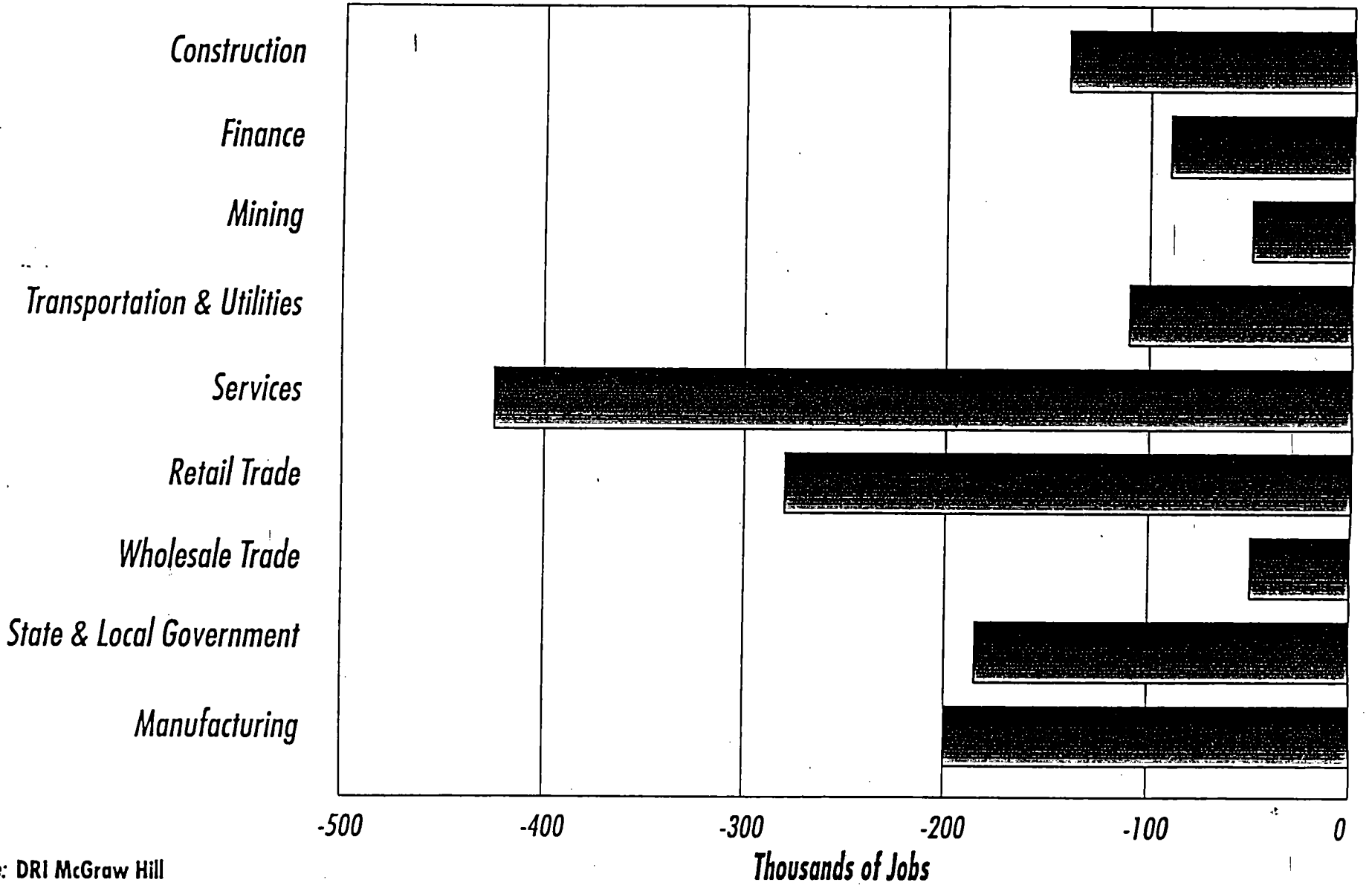
Although the studies differ somewhat in their methodology, base case assumptions and focus, they all reach conclusions that show a severely negative impact on the U.S. economy whether the strategies are carried out unilaterally by the U.S. or with international cooperation from industrialized nations. Job loss estimates in the United States range from 900,000 to 1.7 million by the year 2010, with the mining, energy, and manufacturing industries taking the hardest hit. The effect will also be uneven across the country, with the East and West South Central regions, due to their high concentration of energy based industry, taking the brunt of the job losses.

With the adoption of the Berlin Mandate, it has now become clear that global warming has ceased to be solely an environmental issue and has instead evolved into an economic issue that threatens to plunge the United States into an economic crisis with higher unemployment, higher inflation, reduced economic output and increased trade deficits. Developing nations hold the key to the effectiveness of any climate treaty. Until these nations are willing to commit to long term participation under the Rio treaty to reduce emissions, industrial nations cannot develop a rational plan for reducing their emissions. Even the U.S. Government's own Council of Economic Advisors, in a report to the president dated in February 1995 stated:

"Given the global scope of the issue, it will become increasingly important to coordinate national responses in order to avoid excessively costly or perverse outcomes. Focusing only on emissions from today's advanced industrialized countries would do little to prevent 'leakage' of emissions to other countries that are expanding their industrial bases."

Employment Loss by Industry, 2005

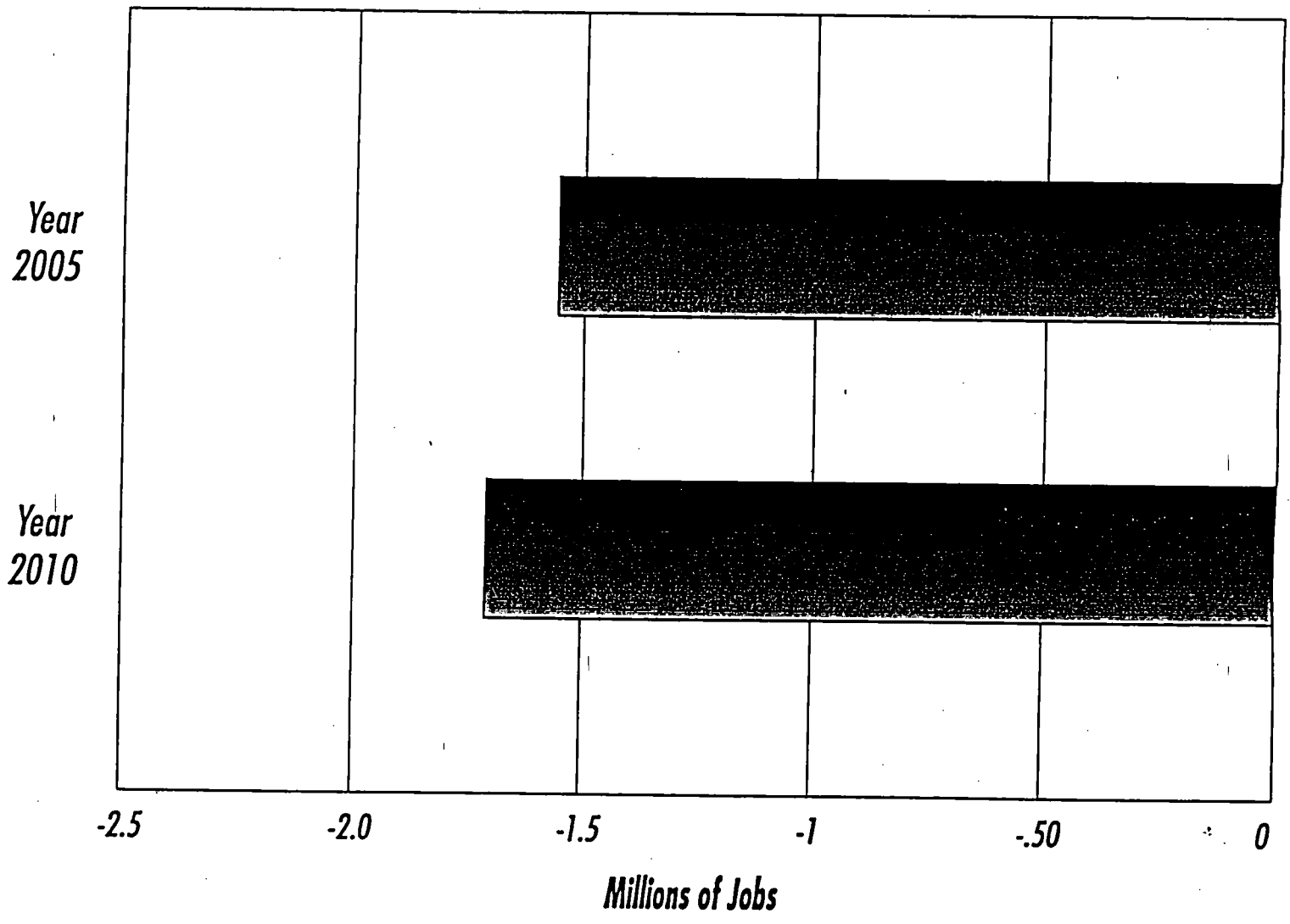
Stabilization at 1990 Levels by Year 2010



Source: DRI McGraw Hill

Total Employment Losses

From Carbon Reduction Policies, Stabilization at 1990 Levels



Source: DRI McGraw Hill

Accelerating Globalization?
The Economics Effects of Climate Change Policies on U.S. Workers

Robert E. Scott

Introduction

The Framework Convention on Climate Change, which the U.S. and other countries signed in 1992, committed the U.S. and other countries to a voluntary plan to reduce emissions of greenhouse gases. In 1995, at the first Conference of the Parties (COP-I), a document was produced which established a process designed "to elaborate policies and measures" which would "set quantified limitation and reduction objectives within specified time frames, such as 2005, 2010, and 2020" for greenhouse gas (GHG) "emissions by sources and removals by sinks."[1] At COP-II in 1996, the U.S. first endorsed the concept of "legally binding" emission targets. The signatories to the Convention are now engaged in negotiations that could lead to a treaty with binding commitments at the third Conference of the Parties in Kyoto, Japan in December 1997.

There is a high level of uncertainty about the benefits of policies to avoid climate change. In fact, it is precisely because of the existence of this uncertainty about the effects, and the costs, of climate change, that some economists have taken an interest in the theoretical aspects of climate change modeling (see, for example, Nordhaus 1994). Some have found that there are greater incentives to implement policies to reduce GHG emissions than would exist if the costs of climate change were known with certainty.

Because of the uncertainly surrounding the benefits of climate change policy, most analysts have focused on an assessment of the costs of GHG policies.[2] However, little attention has been paid to the distributional implications of climate change policies. This paper examines

these issues using a model developed by DRI/McGraw-Hill (1997). The results of this modeling exercise are analyzed and contrasted with a recent administration study of the costs of climate change policies (Interagency Analytic Team 1997). DRI/McGraw-Hill also prepared the most extensively cited model used in the IAT report. We refer here to that earlier effort as the IAT model.

There have been a number of surveys of the cost of climate change policies.[3] We rely on some of these studies in our analysis. This report contributes an analysis of the distribution of the costs of climate change policies across society to the debate. We make no assessment of the potential benefits of GHG policies, in terms of potential risks or damages that could be avoided, nor do we take a position on the advisability of adopting any further policies to restrict GHG emissions. However, we recommend that if such policies are implemented, two specific, additional measures regarding adjustment assistance and border taxes are needed to limit their disruptive effects on the economy, and on the lives of American workers.

We begin by describing the baseline forecasts for the economy (business as usual case) and then review the overall effects of potential GHG policies on output (GDP) and consumption, including a comparison of the DRI/McGraw-Hill (1997) results with those of the IAT. The next section considers the effects of these policies on key sectors of the economy, including employment, wages, profits, and foreign trade. We then examine GHG policy-effects on industries and regions of the economy. The paper concludes with a discussion of policy implications and areas for future research.

The Macroeconomic Impacts of GHG Policies

The model used in this study is the DRI/McGraw-Hill macro-economic model. This is a short-run forecasting model with an input-output-based structure. Some analysts have criticized the use of the DRI model to analyze issues such as GHG policies because of its short-run orientation, arguing that the policies proposed should be designed to reduce energy use and carbon emissions over the next century.[4] However, the policies discussed in IAT (1997) would take effect in the year 2000 and be phased in over 10 years. They would have substantial short-run impacts on economic output, which would exceed the costs identified in the other long-run models used in the IAT report.[5] Therefore, it is appropriate to examine these adjustment costs when considering the distributional effects of GHG policies.

Many models have estimated the costs of stabilizing the emissions of carbon, on a national basis, at 1990 levels by the year 2010. This scenario has become the standard of comparison for modeling of the costs of GHG policies. The IAT chose this scenario as a baseline, and also ran a number of "sensitivity-test" scenarios which varied key assumptions, including a range of targets between 90% and 110% of 1990 level emissions in the year 2010. Most scenarios assume that emissions are held constant after the target is achieved in 2010. The European Union has proposed emission reductions of 15% of 1990 levels by 2010 as a starting point for the the Kyoto-round negotiations. It is also important to point out that ultimate stabilization of atmospheric CO_2 may require further reductions in global emission levels beyond these targets, with attendant increases in the costs of GHG policies.[6] Comparison of cases 1 and 2 suggests that the costs of emissions control increase exponentially. Therefore adjustment costs could continue and expand if future COP meetings results in additional, increasingly restrictive agreements to reduce GHG emissions in the Annex-I countries, as seems likely.

Baseline forecasts

DRI/McGraw-Hill (1997) assumes that real GDP growth will average two percent per year between 2000 and 2010, and 1.5% per year thereafter. GDP growth declines after 2010 because the rate of growth of the labor force declines from about one percent per year between 2000 and 2010 to 0.5% per year thereafter, as the baby boom generation begins to exit the labor force. The energy intensity of the economy is forecast to decline by one percent per year throughout the forecast period. Carbon emissions therefore increase 1.3 percent per year between 2000 and 2010 and 0.8% per year thereafter.

Total carbon emissions in the baseline case are 1,746 million metric tons (MMT) in 2010 and 1,894 MMT in 2020. Actual emissions in 1990 in the U.S. were 1323 MMT, according to DRI/McGraw-Hill (1997).[7] Therefore total emissions in the baseline case grow 32.0% and 43.2%, respectively, in 2010 and 2020 in this model. These are the amounts by which carbon emissions would have to be reduced to stabilize emissions at 1990 levels.[8] Some fuels, such as natural gas and petroleum, emit much less carbon per unit of energy released, so energy use would not have to fall by this amount if fuel switching were to occur (as is assumed in the DRI model).

Policy Scenarios

It is assumed that a system of tradeable carbon emission permits is announced and implemented beginning in 2000. The number of permits in circulation is reduced each year from 2000 to 2010, until the emissions target is achieved. Permits are not traded internationally, but are tradeable within the domestic market, to facilitate adjustment at least possible cost. Three cases are analyzed[9]:

Case 1: **(Grandfathered Permits).** Allowance are issued to industry at no cost. Emissions are stabilized at 1990 levels in 2010.

Case 2: **(Grandfathered Permits, 90% of '90 Emissions).** Allowances are issued to industry at no cost. Emissions stabilized at 90% of 1990 levels in 2010.

Case 3: **(Auction, Deficit Reduction)** Allowances auctioned by U.S. Government, no revenue recycling. Emissions stabilized at 1990 levels in 2010.

Carbon prices range from $180 to $200 per ton in 2010 and $270 to $320 per ton 2020 in DRI/McGraw-Hill (1997), as shown in **Table 1**. These prices have very different effects on different types of fuel, as noted above. Gasoline prices increase only 31.5% to 49.2% in 2010, for example ($.41 to $.63/gallon). However, coal prices rise much more rapidly, 450% to 680%, because coal has a much higher carbon content per unit of energy, as noted above. Natural Gas, which is one of the most carbon-efficient fuels, rises substantially more in price than gasoline because fuel switching sharply increases demand, and capacity is slow to respond.

Energy prices in the IAT draft report are compared in the bottom two sections of Table 1. The base case prices are nearly identical in the two studies. However, carbon prices are much lower in the IAT scenarios. There are two reasons for this. First, the IAT model assumes slightly higher baseline improvements in energy efficiency (1.25% vs. 1.0% per year). Therefore, carbon emissions in 2020, for example, are projected to be 1805 MMT in the IAT base case, versus 1894 MMT in DRI/McGraw-Hill (1997), a difference of about 5%. Second, and more importantly, the IAT report apparently assumes larger price and substitution elasticities than DRI/McGraw-Hill (1997). The IAT report has been criticized because "The price elasticities for energy demands need further explanation. Some very rough ...calculations suggest that they may

be on the high side.[10]" These comments suggest that the estimates in DRI/McGraw-Hill (1997) may be more reliable than those developed for the IAT.[11]

Effects on Output and Consumption

Figure 1 shows that in the cases considered here, GHG policies could have significant costs for the economy, especially in the next ten to fifteen years. Policies designed to stabilize U.S. emissions of greenhouse gases at 1990 levels in 2010 — the least restrictive policies now being discussed for the Kyoto negotiations — could reduce the level of national output by 1.8 to 2% in the short run. If GHG emissions are reduced by 10% in 2010, then the short-run costs increase sharply, to 2.9% of GDP and 3.6% of consumption. The maximum impact occurs in 2007 in all three scenarios, seven years after the permit system begins to be phased in, but three years before emissions are fully reduced to the target level. Output falls because of the increase in energy prices, shown in Table 1 above, which depresses consumption and investment spending.

Overall inflation rates, shown in **Figure 2,** rise by 0.25 to 1 percentage points during the initial implementation period. By 2020, in the grandfathered permits cases, the cumulative effect of these price effects causes a 7% to 9% increase in the level of the GDP price deflator, relative to the base case, because businesses will pass along the cost of permits to their customers. This increase in the *level* of the GDP deflator is permanent, even though inflation returns to base case levels by 2015.

If permits are auctioned by the government, the policy will have a more depressing effect on output, because the permit fees will cause a sharp, permanent increase in government savings. The effect of the permits is similar to that of a tax increase. Inflation increases in the short run, and then falls below the base case after 2008, reflecting the permanent suppression of demand

caused by this policy.

In all three scenarios, investment recovers and is increased as a share of GDP, relative to the base case, as shown in Figure 10, below. Firms and consumers increase their spending on capital goods to increase energy efficiency, effectively substituting capital for energy and accelerating the replacement of the existing capital stock. For example, total purchases of vehicles in 2020 in the three policy scenarios are 200,000 to 500,000 units higher than in the base case. As a result of the increased investment, the available stock of effective non-residential capital increases steadily throughout the forecast period, as shown in Table A, above. By 2020, it is 85 to 10% higher than in the base case.

The increase in investment is effectively financed through a forced increase in national savings in the three policy scenarios. If the permits are simply granted to businesses, free of charge, then business revenues and corporate profits will increase dramatically. Part of these retained earnings will then be available to finance increased investment spending. Savings through the federal budget also increase in all three models, after an initial adjustment period. If permits are grandfathered, then corporate profit tax revenues will increase. If the permits are auctioned by the government, then the revenues will flow directly into the treasury. The model assumes in all cases that the government uses the increased revenues to reduce the deficit or, if there is a surplus, to reduce the stock of outstanding federal debt, increasing the effective rate of government savings.

The increase in national savings and investment that would result from a system of energy permit sales is a key element in all models of the effects of GHG policies. In the long run, the increase in savings and investment causes GDP to be higher in 2020 than in the base case, in all

three scenarios, as shown in Figure 1. Furthermore, GDP is growing 0.1 to 0.2 percentage points faster than in the base case in all three scenarios in 2020. Hence, the stimulus to investment provided by GHG policies could slightly increase the underlying rate of growth of the domestic economy, in the long run. However, the assumption that permit sales would increase national savings is highly questionable, for reasons discussed below. In the absence of the stimulus to savings and investment, GDP levels and growth rates would be lower throughout the forecast period.

Figure 3 demonstrates that the increase in real energy prices has a bigger effect on consumption than it does on output. GHG policies have a larger impact on consumption than on GDP for at least two reasons. First, a larger share of output is devoted to investment, for reasons explained above, and thus consumption must decline as a share of national income. Second, the increase in energy prices will force consumers to reduce real purchases of other goods, holding everything else constant (unless overall demand for energy is price elastic, which is not the case in most models).

Consumption losses reach a peak of 2.2 to 3.6 percent in 2007, relative to the base case, as shown in Figure 2. Consumption also recovers, following the GDP path in figure 1. However, overall consumption levels remain about one-half percent below the base case in 2020 in all three scenarios, despite the increased levels of output in that year, reflecting the increase in savings discussed above.

Comparisons with IAT Estimates.

The IAT estimates generated much smaller projections of the losses than would result under similar policy scenarios. For example, **Figure 4** compares predicted changes in total

consumption from the base case, assuming grandfathered permits in both the IAT and the DRI/McGraw-Hill (1997) models. The maximum loss in the IAT model, of 1.4%, occurs two years earlier (2006) and is only 55% as large as the maximum loss in the DRI/McGraw-Hill (1997) model of 2.5% of base consumption. The difference between the two forecasts reflects the two key differences in energy forecasts: 1) lower base case energy use in the IAT model; and 2) higher price elasticities in that model.

The Reliability of Critical Assumptions

There are substantial economic and practical reasons to question some of the assumptions underlying both the IAT and the DRI/McGraw-Hill (1997) models. One key assumption concerns they way that revenues from the sale of permits are used in the economy. **Figure 5**, which contrasts two scenarios from the IAT report, illustrates the effects of different ways of handling permit revenues on total consumption in the U.S. If permit revenues are recycled to consumers, rather than being used for deficit reduction, losses to consumers will not fade away over time.[12] In this case, consumption will fall and remain at a lower level throughout the forecast period. Given the political realities of the federal budget processes, it is highly unlikely that permit revenues of the type envisioned here would be used to reduce the budget deficit or the federal debt. For example, forecasts in mid-1997 that the federal budget could achieve a small surplus within the next few years if the economy continues to grow at its current pace have generated a wide range of proposals for using projected revenues for new tax cuts, and/or public spending increases. Therefore, national savings are unlikely to increase as assumed in these models.

Higher levels of federal spending for consumption purposes, for example for defense spending, will not stimulate growth in the way envisioned in the DRI model. Thus the permits are

not likely to stimulate as much growth in GDP, nor as rapid a recovery, as is forecast in either the DRI/McGraw-Hill (1997) or IAT (1997). On the other hand, some type of public investment, in areas such a R&D, educational programs and other types of public infrastructure, could have an even larger impact on productivity and economic growth rates than the private investment spending that drives the DRI/McGraw-Hill results. Therefore, the ultimate effects of GHG policies on the economy will be heavily effected by the ways in which the resulting revenues are utilized.

For these reasons it is unlikely that all of the GHG revenue collected by the government would go to deficit reduction. Some federal revenues will probably be returned to consumers (through tax cuts) or otherwise result in new public consumption expenditures. While tax cuts or other expenditures could stimulate the economy, they could not fully offset the depressing effects of GHG policies. Therefore, output is likely to fall with GHG policies, in the long run, in contrast with the case reviewed here.[13] Figure 4 shows that consumption will fall when the permit system is put in place in 2000, recover slightly, and then begin to decline again. The sustained decline is caused by the increase in the cost of carbon permits and energy prices shown in Table 1, above.[14] The increased cost of energy puts an increasing drag on the rate of growth of economic output. This is the most important long-run cost of GHG policies.

The initial decline in consumption shown in Figure 4 is smaller if all the revenues are returned to consumers, perhaps through reductions in income or other labor taxes (such as the social security tax). This "revenue neutral" policy has a less depressing effect on total output and consumption than the grandfathered permits policy. Losses begin to increase in 2015 because of the long-run effects of higher energy prices. The losses and distortion effects shown in Figure 4

would increase with the size of the effective carbon tax. Permit fees as large as those estimated in DRI/McGraw-Hill (1997, $180 to $320 per ton, Table 1 above) would have proportionately larger effects on consumption than the IAT cases (in which permit fees are only $95 per ton in 2010 and $125 in 2020).

One final economic reason for questioning the results of both the IAT and DRI/McGraw-Hill (1997) is that investment may not respond in the way assumed in the models. In each case (except for the auction, 100% to consumer case shown in Figure 4), it is assumed that increases in savings by the business and government sector stimulate a proportionate increase in domestic investment.[15] However, even though corporate retained earnings would rise sharply if permits were grandfathered to existing energy users, there is no guarantee that the resulting excess cash would be invested in the U.S. Investment opportunities elsewhere in the world could be more attractive, particularly if there are parts of the world not subject to GHG policies (as discussed below). In fact, recent empirical research has shown that in the long run, about one-quarter of any given change in savings has flown out of the U.S. in the past. This ratio could change in the future, as well. For these reasons, investment (and therefore GDP and consumption) might not receive the stimulus expected in the IAT and DRI/McGraw-Hill (1997) models even if savings are increased. In fact, increased corporate earnings could accelerate capital flight problems that are discussed below.

On balance, we expect that GHG policies designed to stabilize emissions at 1990 levels will reduce consumption by at least $50 to $100 billion per year, on average, between 2000 and 2020. Losses are likely to continue and grow in the future because the policies will reduce the economy's potential growth rate, because permit revenues are likely to be spent on tax cuts or

new public expenditures, and because savings and investment will be diverted to other countries because of the effects of GHG policies on economic incentives. However, the Kyoto negotiations also need to consider the distribution of the benefits and the costs of these policies.

Distributional Effects of GHG Policies

Since 1973, U.S. production workers have experienced a steady decline in their real wages and earnings, as shown in **Figure 6.** After rising steadily at an average rate of $0.14 per hour (in $1982) through 1973, real compensation began to decline steadily thereafter at a rate of $.035 per hour. This decline in production worker incomes contrasts sharply with the continued growth in real hourly earnings of the top twenty percent of the labor force, which has been maintained throughout the 1980s and 1990s. Earnings inequality, the gap between the top and bottom classes of wages earners, has increased sharply as a result. For example, the ratio of the top to the bottom deciles of workers has increased from 3.7 to 4.5 since 1973, an increase of more than 20%.

Wages have been eroding and income inequality has been increasing for a number of reasons, including declining rates of unionization, falling real values of the minimum wage, deregulation and increased rates of immigration. Rapid growth in foreign trade and investment are also important causes of declining real wages (Mishel, Bernstein and Schmitt, 1997). Unless these issues are considered in the development of GHG policies, those measures will exacerbate the effects of globalization on American workers. Recent reports suggest that trade may be responsible for at least 20 to 25% of the increase in U.S. income inequality in this period (Tyson, 1997).[16] With these facts in mind, we turn next to an analysis of the effects of GHG policies on labor and other factors of production, and then examine the effects of GHG policies on trade in

some detail.

The effects of GHG policies on employment in DRI/McGraw-Hill (1997) are illustrated in **Figure 7.** As GDP and consumption fall after the permit system is introduced, unemployment (not shown) rises initially and peaks (relative to the base case) in 2006. Overall, unemployment (not shown) is increased by 0.6 to 1.1 percentage points in. To put this in perspective, in the 1990-1991 recession in the U.S., unemployment increased by 2.2 percentage points from its 1989 low of 5.3 percent. Thus, the effects of GHG policies on unemployment are projected be one-quarter to one-half as large as the last U.S. recession.

Job displacement peaks in 2007 or 2008 and persists, as shown in Figure 7, even as excess unemployment is eliminated. Displacement persists, though at lower levels, throughout the forecast period because real wages are depressed by the rise in energy prices (and the overall price level), causing workers to drop out of the labor force. Job losses are especially large in the scenario with the lowest emission targets (grandfathered permits, 90% of '90 emissions), in which energy prices must rise most rapidly.

GHG policies have a strikingly consistent, negative impact on real wages, as shown in **Figure 8.**[17] The rate of growth in real wages is reduced by 0.4 to 0.55 percentage points immediately after the introduction of the permit system in 2000. These reductions in real wage growth, relative to the base case, persist for over a decade. The losses are largest with the most restrictive emission limits (90% of '90 emissions), and least for the case with grandfathered permits and 1990 emission targets. In the latter case there is a small, offsetting, positive effect from the increased ability of corporations to grant wage increases when permits are grandfathered, which increases corporate revenues.

The decade-plus suppression of wage growth rates could cumulatively reduce the growth in the level of real wages by more than 50% between 1995 and 2020, relative to the base case, as shown in **Figure 9.** Real wages decline in all three scenarios between 2000 and 2006, and by 2020 they are only 3% to 4% higher than they were in 1995 (versus a 9% increase in the base case). This translates into an average growth rate of less than 0.2% per year. With such low rates of wage growth the continued increase in inequality will lead to falling wages for most workers. Only the top groups of wage earners are likely to experience any real wage gains over this period.

Impacts on the Business Sector

If GHG policy simply grants permits to business at no cost, then businesses currently using energy will effectively capture the stream of income that is equal to the value of those permits. They can choose to either use the permits themselves, or sell them to other users on the open market. The advantages of this system are that: 1) as the number of permits in circulation is reduced between 2000 and 2010, the lowest cost means of eliminating energy use will be identified by market forces; and 2) the grandfathering of permits will provide some compensation to businesses that will face higher costs of energy because of the implementation of GHG policies.

Under this policy scenario, businesses will capture revenue stream, which will grow in value with the prices of permits, if the permits are given away, as shown in **Figure 10.** Corporate profits (before taxes) are forecast to rise steadily in the base and auction, deficit reduction cases from $500 billion in 1995 to $1.6 trillion in 2020. This reflects both the growth of the capital intensity of the economy (the capital stock is growing faster than in the base case) and an increase in the expected returns to capital, as well as the general growth in real output. If permits are

grandfathered, annual corporate profits in 2020 will increase by an additional $1.1 to $1.2 trillion dollars, an increase of about 66%, as a result of the infusion of GHG permit revenues and associate increases in the prices of domestic products.[18]

Investment as a share of GDP will increase in all three GHG scenarios, as shown in **Figure 11.** Higher energy prices will increase the levels of investment in both residential and non-residential goods, including houses, cars and producer durable equipment (production machinery). This will have important side effects, by stimulating the production of capital goods and construction sectors, as shown below. The increase in investment, if it materializes, is the key to generating increased levels of GDP in the DRI/McGraw-Hill forecasts.

A policy induced increase in the level of profits will cause profits to rise sharply as a share of GDP in the two cases where permits are simply given to businesses (grandfathered), as shown in **Figure 12.** This sizeable increase in profits reflects returns on the incremental investment shown in Figure 11, and also returns on the asset value of carbon permits in circulation. In the DRI/McGraw-Hill model, increasing profits have a positive macroeconomic impact, because they provide savings to fund the investment growth. However, rising profits, as a share of national income, also imply a fall in the labor share of income, providing further evidence that production workers will be squeezed by GHG policies. The profit share of output increases by 9.4 and 11.2 percentage points, respectively, in the two cases with grandfathered permits in 2020, with the larger effect occurring with the restrictive target of 90% of '90 emissions. In the base case, profits rise gradually from 7.4% to 15% of GDP. In Scenario's 1 and 2, profits rise to 24.6% to 26.5% of GDP. Such large increases in capital's share of national income would virtually ensure a sizeable increase in the inequality of income distributions in the U.S. .

Effects of GHG Policies on Trade and Investment flows

By 2020, U.S. Imports would rise sharply under GHG policies because higher energy prices would make foreign goods (made with cheaper energy inputs) more attractive, as shown in **Figure 13.** In the short run, as output falls due to the introduction of the permit system, imports will decline slightly. After 2007 they surpass the base case (no GHG policies), and by 2020 they are $175 to $275 billion higher than in the base case. Imports rise most rapidly under the scenario with the most restrictive limits on GHG gases (90% of '90 emissions), because the high costs of carbon permits. The auction, deficit reduction case has the smallest effect on imports, because output is slightly lower than in the case with grandfathered permits (at '90 emission levels).

Real exports, shown in **Figure 14** would fall below base case exports until at least 2013, for all three policy scenarios. Exports recover somewhat thereafter, because of the effects of increased domestic productivity. In particular, in case 2 (permits auctioned, revenues used for deficit reduction) exports are $25 billion higher than in the base case by 2020.

On balance, the increase in imports is considerably larger than the increase of exports, in the long run, in all three cases. Therefore the trade deficit (imports less exports) increases sharply as a share of GDP, as shown in **Figure 15.** The balance improves slightly during the initial period of adjustment to GHG policies, between 2000 and 2010, because of the decline in consumption, but the deficit expands rapidly thereafter. By 2020, the deficit has increased to between 6.0% and 7.5% of GDP, as compared with a 1997 deficit of approximately 2% of GDP. The trade deficit is forecast to grow substantially in the base case, as well. However, the GHG policies would add between $149, $287 and $240 billion to the trade deficit in 2020 in cases 1 through 3, respectively. The trade deficit would increase by 1.3, 2.7 and 2.1 percentage points of GDP in the

respective cases.

Deficit increases of this size would have huge impacts on traded goods, especially manufacturing-sector products. We have estimated that $1 billion worth of exports would generate approximately 14,000 domestic jobs, including direct and indirect employment effects, in 1995 (Scott and Lee, 1997). Using this multiplier, the forecast increases in the trade deficit could eliminate a gross total of 2 to 4 million job opportunities in goods producing and related industries. As shown below, the DRI/McGraw-Hill industry projections for 2020 do not reflect employment losses of these magnitudes, because the model assumes that the economy returns to full employment and displaced workers are reabsorbed into other industries by that time.[19] However, if the forecast changes in trade flows are correct, then 2 to 4 million fewer jobs will exist or be created in industries producing traded goods, and related inputs, could occur with GHG policies, as compared with base case employment forecasts. In the long run, increased imports will cause shifts in employment within the manufacturing sector, and between manufacturing and services. As a result, gross job displacement is likely to exceed the net job losses that are discussed below.

If GHG policies do eliminate such a large number of manufacturing jobs, they will have a much larger impact on wages and incomes, especially for non-college educated workers, than is suggested by the DRI/McGraw-Hill macroeconomic model, because wages and incomes are much higher in manufacturing than in other sectors of the economy. Further research is needed to separately estimate the effects of GHG policies on the wages and incomes of blue- and white-collar workers.

There is also a more fundamental set of international trade and investment issues that are

not addressed in the DRI model, as suggested by outside reviewers of the IAT, noted above. The DRI model assumes that the share of imports coming from the Annex-I countries (that will impose GHG emission limits) and non-Annex-I countries (which will presumably not be limited, for some time to come) will remain fixed in the base case. However, the structure of trade flows has shifted rapidly in the past 10 years, even without the incentives provided by GHG policies. The share of U.S. imports originating in the developing countries increased from 29.1% in 1978 to 36.4% in 1990, even while the ratio of imports to value added in the manufacturing sector was increasing sharply, from 18.3% to 30.7% (Sachs and Shatz 1994, 10 and 12).

GHG policies will also create incentives to accelerate the pace of globalization and integration of the world economy. Globalization will take at least two forms. First, the share of U.S. imports originating in developing countries will grow, even more rapidly than it has in the past (for example, Mexico and China have experienced some of the most rapid rates of growth in U.S. imports in the 1990s). Second, investment will be diverted from the U.S. to non-Annex I countries, especially Mexico and other countries with large supplies of low-wage, semi-skilled labor. The pool of investment capital available for investing abroad could also be increased if grandfathered permit policies are implemented, as shown above. For the past two decades trade has grown twice as fast as world income, and foreign direct investment has grown four times as fast as income. Globalization is likely to accelerate if GHG policies are implemented that do not limit or otherwise control production shifts designed to escape GHG limits.

Sectoral and Regional Impacts of GHG Policies

Tables 2 and 3 forecast the effects of GHG policies on total and sectoral employment, at a fairly aggregated level in the economy (1- and 2-digit SIC categories of output). Employment

changes in 2007 (Table 2) will be dominated by the initial reduction in output, relative to the base case, as noted above. Employment changes will be almost universally negative, and will be spread more or less evenly across the economy. Total losses are greatest when GHG limits are most restrictive (90% of '90 emissions). DRI/McGraw-Hill predicts that a net total of 1.5 to 2.6 million jobs, or about 1.0% to 1.8% of total employment in the base case, will be lost in this first recession. At the high levels of aggregation shown in Table 2, only the energy-related sectors are predicted to experience very large job losses in the short run, including mining (down 11.5% to 15.4%) and petroleum refining (down 2.5% to 7.4%)

In 2020 employment changes are more mixed (Table 3). Total employment declines by 400,000 to 1 million jobs (0.1% to 0.4% of base case employment in 2020), because of the reduction in real wages discussed above. However, employment grows in some sectors (such as other services, retail trade and durable goods) while declining in others (including mining, transportation and non-durables manufacturing). Contract construction employment increases in the two cases with less restrictive limits on carbon emissions because of increased levels of investment. Significant employment losses spread to a much wider range of industries, as the effects of higher energy costs and related changes in other costs are spread throughout the economy. Mining losses rise to 22% to 24% of the base case and petroleum refining employment declines by 17% to 24%. Several industries are forecast to have significant job losses under grandfathered permits, but gains when permits are auctioned and the revenues used to reduce the federal deficit or increase savings, including apparel products, leather products, electrical machinery and miscellaneous manufacturing. These are all sectors that are open to international competition, where production is highly sensitive to wage levels. Nominal wages would be about

six percent lower than in the base case by 2020 in the auction, deficit reduction scenario. However, wages are higher than in the base case when permits are grandfathered, which explains why employment impacts differ at the sectoral level in these scenarios.[20]

Employment shifts between industries could contribute to the downward pressure on wages discussed above. **Table 4** reproduces forecasts for employment changes in 2020 from Table 3 for a selected group of the most highly aggregated industries, and also includes information on average production worker wages in these sectors in 1995. This table strikingly illustrates one reason why wages grow so slowly in these scenarios. 400,000 to 500,000 job opportunities in mining, transportation and public utilities, where wages average between $14.22 and $15.32 per hour, would be eliminated (relative to base-case forecasts), while 240,000 to 290,000 jobs would be created in retail trade, which had wages averaging $7.70 per hour in 1995. In addition, 180,000 to 340,000 manufacturing jobs, paying between $11.60 and $12.90 per hour, would also be eliminated if GHG emission quotas were allocated to industry (rather than auctioned to raise government revenues). This process of structural change resulting from GHG policies will contribute to increasing inequality within labor markets in the U.S.

DRI/McGraw Hill also provides detailed forecasts at the 3 digit level for industries, and at the 2 digit level for the 10 census regions of the U.S. **Table 5** reports the industries that are predicted to gain or lose more than 5% of base-case employment in 2020. Losses outweigh gains in Table 4, in several ways. The number of industries experiencing losses of more than 5% of output is more than twice as large as the number with gains of more that 5%. In addition, there are 13 industries that lose more than 10% of output in 2020, including Rubber and Plastics footwear (-56%) coal mining (-45%), other leather goods (-34%) and electric utilities (30%).

However, there are no industries that gain more than 7.1% in total output. These trends reflect the broader tendency for employment to fall in manufacturing, especially durable goods, and rise in services sectors, including education services, retail and wholesale trade and state and local governments, as shown in Tables 3 and 4, above. Other individual industries that would be especially hard hit by GHG policies include kitchen products, apparel, toys, and various other mining industries (fertilizers, nonferrous metals and iron and ferroalloy ores).

Coal mining is one of largest and most heavily affected industries under GHG policies.[21] Coal output is projected to fall by 45 to 50% in 2020, relative to a base case with no restrictions on carbon emissions. The coal industry employed 116,000 workers in 1995. DRI/McGraw-Hill's (1997) base case forecasts that coal industry employment will decline to 80,000 workers in 2020. GHG policies will eliminate another 35,000 to 38,000 jobs in this industry by 2020, reducing total employment to between 42,000 and 45,000 workers. GHG policies will double projected job losses in this hard-hit sector between 1995 and 2020.

The tendency for GHG policies to shift employment from manufacturing to services would be much more pronounced if trade and foreign investment effects were larger, for the reasons noted above. In addition, given the large increase in imports and the trade deficit, shown in Figures 12 and 14 above, DRI may be underestimating the effect of the GHG policies on output at the sectoral level. The shift of employment from manufacturing to services, the growth of imports and the decline in the price competitiveness of U.S. products would all have depressing effects on U.S. wages, for the reasons discussed above.

The shift from manufacturing to services, especially retail trade, is illustrated in **Table 6**, which summarizes forecast changes in population and employment in the 10 census regions of the

U.S. in 2020, under the case 1 assumptions (grandfathered permits, 1990 emission limits). Manufacturing employment (shown in the last column) declines in 9 of 10 regions, rising only in the Pacific Northwest, where it is attracted by the availability of relatively cheap hydro-powered electricity. Retail trade experiences employment gains in 7 of the 9 regions that experience declining manufacturing employment. Mining, especially coal mining, declines sharply in all regions of the country, as noted above. Construction absorbs some of excess labor in regions that are forecast to enjoy stable or rising population levels because of GHG policies. Overall, employment declines in 6 of the regions (more than 1% in the East South Central and West South Central areas), and population declines in 3 of the 10 regions. Changes in energy costs, and the location of employment opportunities drive population shifts. In general, there is a substantial shift of jobs and population to the Pacific Northwest, with the other 7 regions not noted here experiencing small net gains or losses of jobs and employment in Case 1.

Regional and industrial shifts in production and employment will reinforce the tendency of GHG policies to increase income disparities in the U.S. The movement of labor out of high-wage sectors, such as manufacturing and mining, and into low wage sectors, such as retail trade, will tend to increase income inequality across the U.S., as the supply of good jobs for the bottom three-fourths of the labor force is reduced. Regionally, the Pacific Northwest, which already enjoys relatively high standards of living, will experience employment and population gains, while relatively low-income regions such as the East South Central will experience job and populations losses. These changes will tend to increase the disparity which exists in wages and income distributions among these regions, by increasing labor demands in the regions that gain and reducing labor demand in the regions that lose jobs and population.

Policy Implications and Areas for Future Research

To date, the discussion of GHG policies has paid inadequate attention to sectoral, regional and other adjustment policies needed to minimize the negative effects of GHG policies on the distribution of income. Previous research on GHG policies has focused almost exclusively on the identification of costs and benefits at the macroeconomic level of the economy. This analysis adds consideration of equity issues to the debate.

Optimal GHG Control Strategies

As noted above, policy makers are discussing a range of goals for the Kyoto-COP-III meetings and potential agreements. These range from stabilizing emissions in the Annex-I countries at 110% of 1990 levels by 2010 (IAT, 1997), or 2020, to reducing them by up to 20% as soon as 2005.[22] DRI/McGraw-Hill (1997) estimates that stabilizing or reducing emissions at 1990 levels will require an effective carbon permit price of $180 to $192/ton in 2010, and $270 to $281 per ton in 2020 (Table 1, above). Further emission reductions would require substantially higher carbon prices.

Nordhaus (1994, 93-96) has developed a simple simulation model of the costs and benefits of global climate change which identifies optimal emission control rates and the carbon taxes needed to achieve those levels of control (the carbon tax would have essentially the same effect as a carbon permit-fee on energy use and carbon emissions). His model suggests that very small and gradual controls are needed, with carbon taxes of only $5.29 per ton (in 1989 $), rising to $17.75 per ton in 2075.[23] He reviews a number of other, earlier studies which also reached similar conclusions. Fankhauser and Tol (1996) also review a number of recent estimates of the marginal damage of a ton of carbon emissions of $5 to $125 per ton of carbon, "with most estimates in the

lower end of this range." This literature suggests that the emission limits considered in IAT (1997) and DRI/McGraw-Hill (1997) may be too restrictive, in the sense that marginal costs would exceed marginal benefits at the given levels of carbon emission limits.

Measures to Offset the Effects of GHG Policies on Income Distribution

This report makes no assessment of the potential benefits of GHG policies, in terms of potential risks or damages that could be avoided, nor does it take a position on the advisability of adopting any further policies to restrict GHG emissions. However, we recommend that if such policies are implemented, two specific, additional measures are needed to limit their disruptive effects on the economy, and on the lives of American workers.

The first concerns the impact of GHG policies on globalization of trade and investment. If two different sets of standards or timetables for emission reductions are established for developed and developing counties, they will create incentives for firms to increase imports and move production and investment out of the U.S., in order to take advantage of lower energy prices and less restrictive emission limits in the developing countries. There are policies available which can reduce the trade and investment distorting effects of GHG policies.

In order to reduce or eliminate the negative effects of GHG policies on U.S. trade and investment, it could even be necessary to establish a border equalization tax policy. This tax would rebate the cost of emission limits on the energy content of exports, and assess an equivalent fee on products imported into the U.S. This kind of policy could eliminate the incentive to import goods and move plants abroad to escape U.S. emission limits. Other policies which could reduce the effects of GHG policies on trade and foreign investment include quotas on energy intensive imports, and safeguard measures to limit import surges. However, each of these measures could

conflict with our obligations under the GATT, increasing the difficulty of developing a comprehensive GHG policy package.

The second type of policy that would be needed is a set of measures that would provide substantial assistance to the workers and communities damaged by the creation of greenhouse gas policies. For workers, such a program should involve meaningful retraining opportunities, and several years of income support while involved in those activities. For particularly hard hit sectors and regions, special programs could be required to provide for early retirements, buyouts and to ensure continuation of health and pension benefits. For communities, there are many options including, but not limited to, industrial and R&D policy support.

Worker retraining policies, especially in the trade adjustment area, have established a poor track record, which may raise questions about the wisdom of incorporating such measures into a GHG policy or treaty package. These policies have failed for several reasons. They have historically been poorly funded, not providing sufficient resources for meaningful retraining nor the time and family income needed to sustain it. In addition, commitments have often been dishonored in the past, when funding for adjustment programs was terminated or drastically reduced after the policy had been implemented. For these reasons, a much larger and more dependable commitment of resources would be needed to compensate workers and communities for the costs of GHG policies.

Limitations and Areas for Future Research

Finally, we conclude by noting three areas of uncertainty. First, there is substantial uncertainty about the pace of global warming and the precise climactic impact of a given volume of CO_2 emissions. Second, this report analyzes the costs, but not the potential benefits of climate

change policy, including any possible economic benefits. Third, there are many unknowns about the costs of reducing emissions. The DRI model provides one way to estimate those costs. This model could overstate or understate the costs of reducing GHG emissions. If the energy efficiency of the economy grows more slowly than is expected in the base case, then greater reductions in energy use will be required to meet any given standard, which would dramatically increase the costs of compliance. On the other hand, in the past such modeling exercises have produced estimates that have proved, in retrospect, to significantly overestimate the costs of new pollution controls. However, even if the models discussed in this report overestimate the costs of GHG policies by 50% or more, the actual costs would still be large and significant.

In addition to these general areas of uncertainty, this report has raised a number of specific concerns that require future research. These include the effect of GHG policies on foreign trade and investment, including sectoral details and relationships between the major accounts (merchandise, services, current and capital accounts); and if permits are traded internationally, or joint implementation is allowed (neither of these alternatives was considered in this report), the implications for trade and exchange rates in a general equilibrium context. Another major area of concern is the system for implementing permits, how they will be created and traded, the nature of the property rights involved, and the wealth effects of grandfathering or other forms of distribution to the private sector. There is a related set of issues concerning the distribution of income between labor and capital, and the future rate of return on capital, that GHG policies will also intersect with. Finally, further disclosure, review and debate is needed about the technical assumptions of the models used to analyze GHG policies. This review should include the relevant price and/or substitution elasticities and the potential (and cost) of increasing the energy-efficiency

of the domestic economy without GHG policies. Differences in base case level of energy use, during the forecast period, can have a very large impact on the cost of limiting carbon emissions and this issue has not been adequately addressed in the literature.

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Endnotes

1. This section is based on, and the quotes are drawn from Bernstein, Montgomery and Rutherford (1997).

2. Nordhaus (1994), which estimates optimal GHG policies from an explicitly defined welfare model is a notable exception. Other examples include Boyd, Krutilla and Viscusi (1995) and Madisson (1995).

3. See, for example, Hoeller, Dean and Nicolaisen (1991) and Repetto and Austin (1997).

4. See, for example, comments on the IAT draft report in letters released to the House Subcommittee on Energy and Power, as an appendix to Yellen (1997):
Dale Jorgenson and William D. Nordhaus (April 24, 1997) "This model is ... highly inappropriate...extremely sensitive to assumptions about energy prices."The letter also criticized the "use of fixed-coefficient, input-output model." and Raymond J. Kopp (May 15, 1997) stated that the DRI model is "...useful only for the analysis of short-term adjustments, and even here, one should proceed with caution..." because the model is "driven from fixed coefficient input-output tables that can give very distorted views of the adjustment behavior of the economy."

5. The IAT report utilized three models. In addition to the DRI model discussed here, the IAT also developed forecasts for a similar set of policy scenarios using the Markal-Macro and Second Generation Models (SGM). These are simulation-type models that calculate equilibrium output levels, given constraints (such as available energy resources) and a set of initial conditions and assumptions about the structure of the economy. The Markal-Macro and SGM models are not designed to estimate adjustment costs or economic disequilibria that will result from policy changes. Hence the DRI model is better suited to the analysis of displacement issues, while the general class of simulation models are more appropriate for estimating long-run consequences. Note, however, that the IAT was criticized by reviewers for: 1) failing to utilize a full computable general equilibrium model, rather than the Markal-Macro or SGM; and 2) because neither of those models included a well developed foreign trade sector. See comments by Nordhaus and Jorgenson (previously cited), Ray Kopp, John Weyant and Richard Richels, in letters released to the House Subcommittee on Energy and Power, as an appendix to Yellen (1997).

6. See Wiley, T.M.L., R. Richels and J.A. Edmonds 1996.

7. Note that IAT (1997, Table 1) reports that total carbon emissions in 1990 were 1338 MMT, 1.1% more than is reported for 1990 consumption levels in DRI/McGraw-Hill (1997).

8. These target reduction levels are 5% to 8% larger than those required in IAT (1997). The difference is explained by the combination in the IAT report of more rapid declines in the energy intensity of the economy (1.25 percent per year vs. 1.0 percent per year), and the slightly higher baseline level of carbon emissions. The efficiency assumption is the most important difference, by far, between the two baseline cases.

9. A fourth case and a new base case are also analyzed in DRI/McGraw-Hill (1997). These cases assume that the energy intensity of the domestic economy in the "heroic base case" improves at 1.75% per year. This corresponds to a similar scenario in the IAT report. Results parallel those of the cases discussed below. The scenario in case 4 is otherwise identical to case 1 (grand fathered permits). Case 4 and its comparable base case are not analyzed here because the "heroic base case" scenario is highly unlikely to occur.

10. Comments on the IAT draft report released to the House Subcommittee on Energy and Power, as an appendix to Yellen (1997) in letter from Richard Richels, May 30, 1997. See also letter from Larry Goulder, June 2, 1997, "The report seems consistently to employ assumptions and policy scenarios that contribute to low costs of emissions reductions."

11. This view is also supported by Ray Kopp, in a letter of May 30, 1997, who noted that "All of the departures from AEO97 used in the draft report serve to decreased carbon emissions [in the base case] and therefore make attainment of a 1990 stabilization less costly." (Letter released to the House Subcommittee on Energy and Power, as an appendix to Yellen, 1997).

12. Figure 4 is derived from two of the scenarios shown in Figure 16 (p. 28) of the IAT draft report.

13. If public investment were to be increased using GHG revenues, then output, consumption and other segments of the economy could achieve higher levels in the long run than in the cases considered here. However, increases in public investment would appear less likely to obtain than general or targeted tax cuts, in the present political environment in the U.S.

14. Bovenberg and de Mooij (1994) have shown that, in theory, revenue raising environmental taxes can lower economic output because they "exacerbate, rather than alleviate, preexisting tax distortions." Goulder (1995) develops a general equilibrium model which shows that the problem with the carbon tax is its "focus on intermediate inputs and its relatively narrow base in comparison with income taxes." In principle, raising the cost or limiting the supply of energy inputs will change the shape and position of the production possibility frontier, generally reducing the amount of output that can be generated with any given set of other inputs.

15. For example, comparing Case 1 and the Base Case, the increase in investment is about 90% as large as the increase in total national savings.

16. Mishel, Bernstein, and Schmitt (1997, 195) estimate that trade could be responsible for more than 30% of the increase in income inequality in the U.S. between 1979 and 1989.

17. The effects on real wages are estimated by dividing the employment cost index by the consumer price index series in DRI-McGraw-Hill (1997, 20 and exhibit 15). The base case value for this series is then contrasted with each of the forecasts to determine the change in the real value of compensation. Note that DRI-McGraw Hill draws a sharp contrast between changes in the nominal wage series for case 3 (permit auctions) which decline sharply, and the other policy cases, where nominal wages increase because of increases in corporate revenues and hence the

ability to pay. However, the variation in these results is eliminated when real wage series (and the corresponding differences of consumer prices in each case) are considered.

18. This increase in before-tax corporate profits appears to primarily reflects an increase in the implicit rate of return on capital. The cumulative increase in fixed nonresidential capital between 2000 and 2020 in the three cases analyzed here is between $1.0 and $1.4 trillion, roughly equivalent to the increase in annual corporate profits by 2020. Therefore most of the increase in profits would appear to reflect higher returns on existing capital stock. This implicit forecast of increased returns is unrealistic, unless the world-wide corporate rate return on invested capital rises sharply because of GHG policies. However, an alternative view might treat the incremental profits as the returns on the imputed capital value of carbon emission permits. This view suggests that grandfathering of permits will not only transfer revenues to permit holders, but also new assets with a significant capital value. The implicit rate of return of capital, and wealth transfers associated with the permits, are important issues for future research.

19.Note that the DRI/McGraw-Hill (1997) forecasts for the three scenarios contain puzzling and potentially contradictory results. The Merchandise trade balance worsens by less than $100 billion in each case, although the calculated trade balances (including services) decline much more sharply, as indicated in the text. It is unlikely that services trade can or will account for these differences. In addition, the current account balance *improves* by $87 to $175 billion in the three GHG scenarios, presumably because of the increase in national savings. However, improvements of this magnitude in the current account are unlikely unless they are mirrored in changes in the trade balances, which dominate current account transactions.

20. Exchange rates are essentially unchanged in the DRI/McGraw-Hill (1997) forecasts, so changes in nominal wages and prices directly effect competitiveness. The rigidity of exchange rates in these forecasts is a potential source of error.

21. There is a greater percentage drop in employment in rubber and plastic footwear under GHG policies, as shown in Table 4. However, output in this industry was less than $1 billion in 1995, as compared with coal industry output of over $28 billion in that year.

22. Association of Small Island States, 1995, "Draft Protocol Submitted to the United Nations Framework Convention on Climate Change," as referenced in Repetto and Austin (1997, 1).

23. Nordhaus and Yang (1996) develop a regional bargaining model which generates slightly higher optimal permit prices of roughly $30 per ton of carbon in 2090, versus $21 in the DICE model developed in Nordhaus (1994).

Statement of Cecil E. Roberts
President
United Mine Workers of America
on the
DRI and EPI Economic and Employment Impact Analyses
September 17, 1997

Today we are releasing the results of two economic and employment studies of climate change policies. These studies, conducted by DRI McGraw Hill (DRI), the same economic forecasting firm used by the Clinton and Bush administrations, and the Economic Policy Institute (EPI), a well known Washington-based economic think tank, should give pause to the administration and its negotiators in the Berlin Mandate process.

Background

As you know, the U.S. is participating in negotiations pursuant to the Berlin Mandate to amend the 1992 Framework Convention on Climate Change, also known as the Rio Treaty. Negotiations are scheduled to conclude in December at a meeting in Kyoto, Japan. We believe the Berlin Mandate is a flawed instrument for dealing with climate issues. It is flawed because it specifically exempts more than half of the world's future emissions from any controls, while asking for substantial sacrifices from American workers and consumers. And as currently structured, it will do nothing to address the climate change issue.

Job Losses

The job losses that are likely to result from carbon reduction efforts are staggering. DRI projects that a policy aimed at reducing emissions in 2010 to 1990 levels will cost nearly 1.6 million jobs in 2005. Job losses will hit every region of the country and every industrial sector (with the exception of the federal government). For most industries and regions there is no recovery throughout the forecast period, which runs to 2020. The coal industry is devastated, but numerous other industries are hard hit--110,000 jobs lost in the transportation and public utility

sector, 199,000 jobs lost in the manufacturing sector, 426,000 jobs lost in the services sector and 182,000 jobs lost in state and local governments as the tax base erodes.

For a policy to reduce emission 10% below 1990 levels by 2010, DRI projects the loss of nearly 2.3 million jobs by 2005, increasing to a high of 2.7 million lost American jobs.

Economic Output and Trade

DRI projects that climate policies will reduce U.S. gross domestic product 1.8% to 2.9% during the forecast period. This means that the U.S. economy will lose over $200 billion annually at the peak of the phase-in effects in 2005-2010. Climate policies limited to developed nations are also likely to significantly increase the U.S. trade deficit. EPI notes that the DRI model may underestimate the trade flow implications of such policies. EPI estimates that real imports are likely to increase substantially and real exports are likely to decline. EPI estimates that this could result in an increase of up to $240 billion in the U.S. trade deficit. If this occurs, EPI estimates that job losses could be as high as 2-4 million.

Wage Growth

The EPI report notes that carbon reduction policies are likely to depress wage growth, as higher wage jobs are knocked out of the economy and only partially substituted with lower wage jobs. EPI estimates that future wage growth could be cut by 50%. This will exacerbate the stagnation and decline in real wages that American workers have endured for the last two decades and will tend to increase the already wide income disparity in our economy.

Energy Prices

The policies analyzed by DRI were based upon the U.S. proposal for a carbon permit trading scheme modeled on the U.S. acid rain sulfur dioxide trading program. DRI estimates that carbon permit prices would have to be $180-190 per ton (1995 dollars) in 2010 to reduce

emissions to 1990 levels, and would rise to $270-280 per ton in 2020.

The carbon permits will act like a carbon tax, raising the price of energy based on its carbon content. Coal, with the highest carbon content of all fossil fuels, will be taxed the highest. But all fossil fuels are projected by DRI to increase in price. Gasoline prices are projected to increase $0.41-$0.64 per gallon. Electricity prices will increase over 11 cents per kilowatthour and natural gas prices will increase $1.14 per therm (100,000 Btu). For an average American family these energy price increases will add nearly $900 per year to the annual household energy bill by 2005, increasing to about $2,200 per household by 2020.

Energy taxes are highly regressive by nature. Families, regardless of income, must heat and cool their homes, cook their food and travel to work. For example, the U.S. Department of Energy estimates that a family with an annual income of less than $10,000 still spends nearly $1,000 per year in energy costs in the home. Energy taxes, or equivalent carbon permit schemes, will be crushing for low-income workers and seniors living on fixed incomes.

Conclusion

The upcoming U.N. climate treaty is **All Pain and No Gain** for American workers and consumers. It is a bad deal for American families, and will provide a perverse incentive for American corporations to relocate their operations abroad. That is why the labor movement has taken positions warning the administration to avoid signing a treaty amendment that harms workers, consumers and our economy. We have had unanimous votes on climate policies at the Industrial Union Department of the AFL-CIO, the Transportation Trades Department, the Maritime Trades Department, and the full AFL-CIO Executive Council. Because of concerns about increased energy prices, the National Council of Senior Citizens (NCSC) has adopted similar positions. The fear that we may be on the verge of signing a bad deal also motivated the Senate in July to adopt unanimously a resolution calling on the administration to insist that all nations participate in any new commitments and that any proposed treaty not harm the American economy. The studies we have released today clearly show that efforts to reduce greenhouse

gases in the short time frames being discussed will have significant negative effects in terms of lost jobs, higher consumer energy prices, and higher trade deficits. I repeat, this is a bad deal for American families.

For those who question the science of climate change, this is a dumb idea. For those who believe the science is compelling, this is a dumb idea. Developed nations alone cannot address this issue, and we believe developing nations will be less likely to join a treaty after we have built in trade and economic advantages for those nations through a flawed treaty. The U.S. should not compound the flaws of the Berlin Mandate by signing a flawed treaty in Kyoto.

Labor Union Climate Change Resolutions

- AFL-CIO
- Industrial Union Department, AFL-CIO
- Transportation Trades Department, AFL-CIO
- Maritime Trades Department, AFL-CIO
- ICEM

American Federation of Labor and Congress of Industrial Organizations

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AFL-CIO Executive Council February 20, 1997 Statement

U.N. CLIMATE CHANGE NEGOTIATIONS

The U.S. government is involved in United Nations negotiations pursuant to the "Berlin Mandate" for an amendment to the Rio Treaty on Climate Change. The Rio Treaty committed the United States and other nations to voluntarily stabilize carbon emissions at 1990 levels by the year 2000. Current negotiations are aimed at mandatory reductions below 1990 levels after the year 2000.

The Berlin Mandate specifically excludes developing nations from emission reduction requirements while legally binding the United States to future emission reductions. By exempting developing nations from any future commitments, the Berlin Mandate ensures that there will be no meaningful worldwide effort to stabilize atmospheric concentrations of carbon dioxide.

We believe the parties to the Rio Treaty made a fundamental error when they agreed to negotiate legally-binding carbon restrictions on the United States and other industrialized countries, while simultaneously agreeing to exempt high-growth developing countries like China, Mexico, Brazil and Korea from any new carbon reduction commitments. As much as 60 percent of global carbon emissions are expected to come from such countries in the next few decades, with China becoming the single-largest emitter in the near future. The exclusion of new commitments by developing nations under the Berlin Mandate will create a powerful incentive for transnational corporations to export jobs, capital, and pollution, and will do little or nothing to stabilize atmospheric concentrations of carbon. Such an uneven playing field will cause the loss of high-paying U.S. jobs in the mining, manufacturing, transport and other sectors.

Carbon taxes, or equivalent carbon emission trading programs, will raise significantly electricity and other energy prices to consumers. These taxes are highly regressive and will be most harmful to citizens who live on fixed incomes or work at poverty-level wages.

As corporations shut down domestic factories, mines and mills as a result of higher energy

costs, they will have additional incentives, beyond the search for cheap labor and anti-labor regulatory regimes, to locate new capacity off-shore, in countries with no carbon reduction commitments. Carbon emissions, therefore, will be transferred to the developing world along with the jobs, thus providing no real benefit to the environment.

The U.S. government has not completed a thorough economic analysis of the effects of a treaty amendment on the U.S. economy, even though U.S. negotiators have been at the bargaining table for over 18 months and have agreed to a December 1997 deadline for reaching agreement on this far-reaching treaty amendment.

The AFL-CIO Executive Council calls upon the responsible agencies of the U.S. government to provide it and its affiliates with any existing studies of the economic impact of future treaty obligations and, further, make available the results of the economic modeling effort currently being undertaken by the government within 30 days of completion.

The AFL-CIO Executive Council further urges that in the ongoing negotiations to amend the Rio Treaty on climate change, the United States insist upon the incorporation of appropriate commitments from all nations to reduce carbon emissions; and seek a reduction schedule compatible with the urgent need to avoid unfair and unnecessary job loss in developed economies. The President should not accept and the Congress should not ratify any amendment or protocol that does not meet these standards.

INDUSTRIAL UNION DEPARTMENT, AFL-CIO

IUD Resolution On
U.N. CLIMATE CHANGE NEGOTIATIONS

The United States is involved in United Nations Negotiations pursuant to the "Berlin Mandate" for an amendment to the Rio Treaty on Climate Change.

The Berlin Mandate specifically excludes developing nations from emission reduction requirements while legally binding the U.S. to future emission reductions.

The exclusion of new commitments by developing nations under the Berlin Mandate will create an uneven playing field in favor of developing nations such as China, India, Mexico and Brazil in the competition for jobs and economic growth.

Such an uneven playing field will cause the loss of high-paying U.S. jobs in the mining, utility and manufacturing sectors.

Processes which generate carbon emissions will be transferred to the developing world along with the jobs, thus providing little or no real benefit to the environment.

The U.S. government has not completed a thorough economic analysis of the effects of a treaty amendment on the U.S. economy;

THEREFORE, BE IT RESOLVED:

That the Industrial Union Department of the AFL-CIO calls upon the Congress and the President of the United States to refrain from entering into or ratifying any treaty amendment or protocol that causes the loss of U.S. jobs; and

That the U.S. renegotiate the Berlin Mandate to ensure that all nations have appropriate commitments to reduce carbon emission to prevent the transfer of jobs and emissions to the developing world.

Adopted by IUD November 13, 1996

A SENSIBLE AND FAIR POLICY ON GREENHOUSE EMISSIONS

As the international community takes steps to reduce the levels of greenhouse gases in the environment, the United States should not be asked to shoulder an unfair level of responsibility that would jeopardize our economy and the millions of industrial and transportation jobs it supports. In 1992, the United States signed the Rio Framework Convention on Climate Change which required a reduction in greenhouse gases such as carbon dioxide to 1990 levels by the year 2000. In 1995, the United States and other parties to the 1992 climate convention agreed in the "Berlin Mandate" for a process of new negotiations to establish emission reduction goals for the next century. The Berlin Mandate calls for developed countries, such as the United States, to take the lead in combating climate change, but excludes developing nations from any new obligations to further reduce greenhouse emissions.

This double standard means that while global warming is an international problem and that most of the world's future growth of carbon emissions will come from high-growth countries like Mexico, China, and Korea, the U.S. is being asked to do more than its fair share. Even more troubling is the fact that the problem of global warming will not be adequately addressed. Companies wishing to avoid emission control requirements will simply move their operations to countries that were able to evade the provisions embodied in the Berlin Mandate.

The United Nations is currently conducting negotiations that will determine the magnitude of the reductions that the U.S. will have to undertake under the Berlin Mandate and the timetable required for meeting these objectives. In these negotiations the Clinton Administration is supporting an emission control program modeled after the 1990 Federal acid rain law. In order to meet the goals of this program, an increased energy tax on carbon fuels several times larger than all current state and federal energy taxes combined, or an equivalent permit trading program, would have to be imposed on consumers of fossil fuels. The negative impact this would have on our economy cannot be overstated.

It is clear that the use and transportation of coal would be greatly curtailed if not eliminated, gasoline prices would skyrocket, and the increased cost of basic electricity would be felt in the production of almost every consumer good. The Department of Commerce has estimated that a carbon tax sufficient to reduce CO2 emissions by 20% would result in 800,000 jobs lost by the year 2000 and 1.7 million jobs by 2010. An independent research corporation found that 1.4 million American jobs could be "severely at risk" under a carbon tax of $24 per ton. This includes over 132,000 rail workers, 76,300 transit employees, 157,000 involved in water transportation, and 625,200 aviation workers. The entire economy would be placed at risk with little or no environmental benefit. Transportation labor is not opposed to reasonable steps that will reduce greenhouse gases, but we cannot support policies that unfairly harm American workers while allowing less developed nations to avoid any responsibility for solving this global problem.

MARITIME TRADES DEPARTMENT

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U.N. CLIMATE CHANGE NEGOTIATIONS

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Carbon taxes, or equivalent carbon emission trading programs, will raise significantly electricity and other energy prices to consumers. These taxes are highly regressive and will be most harmful to citizens who live on fixed incomes or work at poverty-level wages.

ICEM

International Federation of Chemical, Energy, Mine and General Workers'

Climate Change

The nations of the world are involved in the United Nations negotiations pursuant to the Berlin Mandate for amendment to the Framework Convention on Climate Change (RIO Treaty).

In view of the far-reaching implications of this Convention, not only for the future of the planet, but also for the livelihoods of workers involved in the resource and energy-using industries, and for global economic growth, the ICEM calls upon the parties to the Framework Convention on Climate Change to insist upon a treaty amendment that:

1. Places the highest priority on the needs of workers and consumers who will shoulder the greatest burdens of efforts to address global climate change.

2. Promotes improvements in energy efficiency in all countries, and provides assistance for this purpose to developing countries.

3. Includes the protection of existing jobs and the creation of new ones, and the improvement of living standards in all countries as a critical goal to be met in any climate treaty.

4. Provides adequate time for both developed and developing countries to meet the needs of the environment and the needs of working people.

All 50 States Lose Jobs by 2005

State	Jobs Lost	State	Jobs Lost
Alabama	49,410	Montana	5,310
Alaska	3,460	Nebraska	4,630
Arizona	33,800	Nevada	1,190
Arkansas	11,490	New Hampshire	5,860
California	154,750	New Jersey	47,850
Colorado	16,730	New Mexico	4,140
Connecticut	10,320	New York	101,100
Delaware	4,990	North Carolina	47,560
District of Columbia	4,840	North Dakota	1,110
Florida	74,030	Ohio	86,140
Georgia	60,990	Oklahoma	7,150
Hawaii	2,610	Oregon	21,390
Idaho	6,540	Pennsylvania	72,060
Illinois	68,710	Rhode Island	3,640
Indiana	37,380	South Carolina	27,210
Iowa	11,480	South Dakota	1,530
Kansas	10,850	Tennessee	57,620
Kentucky	27,920	Texas	125,410
Louisiana	19,620	Utah	9,470
Maine	3,410	Vermont	2,250
Maryland	37,040	Virginia	48,120
Massachusetts	22,360	Washington	23,320
Michigan	55,990	West Virginia	17,070
Minnesota	18,130	Wisconsin	26,830
Mississippi	15,630	Wyoming	5,040
Missouri	22,730	**TOTAL**	**1,548,920**

"The Impact of Carbon Mitigation Strategies on Energy Markets, The National Economy, Industry, and Regional Economies"
Prepared by Data Resources, Inc.
September 17, 1997

Overview

In response to international efforts to address global climate change, the Clinton Administration has proposed adoption of legally binding targets and timetables for reducing manmade emissions of carbon dioxide to 1990 levels or lower. As the energy sector accounts for the majority of these emissions, any proposals to reduce carbon emissions would disproportionately affect the energy sector.

For this reason, The Labor Management Positive Change Process Fund (LMPCP), a cooperative program between the United Mine Workers of America - BCOA, commissioned a study to determine the effect emission mitigation strategies would have on energy markets, the national economy, industry, and regional economies. In order to ensure objectivity, the LMPCP commissioned Data Resources Inc., the same respected research firm employed by the Federal Government, to conduct the study.

Unfortunately, for the American worker the study confirmed our worst fears. Without a requirement in place that would commit developing nations like China and Mexico to similar emission reduction policies as developed nations, the entire U.S. economy would be placed at risk with little or no environmental benefit.

If the current proposal is enacted, use and transportation of coal would be greatly reduced if not eliminated, gasoline prices would skyrocket, millions of jobs would be lost and hundreds of thousands more sent overseas, and the increased cost of electricity would be felt in the production of almost every consumer good.

Specific study results are summarized below.

- Energy industries would be devastated, with coal mining by far the hardest hit of all the industries followed by electric utilities, natural gas, gas utilities, petroleum refining, and crude petroleum.

- If emissions are stabilized at 1990 levels by 2010:

  - nearly one out of every two coal miners will lose their jobs.
  - 1.7 million more American jobs will be eliminated.

- If emissions are stabilized by 2010, by 2020 gasoline prices would rise 43%, fuel oil prices by 119%, and electricity prices by 94%.

- Among others, this would hit low-income workers, senior citizens, retirees and those who live on fixed incomes particularly hard.

- If emissions are stabilized at 1990 levels by 2010, every region of the country suffers heavy employment losses. The sharpest employment decline occurs in the East South Central region (220,000 jobs) followed by the West South Central region (270,000 jobs). The largest absolute employment losses occur in the South Atlantic region where 430,000 jobs will be lost.

- Every sector of the economy — with the exception of the federal government — will suffer job losses. Energy industries are particularly hard hit, but other sectors also suffer — 110,000 jobs lost by 2005 in the transportation and public utility sector, 199,000 jobs lost in the manufacturing sector, 426,000 jobs lost in the services sector, and 182,000 jobs lost in state and local governments.

Economic Policy Institute Analysis of the Economic Effects of Climate Change Policies on U.S. Workers
September 1997

The Economic Policy Institute (EPI), a Washington, D.C.-based economic think tank with an impressive track record of analysis in wage and employment forecasts, was asked to review the DRI study with special attention to employment impacts.

EPI's analysis supports the DRI results. It also highlights additional negative impacts, including further wage erosion among American workers and significant increases in the American trade deficit if the treaty is signed as proposed. Specific EPI analysis results are summarized below.

- Wages Decline:

  GHG policies could cut wage growth in half over the next two decades. Real wages decline in all three scenarios between 2000 and 2005, and by 2020 they are only 3% to 4% higher than they were in 1995 (versus a 9% increase in the base case). With such low rates of wage growth, the continued increase in inequality will lead to falling wages for most workers, and will exacerbate the widening income inequality in America.

- Good Jobs Lost:

  In the short run, overall employment growth will decrease by 1.5 to 2.6 million jobs in 2006.

  In the long run, 400,000 to 500,000 high paying job opportunities in mining, transportation, and public utilities and 180,000 to 340,000 high-wage manufacturing jobs would be eliminated in 2020.

- Trade Deficit Widens

  The GHG policies would increase the trade deficit by up to $240 billion. Deficit increases of this size would have huge impacts on traded goods, especially manufacturing-sector products.

- Energy Prices Skyrocket:

  Emission policies will sharply increase energy prices in the U.S. In the first DRI scenario:

  - By 2010, gasoline prices will rise to $1.73 per gallon, 33% more than it will cost with no treaty;

- By 2020, the price per gallon will jump to $2.06 per gallon or 43% more than it will cost with no treaty;

- Natural Gas prices will increase 129% in 2010 and jump 157% by 2020;

- Coal prices will rise 482% in 2010 and jump a staggering 761% by 2020;

- Electricity prices will increase 66% in 2010 and 94% in 2020.

Energy prices increase even more sharply in an alternative scenario which assumes more restrictive limits on emissions.

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DOCUMENT NO. AND TYPE	SUBJECT/TITLE	DATE	RESTRICTION
001. biography	Biography of Cecil E. Roberts, Jr. [partial] [PII] (1 page)	00/00/0000	b(6)

COLLECTION:
Clinton Presidential Records
Council of Economic Advisers
Frankel, Jeffrey
OA/Box Number: 13727

FOLDER TITLE:
EPI [Economic Policy Institute] Study - [Climate Change]

2017-1095-F
bg234

RESTRICTION CODES

Presidential Records Act - [44 U.S.C. 2204(a)]

P1 National Security Classified Information [(a)(1) of the PRA]
P2 Relating to the appointment to Federal office [(a)(2) of the PRA]
P3 Release would violate a Federal statute [(a)(3) of the PRA]
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P5 Release would disclose confidential advice between the President and his advisors, or between such advisors [a)(5) of the PRA]
P6 Release would constitute a clearly unwarranted invasion of personal privacy [(a)(6) of the PRA]

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Biography of
CECIL E. ROBERTS, JR.

Cecil Edward Roberts, Jr., a sixth-generation coal miner and one of the labor movement's most stirring orators, became president of the United Mine Workers of America on October 22, 1995, having served as vice president of the union since December 1982. Roberts succeeds Richard L. Trumka, who was elected secretary-treasurer of the AFL-CIO.

In 1984, Roberts served on the UMWA negotiating team that won the first national coal industry agreement in 20 years without a strike. Again in 1988, he was a member of the bargaining team that secured major contract gains without a strike. In 1984 and 1987, he headed the union's negotiating team that won contract improvements from coal operators in the West. He played a key role on the negotiating team which won a 1993 agreement with the Bituminous Coal Operators Association, ending a bitter 8-month selective strike. The agreement included major gains in job security, the largest pension increase in UMWA history, and the Labor-Management Positive Change Process that empowers UMWA members with a voice in coal mining operations.

In 1989, Roberts was the on-the-scene leader and day-to-day negotiator in the UMWA's militant 10-month strike against the Pittston Co., which had cut off health benefits to its retirees and was trying to walk away from its obligations to the UMWA Health and Retirement Funds. For his role in that successful strike, Roberts received the Rainbow Coalition's Martin Luther King award as well as awards from Citizen Action and the Midwest Academy.

Born to Evelyn and Cecil E. Roberts, Sr., on (b)(6) Roberts grew up on Cabin Creek in Kanawha County, WV. His great-uncle, Bill Blizzard, was a legendary organizer during the West Virginia mine wars of the 1920s and a UMWA district president under John L. Lewis. Both of his grandfathers were killed in the mines. [001]

After college and military service in Vietnam, Roberts began work at Carbon Fuels' No. 31 mine in Winifred, W.Va., in 1971. He worked for 6 years in a variety of underground jobs including general inside laborer, shuttle car operator, unitrack operator, greaser, beltman and mechanic.

His fellow Local Union 2236 members elected him to the local's mine, safety and political action committees. He became active in the Miners for Democracy movement that restored control of the UMWA to its membership in December 1972.

In 1976, he taught contract education classes for District 17. He served as an investigator for district and International attorneys in the Carbon Fuels lawsuit which ended in a major UMWA victory when the U.S. Supreme Court ruled that an International union cannot be held liable for unauthorized work stoppages in which only local unions are involved.

In 1977, his local elected him a delegate to the District 17 convention, where he chaired the constitution committee. The same year, he was elected vice president of District 17 by a 2-to-1 margin. In May 1981, he was reelected without opposition.

On November 9, 1982, Roberts was elected vice president of the UMWA, again by a 2-to-1 margin, running on a slate headed by Trumka and including John J. Banovic, who was elected secretary-treasurer. The Trumka-Roberts-Banovic team was reelected without opposition 5 years later.

On November 10, 1992, Roberts was reelected by an 80-percent margin to his third term as vice president. Trumka was reelected president and Jerry D. Jones, secretary-treasurer.

In December, 1995, Roberts assumed the UMWA presidency, following Richard Trumka's resignation to become the AFL-CIO's new secretary-treasurer. Subsequently, Jones was named vice president and Carlo Tarley was appointed by Roberts to be the UMWA's new secretary -treasurer.

In August 1997, Roberts was elected by acclamation to a new, five-year term, winning the support of 99 percent of the locals participating in the union's nominating process. He is once again joined at the union's helm by Vice President Jones and Secretary-Treasurer Tarley. Also of note, for the first time in UMWA history, the entire leadership team's slate, including tellers and auditors, ran unopposed.

In addition to serving as UMWA president, Roberts has also held office or worked on behalf of several other organizations over the years, including serving on the Committee for Employer Support of Veteran Employment and the West Virginia Employment Opportunities and Economic Development Commission. In 1985, he was elected president of the National Council of the Holmes Safety Association.

Roberts has also served on the boards of directors of Blue Cross and Blue Shield of Southern West Virginia and the Cabin Creek Clinic in Cabin Creek, W.Va., and on the Advisory Committee of the Black Lung Program at the Cabin Creek Clinic. He has been elected as General Vice President of the National Council of Senior Citizens by their Executive Board. He has also been appointed to serve as a member of the West Virginia University Institute for Labor Studies and Research Advisory Board in 1996. He is a member of the Vietnam Veterans of America and the American Legion.

Roberts graduated in 1964 from East Bank High School in East Bank, W.Va. He was drafted into the U.S. Army in May 1966, serving a year in Vietnam with the 196th Light Infantry Brigade, Americal Division. After his military service, he attended Beckley Junior College for two years, majoring in sociology. In 1987, he graduated from West Virginia Technical College.

Roberts is married to the former Carolyn Sue Stewart. They have a son, Kyle Edward, a daughter, Melissa Dawn, and two grandsons, Aaron and Brandon.

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002. biography	Biography of Peter B. Lilly [partial] [PII] (1 page)	08/00/1997	b(6)

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b(1) National security classified information [(b)(1) of the FOIA]
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b(3) Release would violate a Federal statute [(b)(3) of the FOIA]
b(4) Release would disclose trade secrets or confidential or financial information [(b)(4) of the FOIA]
b(6) Release would constitute a clearly unwarranted invasion of personal privacy [(b)(6) of the FOIA]
b(7) Release would disclose information compiled for law enforcement purposes [(b)(7) of the FOIA]
b(8) Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA]
b(9) Release would disclose geological or geophysical information concerning wells [(b)(9) of the FOIA]

Peabody

Biography

PETER B. LILLY

Present Position:	President and Chief Operating Officer, Peabody Holding Company, Inc., St. Louis, Mo., July 1995-present.
Responsibilities:	Responsible for overseeing Peabody Holding's North American coal operations that produce approximately 143 million tons of coal annually.
Past Positions:	Executive Vice President, Peabody Holding Company, Inc., St. Louis, Mo., 1994-1995. President, Eastern Associated Coal Corp., Charleston, W.Va., 1991-1994. President, Kerr-McGee Coal Corporation and Senior Vice President, Kerr-McGee Corp., Oklahoma City, Okla., 1989-1991. Vice President-Marketing and Planning, Kerr-McGee Coal Corporation, 1988-1989. General Manager, Galatia Mine, Kerr-McGee Coal Corporation, Harrisburg, Ill., 1983-1988. Director of Administration, Kerr McGee Coal Corporation, 1981-1983. Manager-Maintenance Planning, Kerr-McGee Coal Corporation, 1980-1981. Management Consultant (Coal Industry), Emory Ayers Associates, New York, N.Y., 1977-1980.
Education:	U.S. Military Academy, West Point, N.Y., B.S. General Engineering and Applied Science, 1970. Harvard University, M.B.A., Finance, Industrial Marketing and Operations Management, 1977. Northwestern University, Kellogg Graduate School of Management, Advanced Executive Program, 1988.
Military Service:	U.S. Army, 1970-1975, Captain.
Activities:	Chairman, West Virginia Coal Association (1993-1994); member, National Coal Council (1989-present); Board of Directors, American Mining Congress (1989-1991); Board of Directors, National Coal Association (1989-1991 and 1995-present); Board of Advisors, West Virginia University, Morgantown, W.Va. (1991-present); and Young Presidents' Organization.
Born:	(b)(6) (b)(6) [002]
Immediate Family:	Brenda, wife; Lauren Elizabeth, daughter, born (b)(6) Peter Ernst, son, born (b)(6) [0027]
Office Address:	Peabody Holding Company, Inc. 701 Market Street, Suite 700 St. Louis, Missouri 63101-1826 Phone: (314) 342-7780 Fax: (314) 342-7720

8/97

MP

Michelle

Note to Todd--

This is a draft of the labor analysis which will be released next week. It is still in internal review among Labor and EPI, and it could change.

It would not be good if they knew we have it. It is being fairly closely held, and someone could get in trouble for giving it to us.

The principal author is Robert Scott, who was one of the IAT peer reviewers.

There are a number of places in the existing text where context is provided that is relatively helpful to us (e.g., comparing the costs to other larger costs). My source tells me that this context may be deleted or modified, which would be unfortunate. I indicated in marginal notes the now-helpful text that may be deleted or modified.

They spend a fair amount of time comparing their analysis to the draft IAT analysis. We need to decide whether we want to defend the draft IAT analysis against their criticisms. I think we could, but we have not done that thus far. For example, they say that the demand elasticity in the version of the DRI model we used is too high. We could explain that we incorporated projections for the success of the voluntary CCAP programs, which business generally supports.

The overall message is that the treaty is going to be very bad for working people. They think it's going to increase income equality (by increasing investment income and decreasing wage income), depress wages for non-college educated Americans, eliminate high paying jobs, send investment overseas, etc. EPI says that we could mitigate these costs somewhat through border adjustment policies and real transition programs. One option for responding is to engage in substantive dialogue with them over border adjustment policies and transition programs. As I'm sure you know, both of these are fraught with difficulty. As I understand it, there has been some limited internal discussion of these issues as part of the interagency policy process. The free traders don't like border adjustments, and past transition programs have not worked very well. Although these are difficult policy issues, I think if we really are serious about getting labor support, we're going to have to discuss this seriously and in great detail. I also think such a discussion, despite its difficulties, is likely to be much more fruitful than arguing about the costs.

-Jude

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Accelerating Globalization? The Economics Effects of Climate Change Policies on U.S. Workers

Robert E. Scott
August 14, 1997

Executive Summary

The Framework Convention on Climate Change, which the U.S. and other countries signed in 1992, commits the signatory countries to limit, and ultimately reduce, their emissions of greenhouse gases. These measures were designed to limit the damages which could result from climate changes associated with increasing concentrations of these gases in the world's atmosphere. Most GHGs are generated through the burning of fossil fuels, so reducing their emissions will require limits on energy use. The signatories to the Convention are now engaged in negotiations that could lead to a treaty with binding commitments to reduce GHG emissions at a Conference of the Parties in Kyoto, Japan in December 1997.

This report examines the costs to the U.S. economy of some of the policies that have been proposed to limit GHG emissions. While there have been a number of studies of the costs of these policies, inadequate attention has been given to the effects of greenhouse gas policies on the distribution of income. We analyze a set of possible GHG policies using the DRI/McGraw-Hill model of the economy, and we find that these policies could have significant costs for the economy, especially in the next ten to fifteen years, and that their distributional effects would be even larger than their effects on the overall level of output. Policies designed to stabilize U.S. emissions of greenhouse gases at 1990 levels in 2010 — the least restrictive policies now being discussed for the Kyoto negotiations — could reduce the level of national output by 1.8 to 2% in the short run, relative to the base case of no GHG policies. Because of the increase in real energy prices, consumption would fall even more, from 2.2 to 2.5%, relative to the base-case forecast. If GHG emissions are reduced by 10% in 2010, then the short-run costs increase sharply, to 2.9% of GDP and 3.6% of consumption.

The effects of GHG policies on the distribution of income and employment should be considered in the broader context of overall labor market trends. U.S. production workers have

experienced a steady erosion in their real wages since at least 1973 (Mishel, *et al* 1997). Wages are eroding for a number of reasons, including declining rates of unionization, falling real values of the minimum wage, deregulation and increased rates of immigration. Rapid growth in foreign trade and investment are also important causes of declining real wages. Unless these issues are considered in the development of GHG policies, those measures will exacerbate the effects off globalization on American workers. Without offsetting measures, these policies can lead to further downward pressure on the wages of the three-quarters of the workforce that does not have a college degree.

The DRI/McGraw-Hill model shows that GHG policies could cut wage growth in half over the next two decades. In the short run, 1.5 to 2.6 million jobs fewer would be created, and in the long run there will be substantial shifts in employment and population between industries and regions of the country. Even in the long run, after the initial recession caused by the shock of adjusting to higher energy prices is absorbed, total employment would still be lower with GHG policies than without them. In addition, 400,000 to 500,000 high-paying job opportunities in mining, transportation and public utilities would be eliminated (relative to base-case forecasts), while 240,00 to 290,000 jobs would be created in low-wage retail trade sectors. In addition, 180,000 to 340,000 high-wage manufacturing jobs would also be eliminated if GHG emission quotas were allocated to industry (rather than auctioned to raise government revenues).

Coal, in particular, is the most carbon-intensive of all the fossil fuels, so all GHG policies will have a disproportionately large impact on this industry. Coal output is projected to fall by 45 to 50% in 2020, relative to a base case with no restrictions on carbon emissions. This will eliminate 35,000 to 38,000 jobs in this industry by 2020, which is already forecast to lose 36,000 jobs in the base case. GHG policies will double projected job losses in this hard-hit sector. Other individual industries that would be especially hard hit by GHG policies include rubber and plastics footwear, leather footwear and related goods, kitchen products, apparel, toys, and various other mining industries (fertilizers, nonferrous metals and iron and ferroalloy ores).

The DRI/McGraw-Hill model, like most other macroeconomic models, is not designed to fully capture the effects of greenhouse gas policies on patterns of trade or foreign investment flows. Most models assume that the U.S. will continue to purchase most of its imports from other developed countries, which will also need to limit greenhouse gas emissions. However, higher energy prices will increase the competitiveness of exporters based in low-wage developing countries, who will capture a growing share of the U.S. market. The trade deficit will expand dramatically, because rising energy prices will make imports more attractive and our exports less competitive. Increases in energy prices, and in the trade deficit, will cause the shift of resources out of mining and manufacturing into services and other low-wage sectors of the economy that was noted above. This could amplify labor-market problems that will result from GHG policies.

The model forecasts that the trade deficit, as a share of GDP, will increase by 1.3 to 2.8 percentage points if GHG emissions are reduced to 1990 levels in 2010. Imports would increase by $175 to $240 billion per year. But these estimates may be too low. Multinational firms in

developed countries will have additional incentives to shift investment to the developing countries, if those countries do not face limits on their emissions of greenhouse gases. The DRI/McGraw-Hill model does not include the effects of plant closures or investment diversion to countries excluded from the agreement, so it may underestimate the effects that GHG policies will have on the U.S. trade deficit, and on manufacturing output, employment, and wages.

Greenhouse gas policies are likely to apply market-based mechanisms to discourage energy use. These could include a tax on the carbon content of fuels, or a system of permits that are auctioned to the highest bidder. This report considers two systems of permits, rather than a direct carbon tax, in which markets ration energy use. Either system will generate substantial amounts of revenue for either the government, or the holders of private permits. If revenues are collected by the government and used to reduce public borrowing, then sustained losses in consumption will result. If the permits are granted to businesses, corporate profits will increase dramatically and labor's share of national income will decline sharply. Total before tax corporate profits would increase by over $1 trillion per year in 2020, if the permits are granted to businesses.

On the other hand, the expected costs of GHG policies, at least at the macroeconomic level, are not larger than some other recent policy initiatives, such as the U.S. defense build-up in the 1980s. This report makes no assessment of the potential benefits of GHG policies, in terms of potential risks or damages that could be avoided, nor does it take a position on the advisability of adopting any further policies to restrict GHG emissions. However, we strongly suggest that if such policies are implemented, two specific, additional measures are needed to limit their disruptive effects on the economy, and on the lives of American workers.

The first concerns the treatment of developing countries in the Kyoto negotiations. In July, 1997 the U.S. Senate unanimously endorsed a resolution which required that developing countries be included in any climate change agreement to be signed by the President. However, it will not be sufficient to include these countries in a broad framework agreement, if firms are allowed to take advantage of lower energy prices and less restrictive emission limits by moving plants and production to the developing countries.

It is possible to reduce or eliminate the negative effects of GHG policies on U.S. trade and investment. One way to achieve this goal would be to establish a border equalization tax policy. This tax would rebate the cost of emission limits on the energy content of exports, and assess an equivalent fee on products imported into the U.S. This kind of tax would eliminate the incentive to import goods and move plants abroad to escape U.S. emission limits. Since the U.S. currently has a large trade deficit, it could also generate revenues for the U.S. treasury. Other policies which could reduce the effects of GHG policies on trade and foreign investment include quotas on energy intensive imports, and safeguard measures to limit import surges.

The second policy that would be needed is a set of measures that would provide substantial assistance to the workers and communities damaged by the creation of greenhouse gas policies. For workers, such a program should involve meaningful retraining opportunities, and

several years of income support while involved in those activities. For particularly hard hit sectors and regions, special programs could be required to provide for early retirements, buyouts and to ensure continuation of health and pension benefits. For communities, there are many options including, but not limited to, industrial and R&D policy support, alternative energy investment and public investment in mass transit, bike paths and other measures designed to reduce neighborhood energy use while creating attractive community living spaces. Resources needed to support these programs could be funded through carbon taxes or permit-sale revenues.

Worker retraining policies, especially in the trade adjustment area, have established a poor track record, which may raise questions about the wisdom of incorporating such measures into a GHG policy or treaty package. These policies have failed for several reasons. They have historically been poorly funded, not providing sufficient resources for meaningful retraining nor the time and family income needed to sustain it. In addition, commitments have often been dishonored in the past, when funding for adjustment programs was terminated or drastically reduced after the policy had been implemented. However, more broadly-based development and retraining programs have had demonstrable effects on output and employment at the regional level. In particular, investments in infrastructure, such as roads, utilities and startup facilities, have been successful tools in regional development policies. When coupled with adequate investments in retraining and income maintenance for displaced workers, there is every reason to believe that well-funded, community-based, adjustment programs could offset some of the negative distributional consequences of GHG policies.

Finally, these results must be qualified by noting two major areas of uncertainty. First, there are many unknowns about the costs of reducing emissions. The DRI model provides *one* way to estimate those costs. This model could overstate or understate the costs of reducing GHG emissions. If the energy efficiency of the economy grows more slowly than is expected in the base case, then greater reductions in energy use will be required to meet any given standard, which would dramatically increase the costs of compliance. On the other hand, in the past such modeling exercises have produced estimates that have proved, in retrospect, to significantly overestimate the costs of new pollution controls. Examples include the costs of reducing asbestos, cotton dust and vinyl chloride emissions.

In addition, there is substantial uncertainty about the pace of global warming and the precise climactic impact of a given volume of CO_2 emissions. As noted above, any potential benefits of climate change policies, including the explicitly economic benefits, have not been considered in these calculations. Some studies have found that the benefits of GHG reduction are less than the costs of the policies considered here, and that optimal levels of control would therefore be less restrictive or that limits should be phased-in over a longer time-span. Other studies forecast that the costs of GHGs will rise sharply in the future, and that the overall costs of control will be lower the sooner steps are taken to limit or reduce GHG emissions. For these reasons, this report does not take a position on the advisability of adopting further policies to restrict GHG emissions. Further study is clearly required in the areas noted above, whether new GHG policies are adopted in Kyoto, or not, to improve the policy making process in the future.

Accelerating Globalization?
The Economics Effects of Climate Change Policies on U.S. Workers

Robert E. Scott

Introduction

The Framework Convention on Climate Change, which the U.S. and other countries signed in 1992, committed the U.S. and other countries to a voluntary plan to reduce emissions of greenhouse gases. In 1995, at the first Conference of the Parties (COP-I), a document was produced which established a process designed "to elaborate policies and measures" which would "set quantified limitation and reduction objectives within specified time frames, such as 2005, 2010, and 2020" for greenhouse gas (GHG) "emissions by sources and removals by sinks."[1] At COP-II in 1996, the U.S. first endorsed the concept of "legally binding" emission targets. The signatories to the Convention are now engaged in negotiations that could lead to a treaty with binding commitments at the third Conference of the Parties in Kyoto, Japan in December 1997.

There is a high level of uncertainty about the benefits of policies to avoid climate change. In fact, it is precisely the because of the existence of this uncertainty about the effects, and the costs, of climate change, that some economists have taken an interest in the theoretical aspects of climate change modeling (see, for example, Nordhaus 1994). Some have found that there are greater incentives to implement policies to reduce GHG emissions than would exist if the costs of climate change were known with certainty.

Because of the uncertainly surrounding the benefits of climate change policy, most analysts have focused on an assessment of the costs of GHG policies.[2] However, little attention has been paid to the distributional implications of climate change policies. This paper examines

these issues using a model developed by DRI/McGraw-Hill (1997). The results of this modeling exercise are analyzed and contrasted with a recent administration study of the costs of climate change policies (Interagency Analytic Team 1997). DRI/McGraw-Hill also prepared the most extensively cited model used in the IAT report. We refer here to that earlier effort as the IAT model.

There have been a number of surveys of the cost of climate change policies.[3] We rely on some of these studies in our analysis. This report contributes an analysis of the distribution of the costs of climate change policies across society to the debate. We make no assessment of the potential benefits of GHG policies, in terms of potential risks or damages that could be avoided, nor do we take a position on the advisability of adopting any further policies to restrict GHG emissions. However, we strongly suggest that if such policies are implemented, two specific, additional measures are needed to limit their disruptive effects on the economy, and on the lives of American workers. It is important to consider such policies before the U.S. position in the Kyoto negotiations is finalized.

We begin by describing the baseline forecasts for the economy (business as usual case) and then review the overall effects of potential GHG policies on output (GDP) and consumption, including a comparison of the DRI/McGraw-Hill (1997) results with those of the IAT. The next section considers the effects of these policies on key sectors of the economy, including employment, wages, profits, and foreign trade. We then examine GHG policy-effects on industries and regions of the economy. The paper concludes with a discussion of policy implications and areas for future research.

The Macroeconomic Impacts of GHG Policies

The model used in this study is the DRI/McGraw-Hill macro-economic model. This is a short-run forecasting model with an input-output-based structure. Some analysts have criticized the use of the DRI model to analyze issues such as GHG policies because of its short-run orientation, arguing that the policies proposed should be designed to reduce energy use and carbon emissions over the next century.[4] However, the policies discussed in IAT (1997) would take effect in the year 2000 and be phased in over 10 years. They would have substantial short-run impacts on economic output, which would exceed the costs identified in the other long-run models used in the IAT report.[5] Therefore, it is appropriate to examine these adjustment costs when considering the distributional effects of GHG policies.

Many models have estimated the costs of stabilizing the emissions of carbon, on a national basis, at 1990 levels by the year 2010. This scenario has become the standard of comparison for modeling of the costs of GHG policies. The IAT chose this scenario as a baseline, and also ran a number of "sensitivity-test" scenarios which varied key assumptions, including a range of targets between 90% and 110% of 1990 level emissions in the year 2010. Most scenarios assume that emissions are held constant after the target is achieved in 2010. The European Union has proposed emission reductions of 15% of 1990 levels by 2010 as a starting point for the the Kyoto-round negotiations. It is also important to point out that ultimate stabilization of atmospheric CO_2 and climate may require further reductions in global emission levels beyond these targets.[6] Therefore adjustment costs could continue and expand if future COP meetings results in additional, increasingly restrictive agreements to reduce GHG emissions in the Annex-I countries, as seems likely.

Baseline forecasts

DRI/McGraw-Hill (1997) assumes that real GDP growth will average two percent per year between 2000 and 2010, and 1.5% per year thereafter. GDP growth declines after 2010 because the rate of growth of the labor force declines from about one percent per year between 2000 and 2010 to 0.5% per year thereafter, as the baby boom generation begins to exit the labor force. The energy intensity of the economy is forecast to decline by one percent per year throughout the forecast period. Carbon emissions therefore increase 1.3 percent per year between 2000 and 2010 and 0.8% per year thereafter.

Total carbon emissions in the baseline case are 1,746 million metric tons (MMT) in 2010 and 1,894 MMT in 2020. Actual emissions in 1990 in the U.S. were 1323 MMT, according to DRI/McGraw-Hill (1997).[7] Therefore total emissions in the baseline case grow 32.0% and 43.2%, respectively, in 2010 and 2020 in this model. These are the amounts by which carbon emissions would have to be reduced to stabilize emissions at 1990 levels.[8] Some fuels, such as natural gas and petroleum, emit much less carbon per unit of energy released, so energy use would not have to fall by this amount if fuel switching were to occur (as is assumed in the DRI model).

Policy Scenarios

It is assumed that a system of tradeable carbon emission permits is announced and implemented beginning in 2000. The number of permits in circulation is reduced each year from 2000 to 2010, until the emissions target is achieved. Permits are not traded internationally, but are tradeable within the domestic market, to facilitate adjustment at least possible cost. Three cases are analyzed[9]:

Case 1: **(Grandfathered Permits).** Allowance are issued to industry at no cost. Emissions are stabilized at 1990 levels in 2010.

Case 2: **(Grandfathered Permits, 90% of '90 Emissions).** Allowances are issued to industry at no cost. Emissions stabilized at 90% of 1990 levels in 2010.

Case 3: **(Auction, Deficit Reduction)** Allowances auctioned by U.S. Government, no revenue recycling. Emissions stabilized at 1990 levels in 2010.

Carbon prices range from $180 to $200 per ton in 2010 and $270 to $320 per ton 2020 in DRI/McGraw-Hill (1997), as shown in **Table 1**. These prices have very different effects on different types of fuel, as noted above. Gasoline prices increase only 31.5% to 49.2% in 2010, for example ($.41 to $.63/gallon). However, coal prices rise much more rapidly, 450% to 680%, because coal has a much higher carbon content per unit of energy, as noted above. Natural Gas, which is one of the most carbon-efficient fuels, rises substantially more in price than gasoline because fuel switching sharply increases demand, and capacity is slow to respond.

Energy prices in the IAT draft report are compared in the bottom two sections of Table 1. The base case prices are nearly identical in the two studies. However, carbon prices are much lower in the IAT scenarios. There are two reasons for this. First, the IAT model assumes slightly higher baseline improvements in energy efficiency (1.25% vs. 1.0% per year). Therefore, carbon emissions in 2020, for example, are projected to be 1805 MMT in the IAT base case, versus 1894 MMT in DRI/McGraw-Hill (1997), a difference of about 5%. Second, and more importantly, the IAT report apparently assumes larger price and substitution elasticities than DRI/McGraw-Hill (1997). The IAT report has been criticized because "The price elasticities for energy demands need further explanation. Some very rough ...calculations suggest that they may

be on the high side."[10] These comments suggest that the estimates in DRI/McGraw-Hill (1997) may be more reliable than those developed for the IAT.[11]

Effects on Output and Consumption

Figure 1 shows that in the cases considered here, GHG policies could have significant costs for the economy, especially in the next ten to fifteen years. Policies designed to stabilize U.S. emissions of greenhouse gases at 1990 levels in 2010 — the least restrictive policies now being discussed for the Kyoto negotiations — could reduce the level of national output by 1.8 to 2% in the short run. If GHG emissions are reduced by 10% in 2010, then the short-run costs increase sharply, to 2.9% of GDP and 3.6% of consumption. The maximum impact occurs in 2007 in all three scenarios, seven years after the permit system begins to be phased in, but three years before emissions are fully reduced to the target level. Output falls because of the increase in energy prices, shown in Table 1 above, which depresses consumption and investment spending.

Overall inflation rates, shown in **Figure 2,** rise by 0.25 to 1 percentage points during the initial implementation period. By 2020, in the grandfathered permits cases, the cumulative effect of these price effects causes a 7% to 9% increase in the level of the GDP price deflator, relative to the base case, because businesses will pass along the cost of permits to their customers. This increase in the *level* of the GDP deflator is permanent, even though inflation returns to base case levels by 2015.

If permits are auctioned by the government, the policy will have a more depressing effect on output, because the permit fees will cause a sharp, permanent increase in government savings. The effect of the permits is similar to that of a tax increase. Inflation increases in the short run, and then falls below the base case after 2008, reflecting the permanent suppression of demand

caused by this policy.

In all three scenarios, investment recovers and is increased as a share of GDP, relative to the base case, as shown in Figure 10, below. Firms and consumers increase their spending on capital goods to increase energy efficiency, effectively substituting capital for energy and accelerating the replacement of the existing capital stock. For example, total purchases of vehicles in 2020 in the three policy scenarios are 200,000 to 500,000 units higher than in the base case.

The increase in investment is effectively financed through a forced increase in national savings in the three policy scenarios. If permits are auctioned and firms are allowed to capture the resulting revenue streams (which will occur if permits are "grandfathered" to existing users of energy), business revenues and profits will increase sharply. Part of these retained earnings will then be available to finance increased investment spending. Savings through the federal budget also increase in all three models, after an initial adjustment period. If permits are grandfathered, then corporate profit tax revenues will increase. If the permits are auctioned by the government, then the revenues will flow directly into the treasury. The model assumes in all cases that the government uses the increased revenues to reduce the deficit or, if there is a surplus, to reduce the stock of outstanding federal debt, increasing the effective rate of government savings.

The increase in national savings and investment that would result from a system of energy permit sales is a key element in all models of the effects of GHG policies. In the long run, the increase in savings and investment causes GDP to be higher in 2020 than in the base case, in all three scenarios, as shown in Figure 1. Furthermore, GDP is growing 0.1 to 0.2 percentage points faster than in the base case in all three scenarios in 2020. Hence, the stimulus to investment

provided by GHG policies could slightly increase the underlying rate of growth of the domestic economy, in the long run. However, the assumption that permit sales would increase national savings is highly questionable, for reasons discussed below. In the absence of the stimulus to savings and investment, GDP levels and growth rates would be lower throughout the forecast period.

Figure 3 demonstrates that the increase in real energy prices has a bigger effect on consumption than it does on output. GHG policies have a larger impact on consumption than on GDP for at least two reasons. First, a larger share of output is devoted to investment, for reasons explained above, and thus consumption must decline as a share of national income. Second, the increase in energy prices will force consumers to reduce real purchases of other goods, holding everything else constant (unless overall demand for energy is price elastic, which is not the case in most models).

Consumption losses reach a peak of 2.2 to 3.6 percent in 2007, relative to the base case, as shown in Figure 2. Consumption also recovers, following the GDP path in figure 1. However, overall consumption levels remain about one-half percent below the base case in 2020 in all three scenarios, despite the increased levels of output in that year, reflecting the increase in savings discussed above.

It is also important to compare these potential consumption losses with other major policy changes. For example, the decline in defense spending since 1986 has increased consumption by at least 4% in 1997, relative to an alternative scenario with stable shares of defense spending in GDP. Similarly, the military build-up from 1976-86 reduced consumption by several percentage points. The macroeconomic costs of GHG policies are, therefore, not extraordinary when

compared with other important public policies.

Comparisons with IAT Estimates.

The IAT estimates generated much smaller projections of the losses than would result under similar policy scenarios. For example, **Figure 4** compares predicted changes in total consumption from the base case, assuming grandfathered permits in both the IAT and the DRI/McGraw-Hill (1997) models. The maximum loss in the IAT model, of 1.4%, occurs two years earlier (2006) and is only 55% as large as the maximum loss in the DRI/McGraw-Hill (1997) model of 2.5% of base consumption. The difference between the two forecasts reflects the two key differences in energy forecasts: 1) lower base case energy use in the IAT model; and 2) higher price elasticities in that model.

The Reliability of Critical Assumptions

There are substantial economic and practical reasons to question some of the assumptions underlying both the IAT and the DRI/McGraw-Hill (1997) models. One key assumption concerns they way that revenues from the sale of permits are used in the economy. **Figure 5**, which contrasts two scenarios from the IAT report, illustrates the effects of different ways of handling permit revenues on total consumption in the U.S. If permit revenues are recycled to consumers, rather than being used for deficit reduction, losses to consumers will not fade away over time.[12] In this case, consumption will fall and remain at a lower level throughout the forecast period. Given the political realities of the federal budget processes, it is highly unlikely that permit revenues of the type envisioned here would be used to reduce the budget deficit or the federal debt. For example, forecasts in mid-1997 that the federal budget could achieve a small surplus within the next few years if the economy continues to grow at its current pace have generated a

wide range of proposals for using projected revenues for new tax cuts, and/or public spending increases. Therefore, national savings are unlikely to increase as assumed in these models.

Higher levels of federal spending for consumption purposes, for example for defense spending, will not stimulate growth in the way envisioned in the DRI model. Thus the permits are not likely to stimulate as much growth in GDP, nor as rapid a recovery, as is forecast in either the DRI/McGraw-Hill (1997) or IAT (1997). On the other hand, some type of public investment, in areas such a R&D, educational programs and other types of public infrastructure, could have an even larger impact on productivity and economic growth rates than the private investment spending that drives the DRI/McGraw-Hill results. Therefore, the ultimate effects of GHG policies on the economy will be heavily effected by the ways in which the resulting revenues are utilized.

For these reasons it is unlikely that all of the GHG revenue collected by the government would go to deficit reduction. Some federal revenues will probably be returned to consumers (through tax cuts) or otherwise result in new public consumption expenditures. While tax cuts or other expenditures could stimulate the economy, they could not offset the depressing effects of GHG policies. Therefore, output is likely to fall with GHG policies, in the long run, in contrast with the case reviewed here.[13] Figure 4 shows that consumption will fall when the permit system is put in place in 2000, recover slightly, and then begin to decline again. The sustained decline is caused by the increase in the cost of carbon permits and energy prices shown in Table 1, above.[14] The increased cost of energy puts an increasing drag on the rate of growth of economic output. This is the most important long-run cost of GHG policies.

The initial decline in consumption shown in Figure 4 is smaller if all the revenues are

returned to consumers, perhaps through reductions in income or other labor taxes (such as the social security tax). This "revenue neutral" policy has a less depressing effect on total output and consumption than the grandfathered permits policy. Losses begin to increase in 2015 because of the long-run effects of higher energy prices. The losses and distortion effects shown in Figure 4 would increase with the size of the effective carbon tax. Permit fees as large as those estimated in DRI/McGraw-Hill (1997, $180 to $320 per ton, Table 1 above) would have proportionately larger effects on consumption than the IAT cases (in which permit fees are only $95 per ton in 2010 and $125 in 2020).

One final economic reason for questioning the results of both the IAT and DRI/McGraw-Hill (1997) is that investment may not respond in the way assumed in the models. In each case (except for the auction, 100% to consumer case shown in Figure 4), it is assumed that increases in savings by the business and government sector stimulate an equivalent amount of domestic investment. However, even though corporate retained earnings would rise sharply if permits were grandfathered to existing energy users, there is no guarantee that the resulting excess cash would be invested in the U.S. Investment opportunities elsewhere in the world could be more attractive, particularly if there are parts of the world not subject to GHG policies (as discussed below). In fact, recent empirical research has shown that in the long run, about one-quarter of any given change in savings has flown out of the U.S. in the past. This ratio could change in the future, as well. For these reasons, investment (and therefore GDP and consumption) might not receive the stimulus expected in the IAT and DRI/McGraw-Hill (1997) models even if savings are increased. In fact, increased corporate earnings could accelerate capital flight problems that are discussed below.

On balance, we expect that GHG policies designed to stabilize emissions at 1990 levels will reduce consumption by at least $50 to $100 billion per year, on average, between 2000 and 2020. Losses are likely to continue and grow in the future because the policies will reduce the economy's potential growth rate, because permit revenues are likely to be spent on tax cuts or new public expenditures, and because savings and investment will be diverted to other countries because of the effects of GHG policies on economic incentives. However, the Kyoto negotiations also need to consider the distribution of the benefits and the costs of these policies.

Distributional Effects of GHG Policies

Since 1973, U.S. production workers have experienced a steady decline in their real wages and earnings, as shown in **Figure 6.** After rising steadily at an average rate of $0.14 per hour (in $1982) through 1973, real compensation began to decline steadily thereafter at a rate of $.035 per hour. This decline in production worker incomes contrasts sharply with the continued growth in real hourly earnings of the top twenty percent of the labor force, which has been maintained throughout the 1980s and 1990s. Earnings inequality, the gap between the top and bottom classes of wages earners, has increased sharply as a result. For example, the ratio of the top to the bottom deciles of workers has increased from 3.7 to 4.5 since 1973, an increase of more than 20%.

Not very relevant

Wages have been eroding and income inequality has been increasing for a number of reasons, including declining rates of unionization, falling real values of the minimum wage, deregulation and increased rates of immigration. Rapid growth in foreign trade and investment are also important causes of declining real wages (Mishel, Bernstein and Schmitt, 1997). Unless these issues are considered in the development of GHG policies, those measures will exacerbate

the effects of globalization on American workers. Recent reports suggest that trade may be responsible for at least 20 to 25% of the increase in U.S. income inequality in this period (Tyson, 1997).[15] With these facts in mind, we turn next to an analysis of the effects of GHG policies on labor and other factors of production, and then examine the effects of GHG policies on trade in some detail.

The effects of GHG policies on employment in DRI/McGraw-Hill (1997) are illustrated in **Figure 7.** As GDP and consumption fall after the permit system is introduced, unemployment (not shown) rises initially and peaks (relative to the base case) in 2006. Overall, unemployment (not shown) is increased by 0.6 to 1.1 percentage points in 2006, a significant amount, but less than in a typical recession, for example. Job displacement peaks in 2007 or 2008 and persists, as shown in Figure 7, even as excess unemployment is eliminated. Displacement persists though at lower levels, throughout the forecast period because real wages are depressed by the rise in energy prices (and the overall price level), causing workers to drop out of the labor force. Job losses are especially large in the scenario with the lowest emission targets (grandfathered permits, 90% of '90 emissions), in which energy prices must rise most rapidly.

GHG policies have a strikingly consistent, negative impact on real wages, as shown in **Figure 8.**[16] The rate of growth in real wages is reduced by 0.4 to 0.55 percentage points immediately after the introduction of the permit system in 2000. These reductions in real wage growth, relative to the base case, persist for over a decade. The losses are largest with the most restrictive emission limits (90% of '90 emissions), and least for the case with grandfathered permits and 1990 emission targets. In the latter case there is a small, offsetting, positive effect from the increased ability of corporations to grant wage increases when permits are

grandfathered, which increases corporate revenues.

The decade-plus suppression of wage growth rates could cumulatively reduce the growth in the level of real wages by more than 50% between 1995 and 2020, relative to the base case, as shown in **Figure 9.** Real wages decline in all three scenarios between 2000 and 2006, and by 2020 they are only 3% to 4% higher than they were in 1995 (versus a 9% increase in the base case). This translates into an average growth rate of less than 0.2% per year. With such low rates of wage growth the continued increase in inequality will lead to falling wages for most workers. Only the top groups of wage earners are likely to experience any real wage gains over this period.

Impacts on the Business Sector

If permits are granted to businesses currently using energy, then these business will effectively capture a huge stream of income equal to the value of those permits. They can choose to either use the permits themselves, or sell them to other users on the open market. The advantages of this system are that: 1) as the number of permits in circulation is reduced between 2000 and 2010, the lowest cost means of eliminating energy use will be identified by market forces; and 2) the grandfathering of permits will provide some compensation to businesses that will face higher costs of energy because of the implementation of GHG policies.

Businesses will capture a huge stream of revenues, which will grow in value with the prices of permits, if the permits are grandfathered, or given away, as shown in **Figure 10.** Corporate profits (before taxes) are forecast to rise steadily in the base and auction, deficit reduction cases from $500 billion in 1995 to $1.6 trillion in 2020. This reflects both the growth of the capital intensity of the economy (the capital stock is growing faster than in the base case)

and an increase in the expected returns to capital, as well as the general growth in real output. If permits are grandfathered, annual corporate profits in 2020 will increase by an additional $1.1 to $1.2 trillion dollars, an increase of about 66%, as a result of the infusion of GHG permit revenues and associate increases in the prices of domestic products.[17]

Investment as a share of GDP will increase in all three GHG scenarios, as shown in **Figure 11.** Higher energy prices will increase the levels of investment in both residential and non-residential goods, including houses, cars and producer durable equipment (production machinery). This will have important side effects, by stimulating the production of capital goods and construction sectors, as shown below. The increase in investment, if it materializes, is the key to generating increased levels of GDP in the DRI/McGraw-Hill forecasts.

Increases in the level of profits will cause profits to rise sharply as a share of GDP in the two cases where permits are given to businesses (grandfathered), as shown in **Figure 12.** This massive increase in profits reflects returns on the incremental investment shown in Figure 11, and also returns on the asset value of carbon permits in circulation. In the DRI/McGraw-Hill model, increasing profits have a positive macroeconomic impact, because they provide savings to fund the investment growth. However, rising profits, as a share of national income, also imply a fall in the labor share of income, providing further evidence that production workers will be squeezed by GHG policies. The profit share of output increases by an astounding 9.4 and 11.2 percentage points, respectively, in the two cases with grandfathered permits in 2020, with the larger effect occurring with the restrictive target of 90% of '90 emissions. Such massive increases in capital's share of national income would virtually ensure a massive increase in the inequality of income distributions in the U.S. Owners of capital, overwhelmingly concentrated in the top 5% of all

households, would enjoy a massive shift of income from the rest of society, as a result of the grandfathering of permits to businesses.

Effects of GHG Policies on Trade and Investment flows

By 2020, U.S. Imports would rise sharply under GHG policies because higher energy prices would make foreign goods (made with cheaper energy inputs) more attractive, as shown in **Figure 13.** In the short run, as output falls due to the introduction of the permit system, imports will decline slightly. After 2007 they surpass the base case (no GHG policies), and by 2020 they are $175 to $275 billion higher than in the base case. Imports rise most rapidly under the scenario with the most restrictive limits on GHG gases (90% of '90 emissions), because the high costs of carbon permits. The auction, deficit reduction case has the smallest effect on imports, because output is slightly lower than in the case with grandfathered permits (at '90 emission levels).

Real exports, shown in **Figure 14** would fall below base case exports until at least 2013, for all three policy scenarios. Exports recover somewhat thereafter, because of the effects of increased domestic productivity. In particular, in case 2 (permits auctioned, revenues used for deficit reduction) exports are $25 billion higher than in the base case by 2020.

On balance, the increase in imports is considerably larger than the increase of exports, in the long run, in all three cases. Therefore the trade deficit (imports less exports) increases sharply as a share of GDP, as shown in **Figure 15.** The balance improves slightly during the initial impact-recession between 2000 and 2010, but the deficit expands rapidly thereafter. By 2020, the deficit has increased to between 6.0% and 7.5% of GDP, as compared with a 1997 deficit of approximately 2% of GDP. The trade deficit is forecast to grow substantially in the base case, as well. However, the GHG policies would add between $149, $287 and $240 billion to the trade

deficit in 2020 in cases 1 through 3, respectively. The trade deficit would increase by 1.3, 2.7 and 2.1 percentage points of GDP in the respective cases.

Deficit increases of this size would have huge impacts on traded goods, especially manufacturing-sector products. We have estimated that $1 billion worth of exports would generate approximately 14,000 domestic jobs, including direct and indirect employment effects, in 1995 (Scott and Lee, 1997). Using this multiplier, the forecast increases in the trade deficit could eliminate between 2 and 4 million jobs in goods producing and related industries. As shown below, the DRI/McGraw-Hill industry projections for 2020 do not reflect employment losses of these magnitudes, because the model assumes that the economy returns to full employment and displaced workers are reabsorbed into other industries by that time.[18] However, if the forecast changes in trade flows are correct, then 2 to 4 million fewer jobs will exist or be created in industries producing traded goods, and related inputs, could occur with GHG policies, as compared with base case employment forecasts. In the long run, increased imports will cause shifts in employment within the manufacturing sector, and between manufacturing and services. As a result, gross job displacement is likely to exceed the net job losses that are discussed below.

If GHG policies do eliminate such a large number of manufacturing jobs, they will have a much larger impact on wages and incomes, especially for non-college educated workers, than is suggested by the DRI/McGraw-Hill macroeconomic model, because wages and incomes are much higher in manufacturing than in other sectors of the economy. Further research is needed to separately estimate the effects of GHG policies on the wages and incomes of blue- and white-collar workers.

There is also a more fundamental set of international trade and investment issues that are

not addressed in the DRI model, as suggested by outside reviewers of the IAT, noted above. The DRI model assumes that the share of imports coming from the Annex-I countries (that will impose GHG emission limits) and non-Annex-I countries (which will presumably not be limited, for some time to come) will remain fixed in the base case. However, the structure of trade flows has shifted rapidly in the past 10 years, even without the incentives provided by GHG policies. The share of U.S. imports originating in the developing countries increased from 29.1% in 1978 to 36.4% in 1990, even while the ratio of imports to value added in the manufacturing sector was increasing sharply, from 18.3% to 30.7% (Sachs and Shatz 1994, 10 and 12).

GHG policies will also create incentives to accelerate the pace of globalization and integration of the world economy. Globalization will take at least two forms. First, the share of U.S. imports originating in developing countries will grow, even more rapidly than it has in the past (for example, Mexico and China have experienced some of the most rapid rates of growth in U.S. imports in the 1990s). Second, investment will be diverted from the U.S. to non-Annex I countries, especially Mexico and other countries with large supplies of low-wage, semi-skilled labor. The pool of investment capital available for investing abroad could also be increased if grandfathered permit policies are implemented, as shown above. For the past two decades trade has grown twice as fast as world income, and foreign direct investment has grown four times as fast as income. Globalization is likely to accelerate if GHG policies are implemented that do not limit or otherwise control production shifts designed to escape GHG limits.

Sectoral and Regional Impacts of GHG Policies

Tables 2 and 3 forecast the effects of GHG policies on total and sectoral employment, at a fairly aggregated level in the economy (1- and 2-digit SIC categories of output). Employment

changes in 2007 (Table 2) will be dominated by the initial reduction in output, relative to the base case, as noted above. Employment changes will be almost universally negative, and will be spread more or less evenly across the economy. Total losses are greatest when GHG limits are most restrictive (90% of '90 emissions). DRI/McGraw-Hill predicts that a net total of 1.5 to 2.6 million jobs, or about 1.0% to 1.8% of total employment in the base case, will be lost in this first recession. At the high levels of aggregation shown in Table 2, only the energy-related sectors are predicted to experience very large job losses in the short run, including mining (down 11.5% to 15.4%) and petroleum refining (down 2.5% to 7.4%)

In 2020 employment changes are more mixed (Table 3). Total employment declines by 400,000 to 1 million jobs (0.1% to 0.4% of base case employment in 2020), because of the reduction in real wages discussed above. However, employment grows in some sectors (such as other services, retail trade and durable goods) while declining in others (including mining, transportation and non-durables manufacturing). Contract construction employment increases in the two cases with less restrictive limits on carbon emissions because of increased levels of investment. Significant employment losses spread to a much wider range of industries, as the effects of higher energy costs and related changes in other costs are spread throughout the economy. Mining losses rise to 22% to 24% of the base case and petroleum refining employment declines by 17% to 24%. Several industries are forecast to have significant job losses under grandfathered permits, but gains when permits are auctioned and the revenues used to reduce the federal deficit or increase savings, including apparel products, leather products, electrical machinery and miscellaneous manufacturing. These are all sectors that are open to international competition, where production is highly sensitive to wage levels. Nominal wages would be about

six percent lower than in the base case by 2020 in the auction, deficit reduction scenario. However, wages are higher than in the base case when permits are grandfathered, which explains why employment impacts differ at the sectoral level in these scenarios.[19]

Employment shifts between industries could contribute to the downward pressure on wages discussed above. **Table 4** reproduces forecasts for employment changes in 2020 from table 3 for a selected group of the most highly aggregated industries, and also includes information on average production worker wages in these sectors in 1995. This table strikingly illustrates one reason why wages grow so slowly in these scenarios. 400,000 to 500,000 job opportunities in mining, transportation and public utilities, where wages averaged between $14.22 and $15.32 per hour, would be eliminated (relative to base-case forecasts), while 240,00 to 290,000 jobs would be created in retail trade, which had wages averaging $7.70 per hour in 1995. In addition, 180,000 to 340,000 manufacturing jobs, paying between $11.60 and $12.90 per hour, would also be eliminated if GHG emission quotas were allocated to industry (rather than auctioned to raise government revenues). This process of structural change resulting from GHG policies will contribute to increasing inequality within labor markets in the U.S.

DRI/McGraw Hill also provides detailed forecasts at the 3 digit level for industries, and at the 2 digit level for the 10 census regions of the U.S. **Table 5** reports the industries that are predicted to gain or lose more than 5% of base-case employment in 2020. Losses outweigh gains in Table 4, in several ways. The number of industries experiencing losses of more than 5% of output is more than twice as large as the number with gains of more that 5%. In addition, there are 13 industries that lose more than 10% of output in 2020, including Rubber and Plastics footwear (-56%) coal mining (-45%), other leather goods (-34%) and electric utilities (30%).

However, there are no industries that gain more than 7.1% in total output. These trends reflect the broader tendency for employment to fall in manufacturing, especially durable goods, and rise in services sectors, including education services, retail and wholesale trade and state and local governments, as shown in Tables 3 and 4, above. Other individual industries that would be especially hard hit by GHG policies include kitchen products, apparel, toys, and various other mining industries (fertilizers, nonferrous metals and iron and ferroalloy ores).

Coal mining is one of largest and most heavily affected industries under GHG policies.[20] Coal output is projected to fall by 45 to 50% in 2020, relative to a base case with no restrictions on carbon emissions. The coal industry employed 116,000 workers in 1995. DRI/McGraw-Hill's (1997) base case forecasts that coal industry employment will decline to 80,000 workers in 2020. GHG policies will eliminate another 35,000 to 38,000 jobs in this industry by 2020, reducing total employment to between 42,000 and 45,000 workers. GHG policies will double projected job losses in this hard-hit sector between 1995 and 2020.

The tendency for GHG policies to shift employment from manufacturing to services would be much more pronounced if trade and foreign investment effects were larger, for the reasons noted above. In addition, given the large increase in imports and the trade deficit, shown in Figures 12 and 14 above, DRI may be underestimating the effect of the GHG policies on output at the sectoral level. The shift of employment from manufacturing to services, the growth of imports and the decline in the price competitiveness of U.S. products would all have depressing effects on U.S. wages, for the reasons discussed above.

The shift from manufacturing to services, especially retail trade, is illustrated in Table 6, which summarizes forecast changes in population and employment in the 10 census regions of the

U.S. in 2020, under the case 1 assumptions (grandfathered permits, 1990 emission limits). Manufacturing employment (shown in the last column) declines in 9 of 10 regions, rising only in the Pacific Northwest, where it is attracted by the availability of relatively cheap hydro-powered electricity. Retail trade experiences employment gains in 7 of the 9 regions that experience declining manufacturing employment. Mining, especially coal mining, declines sharply in all regions of the country, as noted above. Construction absorbs some of excess labor in regions that are forecast to enjoy stable or rising population levels because of GHG policies. Overall, employment declines in 6 of the regions (more than 1% in the East South Central and West South Central areas), and population declines in 3 of the 10 regions. Changes in energy costs, and the location of employment opportunities drive population shifts. In general, there is a substantial shift of jobs and population to the Pacific Northwest, with the other 7 regions not noted here experiencing small net gains or losses of jobs and employment in Case 1.

Regional and industrial shifts in production and employment will reinforce the tendency of GHG policies to increase income disparities in the U.S. The movement of labor out of high-wage sectors, such as manufacturing and mining, and into low wage sectors, such as retail trade, will tend to increase income inequality across the U.S., as the supply of good jobs for the bottom three-fourths of the labor force is reduced. Regionally, the Pacific Northwest, which already enjoys relatively high standards of living, will experience employment and population gains, while relatively low-income regions such as the East South Central will experience job and populations losses. These changes will tend to increase the disparity which exists in wages and income distributions among these regions, by increasing labor demands in the regions that gain and reducing labor demand in the regions that lose jobs and population.

Policy Implications and Areas for Future Research

If the U.S. and other countries decide that it is desirable to control GHG emissions, then policies will need to be identified that achieve a desirable path of control at least cost to both developed and developing societies. This discussion is likely to include an assessment of both the optimal overall level and path for GHG controls, but it should also consider sectoral, regional and other adjustment policies needed to minimize the negative effects of GHG policies on the distribution of income. To date, research on optimal GHG policies has focused almost exclusively on the identification of the optimal level and path for these policies. This analysis adds consideration of equity issues to the debate.

Optimal GHG Control Strategies

As noted above, policy makers are discussing a range of goals for the Kyoto-COP-III meetings and potential agreements. These range from stabilizing emissions in the Annex-I countries at 110% of 1990 levels by 2010 (IAT, 1997), or 2020, to reducing them by up to 20% as soon as 2005.[21] DRI/McGraw-Hill (1997) estimates that stabilizing or reducing emissions at 1990 levels will require an effective carbon permit price of $180 to $192/ton in 2010, and $270 to $281 per ton in 2020 (Table 1, above). Further emission reductions would require substantially higher carbon prices.

Nordhaus (1994, 93-96) has developed a simple simulation model of the costs and benefits of global climate change which identifies optimal emission control rates and the carbon taxes needed to achieve those levels of control (the carbon tax would have essentially the same effect as a carbon permit-fee on energy use and carbon emissions). His model suggests that very small and gradual controls are needed, with carbon taxes of only $5.29 per ton (in 1989 $), rising to $17.75

per ton in 2075.[22] He reviews a number of other, earlier studies which also reached similar conclusions. Fankhauser and Tol (1996) also review a number of recent estimates of the marginal damage of a ton of carbon emissions of $5 to $125 per ton of carbon, "with most estimates in the lower end of this range." This literature suggests that the emission limits considered in IAT (1997) and DRI/McGraw-Hill (1997) may be too restrictive, in the sense that marginal costs would exceed marginal benefits at the given levels of carbon emission limits.

Measures to Offset the Effects of GHG Policies on Income Distribution

If any limits on GHG emissions are implemented, then we strongly suggest that two specific, additional measures would be needed to limit the disruptive effects of GHG policies on the economy, and on the lives of American workers. The first concerns the treatment of developing countries in the Kyoto negotiations. In July of 1997, the U.S. Senate unanimously endorsed a resolution which required that developing countries be included in any COP-III agreement to be signed by the President. However, it will not be sufficient to include these countries in a broad framework agreement if firms are allowed to take advantage of lower energy prices and less restrictive emission limits by moving plants and production to developing countries.

It is possible to reduce or eliminate the negative effects of GHG policies on U.S. trade and investment. One way to achieve this goal would be to establish a border equalization tax policy (Hoerner and Mueller, 1993 and 1996). This policy would rebate the cost of emission limits on the energy content of exports, and assess an equivalent fee on products imported into the U.S. Such a tax system would eliminate the incentive to import goods and move plants abroad to escape U.S. emission limits. Since the U.S. currently has a large trade deficit, it would also

generate revenues for the U.S. treasury.

There are other policies that could also reduce the effects of GHG policies on trade and foreign investment, including quotas on energy intensive imports, and safeguard measures to limit import surges. These measures would be less comprehensive than the border tax (since they would only apply to selected imports, and not exports), and could be more difficult to administer. However, they may be less likely to create conflicts with the WTO or GATT principles.

The second policy needed is a set of measures designed to provide substantial assistance to the workers and communities damaged by the creation of greenhouse gas policies. For workers, such a program should involve meaningful retraining opportunities, and several years of income support while involved in those activities. For particularly hard hit sectors and regions, special programs could be needed to provide for early retirements, buyouts and to ensure continuation of health and pension benefits. For communities, there are many options including, but not limited to, industrial and R&D policy support, alternative energy investment and public investment in mass transit, bike paths and other measures designed to reduce neighborhood energy use while creating attractive community living spaces. Resources needed to support these programs could be funded through carbon taxes or permit-sale revenues.

Worker retraining policies, especially in the trade adjustment area, have a poor track record, which raises questions about the wisdom of incorporating such measures into a GHG policy or treaty package. These policies have failed for several reasons. They have historically been poorly funded, not providing sufficient resources for meaningful retraining nor the time and family income needed to sustain it. In addition, commitments have often been dishonored, when funding for adjustment programs was terminated or drastically reduced after the policy had been

implemented. However, more broadly-based development and retraining programs have had demonstrable effects on output and employment at the regional level. In particular, investments in infrastructure, such as roads, utilities and startup facilities, have been successful tools in regional development policies. When coupled with adequate investments in retraining and income maintenance for displaced workers, there is every reason to believe that well-funded, community-based, adjustment programs could offset some of the negative distributional consequences of GHG policies.

Limitations and Areas for Future Research

These results estimates reviewed in this paper must be qualified by noting two major areas of uncertainty. First, there are many unknowns about the costs of reducing emissions. The DRI model provides *one* way to estimate those costs. This model could overstate or understate the costs of reducing GHG emissions. If the energy efficiency of the economy grows more slowly than is expected in the base case, then greater reductions in energy use will be required to meet any given standard, which would dramatically increase the costs of compliance. On the other hand, in the past such modeling exercises have produced estimates that have proved, in retrospect, to significantly overestimate the costs of new pollution controls. Examples include the costs of reducing asbestos, cotton dust and vinyl chloride emissions (Mendeloff 1988).

In addition, there is substantial uncertainty about the pace of global warming and the precise climactic impact of a given volume of CO_2 emissions. As noted above, any potential benefits of climate change policies, including the explicitly economic benefits, have not been considered in these calculations. Some studies have found that the benefits of GHG reduction are less than the costs of the policies considered here, and that optimal levels of control would

therefore be less restrictive or that limits should be phased-in over a longer time-span. Other studies forecast that the costs of GHGs will rise sharply in the future, and that the overall costs of control will be lower the sooner steps are taken to limit or reduce GHG emissions. For these reasons, this report does not take a position on the advisability of adopting further policies to restrict GHG emissions. Further study is clearly required in the areas noted above, whether new GHG policies are adopted in Kyoto, or not, to improve the policy-making process in the future.

In addition to these general areas of uncertainty, this report has raised a number of specific concerns that require future research. These include the effect of GHG policies on foreign trade and investment, including sectoral details and relationships between the major accounts (merchandise, services, current and capital accounts); and if permits are traded internationally, or joint implementation is allowed (neither of these alternatives was considered in this report), the implications for trade and exchange rates in a general equilibrium context. Another major area of concern is the system for implementing permits, how they will be created and traded, the nature of the property rights involved, and the wealth effects of grandfathering or other forms of distribution to the private sector. There is a related set of issues concerning the distribution of income between labor and capital, and the future rate of return on capital, that GHG policies will also intersect with. Finally, further disclosure, review and debate is needed about the technical assumptions of the models used to analyze GHG policies. This review should include the relevant price and/or substitution elasticities and the potential (and cost) of increasing the energy-efficiency of the domestic economy without GHG policies. Differences in base case level of energy use, during the forecast period, can have a very large impact on the cost of limiting carbon emissions and this issue has not been adequately addressed in the literature.

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Endnotes

1. This section is based on, and the quotes are drawn from Bernstein, Montgomery and Rutherford (1997).

2. Nordhaus (1994), which estimates optimal GHG policies from an explicitly defined welfare model is a notable exception. Other examples include Boyd, Krutilla and Viscusi (1995) and Madisson (1995).

3. See, for example, Hoeller, Dean and Nicolaisen (1991) and Repetto and Austin (1997).

4. See, for example, comments on the IAT draft report in letters released to the House Subcommittee on Energy and Power, as an appendix to Yellen (1997):
Dale Jorgenson and William D. Nordhaus (April 24, 1997) "This model is ... highly inappropriate...extremely sensitive to assumptions about energy prices." The letter also criticized the "use of fixed-coefficient, input-output model." and Raymond J. Kopp (May 15, 1997) stated that the DRI model is "...useful only for the analysis of short-term adjustments, and even here, one should proceed with caution..." because the model is "driven from fixed coefficient input-output tables that can give very distorted views of the adjustment behavior of the economy."

5. The IAT report utilized three models. In addition to the DRI model discussed here, the IAT also developed forecasts for a similar set of policy scenarios using the Markal-Macro and Second Generation Models (SGM). These are simulation-type models that calculate equilibrium output levels, given constraints (such as available energy resources) and a set of initial conditions and assumptions about the structure of the economy. The Markal-Macro and SGM models are not designed to estimate adjustment costs or economic disequilibria that will result from policy changes. Hence the DRI model is better suited to the analysis of displacement issues, while the general class of simulation models are more appropriate for estimating long-run consequences. Note, however, that the IAT was criticized by reviewers for: 1) failing to utilize a full computable general equilibrium model, rather than the Markal-Macro or SGM; and 2) because neither of those models included a well developed foreign trade sector. See comments by Nordhaus and Jorgenson (previously cited), Ray Kopp, John Weyant and Richard Richels, in letters released to the House Subcommittee on Energy and Power, as an appendix to Yellen (1997).

6. See Wiley, T.M.L., R. Richels and J.A. Edmonds 1996.

7. Note that IAT (1997, Table 1) reports that total carbon emissions in 1990 were 1338 MMT, 1.1% more than is reported for 1990 consumption levels in DRI/McGraw-Hill (1997).

8. These target reduction levels are 5% to 8% larger than those required in IAT (1997). The difference is explained by the combination in the IAT report of more rapid declines in the energy intensity of the economy (1.25 percent per year vs. 1.0 percent per year), and the slightly higher baseline level of carbon emissions. The efficiency assumption is the most important difference, by far, between the two baseline cases.

9. A fourth case and a new base case are also analyzed in DRI/McGraw-Hill (1997). These cases assume that the energy intensity of the domestic economy in the "heroic base case" improves at 1.75% per year. This corresponds to a similar scenario in the IAT report. Results parallel those of the cases discussed below. The scenario in case 4 is otherwise identical to case 1 (grand fathered permits). Case 4 and its comparable base case are not analyzed here because the "heroic base case" scenario is highly unlikely to occur.

10. Comments on the IAT draft report released to the House Subcommittee on Energy and Power, as an appendix to Yellen (1997) in letter from Richard Richels, May 30, 1997. See also letter from Larry Goulder, June 2, 1997, "The report seems consistently to employ assumptions and policy scenarios that contribute to low costs of emisssions reductions."

11. This view is also supported by Ray Kopp, in a letter of May 30, 1997, who noted that "All of the departures from AEO97 used in the draft report serve to decreased carbon emissions [in the base case] and therefore make attainment of a 1990 stabilization less costly." (Letter released to the House Subcommittee on Energy and Power, as an appendix to Yellen, 1997).

12. Figure 4 is derived from two of the scenarios shown in Figure 16 (p. 28) of the IAT draft report.

13. However, if public investment were to be increased using GHG revenues, then output and other macroeconomic variables could even more rapidly in the future than in the cases reviewed here. However, increases in public investment would appear less likely to obtain than general or targeted tax cuts, in the present political environment in the U.S.

14. Bovenberg and de Mooij (1994) have shown that, in theory, revenue raising environmental taxes can lower economic output because they "exacerbate, rather than alleviate, preexisting tax distortions." Goulder (1995) develops a general equilibrium model which shows that the problem with the carbon tax is its "focus on intermediate inputs and its relatively narrow base in comparison with income taxes." In principle, raising the cost or limiting the supply of energy inputs will change the shape and position of the production possibility frontier, generally reducing the amount of output that can be generated with any given set of other inputs.

15. Mishel, Bernstein, and Schmitt (1997, 195) estimate that trade could be responsible for more than 30% of the increase in income inequality in the U.S. between 1979 and 1989.

16. The effects on real wages are estimated by dividing the employment cost index by the consumer price index series in DRI-McGraw-Hill (1997, 20 and exhibit 15). The base case value for this series is then contrasted with each of the forecasts to determine the change in the real value of compensation. Note that DRI-McGraw Hill draws a sharp contrast between changes in the nominal wage series for case 3 (permit auctions) which decline sharply, and the other policy cases, where nominal wages increase because of increases in corporate revenues and hence the ability to pay. However, the variation in these results is eliminated when real wage series (and the corresponding differences of consumer prices in each case) are considered.

17. This increase in before-tax corporate profits appears to primarily reflects an increase in the implicit rate of return on capital. The cumulative increase in fixed nonresidential capital between 2000 and 2020 in the three cases analyzed here is between $1.0 and $1.4 trillion, roughly equivalent to the increase in annual corporate profits by 2020. Therefore most of the increase in profits reflects would appear to reflected increased returns on existing capital stock. This implicit forecast of increased returns is unrealistic, unless the world-wide corporate rate return on invested capital rises sharply because of GHG policies. However, an alternative view might treat the incremental profits as the returns on the imputed capital value of carbon emission permits. This view suggests that grandfathering of permits will not only transfer revenues to permit holders, but also new assets with a huge capital value. The implicit rate of return of capital, and wealth transfers associated with the permits, are important issues for future research.

18. Note that the DRI/McGraw-Hill (1997) forecasts for the three scenarios contain puzzling and potentially contradictory results. The Merchandise trade balance worsens by less than $100 billion in each case, although the calculated trade balances (including services) decline much more sharply, as indicated in the text. It is unlikely that services trade can or will account for these differences. In addition, the current account balance *improves* by $87 to $175 billion in the three GHG scenarios, presumably because of the increase in national savings. However, improvements of this magnitude in the current account are unlikely unless they are mirrored in changes in the trade balances, which dominate current account transactions.

19. Exchange rates are essentially unchanged in the DRI/McGraw-Hill (1997) forecasts, so changes in nominal wages and prices directly effect competitiveness. The rigidity of exchange rates in these forecasts is a potential source of error.

20. There is a greater percentage drop in employment in rubber and plastic footwear under GHG policies, as shown in Table 4. However, output in this industry was less than $1 billion in 1995, as compared with coal industry output of over $28 billion in that year.

21. Association of Small Island States, 1995, "Draft Protocol Submitted to the United Nations Framework Convention on Climate Change," as referenced in Repetto and Austin (1997, 1).

22. Nordhaus and Yang (1996) develop a regional bargaining model which generates slightly higher optimal permit prices of roughly $30 per ton of carbon in 2090, versus $21 in the DICE model developed in Nordhaus (1994).

Table 1
Energy Price Comparisons

	2010	2020
DRI/McGraw-Hill Base Case		
Implicit Price of Carbon ($1995)	$0.00	$0.00
Gasoline-Retail ($/gallon)	$1.30	$1.44
Coal-Electric Utility ($/mmBtu)	$1.07	$0.99
Natural Gas-Utility ($/mmBtu)	$2.30	$2.77
Electricity-Weighted Average (cents/	$4.90	$4.95
DRI Case 1-- Grandfathered Permits		
Implicit Price of Carbon ($1995)	$192.00	$281.00
Gasoline-Retail ($/gallon)	$1.73	$2.06
Coal-Electric Utility ($/mmBtu)	$6.23	$8.52
Natural Gas-Utility ($/mmBtu)	$5.28	$7.14
Electricity-Weighted Average (cents/	$8.13	$9.58
Percentage Changes from Base:		
Gasoline	33.1%	43.1%
Coal	482.2%	760.6%
Natural Gas	129.6%	157.8%
Electricity	65.9%	93.5%
DRI Case 2-- Grandfatherhed Permits, 90% of '90 Emissions		
Implicit Price of Carbon ($1995)	$270.00	$320.00
Gasoline-Retail ($/gallon)	$1.94	$2.16
Coal-Electric Utility ($/mmBtu)	$8.34	$8.52
Natural Gas-Utility ($/mmBtu)	$6.51	$7.73
Electricity-Weighted Average (cents/	$9.29	$10.51
Percentage Changes from Base:		
Gasoline	49.2%	50.0%
Coal	679.4%	760.6%
Natural Gas	183.0%	179.1%
Electricity	89.6%	112.3%
DRI Case 3-- Permits Auctioned		
Implicit Price of Carbon ($1995)	180	270
Gasoline-Retail ($/gallon)	$1.71	$2.06
Coal-Electric Utility ($/mmBtu)	$5.90	$8.21
Natural Gas-Utility ($/mmBtu)	$5.17	$7.18
Electricity-Weighted Average (cents/	$8.00	$9.47
Percentage Changes from Base:		
Gasoline	31.5%	43.1%
Coal	451.4%	729.3%
Natural Gas	124.8%	159.2%
Electricity	63.3%	91.3%
Administration-IAT Draft of May 30, 1997		
(1990 Level Case, No International Trading, Permits Auctioned)		
Implicit Price of Carbon ($1995)	95	125
Gasoline-Retail ($/gallon)*	$1.56	$1.73
Percentage Change in Gasoline Pri	19.8%	19.8%
Comparison, DRI (1997) vs. IAT Estimates:		
Implicit Price of Carbon ($1995)	189%	216%
Percentage Change in Gasoline-Ret	160%	218%

*Estimated, assuming "26 cents gallon of refined petroleum product (IAT Draft at 8)". Note that IAT Draft assumes slightly lower gasoline prices in its base case

Source: Economic Policy Institute

Table 2
Employment Change by Industry in 2007
Relative to Base Case

	Grandfathered Permits		Grandfathered Permits, 90% of '90 Emissions		Auction, Deficit Reduction	
	Percent Change	Jobs Lost (thousands)	Percent Change	Jobs Lost (thousands)	Percent Change	Jobs Lost (thousands)
Civilian Employment - HH Survey	-1.3%	(1,800)	-1.8%	(2,600)	-1.0%	(1,500)
Nonagricultural Establishments	-1.3%	(1,800)	-2.0%	(2,700)	-1.2%	(1,600)
Contract Construction	-1.6%	(100)	-2.8%	(170)	-1.3%	(80)
Finance, Insurance & Real Estate	-1.2%	(90)	-1.4%	(110)	-0.3%	(20)
Mining	-13.5%	(70)	-15.4%	(80)	-11.5%	(60)
Transportation and Public Utilities	-2.5%	(170)	-4.2%	(280)	-2.8%	(190)
Total Services	-1.3%	(570)	-2.0%	(880)	-1.0%	(450)
Health Services	-1.3%	(160)	-2.0%	(240)	-1.3%	(150)
Education Services	-0.9%	(20)	-1.3%	(30)	-0.4%	(10)
Other Services	-1.3%	(390)	-2.0%	(610)	-1.0%	(290)
Retail Trade	-1.2%	(290)	-1.9%	(480)	-0.9%	(220)
Wholesale Trade	-0.6%	(50)	-1.3%	(100)	-0.5%	(40)
Federal Government	0.0%	0	0.0%	0	0.0%	0
State and Local Governments	-1.2%	(240)	-1.7%	(340)	-2.3%	(450)
Manufacturing	-1.0%	(180)	-1.2%	(210)	-0.2%	(30)
Nondurables Manufacturing	-1.5%	(110)	-1.7%	(130)	-0.4%	(30)
Food and Products	-0.9%	(15)	-1.2%	(19)	-0.4%	(7)
Tobacco Products	0.0%	0	0.0%	0	0.0%	0
Textiles and Products	-1.8%	(11)	-1.8%	(11)	-0.2%	(1)
Apparel and Products	-3.2%	(23)	-2.5%	(18)	-0.3%	(2)
Paper and Products	-1.2%	(8)	-1.6%	(11)	-0.4%	(3)
Printing and Publishing	-1.1%	(18)	-1.3%	(22)	-0.4%	(6)
Chemicals and Products	-1.3%	(13)	-2.0%	(20)	-0.5%	(5)
Petroleum Products	-4.1%	(5)	-7.4%	(9)	-2.5%	(3)
Rubber and Plastics Products	-1.2%	(12)	-1.4%	(15)	-0.3%	(3)
Leather and Products	-6.0%	(4)	-4.5%	(3)	0.0%	0
Durables Manufacturing	-0.7%	(70)	-0.9%	(90)	0.0%	0
Lumber and Wood Products	-1.3%	(10)	-1.6%	(12)	0.0%	0
Furniture and Fixtures	-0.8%	(4)	-0.8%	(4)	0.0%	0
Stone, Clay, and Glass	-1.4%	(7)	-2.0%	(10)	-0.4%	(2)
Primary Metal Industries	-1.4%	(9)	-2.0%	(13)	-0.5%	(3)
Fabricated Metal Products	-0.9%	(13)	-1.1%	(16)	-0.1%	(2)
Nonelectrical Machinery	-0.2%	(3)	-0.2%	(4)	-0.1%	(2)
Electrical Machinery	-0.8%	(13)	-0.9%	(14)	0.2%	3
Transportation Equipment	-0.1%	(2)	-0.1%	(2)	0.1%	2
Instruments and Parts	-0.1%	(1)	-0.3%	(2)	0.1%	1
Miscellaneous Manufacturing	-2.3%	(9)	-2.3%	(9)	-0.5%	(2)

Source: Economic Policy Institute

Table 3
Employment Change by Industry in 2020
Relative to Base Case

	Grandfathered Permits		Grandfathered Permits, 90% of '90 Emissions		Auction, Deficit Reduction	
	Percent Change	Jobs Lost (thousands)	Percent Change	Jobs Lost (thousands)	Percent Change	Jobs Lost (thousands)
Civilian Employment - HH Survey	-0.4%	(600)	-0.3%	(500)	-0.1%	(100)
Nonagricultural Establishments	-0.3%	(500)	-0.3%	(500)	-0.1%	(100)
Contract Construction	0.3%	20	-0.2%	(10)	1.5%	90
Finance, Insurance & Real Estate	-0.5%	(40)	-0.4%	(30)	0.7%	60
Mining	-22.2%	(100)	-24.4%	(110)	-22.2%	(100)
Transportation and Public Utilities	-5.6%	(350)	-6.4%	(400)	-5.0%	(310)
Total Services	-0.9%	(490)	-0.9%	(480)	-0.5%	(280)
Health Services	-2.2%	(320)	-2.3%	(330)	-2.0%	(290)
Education Services	0.9%	20	1.4%	30	1.4%	30
Other Services	-0.5%	(180)	-0.5%	(190)	-0.1%	(20)
Retail Trade	0.9%	240	1.1%	290	0.9%	250
Wholesale Trade	0.1%	10	-0.2%	(20)	0.8%	70
Federal Government	0.0%	0	0.0%	0	0.0%	0
State and Local Governments	1.7%	390	2.3%	520	-0.8%	(180)
Manufacturing	-1.1%	(170)	-2.1%	(330)	1.5%	240
Nondurables Manufacturing	-2.5%	(180)	-3.1%	(220)	0.4%	30
Food and Products	-1.3%	(20)	-1.1%	(17)	-1.1%	(17)
Tobacco Products	0.0%	0	0.0%	0	9.1%	1
Textiles and Products	-2.5%	(12)	-2.5%	(12)	3.3%	16
Apparel and Products	-8.8%	(49)	-9.1%	(51)	3.9%	22
Paper and Products	-1.3%	(8)	-2.4%	(15)	0.0%	0
Printing and Publishing	-1.0%	(17)	-0.9%	(15)	0.4%	7
Chemicals and Products	-2.4%	(24)	-4.9%	(48)	0.1%	1
Petroleum Products	-20.0%	(20)	-24.0%	(24)	-17.0%	(17)
Rubber and Plastics Products	-1.7%	(20)	-2.6%	(30)	0.9%	10
Leather and Products	-21.6%	(11)	-27.5%	(14)	5.9%	3
Durables Manufacturing	0.0%	0	-1.2%	(110)	2.4%	210
Lumber and Wood Products	0.1%	1	-0.3%	(2)	3.8%	27
Furniture and Fixtures	1.5%	6	1.0%	4	5.9%	24
Stone, Clay, and Glass	-0.9%	(4)	-2.4%	(11)	1.5%	7
Primary Metal Industries	-2.8%	(15)	-5.9%	(32)	-0.2%	(1)
Fabricated Metal Products	-0.2%	(3)	-1.0%	(15)	2.3%	33
Nonelectrical Machinery	2.5%	38	2.2%	33	0.8%	12
Electrical Machinery	-4.0%	(51)	-7.0%	(90)	1.9%	25
Transportation Equipment	3.1%	45	2.3%	34	3.7%	55
Instruments and Parts	1.3%	8	-0.5%	(3)	3.6%	22
Miscellaneous Manufacturing	-5.7%	(22)	-7.3%	(28)	2.1%	8

Source: Economic Policy Institute

Table 4
Employment by Industry in 2020
Change from the Base Case

	Case 1 Grandfathered Permits		Case 2 Grandfathered Permits, 90% of '90 Emissions		Case 3 Auction, Deficit Reduction Grandfathered Permits		Average Hourly Earnings 1995*
	percent	thousands	percent	thousands	percent	thousands	
Total Civilian Employment	-0.4%	(606.3)	-0.3%	(491.0)	-0.1%	(127.3)	
Nonagricultural Establishments	-0.3%	(498.8)	-0.4%	(579.0)	-0.1%	(153.5)	$11.46
Contract Construction	0.4%	23.3	-0.2%	(10.1)	1.4%	88.5	$15.04
Finance, Insurance and Real Estate	-0.5%	(89.6)	-0.8%	(26.9)	0.8%	64.9	$12.88
Mining	-23.4%	(106.2)	-17.5%	(116.6)	-22.0%	(99.8)	$15.32
Transportation and Public Utilities	-5.6%	(346.6)	-6.4%	(395.9)	-4.9%	(305.9)	$14.22
Services	-0.9%	(490.5)	-0.9%	(488.8)	-0.5%	(282.5)	$11.41
Retail Trade	0.9%	236.5	1.1%	287.5	0.9%	248.6	$7.70
Wholesale Trade	0.2%	17.8	-0.2%	(18.6)	0.9%	75.2	$12.40
Federal Government	0.0%	0.0	0.0%	0.0	0.0%	0.0	n.a
State and Local Government	1.7%	394.7	2.3%	527.6	-0.8%	(176.8)	n.a
Nondurables Manufacturing	-2.5%	(181.4)	-3.2%	(226.2)	0.3%	24.3	$11.60
Durables Manufacturing	0.0%	2.2	-1.3%	(110.9)	2.4%	210.1	$12.90

*"Employment and Earnings", March 1996. Average hourly earnings for production and non-supervisory workers in the private sector, from the establishment survey.

Source: Economic Policy Institute

Table 5
Industrial Winners and Losers
Sectors Experiencing Gains or Losses of More than 5% in Output in 2020 with Grandfathered Permits

	Change in Output from Base Case	
Losses Exceeding 5%	**2010**	**2020**
086 Rubber & Plastics Footwear	-54.3%	-55.9%
012 Coal Mining	-45.9%	-45.3%
091 Other Leather Goods	-24.0%	-33.7%
207 Electric Utilities	-19.7%	-29.6%
014 Natural Gas	-13.7%	-28.1%
208 Gas Utilities	-13.4%	-27.3%
160 Household Audio & Video Equip.	-12.5%	-22.4%
081 Petroleum Refining Ex. Fuel Oil	-11.7%	-19.0%
090 Leather Footwear	-15.9%	-16.0%
203 Pipelines, Ex N. Gas	-10.1%	-13.7%
082 Fuel Oil	-11.3%	-13.0%
096 Kitchen Pottery Products	-11.9%	-12.5%
190 Watches & Clocks	-8.9%	-12.4%
013 Crude Petroleum	-5.2%	-8.7%
042 Apparel From Purchased Mat'l	-8.8%	-8.3%
195 Toys & Sporting Goods	-7.2%	-7.6%
016 Chemical & Fertilizer Mining	-5.7%	-6.6%
089 Leather Tanning & Finishing	-7.7%	-6.5%
011 Misc. Nonferrous Ores	-4.4%	-6.4%
010 Copper Ore Mining	-5.0%	-6.0%
108 Nonferrous Metals NEC	-4.3%	-5.8%
009 Iron & Ferroalloy Ores	-6.0%	-5.6%
083 Lubricating Oils and Greases	-5.4%	-5.0%
Gains Exceeding 5%		
017 New Construction	0.0%	5.0%
130 Elevators & Mat'ls Handling Eq.	1.8%	5.2%
174 Motor Vehicles	1.5%	5.4%
146 Other Service Industry Machinery	2.1%	5.4%
141 Packaging Machinery	2.7%	5.8%
052 Partitions & Fixtures	1.9%	6.0%
127 Lawn & Garden Equipment	2.4%	6.1%
148 Computer Peripheral Equipment	2.4%	6.6%
172 Truck & Bus Bodies	3.2%	7.0%
173 Truck Trailers	3.6%	7.1%

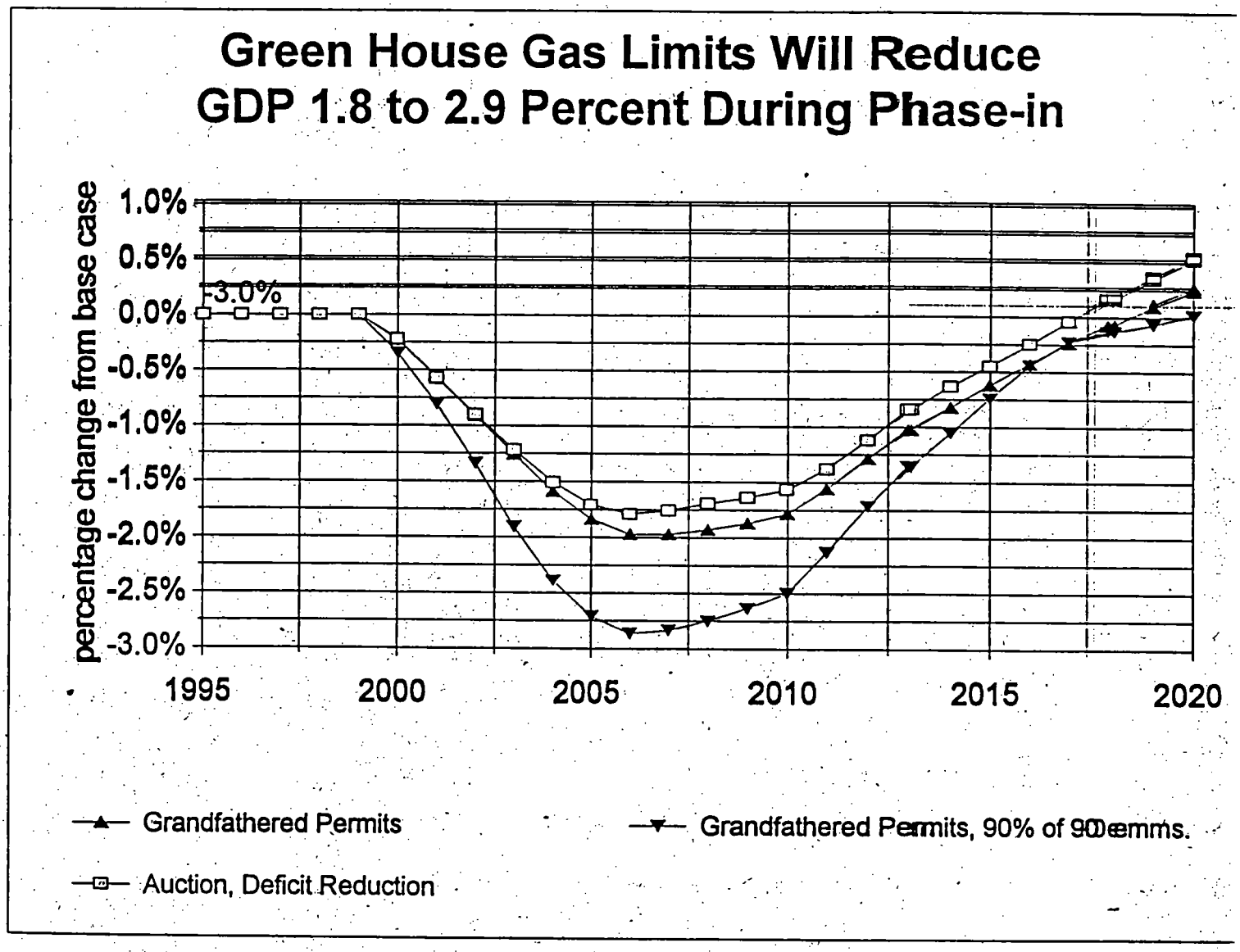
Source: Economic Policy Institute

Table 6
Regional Gains and Losses
Changes in Population and Employment in 2020
(Grandfathered Permits, Percent Change from Base)

Region	Resident Population	Civilian Employment (HH Survey)	Contract Construction	Mining		Total Services	Retail Trade	Manufacturing
				total	Coal			
New England	0.3%	0.1%	0.4%	-3.7%	-51.2%	-3.0%	1.1%	-1.7%
Middle Atlantic	0.0%	-0.3%	6.7%	-23.3%	-41.5%	-0.8%	0.7%	-1.9%
South Atlantic	-0.3%	-0.8%	-0.5%	-28.3%	-40.3%	-1.3%	0.3%	-1.6%
East North Central	0.3%	-0.1%	0.5%	-19.8%	-39.5%	-0.7%	1.2%	-0.5%
East South Central	-1.1%	-2.0%	-1.4%	-33.1%	-39.8%	-3.5%	-0.5%	-2.1%
West North Central	0.5%	0.2%	1.5%	-10.1%	-43.5%	-0.9%	2.1%	-0.4%
West South Central	-0.6%	-1.1%	-0.9%	-20.3%	-65.5%	-1.8%	-0.3%	-1.1%
Pacific Northwest	1.7%	1.6%	1.4%	-20.9%	-47.5%	1.2%	4.5%	1.5%
Pacific Southwest	0.1%	-0.3%	-0.2%	-14.3%	-36.1%	-0.5%	1.0%	-1.5%

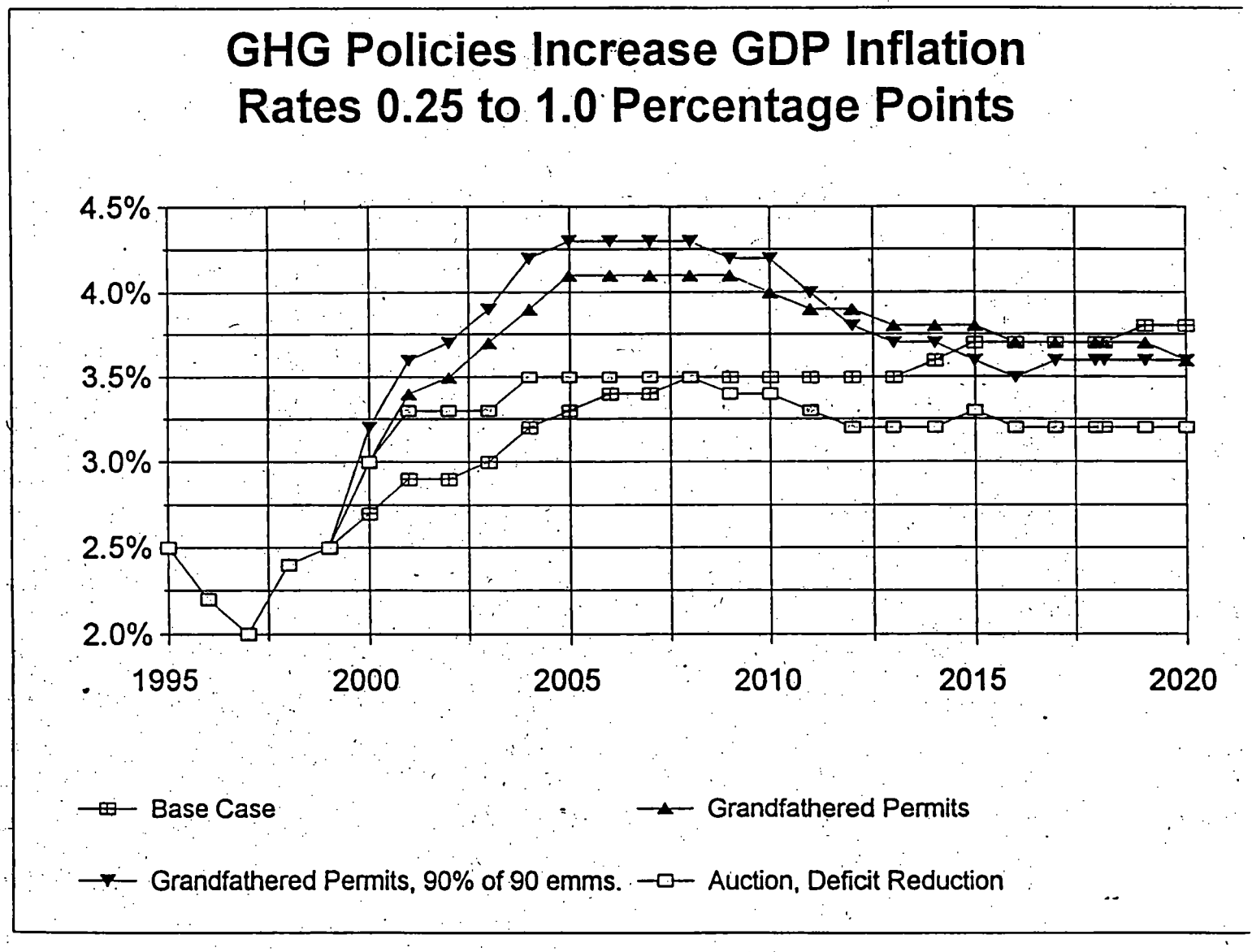
Source: Economic Policy Institute

Figure 1



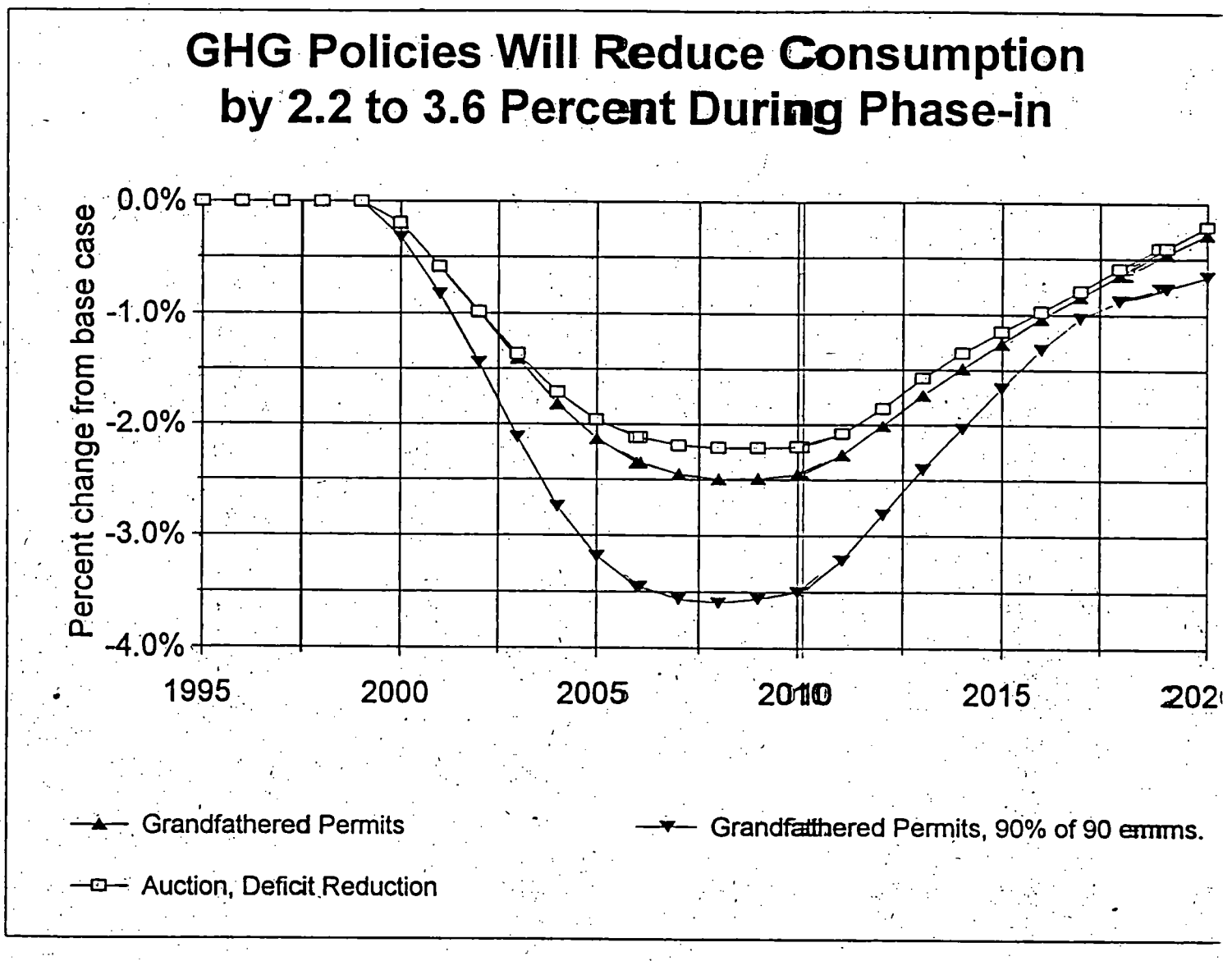
Source: Economic Policy Institute

Figure 2



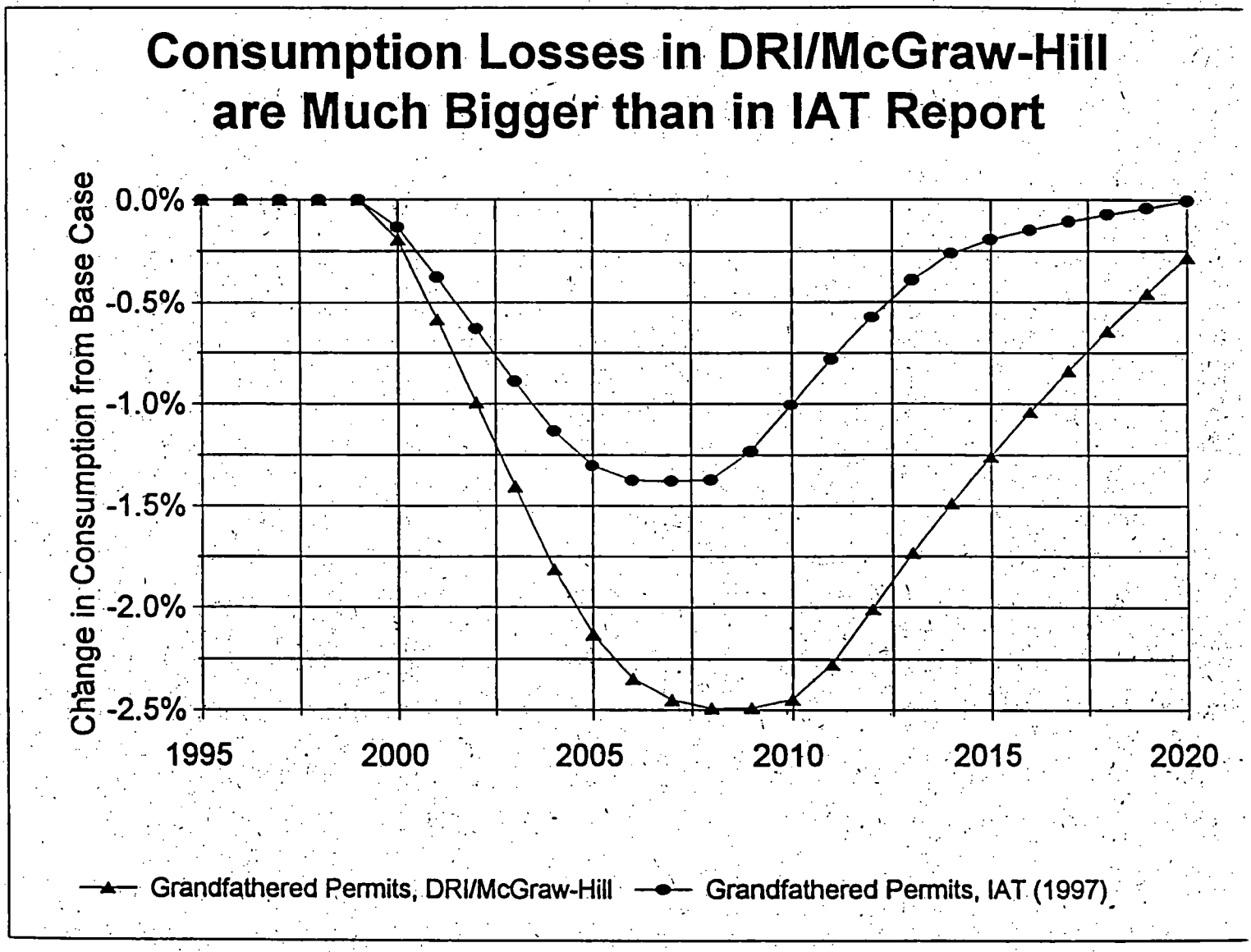
Source: Economic Policy Institute

Figure 3



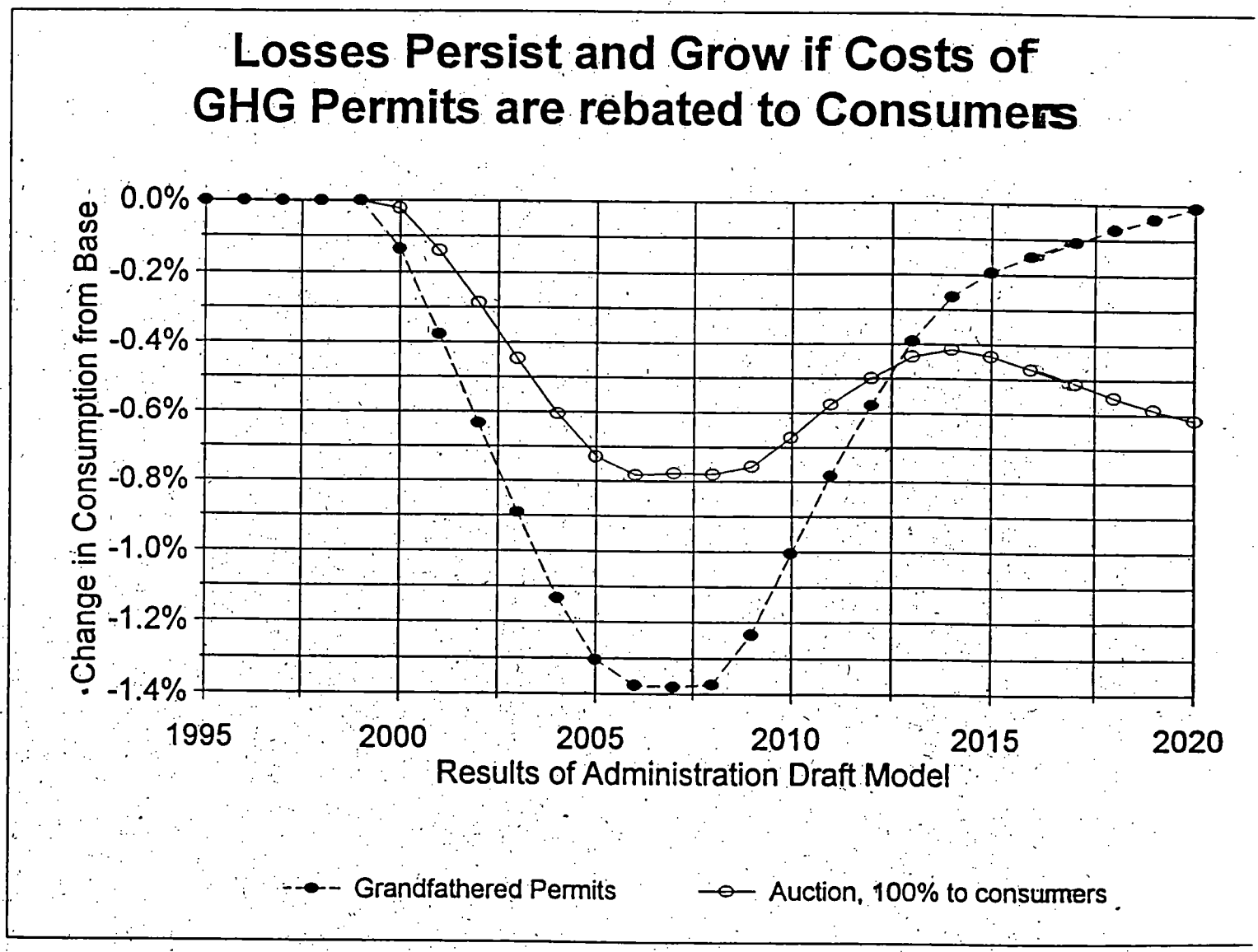
Source: Economic Policy Institute

Figure 4



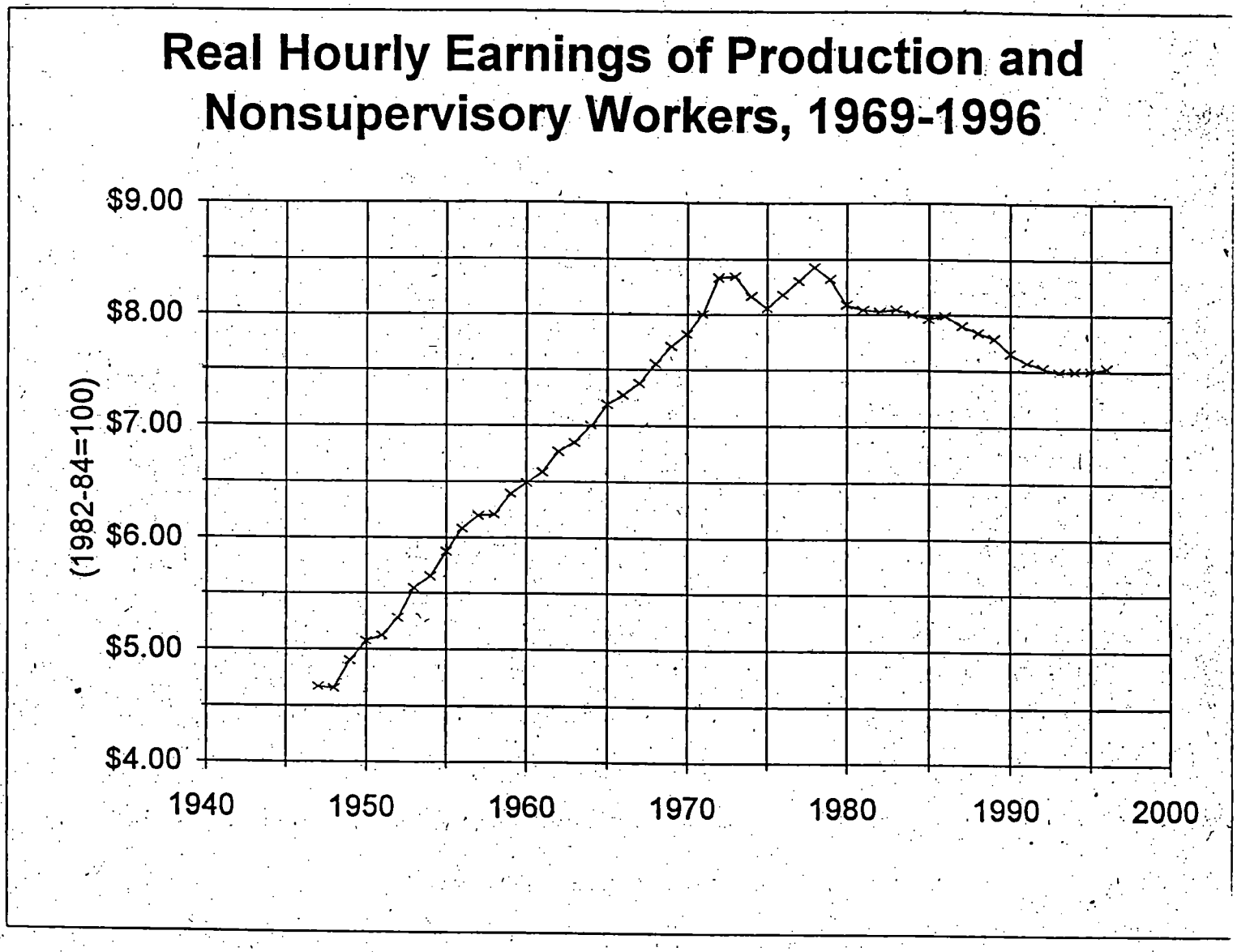
Source: Economic Policy Institute

Figure 5



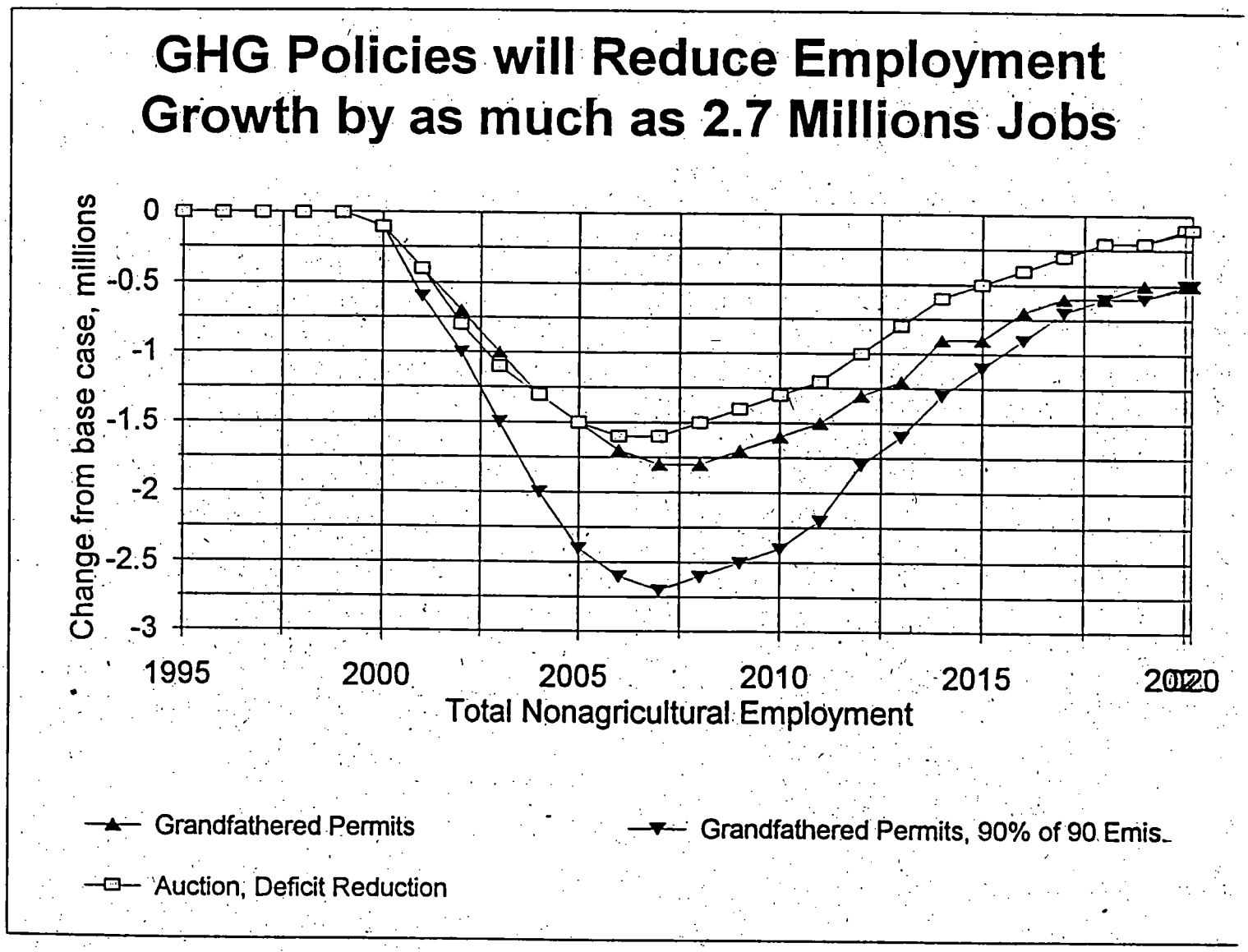
Source: Economic Policy Institute

Figure 6



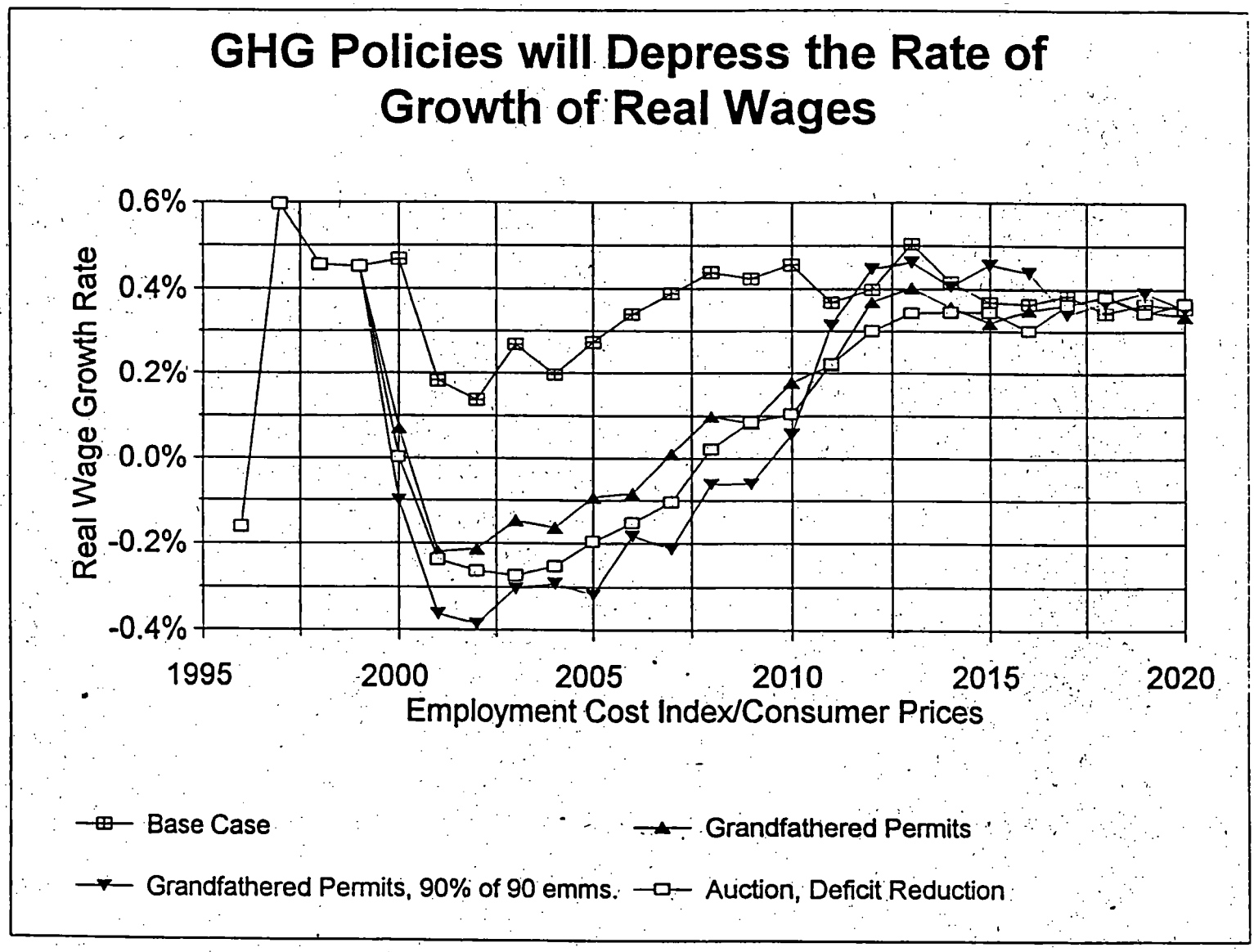
Source: Economic Policy Institute

Figure 7



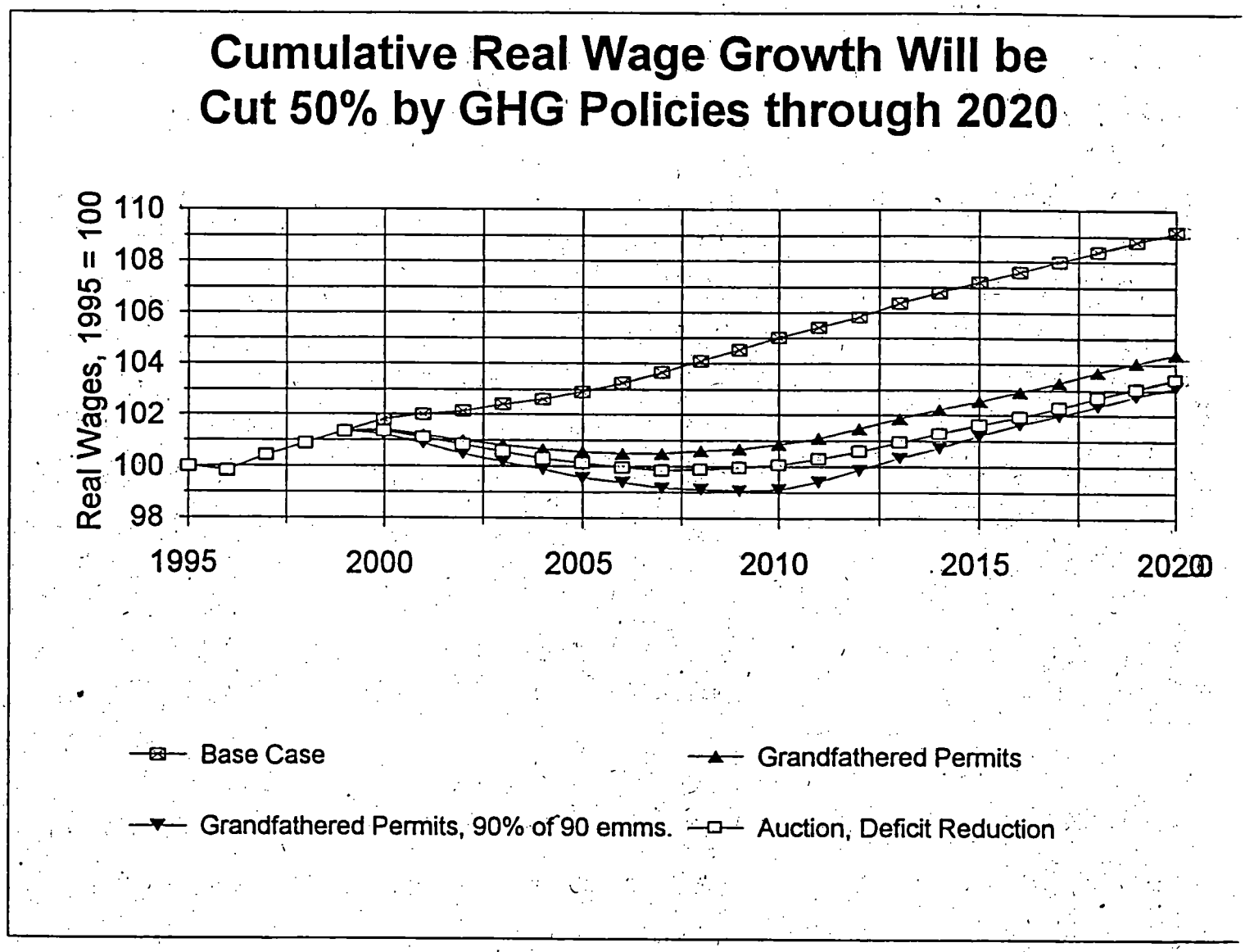
Source: Economic Policy Institute

Figure 8



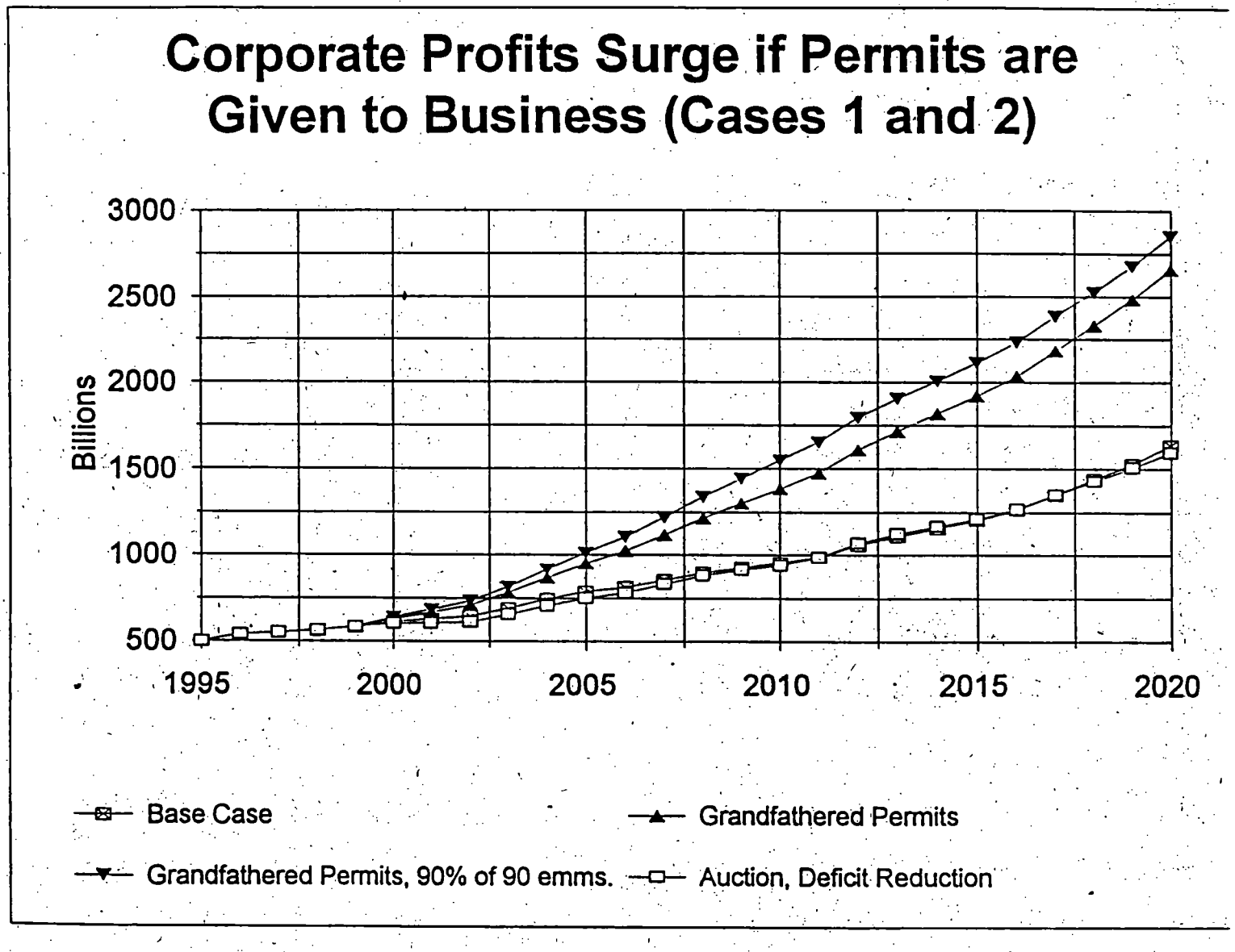
Source: Economic Policy Institute

Figure 9



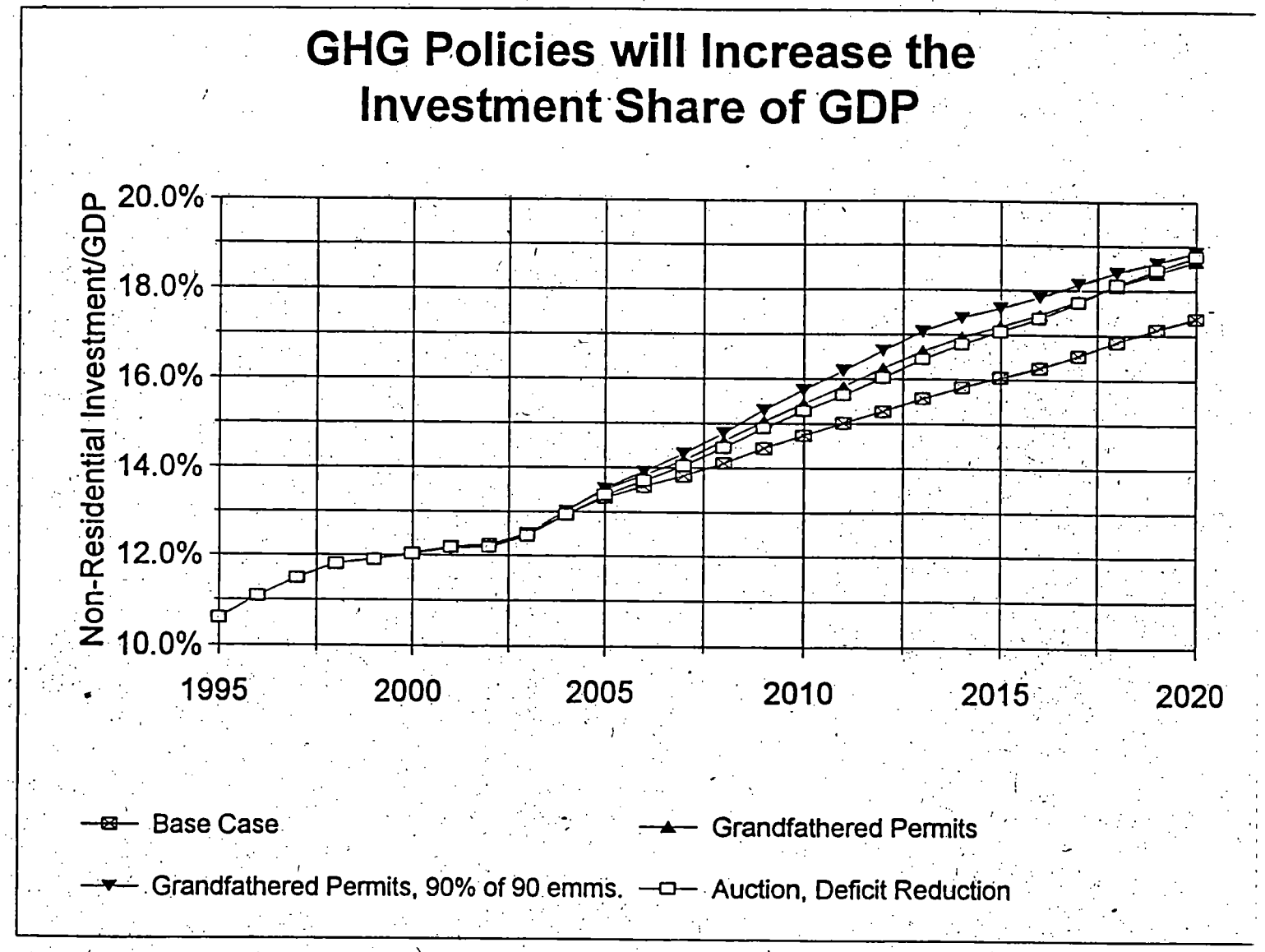
Source: Economic Policy Institute

Figure 10



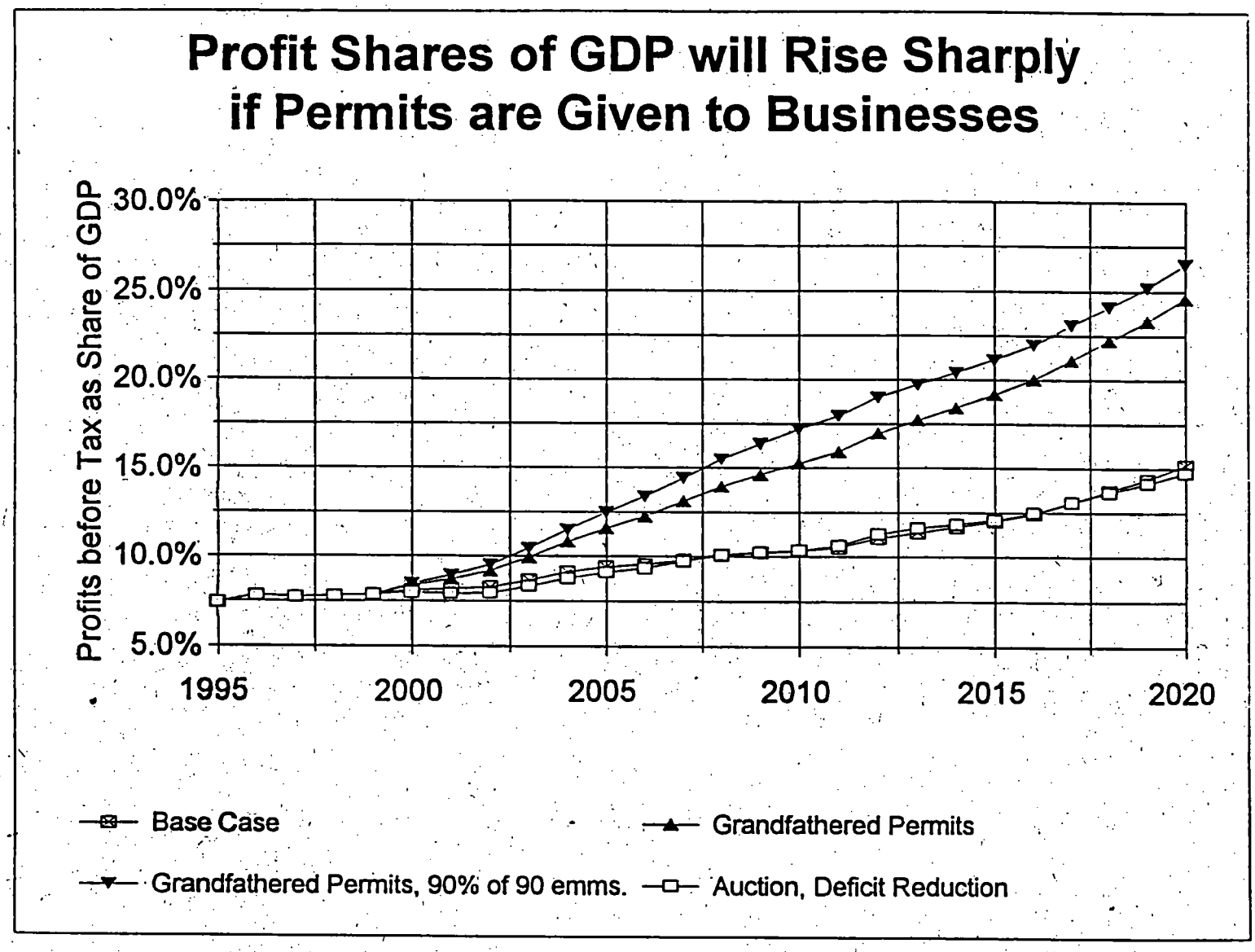
Source: Economic Policy Institute

Figure 11



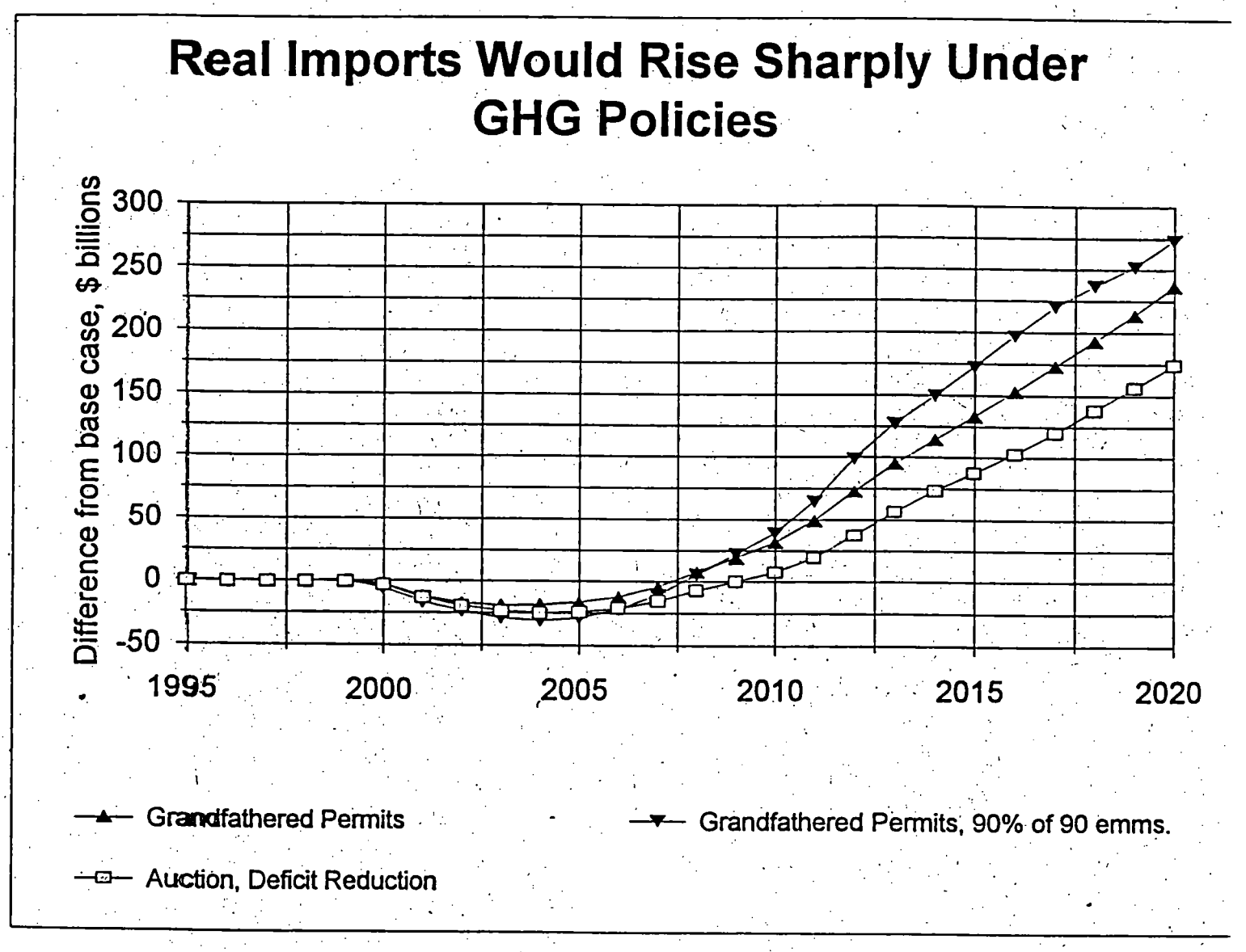
Source: Economic Policy Institute

Figure 12



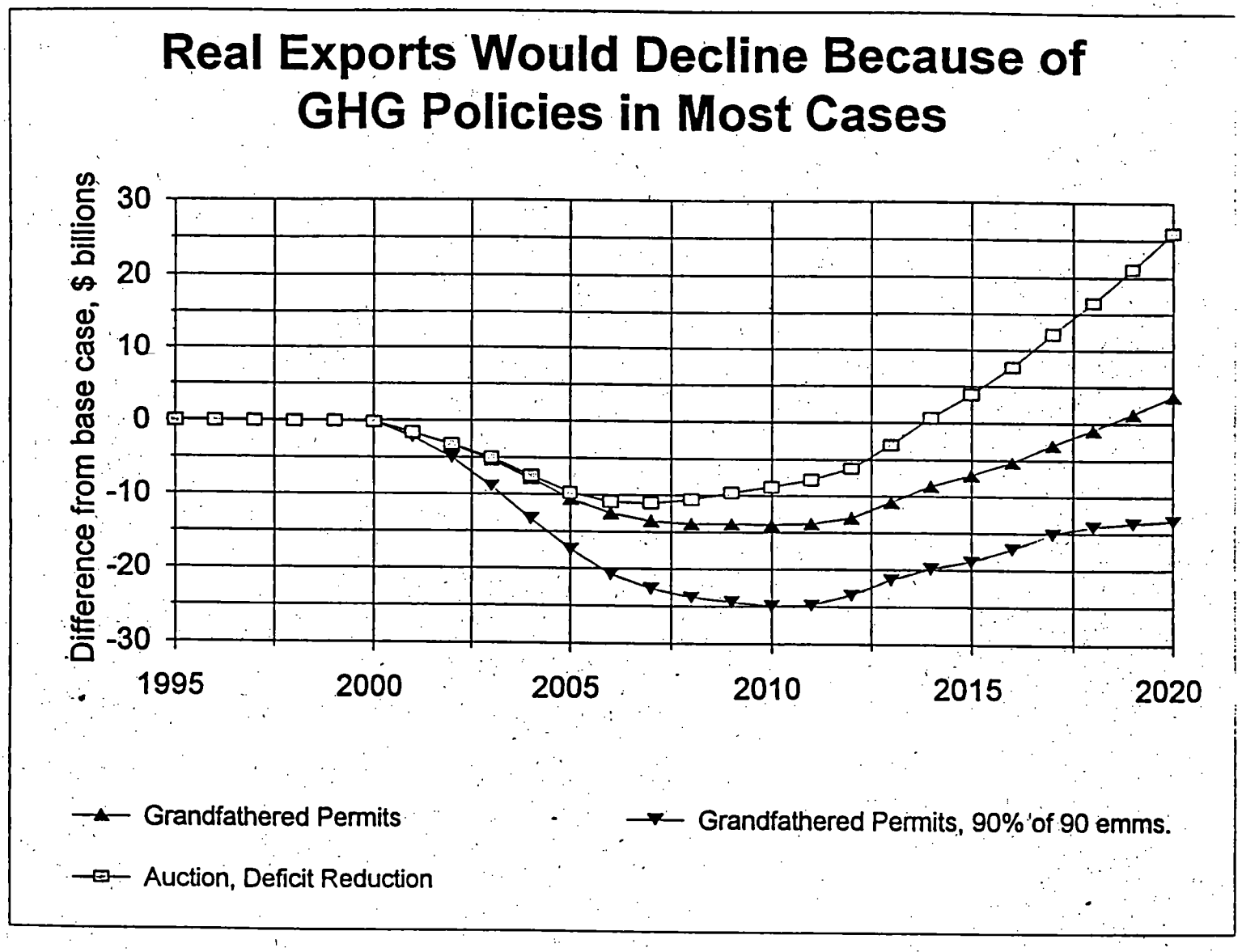
Source: Economic Policy Institute

Figure 13



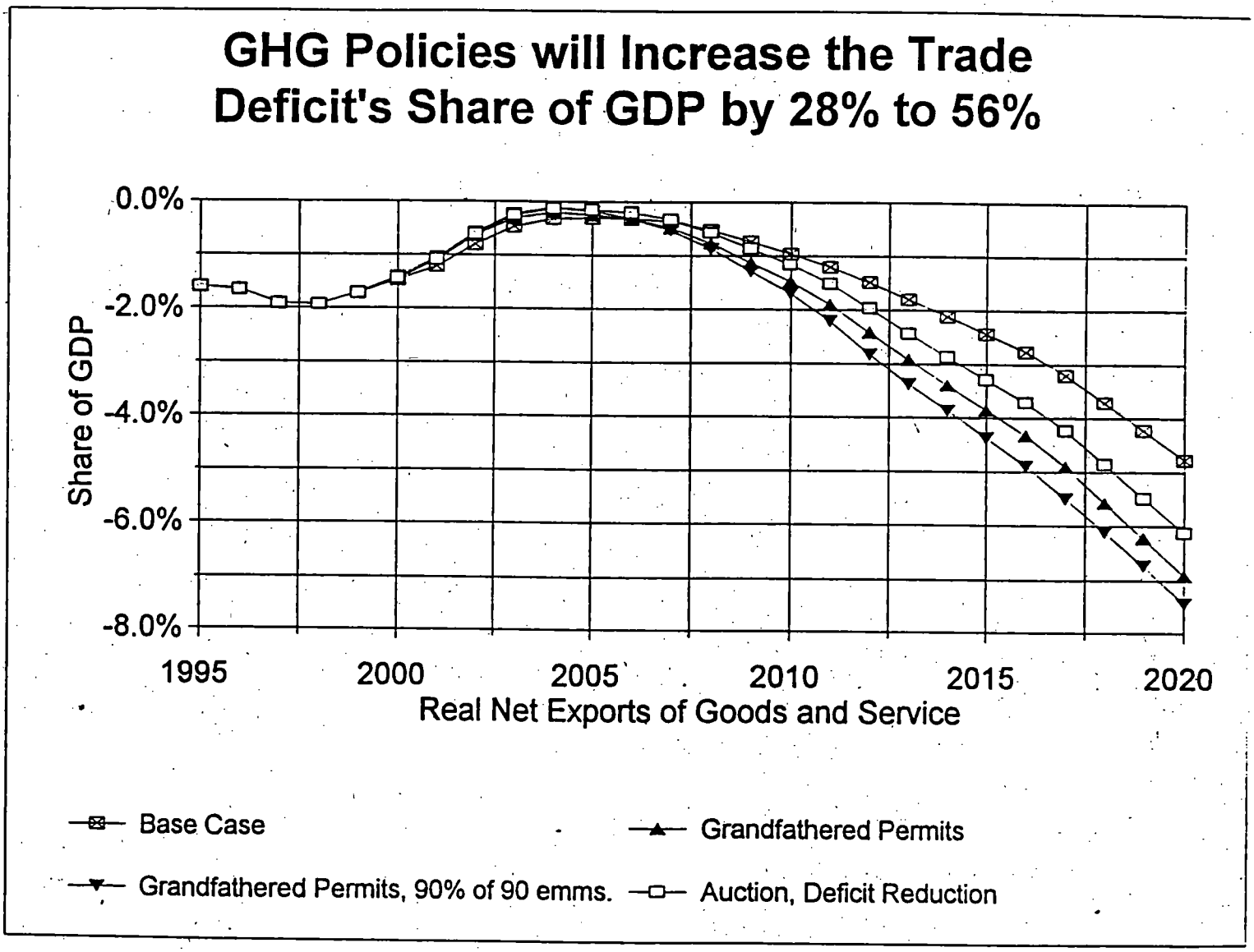
Source: Economic Policy Institute

Figure 14



Source: Economic Policy Institute

Figure 15



Source: Economic Policy Institute

Talking Points on EPI Climate Change Study
September 17, 1997

Background: The Economic Policy Institute released a study today examining the economic ramifications of a policy designed to reduced U.S. greenhouse gas emissions to 1990 levels by the year 2010. The study concludes that such a policy would cause losses of millions of jobs, reduced consumer spending, and a substantial decline in GDP. The study is likely to be used by organized labor (particularly the coal sector) to argue against U.S. acceptance of binding emissions targets and timetables at the climate change negotiations in Kyoto this December.

- First, let's be clear: the Administration has not yet settled on a particular set of new policies to reduce greenhouse gas emissions. Instead, the President has been engaging in a discussion with all interested parties -- he has already met with senior corporate executives and with environmental groups, and he will hold a White House conference on climate change on October 6. This process is intended to inform the Administration's decision-making process, which will culminate in a U.S. policy position for the international negotiations in Kyoto in December of this year.

- Second, President Clinton's top priority, since his first days in office, has been revitalizing the U.S. economy, creating jobs and investing in people and technology to enhance long-term growth. And we have made tremendous progress. The President is not going to jeopardize that progress. Any policy he ultimately endorses on climate change will be informed by his commitment to sustaining a healthy and robust economy.

- Third, as I said in my congressional testimony, we could do this smart or we could do this dumb. By using flexible, market-based policies, we can slow climate change without harming the American economy. 2,500 economists, including 8 Nobel laureates, have signed a statement supporting measures to reduce the threat of climate change.

- Finally, we have learned that the results of climate change modeling exercises are extremely sensitive to the assumptions employed. For example, most studies suggest that international emissions trading has the potential to reduce significantly the costs of mitigating climate change. But the EPI study released today assumed no such international emissions trading -- suggesting that its results may be misleading. Of course the costs could indeed go up if were not able to implement international trading or other aspects of flexible, market-based policies.

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September 17, 1997

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- Third, by using flexible, market-based policies, we can slow climate change without harming the American economy. More than [2500] economists, including 8 Nobel laureates, have signed a statement supporting measures to reduce the threat of climate change.

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Statement by Janet Yellen
September 17, 1997

Today's report from the Economic Policy Institute ("Accelerating Globalization? The Economic Effects of Climate Change Policies on U.S. Workers") examines one possible approach to addressing climate change. But there are many possible approaches, and the Administration has not yet settled on a particular set of new policies to reduce greenhouse gas emissions. Instead, the President has been engaging in a discussion with all interested parties -- he has already met with senior corporate executives and with environmental groups, and he will hold a White House conference on climate change on October 6. This process is intended to inform the Administration's decision-making process, which will culminate in a U.S. policy position for the international negotiations in Kyoto in December of this year.

President Clinton's top priority, since his first days in office, has been revitalizing the U.S. economy, creating jobs and investing in people and technology to enhance long-term growth. And we have made tremendous progress. The President is not going to jeopardize that progress. Any policy he ultimately endorses on climate change will be informed by his commitment to sustaining a healthy and robust economy. By using flexible, market-based policies, we can slow climate change without harming the American economy. More than [2500] economists, including 8 Nobel laureates, have signed a statement supporting measures to reduce the threat of climate change.

Finally, I should note that the results of climate change modeling exercises are extremely sensitive to the assumptions employed. For example, most studies suggest that international emissions trading has the potential to reduce significantly the costs of mitigating climate change. But the EPI study released today assumed no such international emissions trading -- suggesting that its results may be misleading.

EP1

TD: No reason to expect a big negative effect, as it says