# The Economic Benefits of Public Investments in Tropical Forest Conservation

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## Key Findings

- Failing to allocate funds to reduce emissions from tropical forests could drive up the cost of a "hybrid" climate change bill of the type being considered by Senators Kerry, Graham, and Lieberman. International offsets, particularly from the forest sector, are expected to play an important role in making climate policies affordable provided the supply of those offsets proves adequate to meet U.S. demand. Without new publically funded programs designed to prepare tropical forest nations to participate in U.S. carbon markets, however, there is a real risk that international offset supply would fall short of demand and costs would run higher than expected.

- Based on a range of scenarios examined, withholding public funding for new tropical forest conservation programs could cause international offset supply to fall by 6 to 32 percent, which could increase emissions permit prices by an average of 4 to 27 percent annually. This could cause the average annual cost of climate policy (in terms of GDP impacts) to increase by 3 to 24 percent.

- Even when accounting for the cost of these new spending programs, the net savings from allocating funds to prepare tropical forest nations to participate in U.S. carbon markets could range from $317 million to $18 billion per year. This means that under all scenarios examined in this study every $1 spent on international forest conservation would yield greater than $1 in savings to the United States.

- The impact on households of eliminating the set-aside is small, but in most scenarios leads to a net increase in costs.

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## Introduction

Policymakers are currently considering how best to allocate revenues from a "hybrid" climate change bill, of which a central component could be a tradable emissions permit program for the electricity and manufacturing sectors, with the latter phased in over time. One potential use for revenues generated by auctioning allowances within this program is to help developing nations build capacity to reduce deforestation, which accounts for up to 17 percent of global greenhouse gas emissions and is one of the most cost-effective climate solutions. Prior climate bills considered by this Congress (including the Waxman-Markey bill, or H.R. 2454 passed by the House of Representatives) would allocate 5 percent of total emissions allowance value toward programs to reduce deforestation in developing nations. Some policymakers have suggested that monies allocated to reducing deforestation could instead be returned to consumers and households as a rebate or used for such purposes as technology development.

We examine here how the U.S. economy and U.S. households would be affected if the auction revenues setaside for tropical forests in Waxman-Markey were to be cut in half or completely eliminated. Because public funding for tropical forests would finance programs to prepare nations to participate in U.S. carbon markets, a decrease in public funding could result in fewer cost-saving international "offsets". The paper examines optimistic, medium, and pessimistic offset supply responses under different levels of public market readiness funding.

The rest of this paper provides background information, elaborates on key findings, and describes our methodology and assumptions. While this paper is intended to help frame emissions allowance allocation decisions within a hybrid climate change bill, the results presented here represent initial findings only. Furthermore, the paper is not based on a long-term analysis of the costs and benefits of different climate policy options (such as "cap-and-trade" versus a "cap-and-dividend" or a revenue-neutral tax shift). GDP and household impacts are intended to be illustrative and do not account for the economic benefits of increased savings or consumption that could come with additional rebates.

## Background

Even when the benefits of climate action are not counted, climate policy is expected to only cost the average U.S. household $80-$111 per year.[2] One of the most important factors in maintaining these low costs is a large availability of international offsets. In its analysis of existing climate bills (specifically H.R. 2454) the U.S. Environmental Protection Agency (EPA) estimates that emissions allowance prices would increase 89 percent and net present value costs per household would increase 75 percent if no international offsets were available over the lifetime of the program.[3] EPA scenarios show that this effect is roughly

[2] Based on EPA core scenarios. Other U.S. government analyses reveal costs in a similar range.

[3] *See* U.S. EPA. 2009a. *EPA Analysis of the American Clean Energy and Security Act of 2009*. Washington, DC: U.S. EPA, slide 3. http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf; and

proportional—for example, a 33 percent reduction in cumulative international offset supply leads to a 26 percent increase in allowance prices.[4]

Importantly, in their core scenarios EPA largely assumed that the supply of international offsets will be adequate to meet U.S. demand. It based these assumptions on low opportunity costs of international emissions reductions, with limited examination of which countries will really be ready, willing, or able to meet the stringent standards of a U.S. offset program. EPA's core scenario assumes that U.S. companies will purchase at least 1 billion tons of international offsets in each of the program's 39 years.[5]

Several studies have shown that 60 to 80 percent of these low-cost international offsets are likely to come from reductions in deforestation by developing nations.[6] To manage the risk of low offset supply from the international forest sector, prior climate bills considered by this Congress set aside 5 percent of allowance auction revenues for new tropical forest conservation programs(about $3 billion in 2012 and $5 billion in 2020). The levels of public funding (the 5 percent set-aside) allocated to help prepare developing nations to participate in U.S. carbon markets follow the recommendation of several U.S. analyses of deforestation and climate change. These funds are intended to prime the international offset pump by readying developing nations to participate in U.S. carbon markets, guard against deforestation shifting to countries that currently have low rates of deforestation ("leakage"), invest in high-risk countries that may take longer to prepare for markets, and support action in countries that may choose not to participate in U.S. markets (such as Brazil).[7]

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U.S. EPA. 2009b. *EPA Analysis of the American Clean Energy and Security Act of 2009 Appendix*. Washington, DC: U.S. EPA, slide 62. http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis_Appendix.pdf

[4] U.S. EPA. 2009a, slide 40.

[5] The Energy Information Administration (EIA) and Congressional Budget Office (CBO) are more conservative with supply estimates, which could be one reason they project higher allowance prices. Both assume that offsets will increase from initial totals of several hundred million per year to approach two billion annually by 2030 (including domestic and international). EIA and CBO project roughly comparable impacts of a deficiency of offsets on allowance prices and costs, however. In EIA analysis, 2020 allowance prices are 64% higher without international offsets. Calculation based on U.S. Energy Information Administration. 2009. *Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009*, Excel Spreadsheets for "Basic" and "No International Offsets" scenarios. Washington, DC: U.S. Energy Information Administration. http://www.eia.doe.gov/oiaf/servicerpt/hr2454/index.html. In its analysis CBO concluded that that, "…between 2012 and 2050 average annual savings from offsets could be about 70 percent." *See* Congressional Budget Office. 2009. *The Use of Offsets to Reduce Greenhouse Gases*, Washington, DC: Congressional Budget Office, page 8. http://www.cbo.gov/ftpdocs/104xx/doc10497/08-03-Offsets.pdf

[6] Based on EPA cost curves, the Commission on Climate and Tropical Forests estimated that 56% of international offsets would come from tropical forests, while analysis by McKinsey & Company suggests this number could be about 83%, based on the percentage of cost-effective emissions reductions in developing countries in the forest sector. This information drawn from Commission on Climate and Tropical Forests. 2009. *Protecting the Climate Forests*. Washington, DC; and Project Catalyst. 2009. Unpublished slides based on the McKinsey & Company Global Greenhouse Gas Abatement Cost Curve version 2.0.

[7] *See* Commission on Climate and Tropical Forests, 2009. *Protecting the Climate Forests*. Washington, DC; and Eliasch, J. 2008. *Climate Change: Financing Global Forests*. London, UK: Office of Climate Change.

## Analysis

While early indications suggest that the Kerry-Lieberman-Graham hybrid bill being developed in the Senate will likely allow companies to purchase international offsets for compliance purposes, it is unclear whether any new climate revenues (from emissions permit auctions or carbon-linked fees) will be set aside to help prepare tropical forest countries to participate in U.S. offset programs. This raises several critical questions. *First, what would be the impact on international offset supply of reducing or eliminating new public funding for tropical forest conservation programs?*

Answering this question requires estimating how overall tropical forest offset supply would respond to a reduction in public funding. To gain insight, we analyzed several plausible scenarios. The scenarios were developed through qualitative analysis by the authors based on the Forest Carbon Index (FCI)[8] model and other analyses (see Appendix for further information). Overall, however, they were chosen to illustrate the range of possible impacts. The three main political scenarios are as follows:

> **Pessimistic:** In the pessimistic case, lower levels of U.S. public funding to prepare developing nations for U.S. carbon markets leads to a major drop in international offsets from the forest sector. In this scenario, forest sector offsets begin coming online within a decade and reach full supply by 2050. This pessimistic scenario assumed that countries such as Brazil will choose not to participate in U.S. offset markets for political reasons. Brazil stated at the 2009 Copenhagen climate summit that it will allow developed nations with sufficiently ambitious targets to meet up to 10 percent of their reductions through Brazilian offsets. It remains unclear whether U.S. emissions reductions would meet Brazil's threshold. As Brazil has also stated that it will not sell offsets to nations that do not increase public spending for forest conservation, Brazil may choose to withhold offsets for this reason as well. In addition, this scenario assumes that without significant U.S. assistance programs, other major forest carbon offset suppliers, such as Indonesia, would take longer to build the institutions and technical capacity needed to meet the high standards of U.S. offset programs. Given the massive challenges faced by many of these countries in reforming their forest sectors and the difficulty for some in raising private sector capital, this also seems like a plausible outcome.
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> **Medium:** In the medium case, lower levels of U.S. public funding to prepare developing nations for U.S. carbon markets leads to more moderate impacts. In this scenario, forest sector offsets begin coming online immediately at low levels and reach full supply by 2040. This medium scenario assumes that well-governed countries such as Mexico and Brazil enter the market right away but at lower than potential levels, either because of unmet capacity-building needs or for political reasons. This scenario assumes Brazil follows through on its pledge to only allow

[8] Created and maintained by researchers at Resources for the Future and Climate Advisers. For more information, visit www.forestcarbonindex.org.

nations to purchase up to 10 percent of their emissions reductions from Brazil. In addition, this scenario assumes that other major suppliers such as Indonesia would not be as delayed as in the pessimistic case, but would still take longer to come online. This shorter delay could happen if other bilateral donors, such as Norway, step in to partially fill the financing gap created by low levels of U.S. foreign aid for international forests.

**Optimistic:** In the optimistic case, lower levels of U.S. public funding to prepare developing nations for U.S. carbon markets leads to a small limitation on initial offset supply and only a short delay in reaching full capacity (compared to other scenarios). In this scenario, forest sector offsets begin coming online immediately at moderate levels and reach fully supply by 2030. This scenario assumes that Brazil will change its policies and sells large quantities of forest carbon offsets to the United States, and well-governed countries such as Mexico will be ready right away to participate in U.S. carbon markets. This could be realistic if Brazil decides the financial opportunities presented by U.S. markets outweigh political concerns, and well-governed nations decide that the financial rewards of selling offsets are worth investing limited domestic resources. In addition, this scenario assumes that major suppliers such as Indonesia that face greater challenges are able to secure all the technical assistance they need from other donors. This could occur if other nations, such as Japan, that also need cost-saving forest sector offsets decide to make major public investments in international forest conservation despite limited investments by the United States.

*Second, what would be the impact on allowance prices of the likely lower supply of international offsets because of this lack of public funding?*

Because of the way EPA models climate policy, the important point is how much cumulative international offset supply is affected, and how that reduction impacts average allowance prices (see Table 1). We used the proportional relationship between international offset supply and allowance prices in EPA modeling scenarios to determine how strong this effect would be under different supply responses. When the set-aside is cut in half instead of eliminated, we assumed the effect would be half as strong. Across all scenarios, offset supply is reduced between 3 and 32 percent, with corresponding increase in allowance prices between 1 and 27 percent.

**Table 1. Cumulative Supply and Allowance Price Impacts**

| | **Eliminating set-aside** | **Cutting set-aside in half** |
|---|---|---|
| **Pessimistic** | Supply: -32%<br>Allowance prices: +27% | Supply: -22%<br>Allowance prices: +18% |
| **Medium** | Supply: -19%<br>Allowance prices: +16% | Supply: -10%<br>Allowance prices: +8% |
| **Optimistic** | Supply: -6%<br>Allowance prices: +4% | Supply: -3%<br>Allowance prices: +1% |

Note: "Supply" is cumulative 2012–2050 international offset supply (including forest and non-forest offsets). "Allowance prices" are average annual 2012–2050.

*Third, because of its impact on offsets and allowance prices, would households and the economy be better off if this money were invested in tropical forests rather than refunded directly?*

Answering this question requires estimating the costs to the U.S. economy and households of higher allowance prices brought on by a lower offset supply when public funding is removed, and comparing it to an alternative use of those revenues, such as household and consumer rebates. The tables and figures below show relevant findings.

Based on this analysis, the benefits of investing in tropical forests to the U.S. economy and U.S. households in terms of reduced allowance prices could outweigh the potential benefits of refunding this revenue directly. Because of the likely increase in allowance prices, cutting the set-aside for forests in half could increase the average annual GDP impacts of climate policy by 1 to 16 percent, and eliminating it completely could increase impacts by 3 to 24 percent. Household costs could increase by 1 to 16 percent and 3 to 23 percent, respectively.

Even when accounting for the cost of the set-aside, net savings (in terms of GDP impacts) could range from $317 million to $18 billion per year. This means that under all scenarios each $1 in set-aside spent could yield greater than $1 in savings. Net household impacts are relatively small, with consumers being largely indifferent in economic terms to the 5 percent set-aside being spent on forest conservation versus household rebates. Impacts of eliminating the set-aside range from an average annual $9 increase in climate policy costs under pessimistic international offset supply response assumptions to an average annual $5 reduction in costs under optimistic supply response assumptions. Thus, policymakers should not see the ability to make households better off as a strong justification for eliminating the 5 percent set-aside for tropical forests. In most scenarios household costs were higher in net terms if this revenue were rebated than if it were directed to tropical forests. This is due to the linkage between international offset supply, allowance prices and household costs.[9]

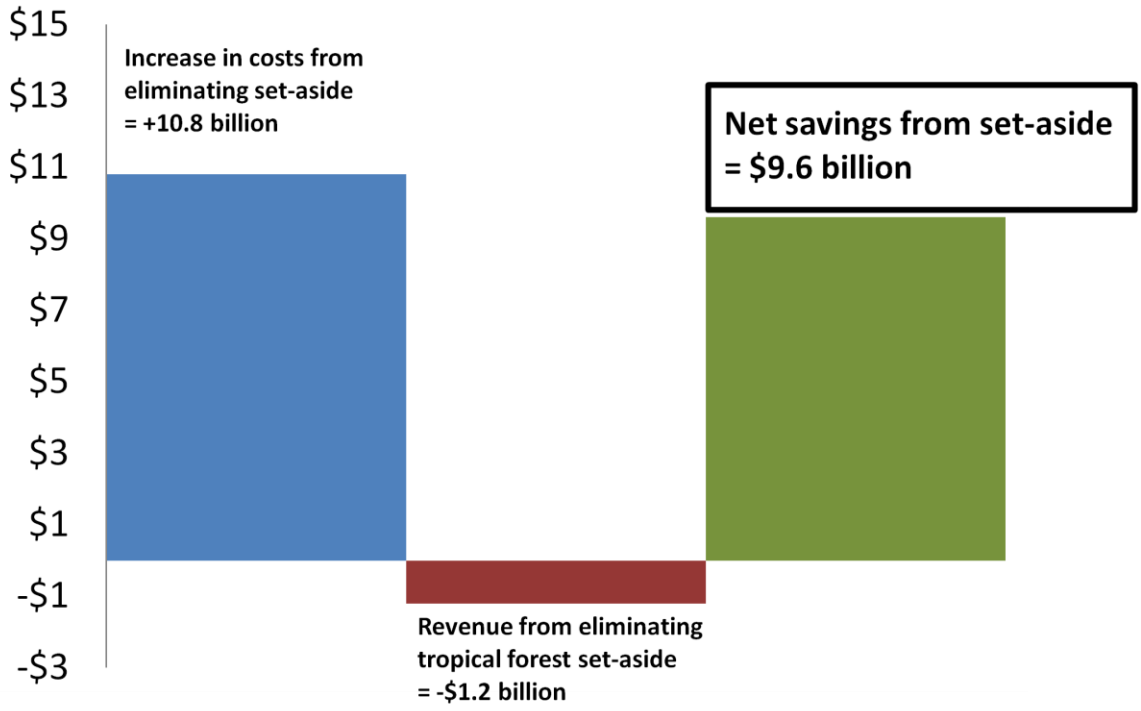
**Table 2. Impacts on the U.S. Economy of Eliminating Forest Set-asides**

| | **Eliminating set-aside** | **Cutting set-aside in half** |
|---|---|---|
| **Pessimistic** | Allowance price 2020: $23<br>Net annual GDP savings: $18 billion | Allowance price 2020: $22<br>Net annual GDP savings: $12 billion |
| **Medium** | Allowance price 2020: $21<br>Net annual GDP savings: $10 billion | Allowance price 2020: $20<br>Net annual GDP savings: $5 billion |
| **Optimistic** | Allowance price 2020: $19<br>Net annual GDP savings: $2 billion | Allowance price 2020: $19<br>Net annual GDP savings: $0.3 billion |

Note: Allowance prices in EPA's Core Scenario are $18 in 2020 (IGEM, June 2009 analysis, real $2010). Allowance price figures are real $2010, GDP savings are average annual net present value (2012–2050).

[9] GDP = private consumption + gross investment + government spending + (exports - imports). To the extent climate policy impacts gross investment, government spending and exports – imports, GDP impacts can be larger than the impacts on private household consumption alone.

## Figure 1. U.S. Economy Savings from Set-Asides for Tropical Forests("Medium" Scenario)



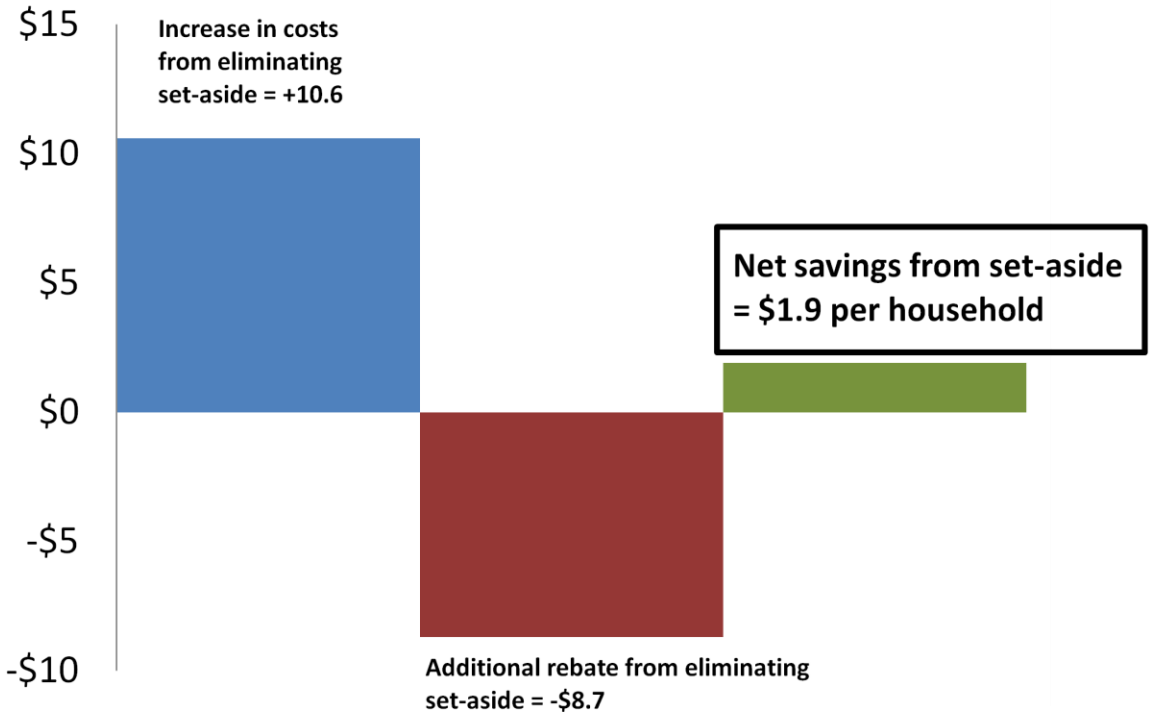

Figures are from eliminating set-aside in "Medium" offset supply response scenario, average annual Net Present Value costs, 2012-2050

## Table 3. Impacts on U.S. Households of Eliminating Forest Set-asides

| | **Eliminating set-aside** | **Cutting set-aside in half** |
|---|---|---|
| **Pessimistic** | Allowance price 2020: $23<br>Net annual household costs: +$9 | Allowance price 2020: $22<br>Net annual household costs: +$8 |
| **Medium** | Allowance price 2020: $21<br>Net annual household costs: +$2 | Allowance price 2020: $20<br>Net annual household costs: +$1 |
| **Optimistic** | Allowance price 2020: $19<br>Net annual household costs: -$5 | Allowance price 2020: $19<br>Net annual household costs: -$3 |

Note: Allowance prices in EPA's Core Scenario are $18 in 2020 (IGEM, June 2009 analysis, real $2010). Allowance price figures are real $2010, household costs are average annual net present value (2012–2050).

**Figure 2. Household Savings from Set-Asides for Tropical Forests("Medium" Scenario)**




**Figures are from eliminating set-aside in "Medium" offset supply response scenario, average annual Net Present Value costs, 2012-2050**

## Appendix: Methodology

This analysis is based primarily on the EPA analysis of the Waxman-Markey climate legislation. We took the following steps in analyzing the impact of reducing public funding for forests on allowance prices, households, and the U.S. economy.

1) *Determining the impact of reduced public funding on deforestation offset supply.* In making this assumption, we relied on quantitative and qualitative analyses of country readiness, opportunity costs, and political considerations, and compared these with estimates of global and national needs for funding. The basis for each scenario was the percentage of totalsupply in certain countries and country groupsfrom 2013 to 2020, based on the Forest Carbon Index model. In this model, Brazil accounts for about 50 percent of total supply, Indonesia for about 10 percent, other countries in the "top 10" for about 20 percent, and all other countries for about 20 percent. In our "Optimistic" scenario, we initially excluded half of all countries, but assumed that they would come online relatively quickly, with full U.S. forest offset demand met by 2030. In our "Medium" scenario we initially excluded all countries, but assumed that supply would eventually reach the level of full demand by 2040 and remain at that level until 2050. In our "Pessimistic" scenario, we assumed no countries would be ready until 2020, at which point supply would increase steadily until full demand was met by 2050. In each case, cutting the set-aside in half instead of eliminating it completely was assumed to have half as strong an effect (that is, in the

"Pessimistic" scenario, supply is still delayed until 2020, but starts at 50 percent of demand rather than 0 percent). While these are speculative assumptions, we believe they provide a reasonable basis for policymakers to make judgments given the information currently available.

**Table 4: Public Funding and Offset Supply Response Scenarios**

| | **Eliminating set-aside** | **Cutting set-aside in half** |
|---|---|---|
| **Pessimistic** | - No forest offset supply until 2020, starts at zero in 2020, gradual increase to meet full demand by 2050 | - No forest offset supply until 2020, starts at 50% of demand in 2020, gradual increase to meet full demand by 2050 |
| **Medium** | - Gradual increase in forest offset supply from 0 in 2012 to meet full demand from 2040-2050 | - 50% of demand met in 2012, gradual increase to meet full demand from 2040-2050 |
| **Optimistic** | - 50% of demand met in 2012, gradual increase to meet full demand from 2030-2050 | - 75% of demand met in 2012, gradual increase to meet full demand from 2030-2050 |

2) *Determining the impact of reduced offset supply on allowance prices*. We relied on the average allowance prices in five EPA modeling scenarios (2, 7, 7a, 7b and 7c) to plot a rough curve for how allowance prices change with a reduction in cumulative international offset supply. Using this curve we determined how the cumulative reductions in offset supply generated by the previous two scenarios would affect average allowance prices. Overall we found this relationship to be roughly linear.[10]

3) *Determining the impact of increased allowance prices on households and GDP.* Again we relied on household and GDP impact data from EPA modeling of the Waxman-Markey core scenario(scenario 2) and no international offsets scenario (scenario 7). We used the assumed proportional relationship between allowance prices and household/GDP impacts given by these two scenarios to project how smaller increases in allowance prices would affect households and GDP.

4) *Determining the impact of increasing rebates on households and GDP*. One drawback of our study is the inability to project the broader impacts on the U.S. economy of providing rebates to households or, alternatively, investing this money in another technology or sector. Therefore, theresults should be seen as illustrative of the relative scale of these policy mechanisms and not a model-based prediction of how the U.S. economy would be affected by these rebates.

[10] For different scenarios see Environmental Protection Agency. 2009. *Data Annex to H.R. 2454 Analysis*, Washington, DC. http://www.epa.gov/climatechange/economics/downloads/HR2454Analysis-DataAnnex.zip; and Environmental Protection Agency. 2009. *EPA Analysis of the American Clean Energy and Security Act of 2009*, Washington, DC. http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf