

BROOKINGS

QUALITY. INDEPENDENCE. IMPACT.

Consequences of Cap and Trade

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Analysis

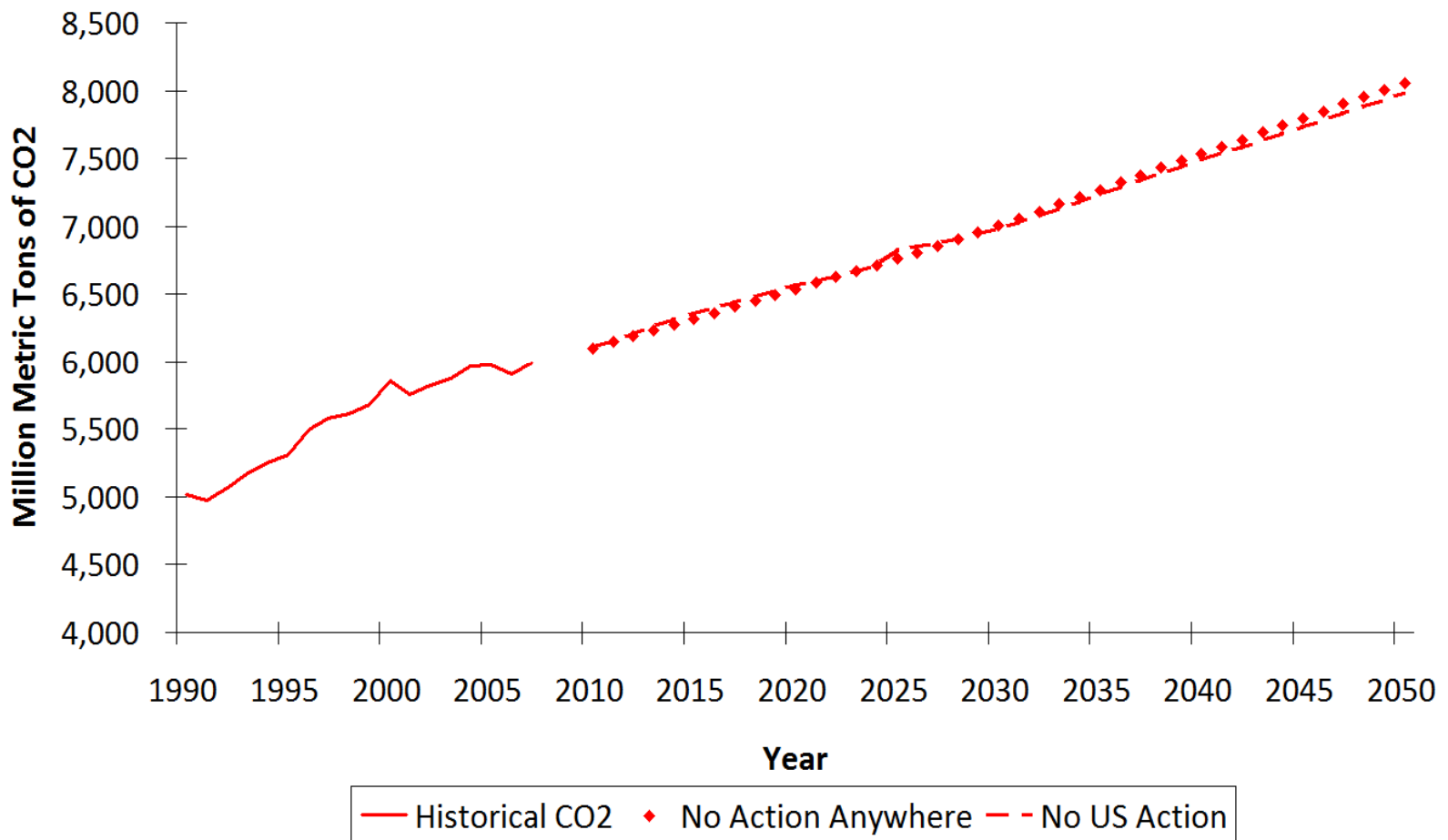
- Not an analysis of particular bills
- Not a cost-benefit analysis
 - » Looking only at mitigation costs and emissions reductions.
- Looking for ways to pursue environmental goals at lower cost

Scenarios

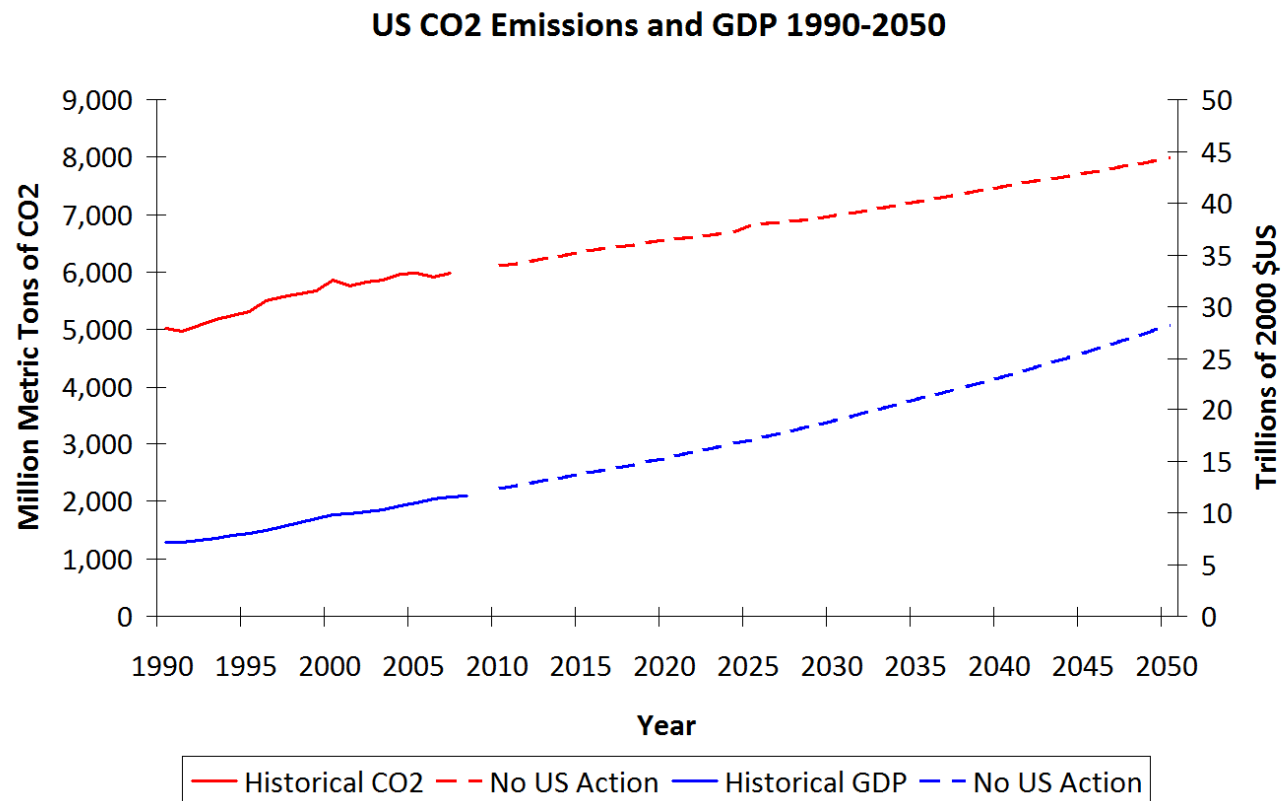
- Two Reference Scenarios
 - » No countries adopt a price on carbon (“take action”)
 - » All countries except the U.S. take action
- Four Policy Scenarios
 - » “Obama” based loosely on Administration proposal
 - » “Waxman-Markey” based loosely on draft targets
 - » “Hotelling 2050” cost-minimizing with same 2050 emissions
 - » “Hotelling Cumulative” cost-minimizing with same total emissions

U.S. Reference Emissions Levels

CO2 Emissions with Alternative Non-US Actions



Reference Emissions and GDP



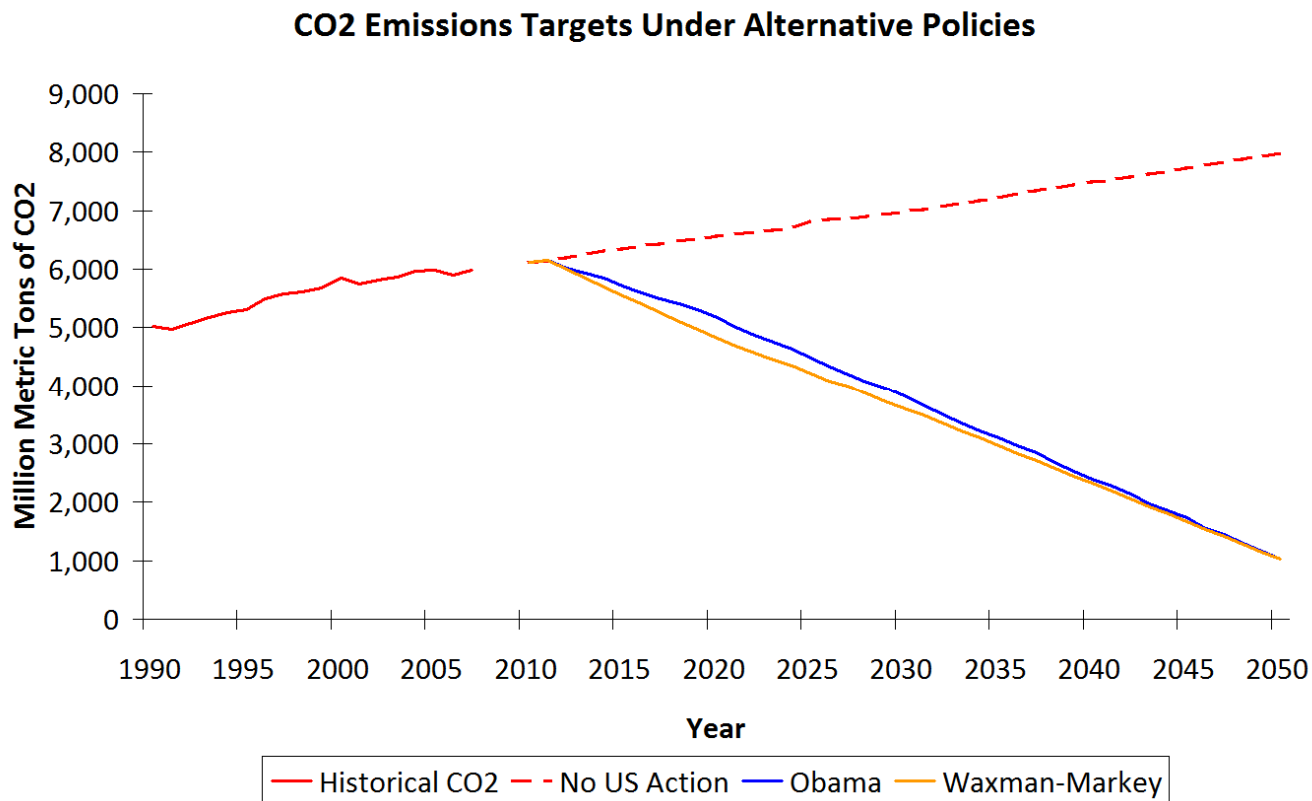
All US Policy Scenarios

- Targets relative to 2005 emissions levels
- Emissions reduced 83% by 2050

Scenario Differences

- Obama
 - » 14% lower by 2020
- Waxman-Markey
 - » 20% lower by 2020
 - » 40% lower by 2030
- Hotelling 2050
 - » Least cost path to 83% reduction by 2050
- Hotelling Cumulative
 - » Least cost path with same cumulative emissions as Obama

U.S. Emissions With Action



Assumptions

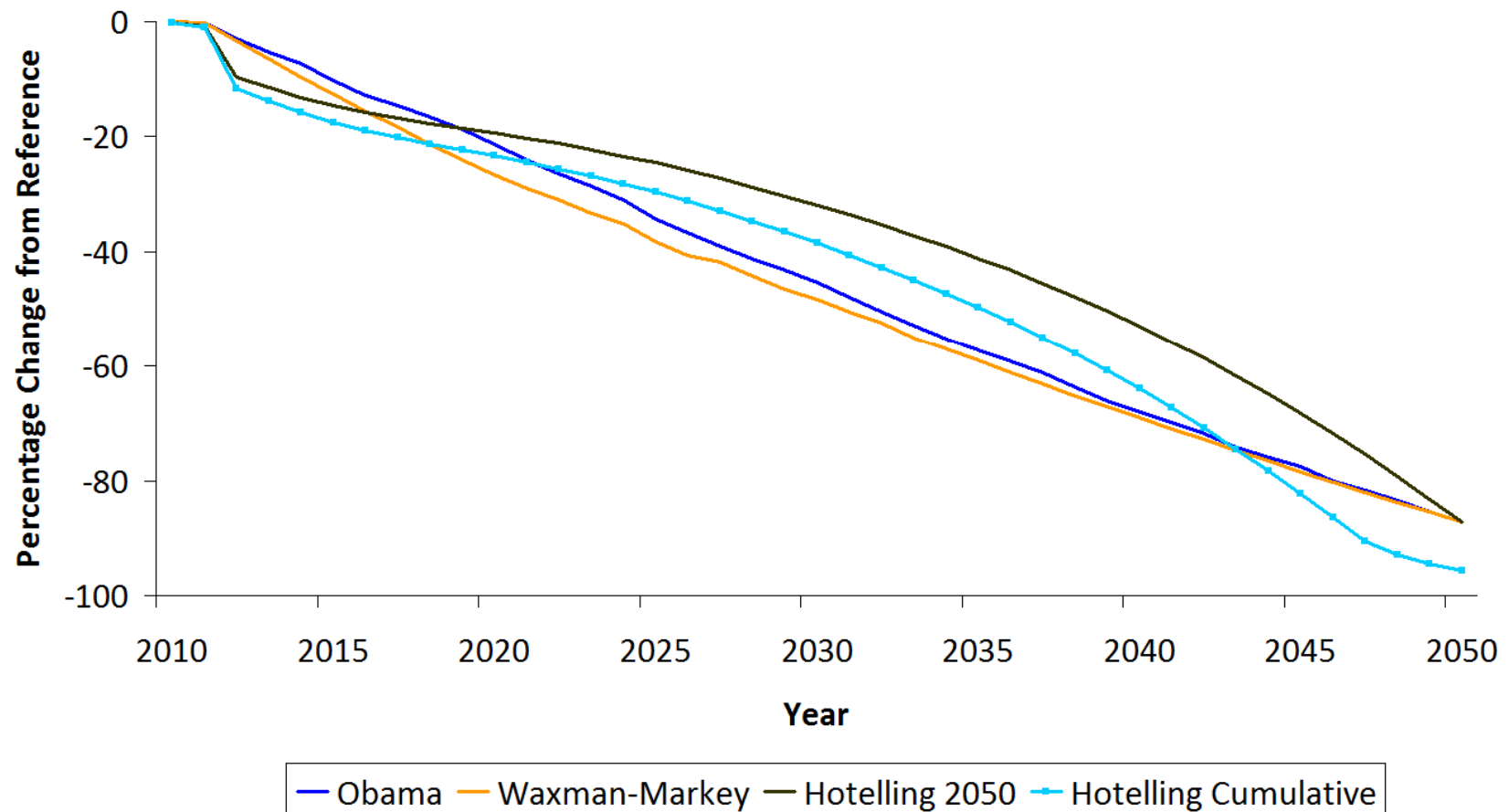
- No banking or borrowing in Obama and Waxman-Markey scenarios
- Caps apply only to fossil energy sectors
- No offsets
- Allowance value finances additional government spending
- Results relative to other countries taking action without the US

The G-Cubed Model

- General equilibrium model with 9 Regions, 12 sectors in each
- Forward looking – firms see a carbon constraint coming
- Financial capital is fully mobile, but physical capital isn't
- Reports trade and investment flows
- Employment adjusts gradually to new policies
- Includes only CO₂ from fossil energy, about 85% of total U.S. greenhouse emissions

Emissions trajectories

Effect of Alternative Policies on US CO2 Emissions



Cumulative US Emissions

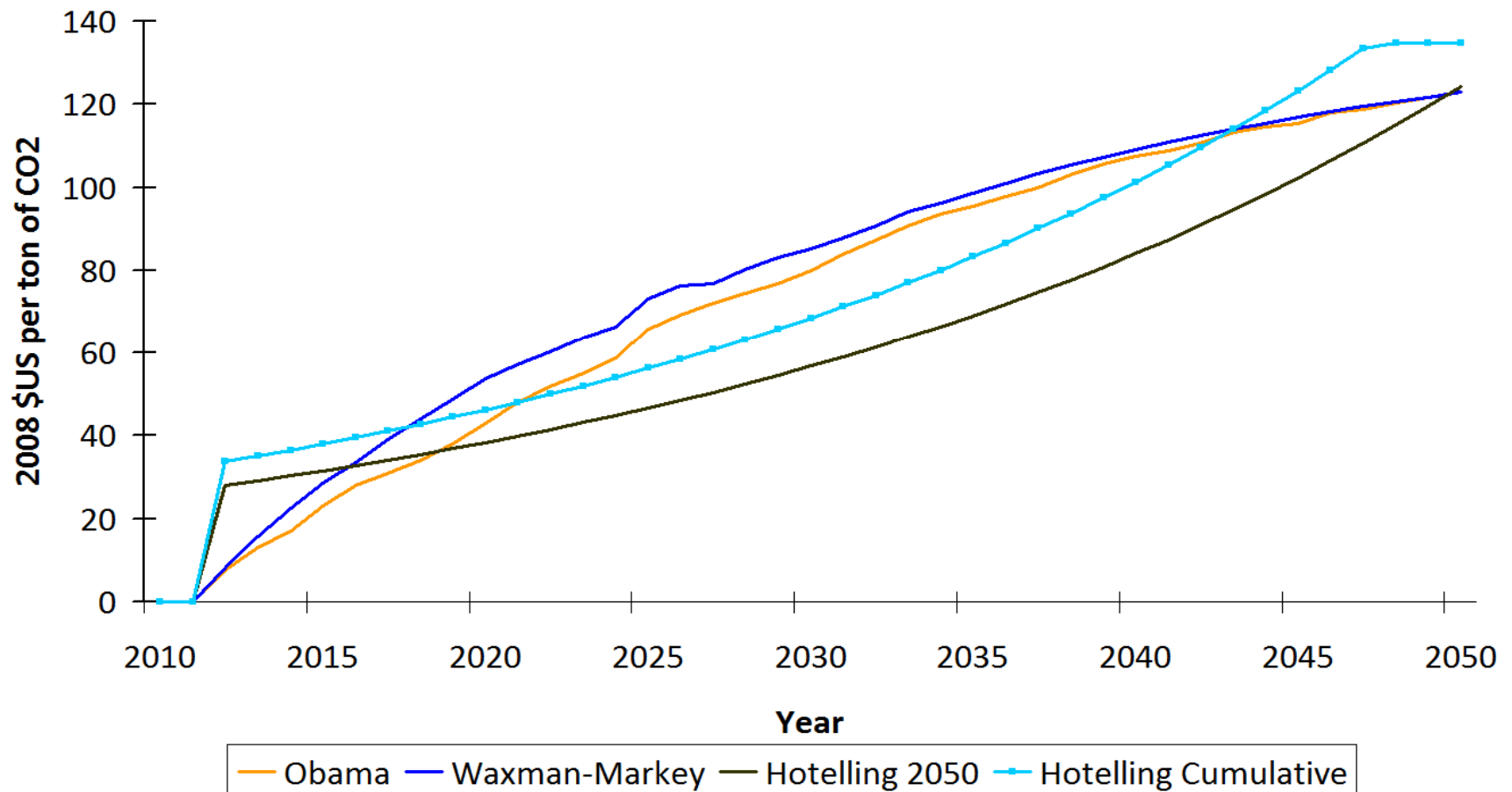
Scenario	Billion Metric Tons of CO ₂	Percent Reduction
Reference	288	N/A
Obama	154	47%
Waxman-Markey	148	49%
Hotelling 2050	176	39%
Hotelling Cumulative	154	47%

Present Discounted Personal Consumption 2010 to 2050 in 2008 dollars

Scenario	2.2% discount rate	4% discount rate
Obama	-0.45% \$1.9 trillion	-0.36% \$1.1 trillion
Waxman-Markey	-0.49% \$2.0 trillion	-0.39% \$1.3 trillion
Hotelling 2050	-0.28% \$1.1 trillion	-0.23% \$0.6 trillion
Hotelling Cumulative	-0.38% \$1.6 trillion	-0.31% \$0.9 trillion

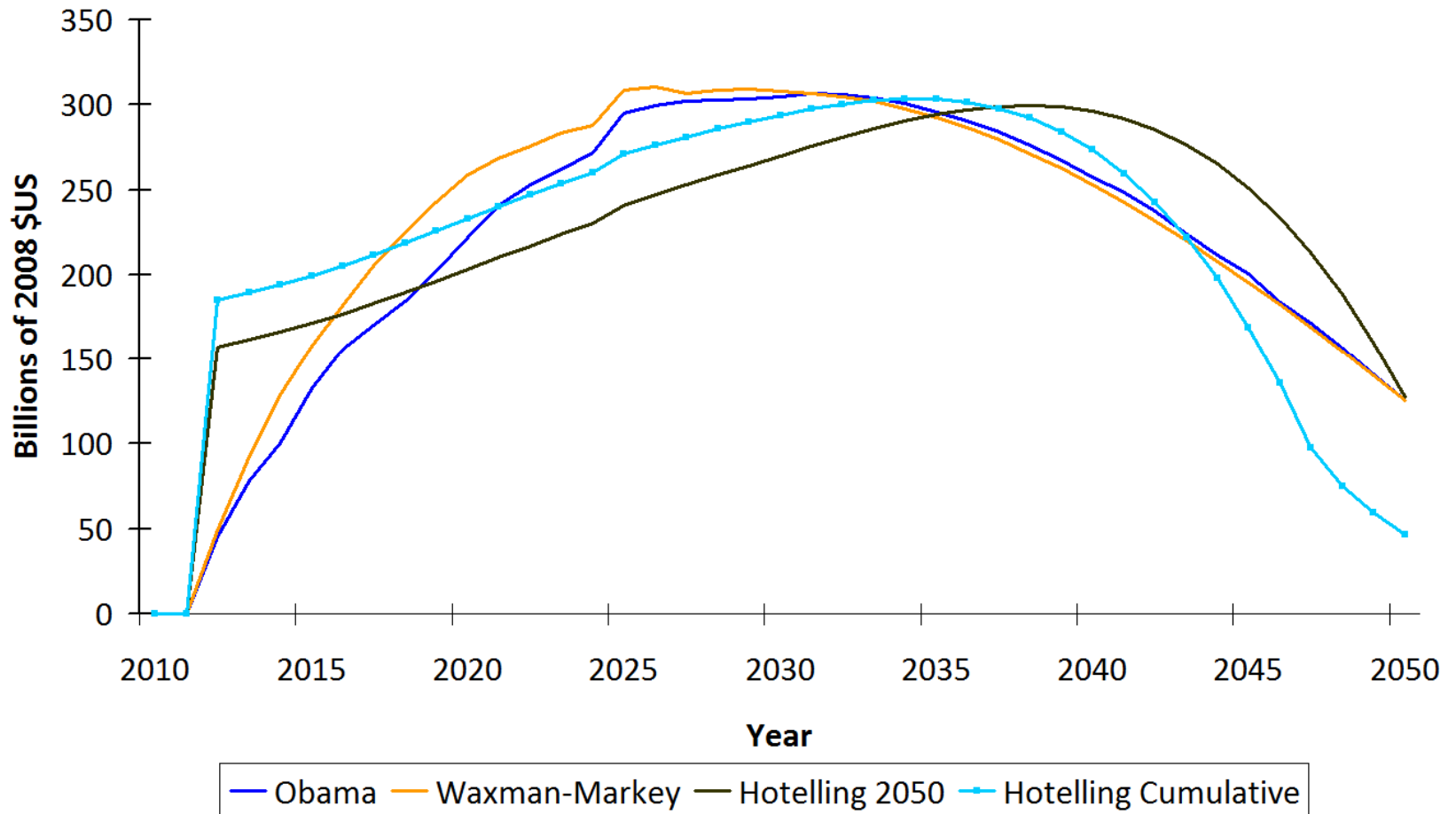
Allowance Prices

Carbon Prices Under Alternative Policies



Total Value of Allowances

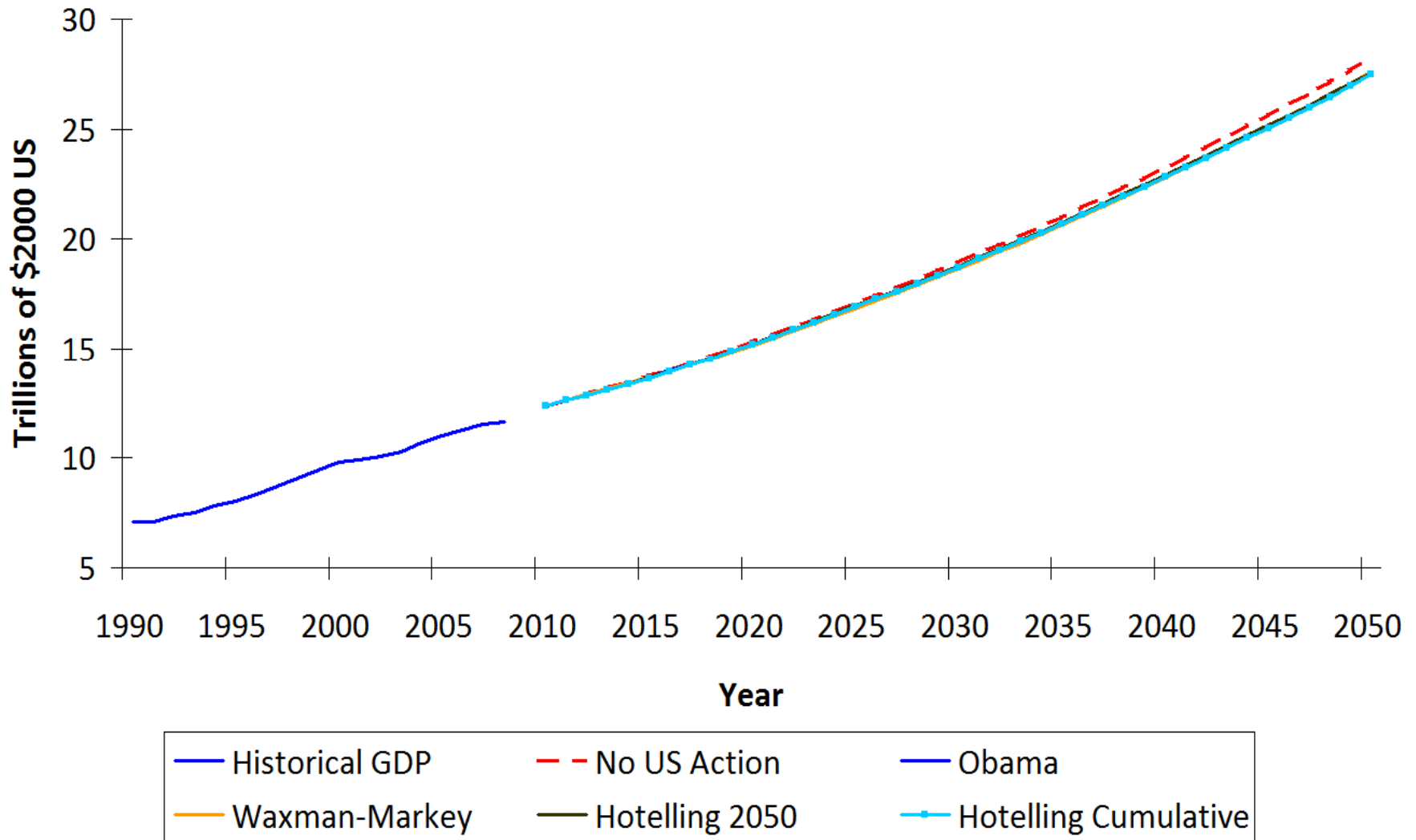
Allowance Values Under Alternative Policies



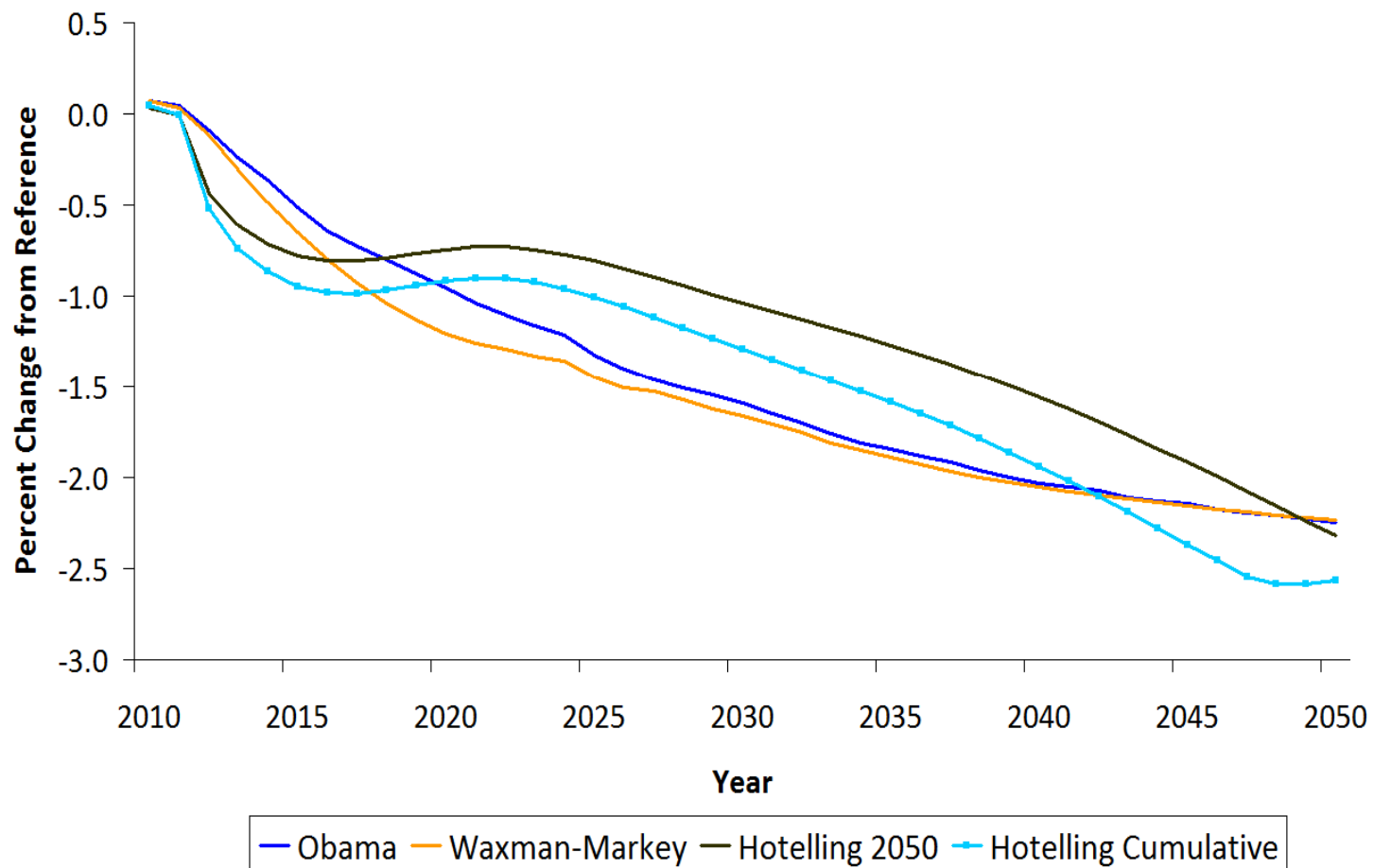
Cumulative Undiscounted Allowance Value 2012 to 2050 in 2008 dollars

Scenario	2012 to 2050	2012 to 2020
Obama	\$8.9 trillion	\$1.3 trillion
Waxman-Markey	\$9.2 trillion	\$1.5 trillion
Hotelling 2050	\$9.2 trillion	\$1.6 trillion
Hotelling Cumulative	\$9.0 trillion	\$1.9 trillion

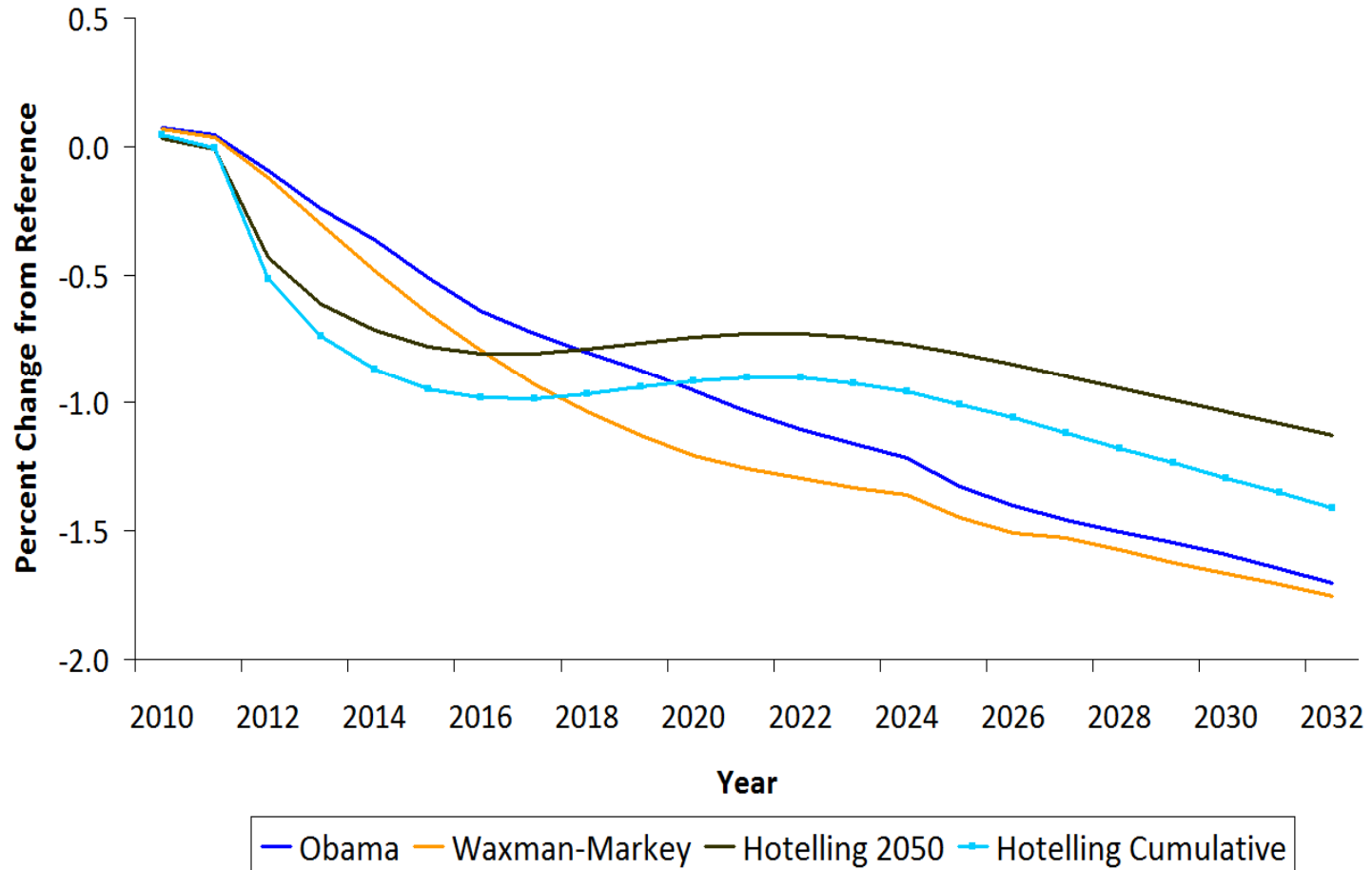
US GDP Under Different Policies and Scenarios



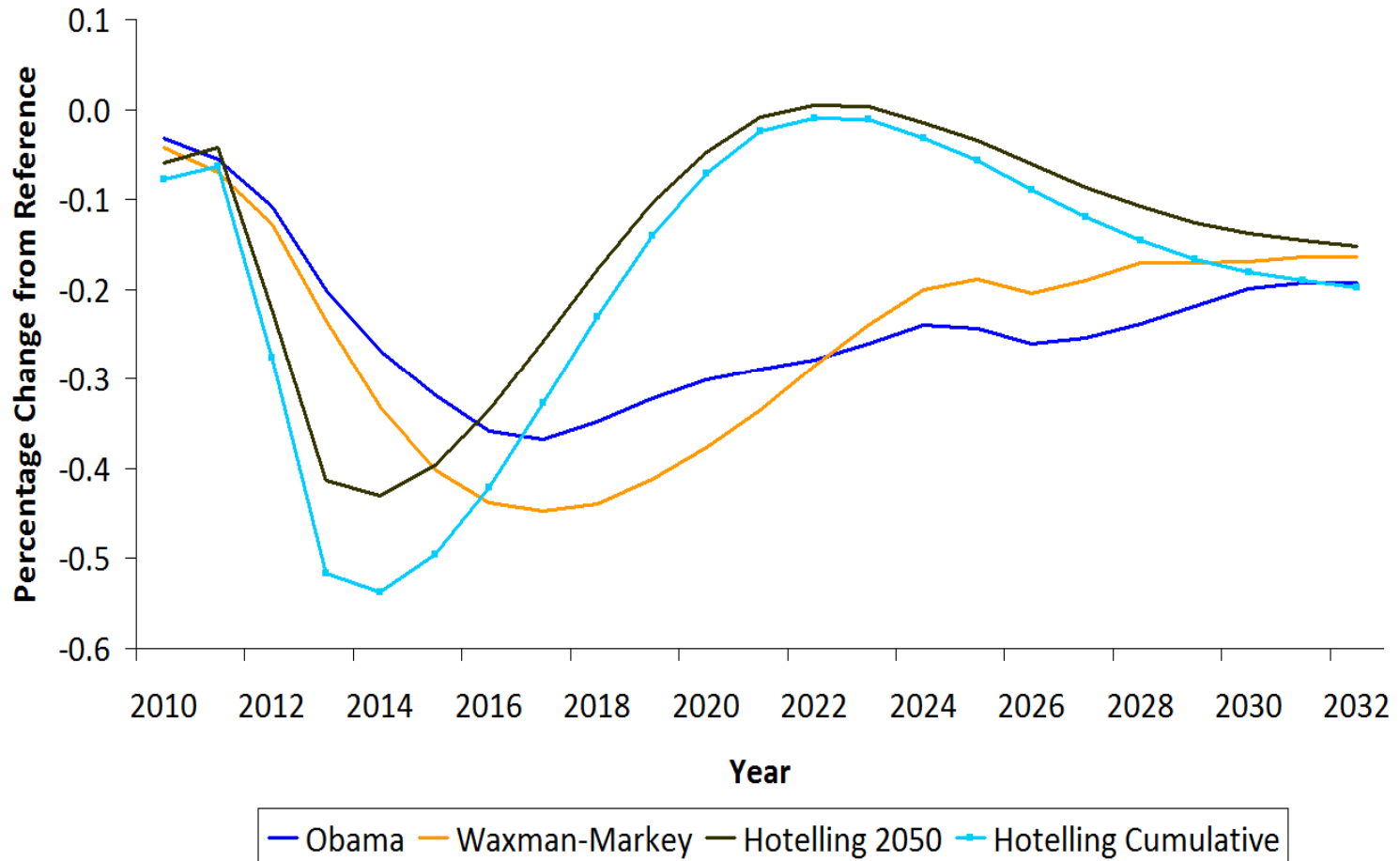
Effect of Alternative Policies on US GDP



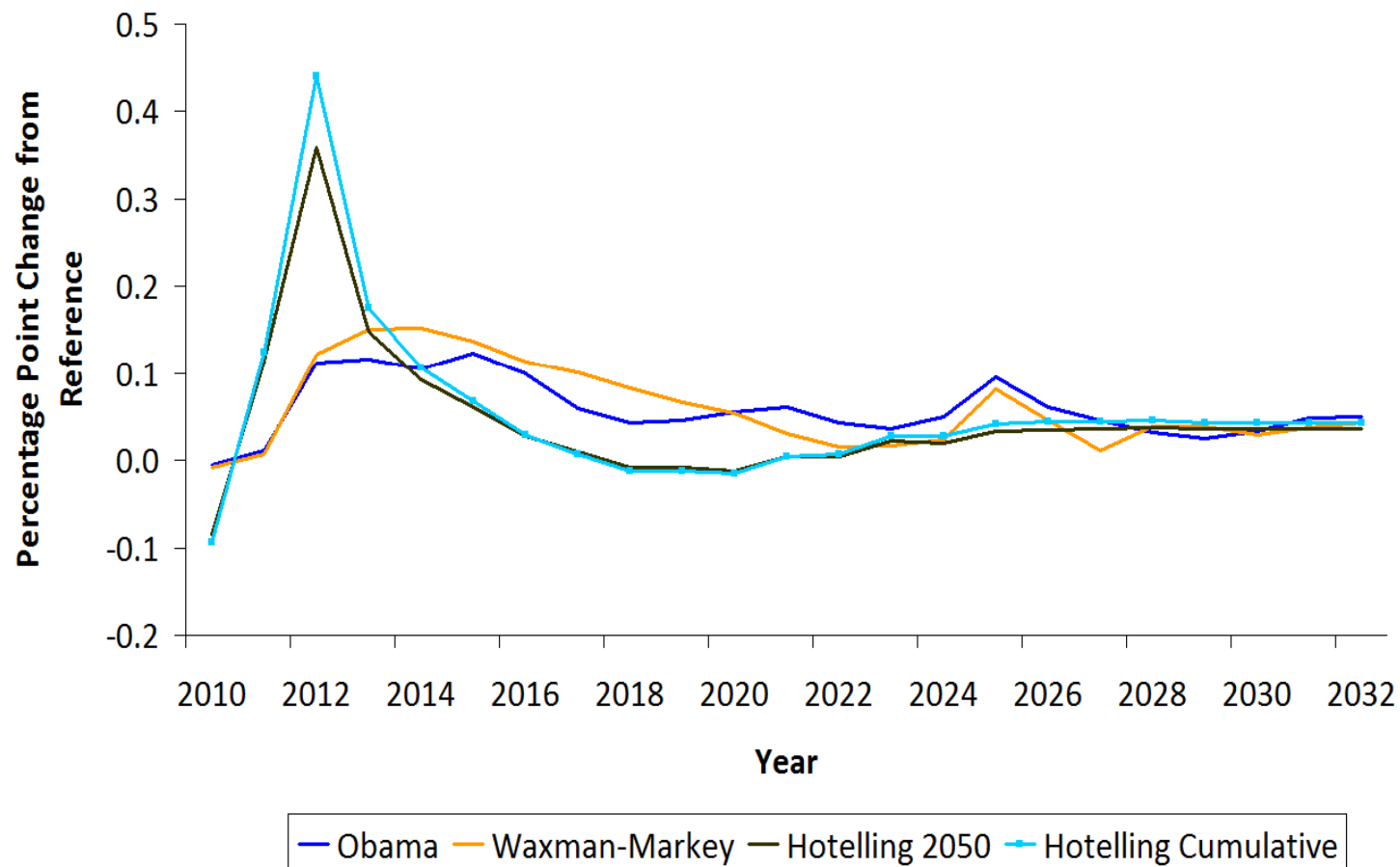
Effect of Alternative Policies on US GDP Through 2032



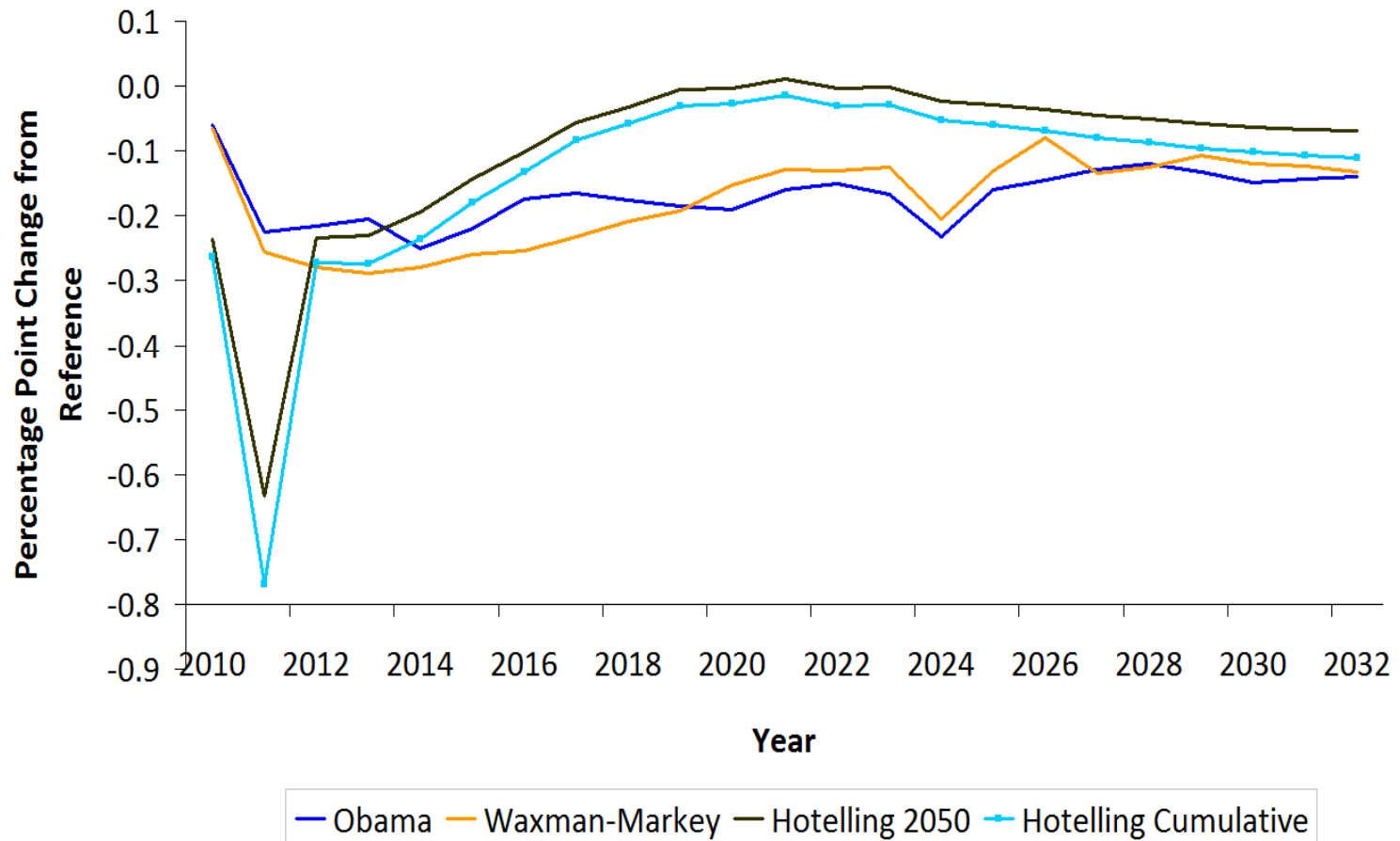
Effect of Alternative Policies on US Employment



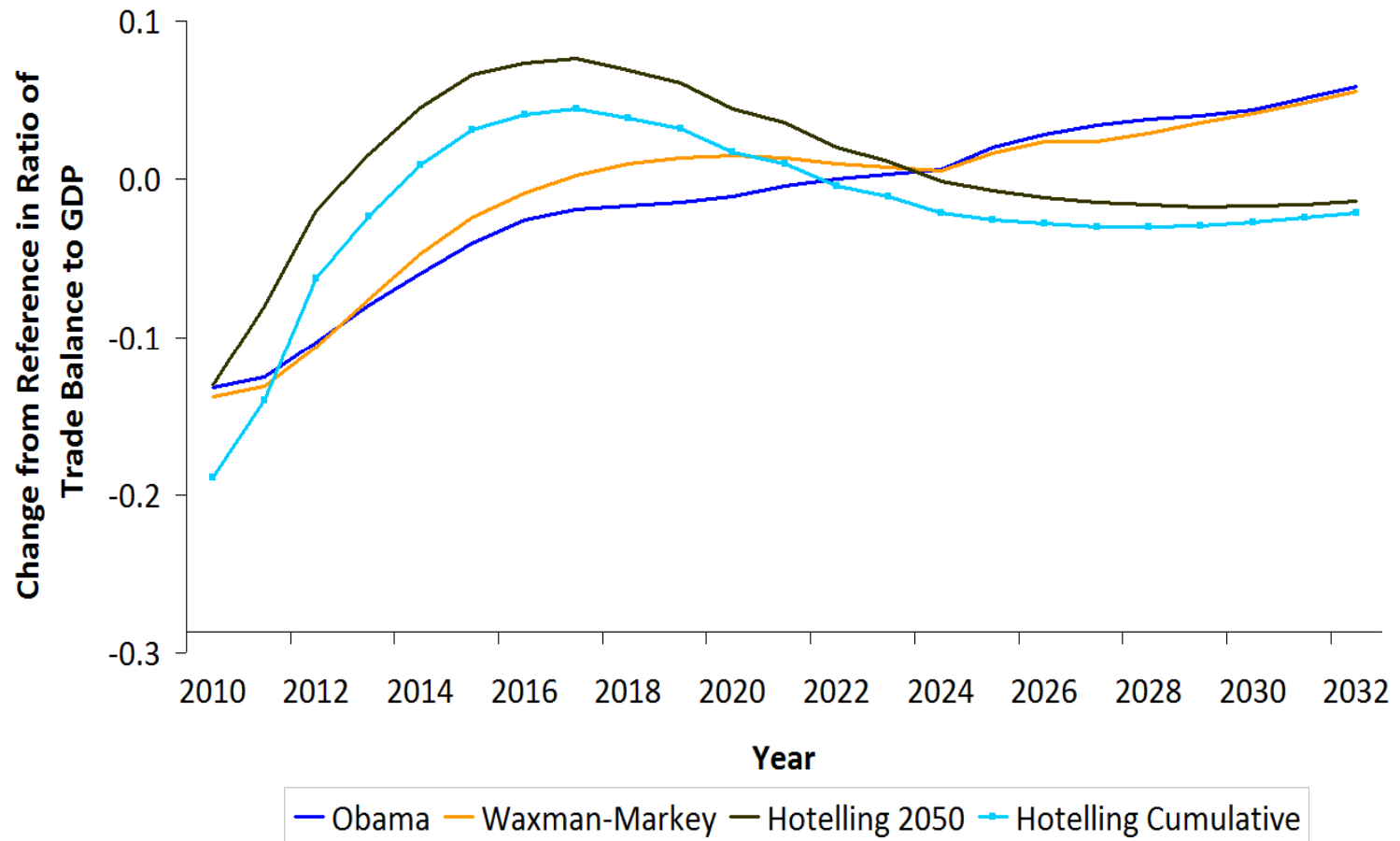
Effect of Alternative Policies on US Inflation



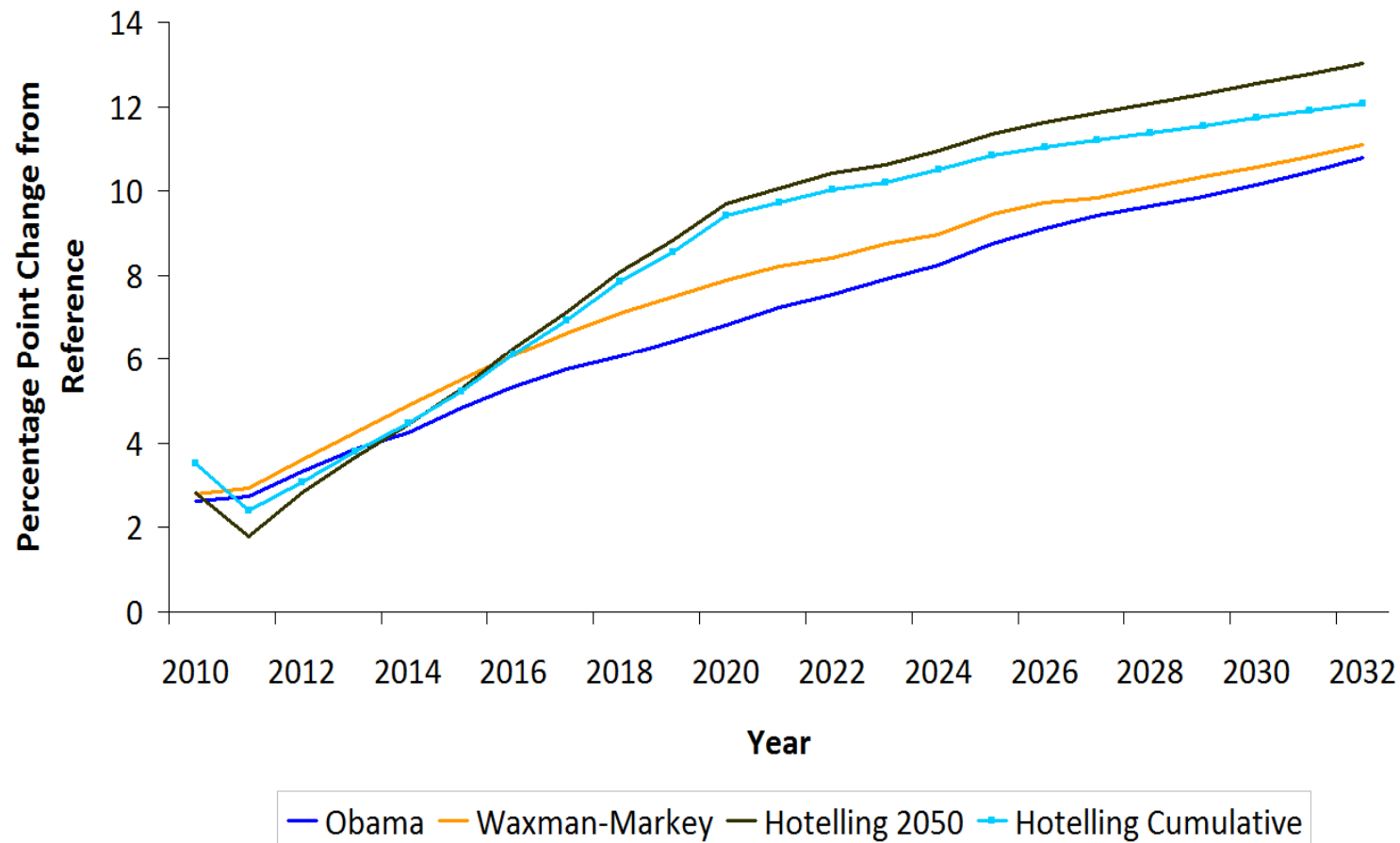
Effect of Alternative Policies on US Real Interest Rates



Effect of Alternative Policies on US Trade Balance to GDP Ratio



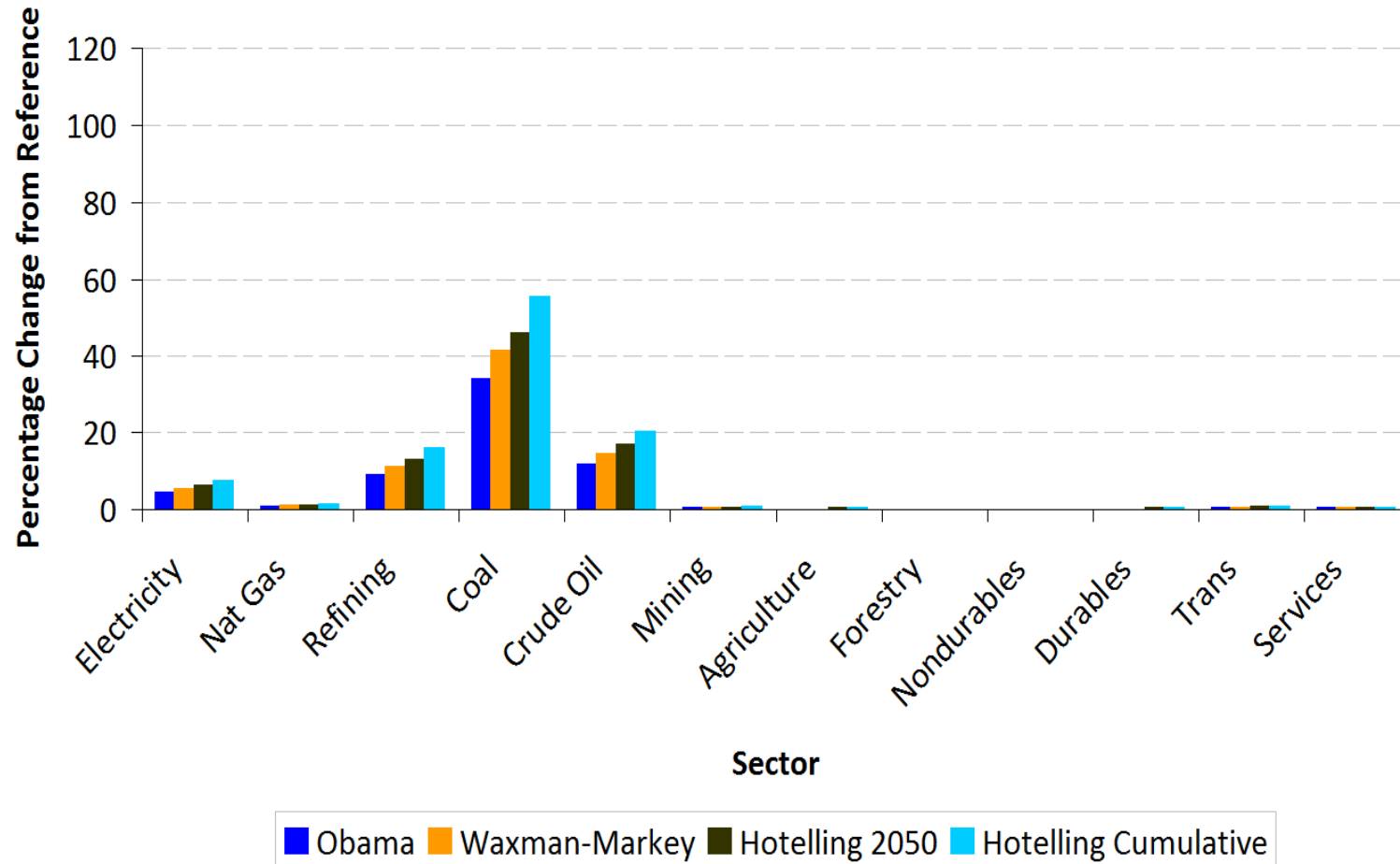
Effect of Alternative Policies on US Real Effective Exchange Rate



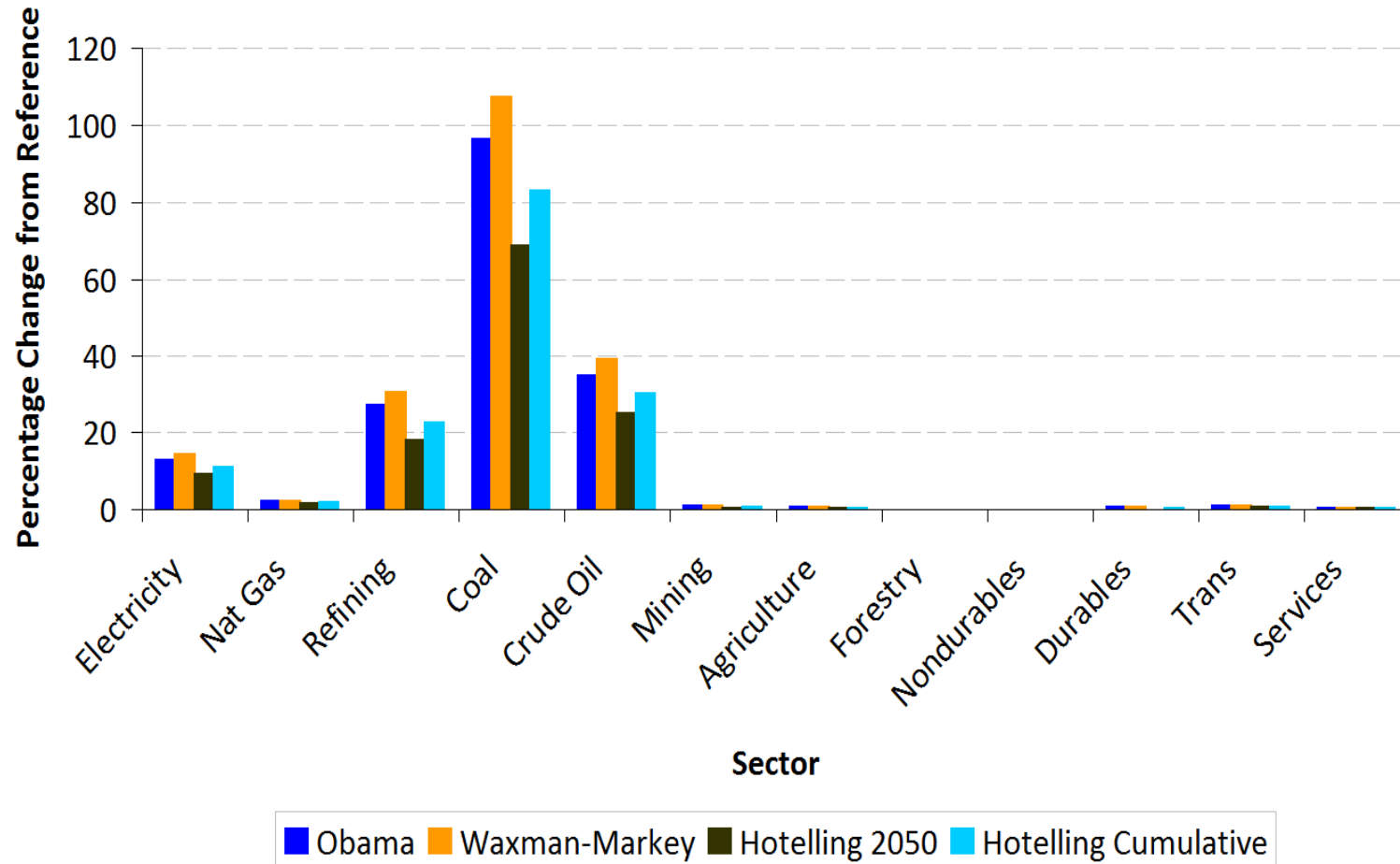
Effects on Sectors

Num	Name	Num	Name
1	Electricity	7	Agriculture
2	Natural Gas	8	Forestry
3	Petroleum Refining	9	Nondurables
4	Coal	10	Durables
5	Crude Oil	11	Transportation
6	Mining	12	Services

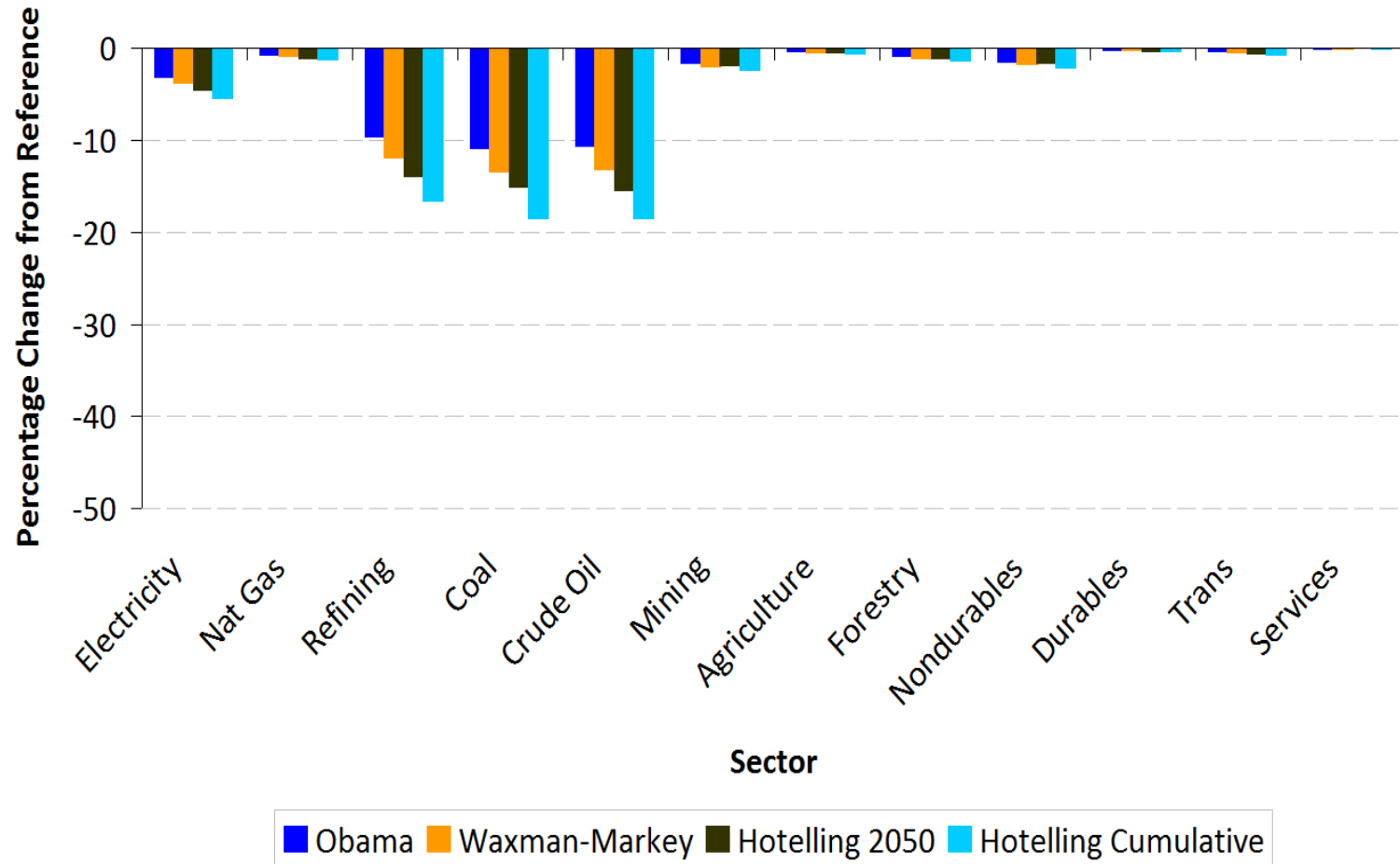
Effect on Purchaser's Prices in 2015



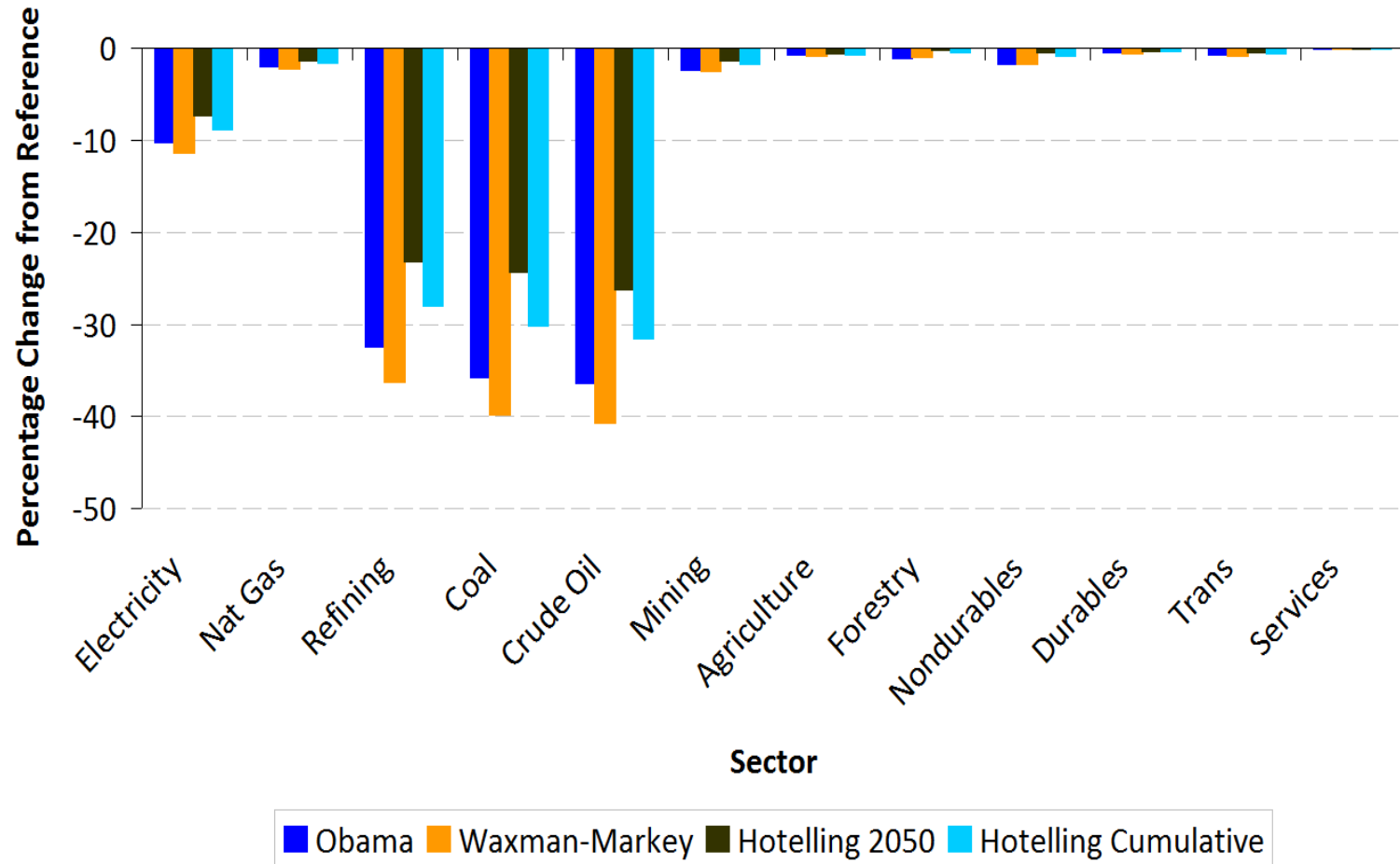
Effect on Purchaser's Prices in 2025



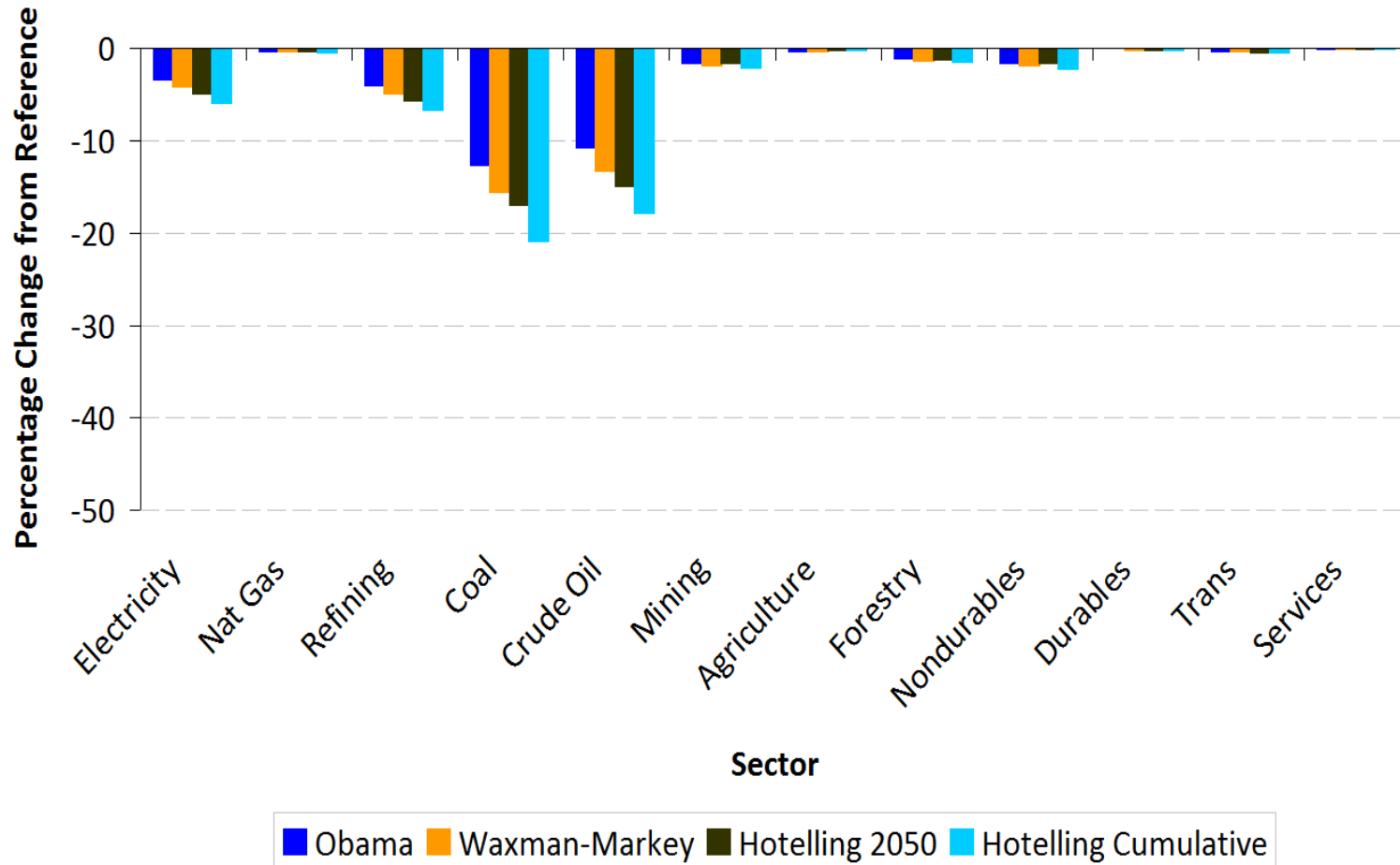
Effect on Production in 2015



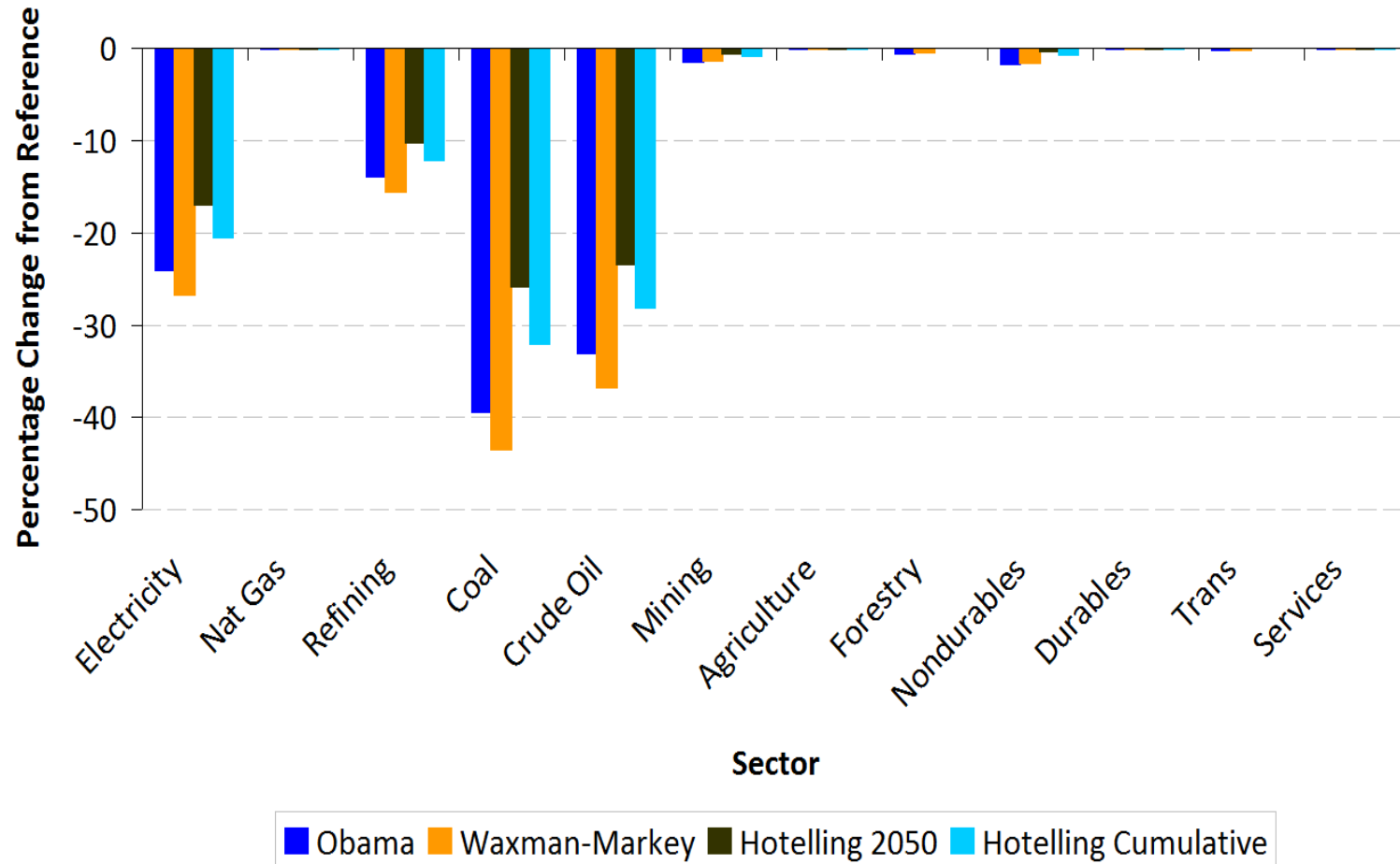
Effect on Production in 2025



Effect on Employment in 2015



Effect on Employment in 2025



Summary

- Emissions effects
 - » All policies reduce cumulative US emissions 38% to 49%
 - » 110 to 140 billion metric tons CO₂ fewer emissions
- Welfare effects
 - » Loss in Personal Consumption of \$1 to \$2 trillion present value
 - » Incremental stringency produces high incremental cost, e.g. extra 8 % reduction increases costs 45%

Summary, continued

- US GDP in 2050 lower by 2.5%
- Employment effect
 - » -0.5% at peak in first decade
- Allowance value
 - » About \$300 billion at peak during 2030-2040
 - » \$9 trillion in total
- Obama and Waxman-Markey targets
 - » Without banking, CO₂ prices rise more gradually than least-cost
 - » More stringent in medium run