



# **Methodologies for Regulatory Impact Analysis: Control Updates and Applications**

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# Outline

- What is the California Air Resources Board (CARB)?
- Regulatory Impact Analysis at CARB
- Reason for updating the REMI controls
- REMI Controls update
  - Data and Methodology
  - User Interface
  - Comparison with REMI Standard Control
  - Results after REMI controls update

# The California Air Resources Board

- CARB is charged with protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change.
- From requirements for clean cars and fuels to adopting innovative solutions to reduce greenhouse gas emissions, California has pioneered a range of effective approaches that have set the standard for effective air and climate programs for the nation, and the world.
- 16 member board, with 12 appointed by governor and 4 for local air districts<sup>3</sup>

# Standardized Regulatory Impact Assessment

- A comprehensive assessment of the costs, benefits, fiscal and macroeconomic impacts of a major regulation in the State of California.
  - Personal income, employment by sector, GDP, and other economic indicators.
- Major regulations are defined as anything with an annual total economic impact > \$50 million
- Requires use of DOF's official economic projections which are released

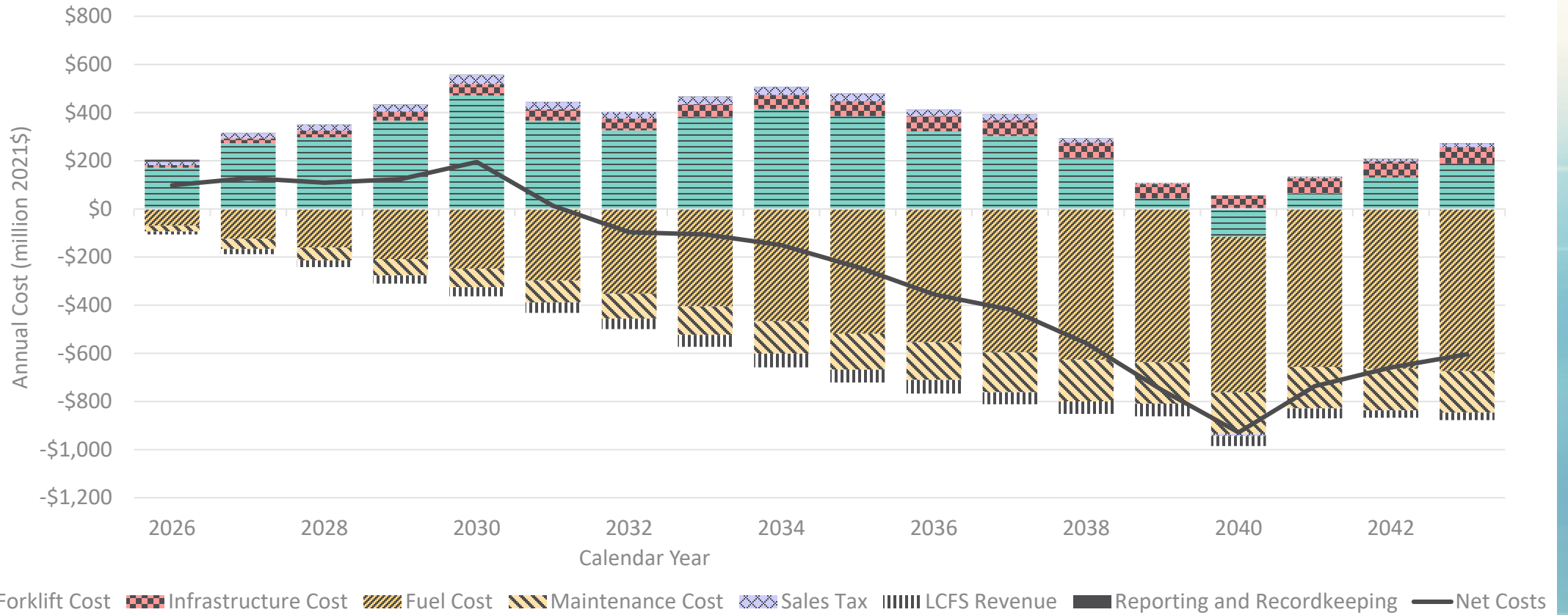
# Zero-Emission Forklift Example

- The regulation will reduce emissions by requiring the phase-out of forklifts running on propane and gasoline.
- Beginning in 2026 in new forklift sales must be zero-emission in most cases.
- Beginning 2028 businesses with fleets of 3 or more forklifts, will need to phase-out the use of forklifts over 10 years old.
- A Population of about 100,000 forklifts need to be phased-out through 2035.

# Zero-Emission Forklift Costs and Benefits

- Total Cost of Ownership (TCO):
  - Capital Costs (forklift, infrastructure)
  - Operational costs (propane, electricity, hydrogen, maintenance)
- Benefits
  - Health benefits
  - Cost-savings
  - Social Cost of Carbon

# Statewide Total Cost of Ownership



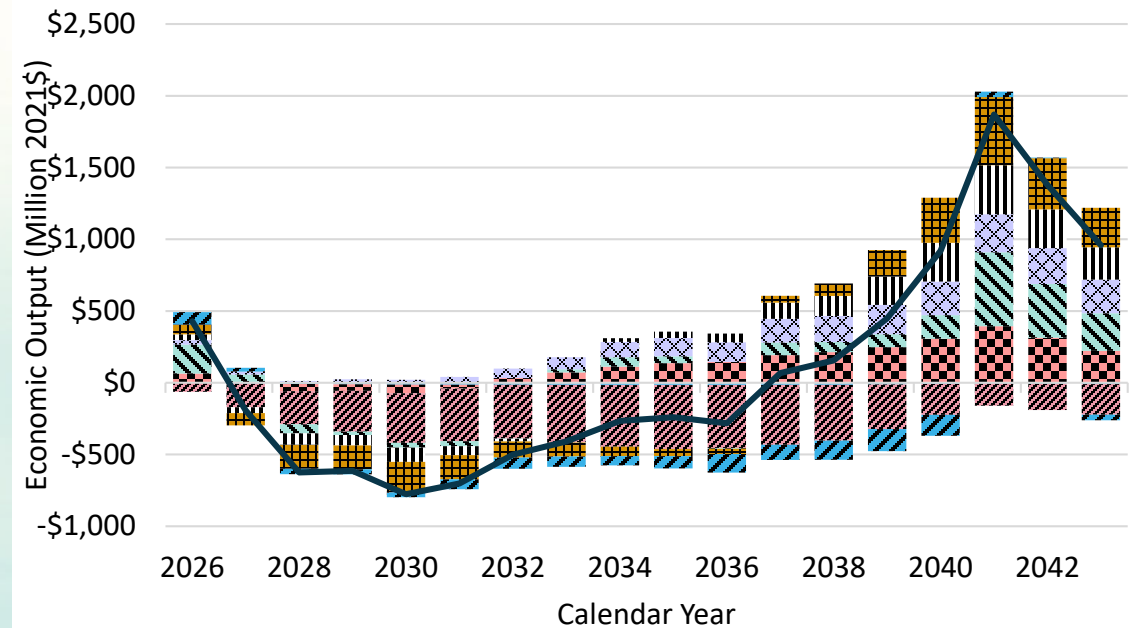
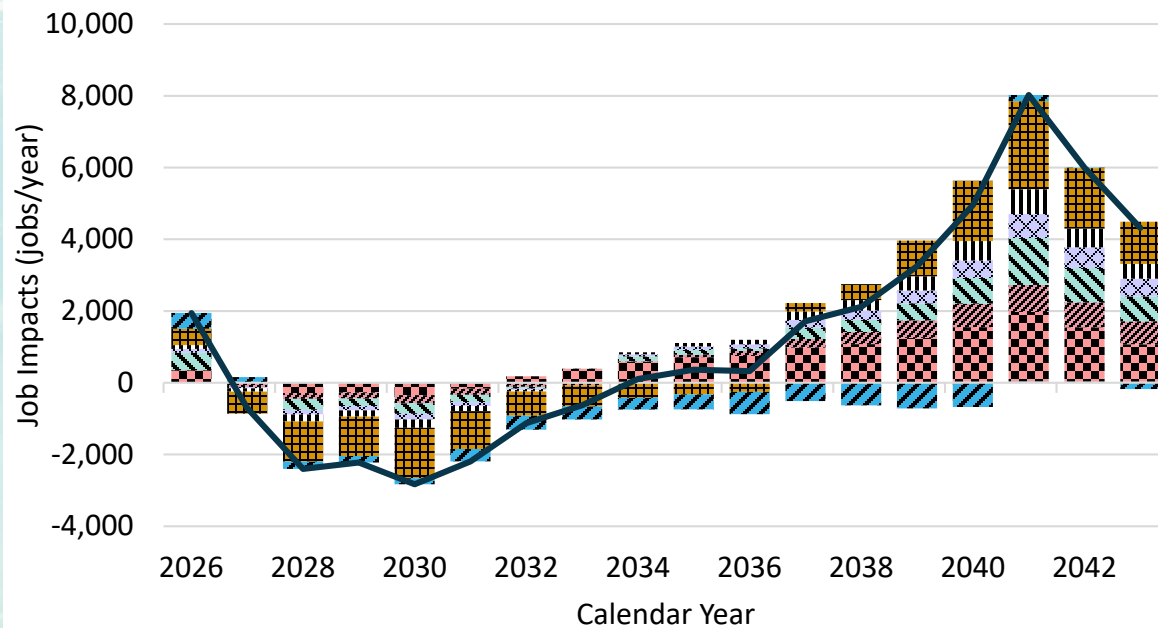
# Zero-Emission Forklift Example

- Total cost of ownership to forklift fleets operators modeled as a change to production cost by industry.
- Exogenous Final Demand for downstream industries

Source of Cost or Savings for Fleets	Industries with Changes in Final Demand (NAICS)
<b>Forklift and battery cost</b>	Upfront cost: Industrial Machinery manufacturing (3332) and industrial machinery and equipment merchant wholesalers (423830)
<b>Infrastructure upgrades</b>	Upfront cost: Construction (23)
<b>Propane and gasoline fuel</b>	Recurring cost: Petroleum and Coal Products Mfg. (324)
<b>Electricity</b>	Recurring cost: Electric power generation, transmission, and distribution (2211)
<b>Hydrogen fuel</b>	Recurring cost: Basic Chemical Manufacturing (3251)
<b>Forklift repair and maintenance</b>	Recurring cost: Industrial Equipment Repair (8113)
<b>Reporting</b>	Recurring cost: Management, scientific, and technical consulting services (5416)
<b>LCFS credit generation</b>	Recurring cost: Fuel prices <sup>a</sup>



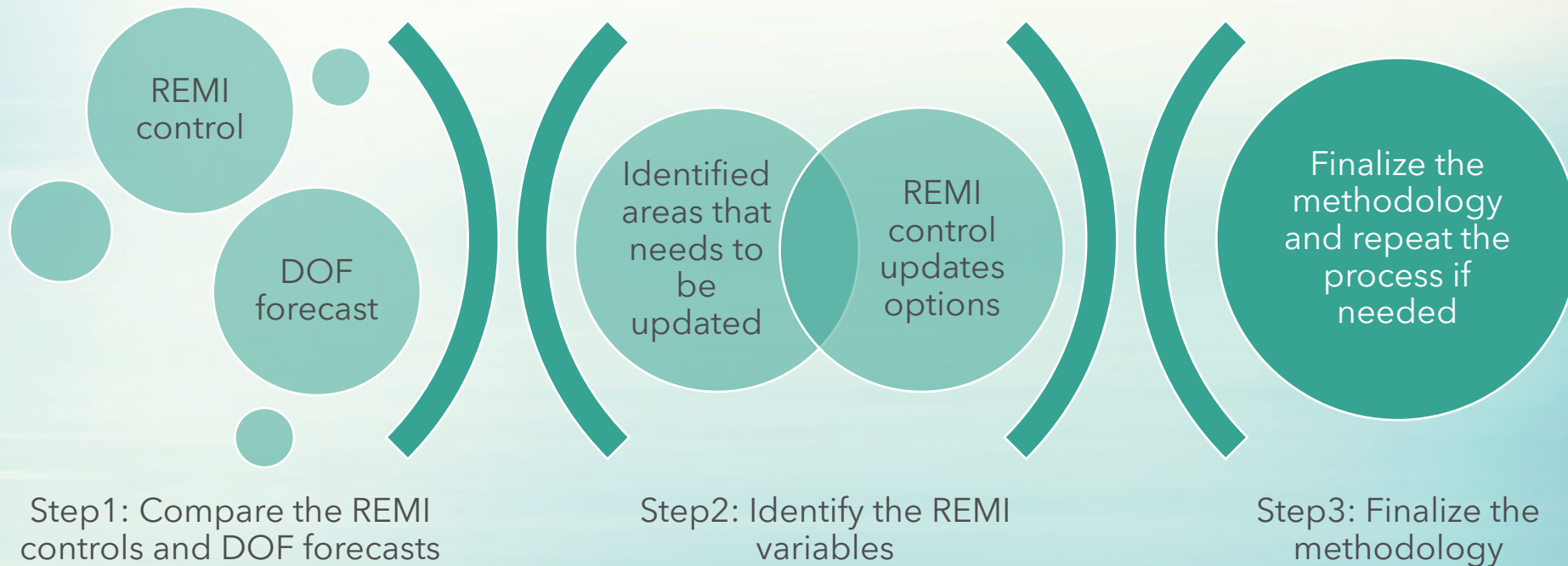
# Zero-Emission Forklift Example



# The Purpose of Updating REMI Controls

- The Department of Finance (DOF) reviews CARB's economic analysis and agencies are required to use the Department of Finance's most current publicly available economic and demographic projections.

# Process to Develop the Control Update



# DOF Forecasts to be Integrated

## National Economic Forecast

GDP, personal income, PCE, and employment

## California Economic Forecast

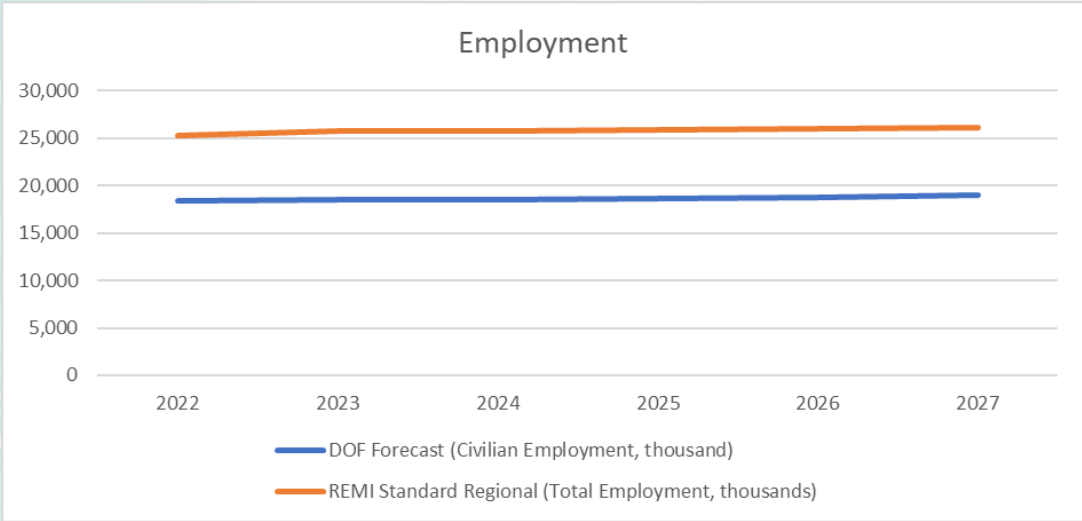
Employment by industry

## California Demographics

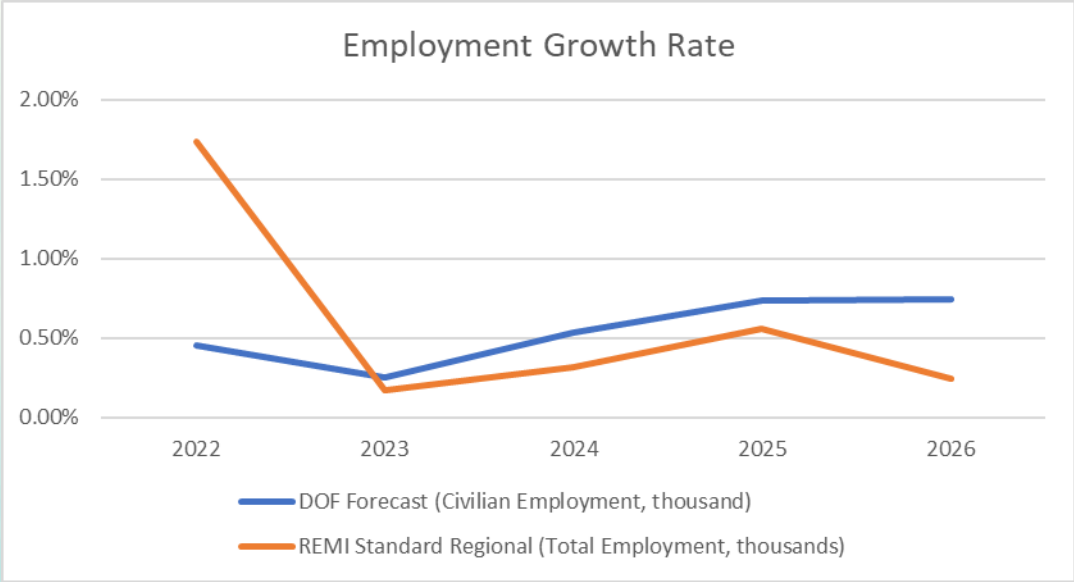
Population by year, gender, race, and age

# REMI Control vs. DOF Forecast, Regional Level

## Employment

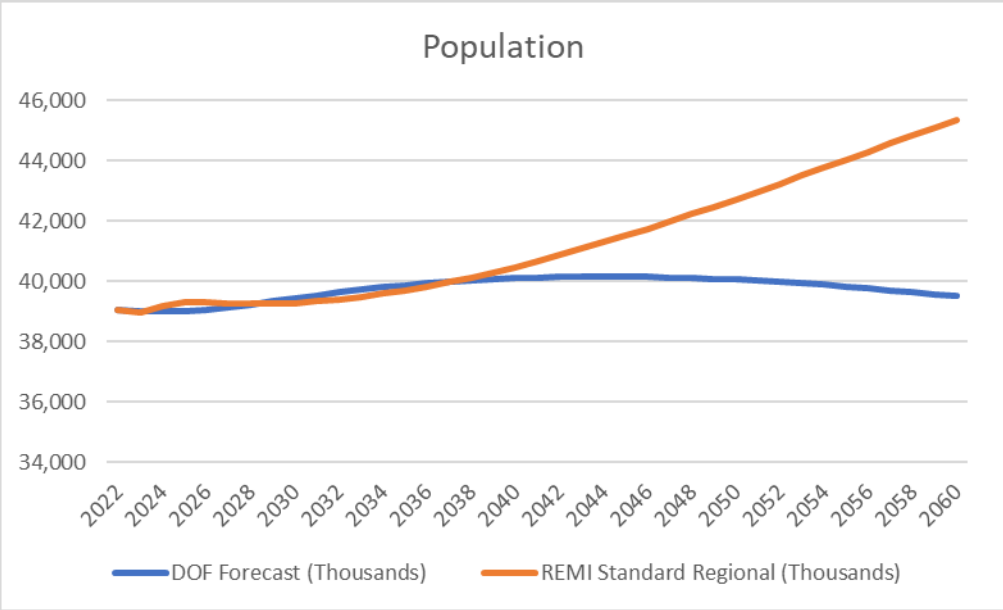


## Employment growth rate

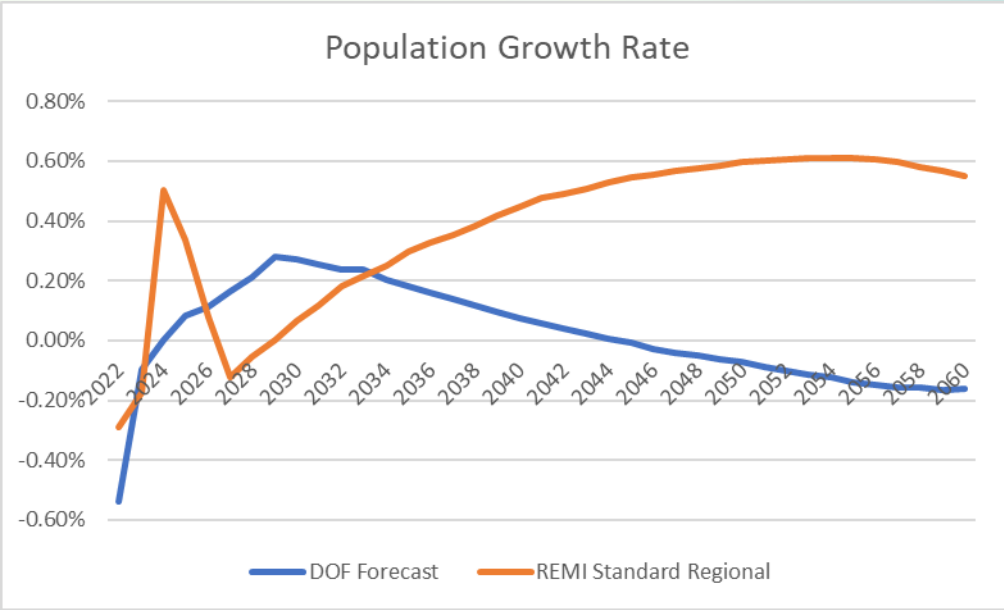


# REMI Control vs. DOF Forecast, Regional Level

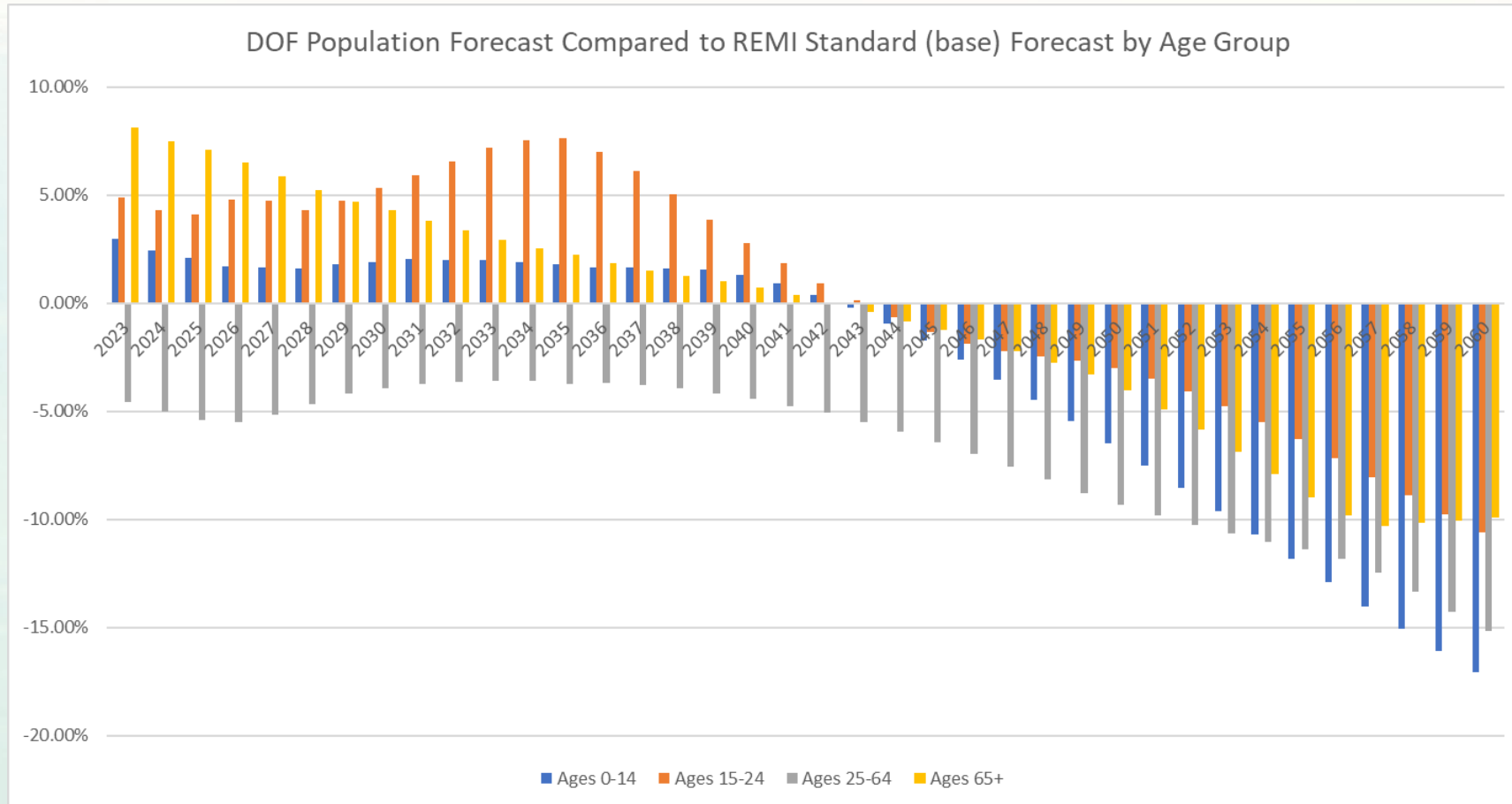
### Population



### Population growth rate



# Differences in Population by Age Group



# Methodology of National Control Inputs Calculation

- General Methodology
  - REMI last historical year level \* (1 + DOF yearly forecast growth rate)

- Example:

	2023	2024	2025	2026	2027
DOF Forecasted Growth Rate (Percent)	1.735068665	0.261878421	0.164445799	0.029338641	0.256970056

Employment Sector	Units	2022	2023	2024	2025	2026	2027	2028	2029
All Industries	Thousands of Employees	212,442	216,128	216,694	217,050	217,114	217,672	#N/A	#N/A

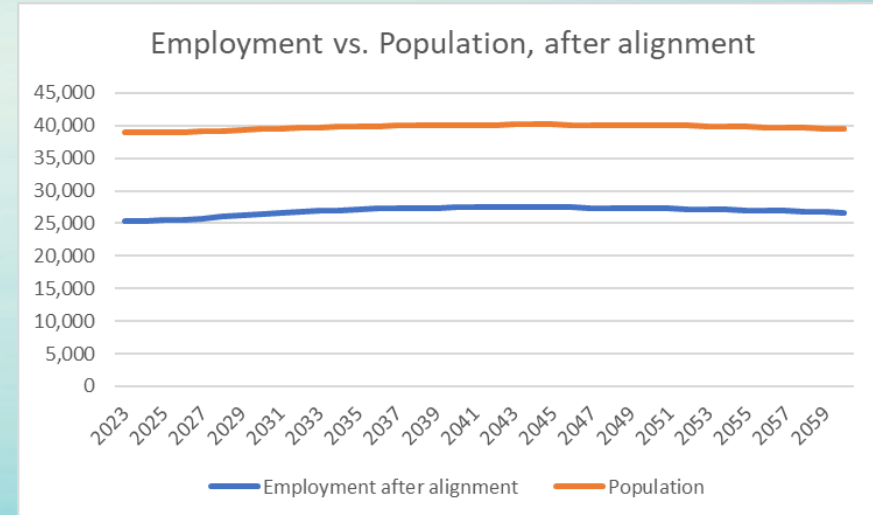
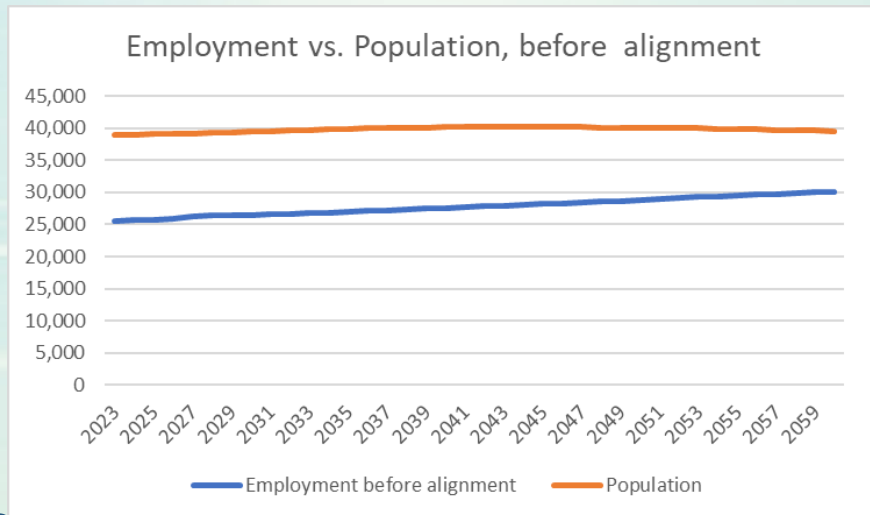
Last REMI Historical year value

Remains empty



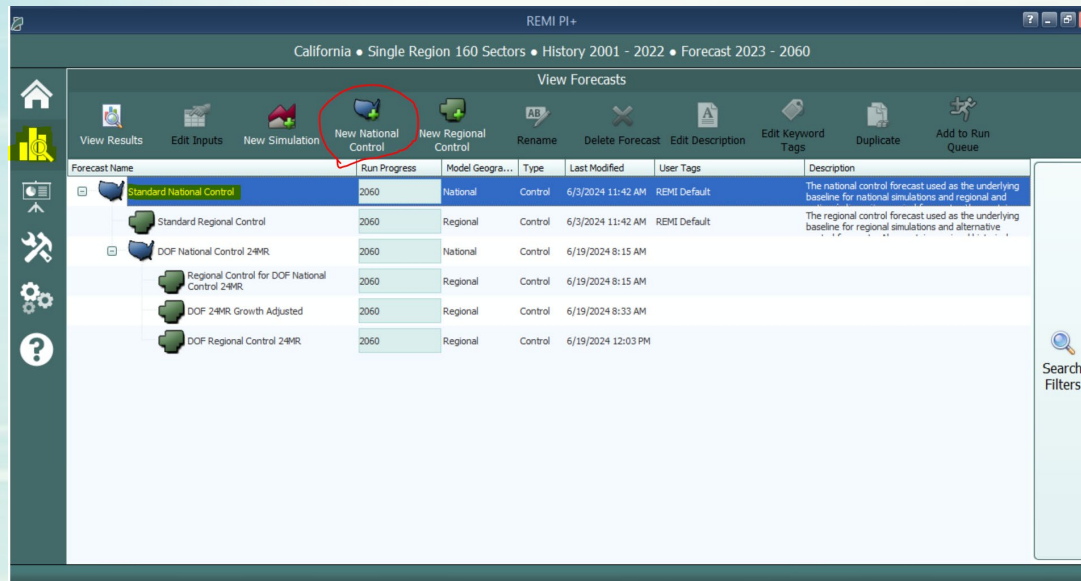
# Methodology of Regional Control Inputs Calculation

- General methodology is the same as in national control
- Extra step of aligning the sectoral growth rates and the employment/population ratio with DOF forecast
  - Step 1: Employment by industry = REMI last historical year level \* (1 + DOF yearly forecast growth rate)
  - Step 2: Scale up/down the employment by the DOF population \* REMI employment/population ratio

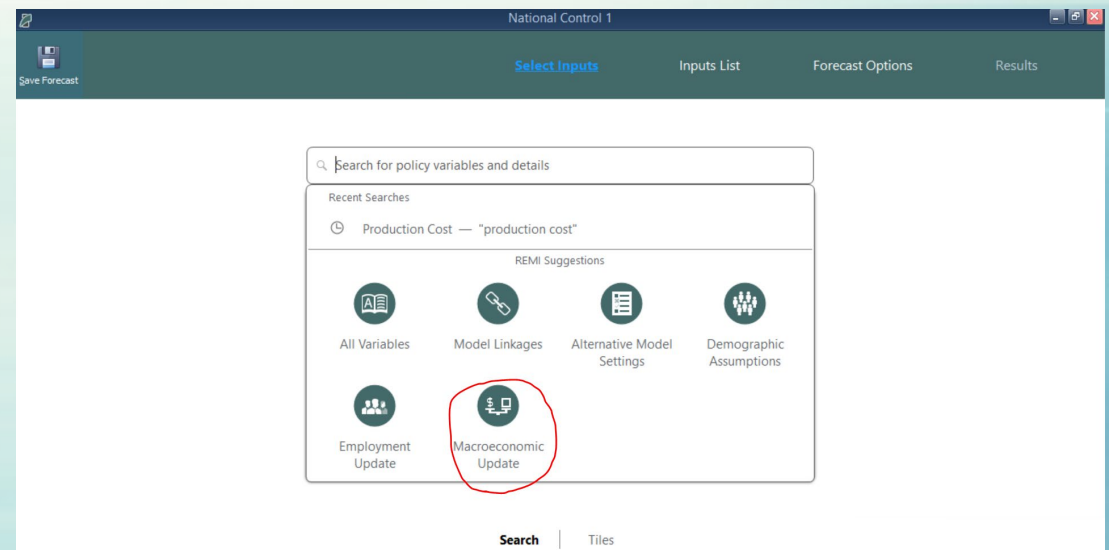


# User Interface of Control Updates

Select New National or New Regional Control



Choose the type of updates



# User Interface of Control Updates

## Configure the options

Macroeconomic Update - New Macroeconomic Update 1

Overview Options Apply Enter Values Confirm Values Review Save As Calculator Cancel

**Calibrate Final Demand Values?**  **Yes**

GDP Aggregation Level: Total GDP

Calibrate personal Income values along with the final demand values?  **Yes**

**Rescale Nominal Values and Price Index?**  **No**

Use the "Rescale Nominal Values and Price Index" to enter a different inflation assumption.

**Enter a different national unemployment rate assumption?**  **No**

This will change the national and regional unemployment rates but will not affect any other economic results.  
The unemployment rate is  $(\text{Unemployed} / \text{Labor Force}) * 100$ , where  $\text{Unemployed} = \text{Labor Force} - \text{Residence Adjusted Employed Population}$ .

**Enter a new average labor productivity growth rate?**  **No** Aggregation Level: [Dropdown]

This will adjust employment for individual industries so the average productivity growth across all industries will match the new total rate or individual industry rates.  
If the productivity growth rate is used in combination with a final demand update, the employment change will occur without a corresponding change in wages, compensation, or earnings. The productivity growth rate will be ignored if used in combination with employment update.

**Update Method**

**Hit Target Values**

Use this option if your update data has the same definition and source as the REMI data. The updated forecast will try to match the entered target values.

**Match Growth Rates**

Use this option if your update data has a different definition or is from a different source than the REMI data. Enter values for the last history year and forecast years the updated forecast will try to match the annual growth rates.

## Input new control data, save, and run the new controls

Macroeconomic Update - New Macroeconomic Update 1

Overview Options Apply Enter Values Confirm Values Review Save As Calculator Cancel

Enter (type or paste) new macroeconomic values.  
The "Adjust GDP" and "Fill Indicated Years" options can be used together to fill the grid with baseline values, adjusted by the specified percentage.

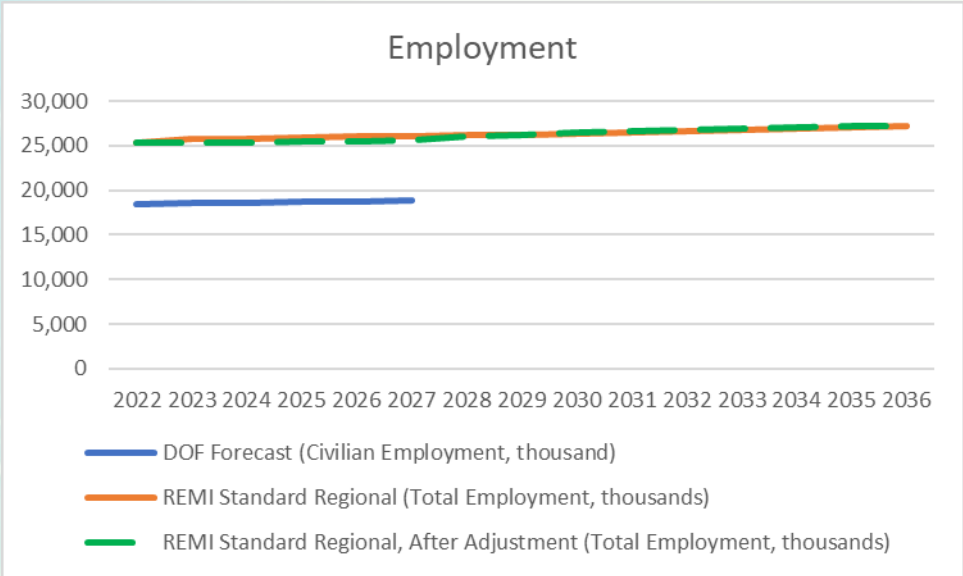
Fill the indicated year range with a percent change to baseline

Years 2022 to 2060 Adjust GDP 0.00 Fill indicated years

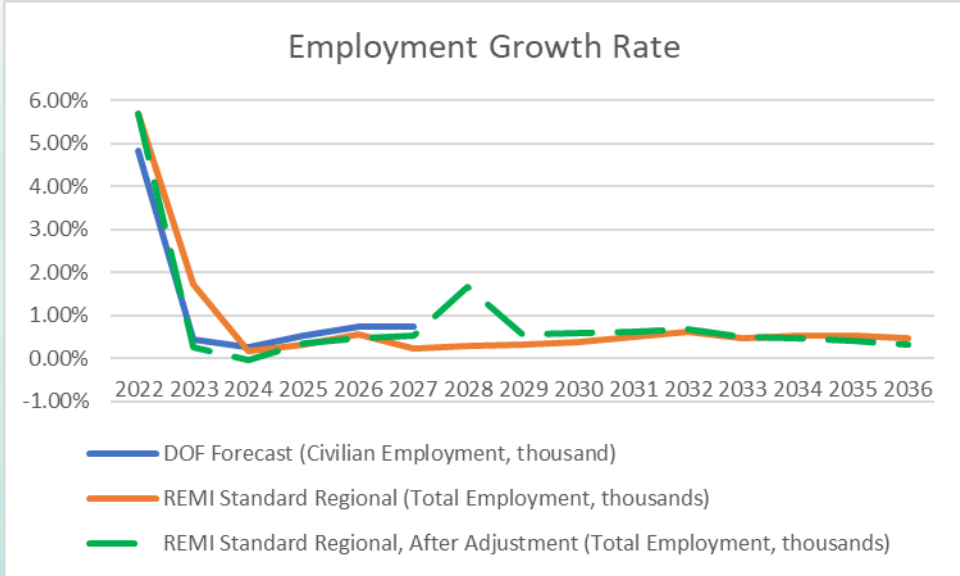
Category	Variable Name	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Total	Total Gross Domestic Product	Billions Chained 2017\$	21822.102											
Income	Personal Income	Billions Current \$	21820.248											
	Wage and Salary Disbursements	Billions Current \$	11105.671											
	Employer Contributions for Employee Pension	Billions Current \$	1549.005											
	Employer Contributions for Government Social Security	Billions Current \$	762.684											
	Proprietors' Income	Billions Current \$	1790.592											
	Dividend Income	Billions Current \$	1804.538											
	Interest Income	Billions Current \$	1622.187											
	Rental Income	Billions Current \$	878.270											
	Social Security benefits	Billions Current \$	1211.508											
	Excluding Social Security benefits	Billions Current \$	37.830											
	Medicare benefits	Billions Current \$	926.088											
	Public assistance medical care benefits	Billions Current \$	827.323											
	Military medical insurance benefits	Billions Current \$	17.721											
	Supplemental security income (SSI) benefits	Billions Current \$	58.946											
	Earned Income Tax Credit (EITC)	Billions Current \$	71.947											
	Supplemental Nutrition Assistance Program (SNAP)	Billions Current \$	127.687											
	Other income maintenance benefits	Billions Current \$	191.274											
State unemployment insurance compensation	Billions Current \$	21.974												
Excluding state unemployment insurance compensation	Billions Current \$	0.463												
Veterans benefits	Billions Current \$	170.510												
Education and training assistance	Billions Current \$	82.937												
Other transfer receipts of individuals from government	Billions Current \$	100.445												
Current transfer receipts of nonprofit institutions	Billions Current \$	88.751												

# After the Regional Control Update

## Employment

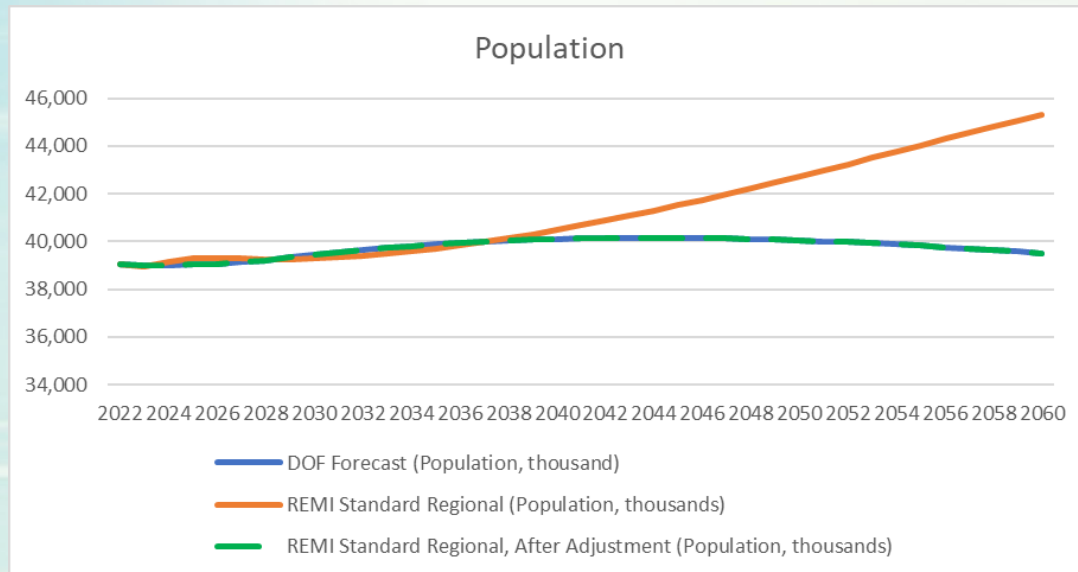


## Employment Growth

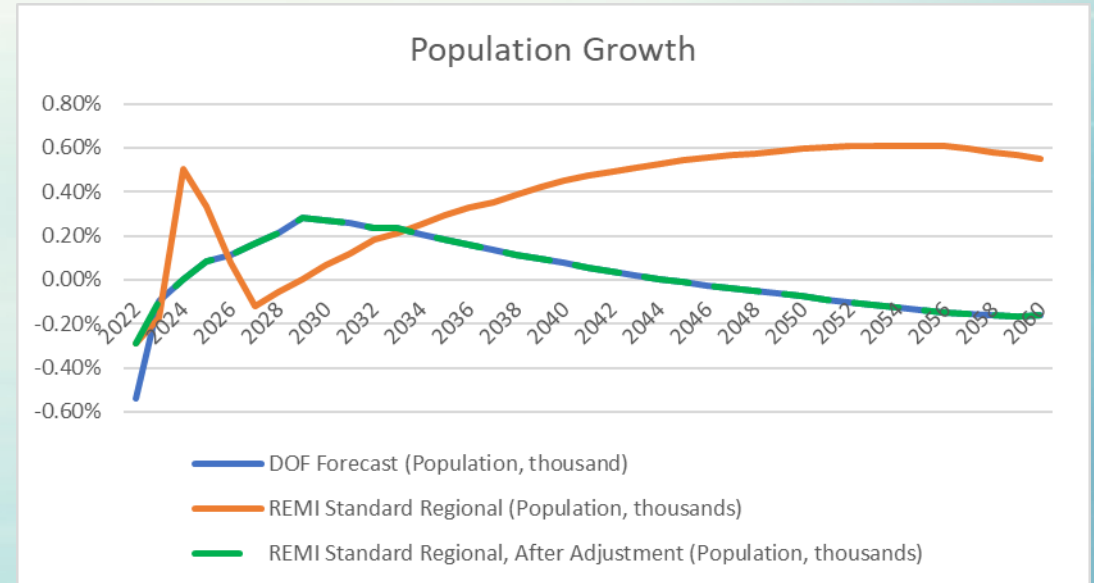


# After the Regional Control Update

## Population

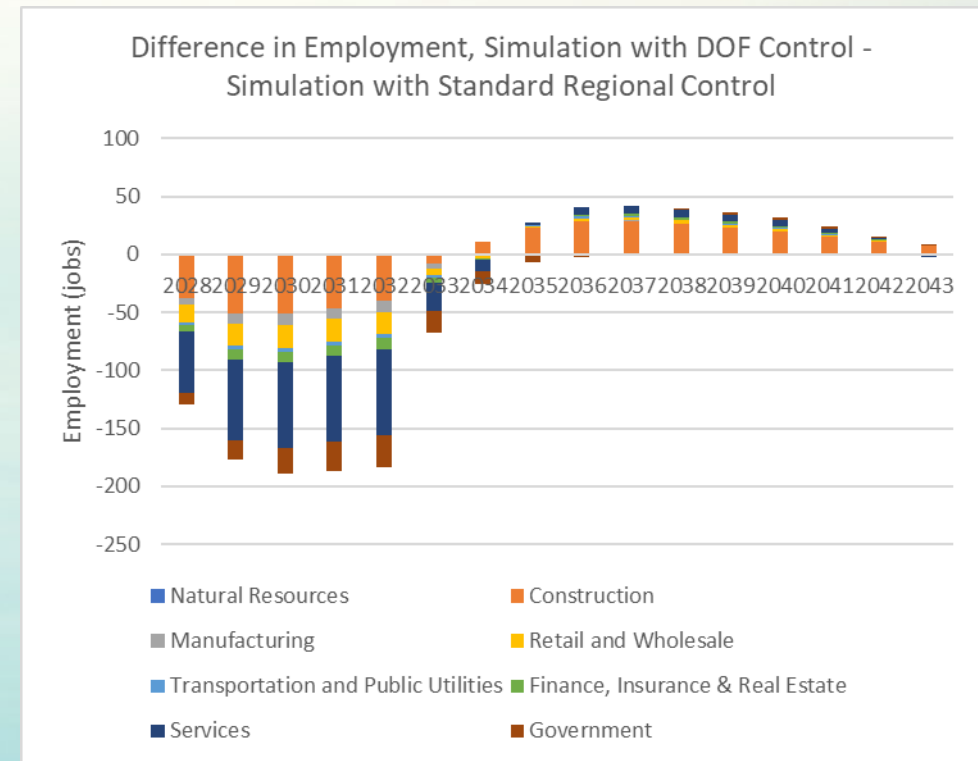
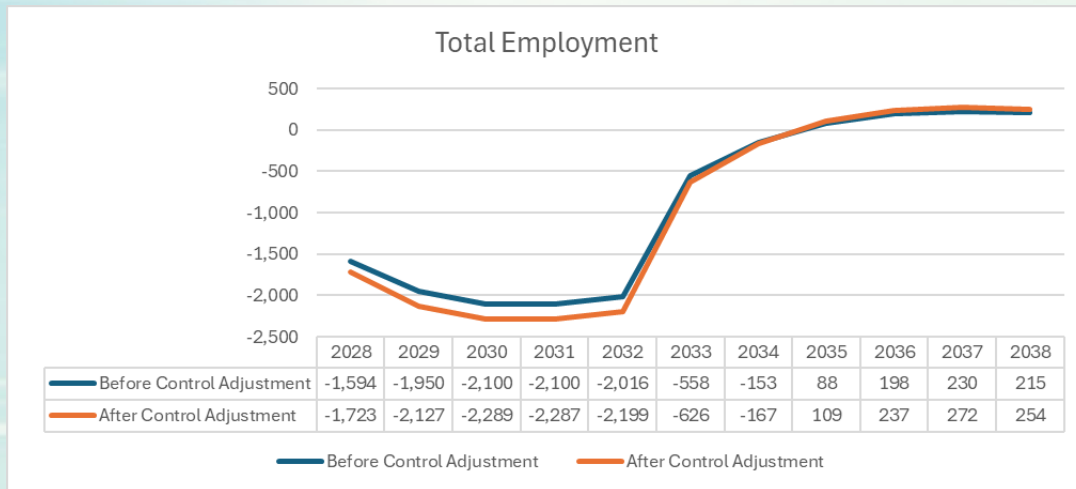


## Population Growth



# Before and After Control Update

Hypothetical example: production cost increase of 100 m\$ in motor vehicle manufacturing from 2028 to 2032



# Conclusion

- We are required by Statute to use the most recent forecasts by the California Department of Finance
- We update the REMI national and regional controls by incorporating the DOF forecasted growth rates into the REMI forecasting
- The approach may be refined if we observe unintuitive relationship between key economic variables, e.g., the relationship between employment and population

# Thank you!

If you would like to know about the topic, please contact:

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