TARIFFS AND THE ECONOMY

what does REMI say? sm

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Regional Economic Models, Inc.

Trade Policy

1. Modeling steel and aluminum tariffs: we show mainstream economic result using REMI model that tariffs negatives outweigh the positives
2. a “what if?” – using tariff revenues to subsidize domestic automotive industry
3. Negotiations and Game Theory: trade as a win-win, but who gets the bigger share of the “surplus”? What if tariffs result in a trade ‘war’?

Trump and Trade Policy

- The Trump administration revived debate over trade with planned tariffs on aluminum and steel imports
- President Trump's comments regarding Chinese imports inspired fear of a trade war

President Trump and First Lady Melania Trump welcome Chinese President Xi Jinping and his wife, Peng Liyuan; Photo: White House

The White House recently announced $50 billion in tariffs on Chinese imports. China responded by proposing tariffs on U.S. goods, adding up to $50 billion. President Trump countered that he was weighing another $100 billion in tariffs on China.

Source: NBC News

U.S.-China Relations

- The controversy rattled global markets, but hope remains the two nations will avoid conflict
  - Trump criticizes U.S-China automobile trade
  - Says China imposes 25% tariff on U.S. cars; U.S. places a 2.5% tariff on Chinese-manufactured cars
  - Refers to this as *"stupid trade"*
- Chinese President Xi Jinping called for "dialogue rather than confrontation" and promised to:
  - Lower restrictions on imported cars
  - Provide greater access to financial markets
  - Strengthen intellectual property rights

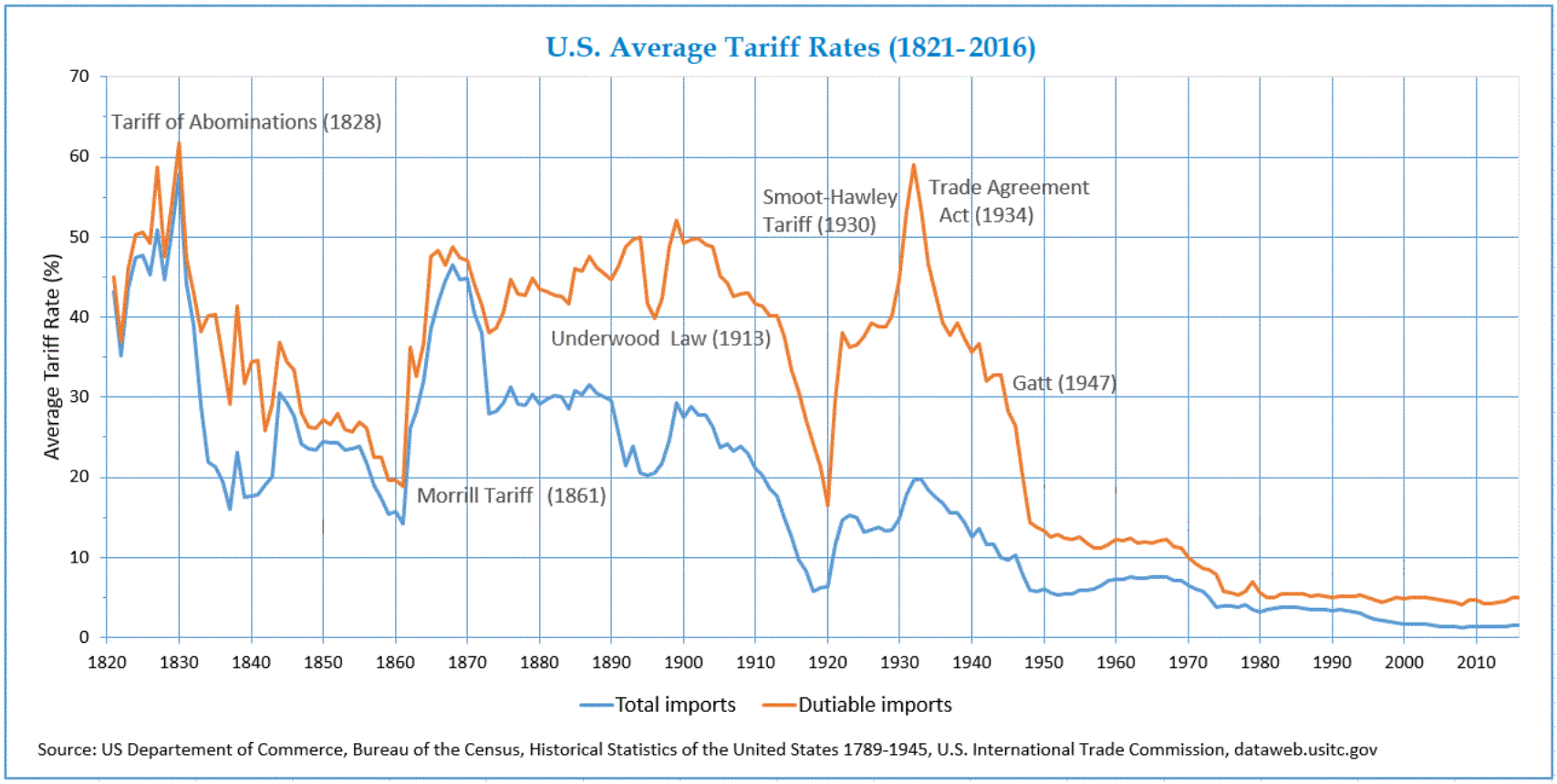
Sources: Bloomberg CNBC, NBC, New York Times; News: Photo: Shutterstock

President's Tariff Proposal

- **25%** ad valorem on **steel** imports
- **10%** ad valorem on **aluminum** imports
- Trump on tariffs: ***"We're going to be very flexible, at the same time, we have some friends and some enemies where we have been tremendously taken advantage of over the years."***
  - Unclear if this proposal will be a universal tariff or a tariff levied only imports from specific countries

Source: New York Times, March 8th 2018

History of US Tariffs



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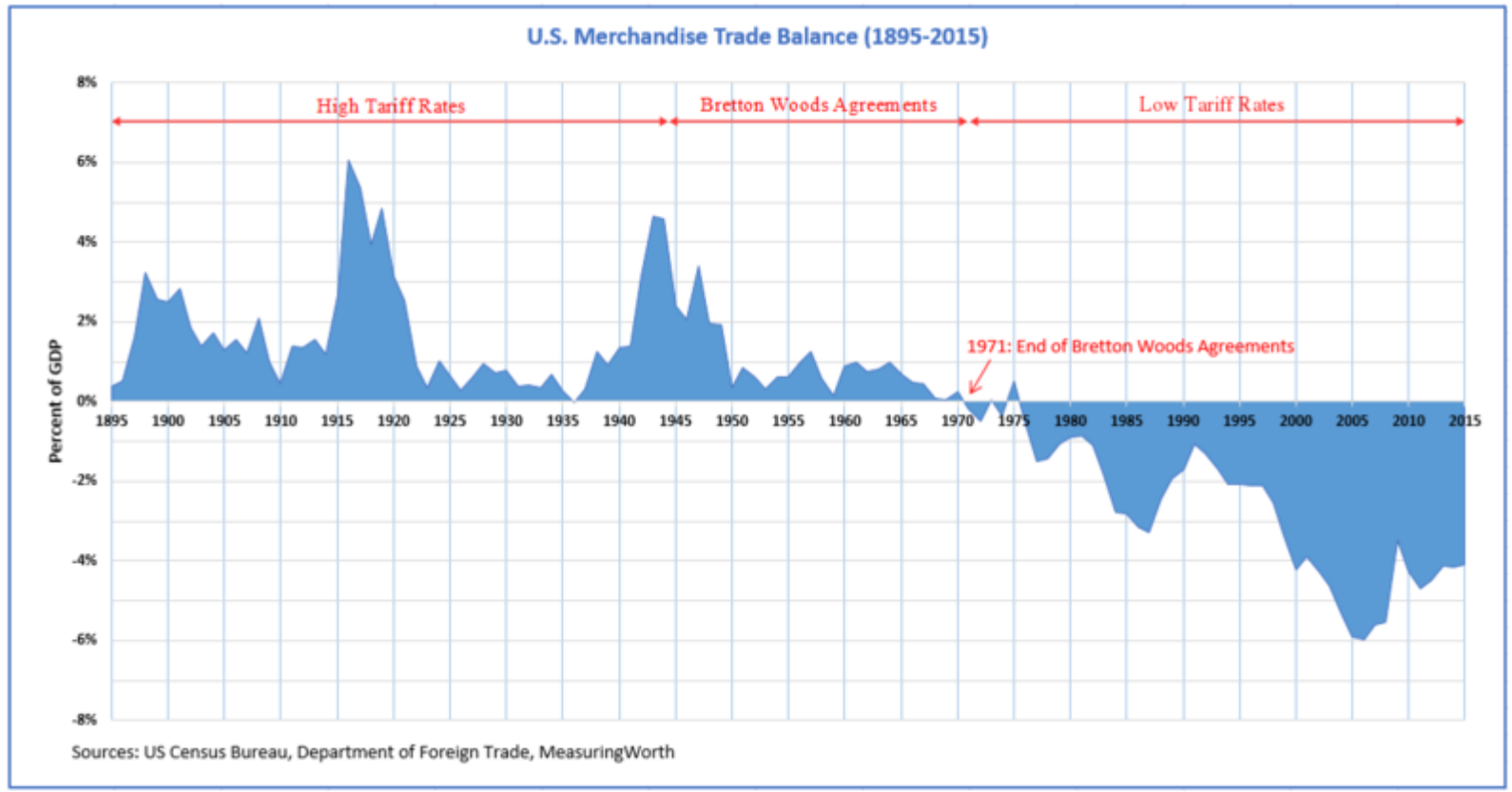
U.S. Trade Balance



Saving-Investment Balance

National Income Identity:

$Y = C + I + G + (EX - IM)$

Where:

- Y: Gross Domestic Product
- C: National Consumption
- I: National Investment
- G: Government Spending
- EX: Export
- IM: Import
- EX—IM: Current Account

The identity can be rewritten as ***(Y – T – C) + (T – G) – I = EX – IM,*** with *T* defined as tax. *(Y-T-C)* is private sector savings, and *(T-G)* is public sector savings.

If we define S as national savings (savings of private sector plus savings of government) and rewrite the identity as:

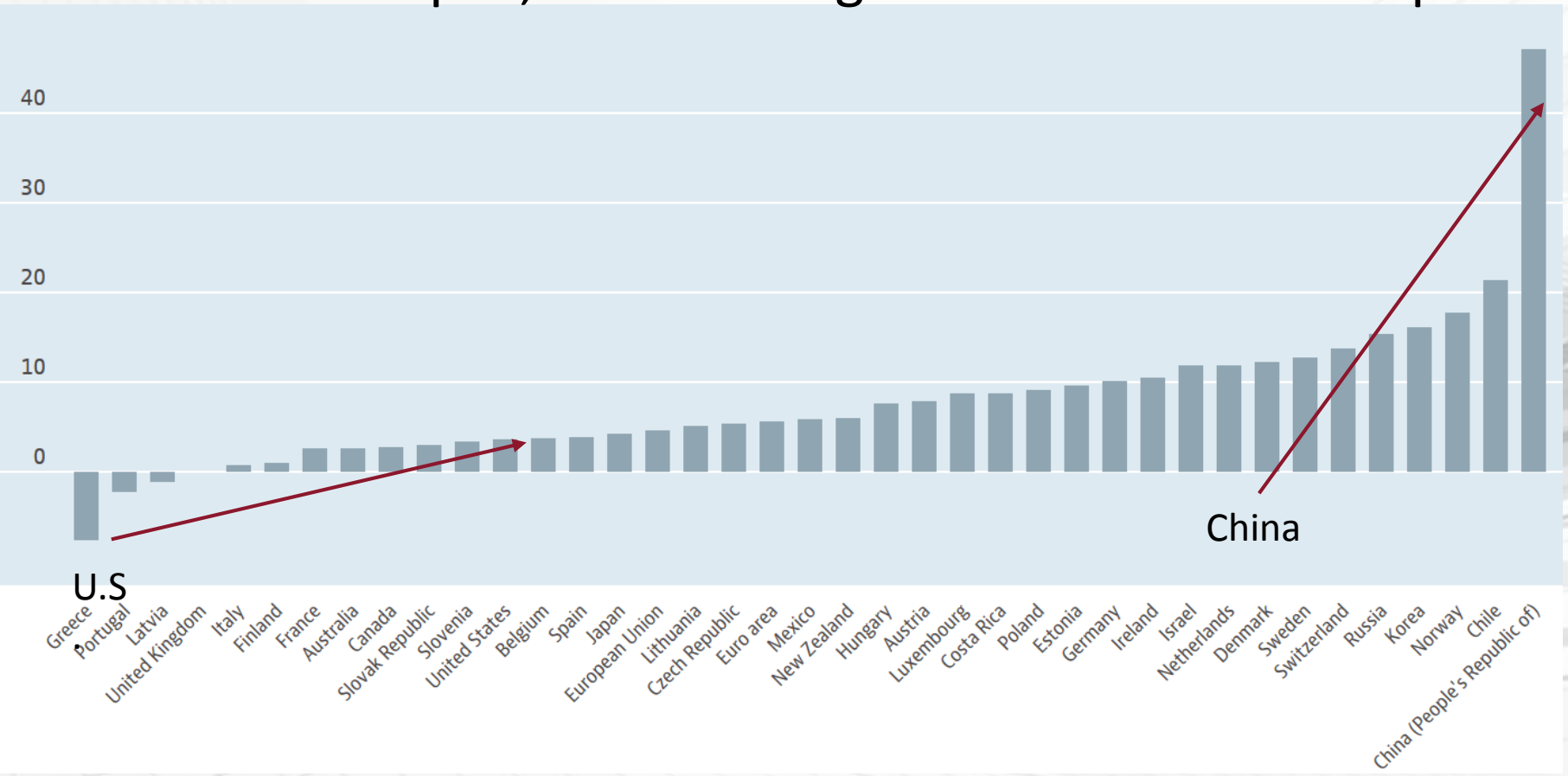
S – I = EX – IM

Thus, negative saving-investment balance (savings – investments) is funded by the trade deficit (EX – IM).

Source: Wikipedia

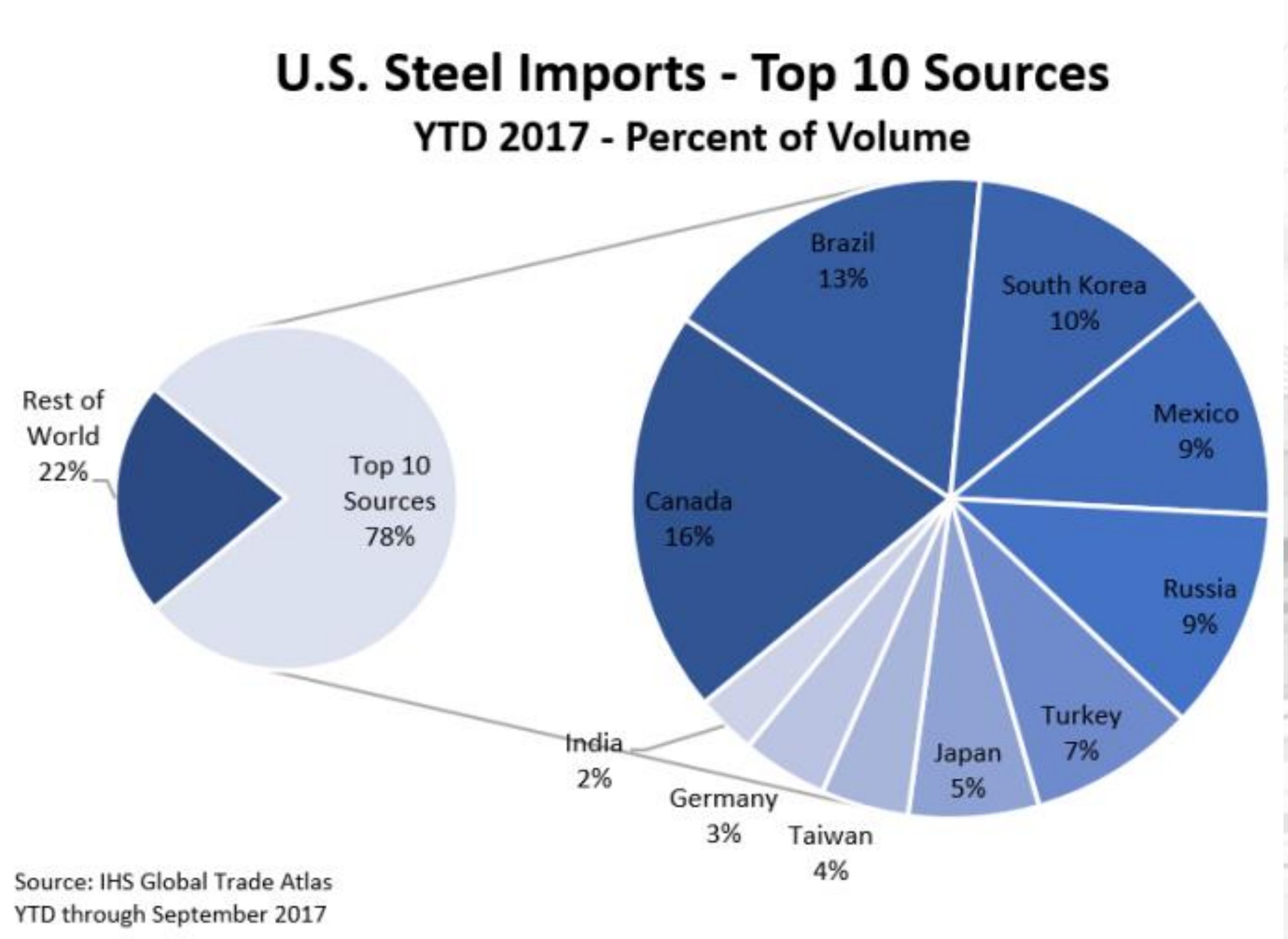
U.S. Trade Balance

- All else equal, lower savings rate ➔ lower net exports



Source: OECD

U.S. Steel Imports



U.S. Aluminum Imports

Table 5. U.S. Aluminum Industry Information for Primary Sector and Semi-finished Products		
	Primary Sector	Semi-finished Products
Domestic Production (Thousands of Metric Tons)	5,456	8,491
Imports (Thousands of Metric Tons)	3,397	1,599
Exports (Thousands of Metric Tons)	362	1,255
U.S. Consumption (Thousands of Metric Tons)	8,491	8,835

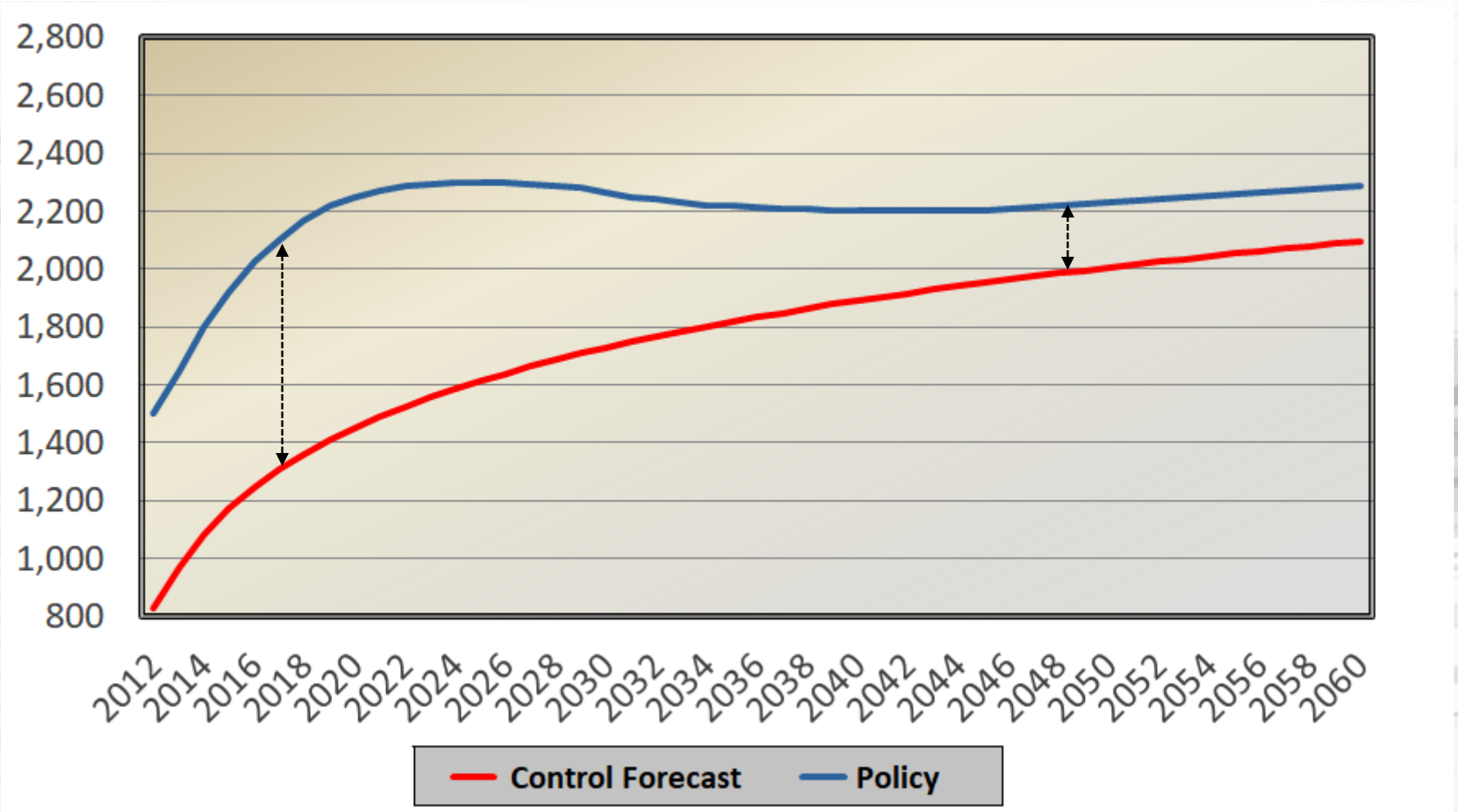
Source: Aluminum Association, 2015 Aluminum Statistical Review

Source: NERA study, 2017.

Steel & Aluminum Tariffs

- Increase in Foreign Import Costs in Primary Metal Manufacturing
  - Accounts for 25% steel tariffs and 10% aluminum tariffs
- Assume tariff revenue returned to consumers via subsidy
  - Decrease in Personal Taxes
    - Tariff percentage of Primary Metal Manufacturing imports
  - Other ways to inject tariff revenue into the economy include:
    - Direct government spending
    - Transfer payments (benefits, entitlements, training, public assistance, etc.)
    - Tax credits
- Model: 50 states + D.C., Period of Study: 2018-2027

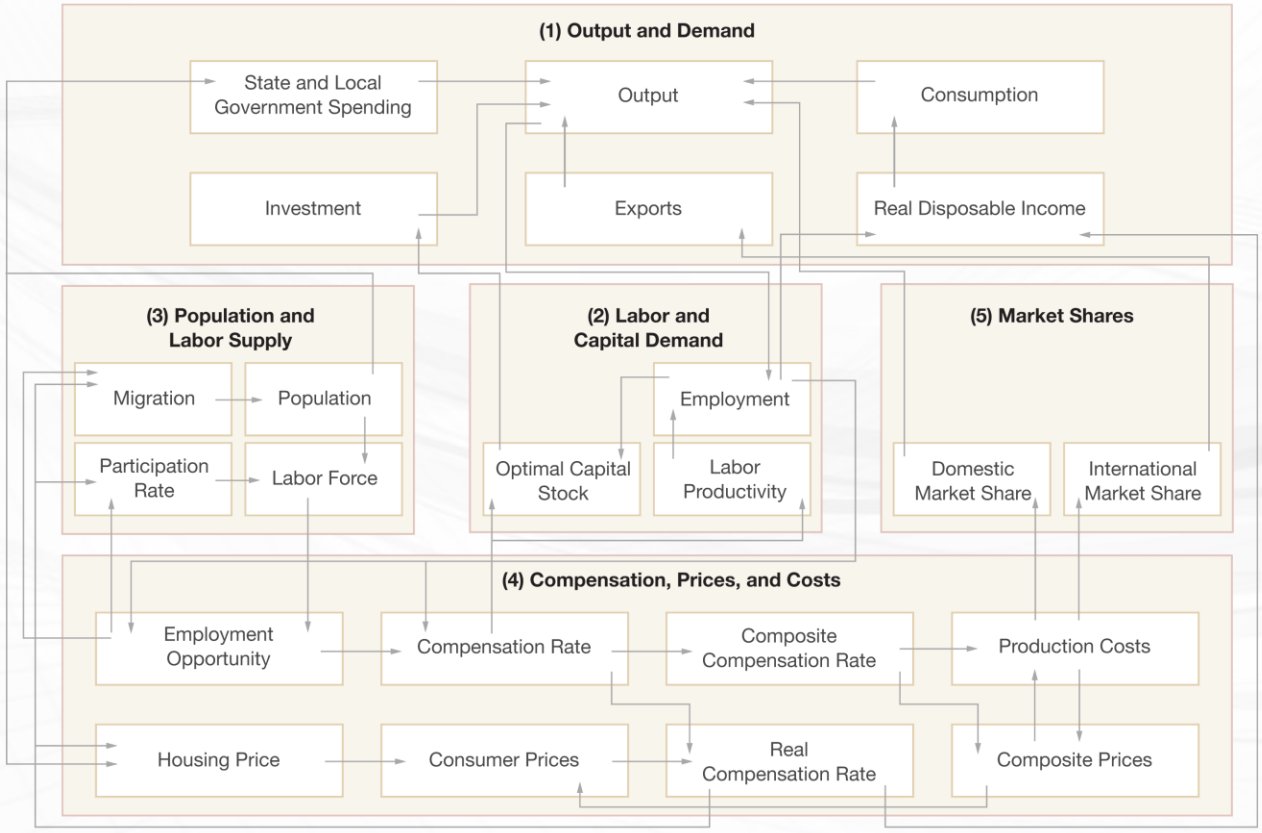
Model Framework



Model Structure

REMI

REMI Model Linkages (Excluding Economic Geography Linkages)



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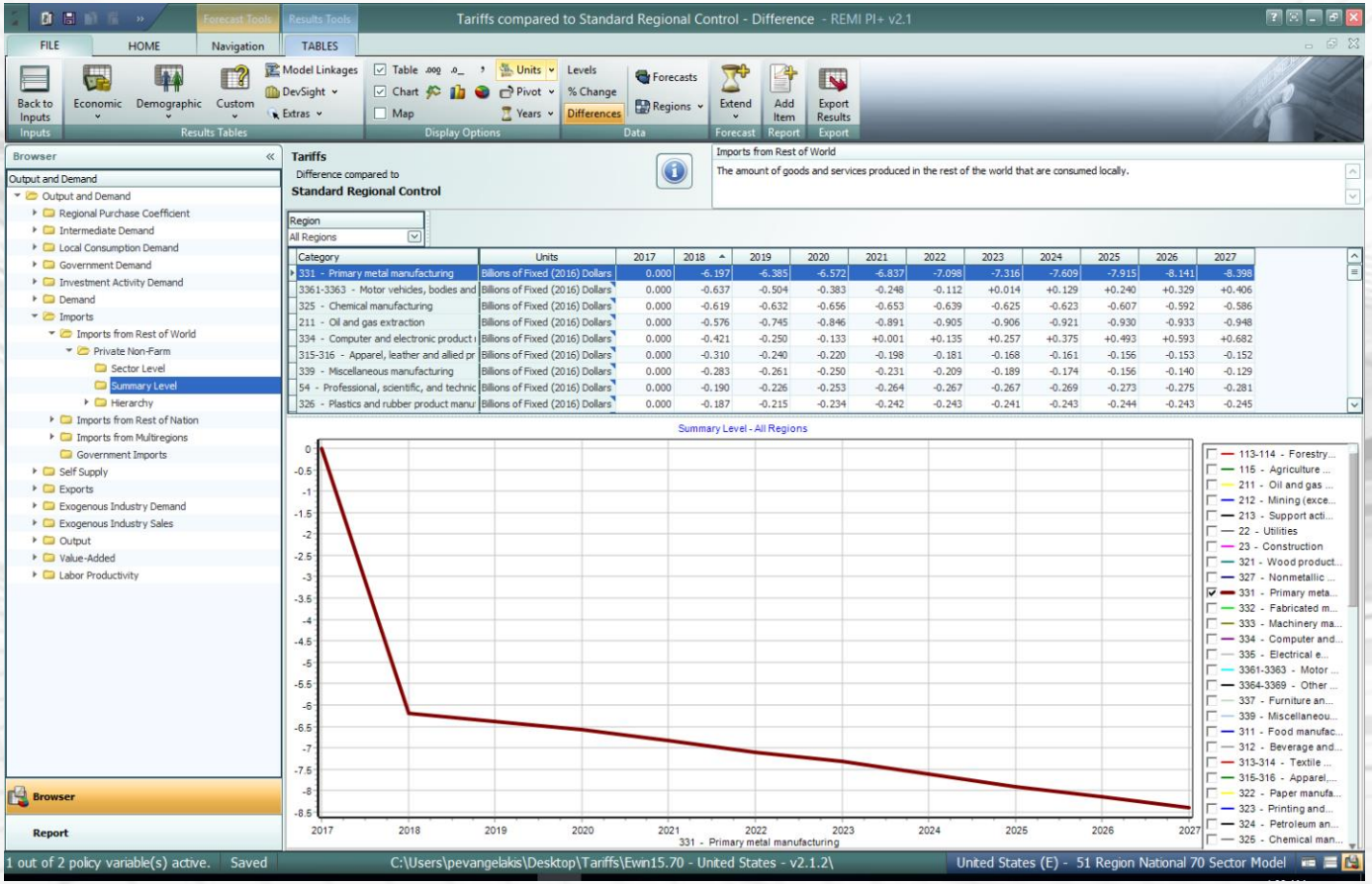
Steel & Aluminum Tariffs

- Primary metal manufacturing imports, national



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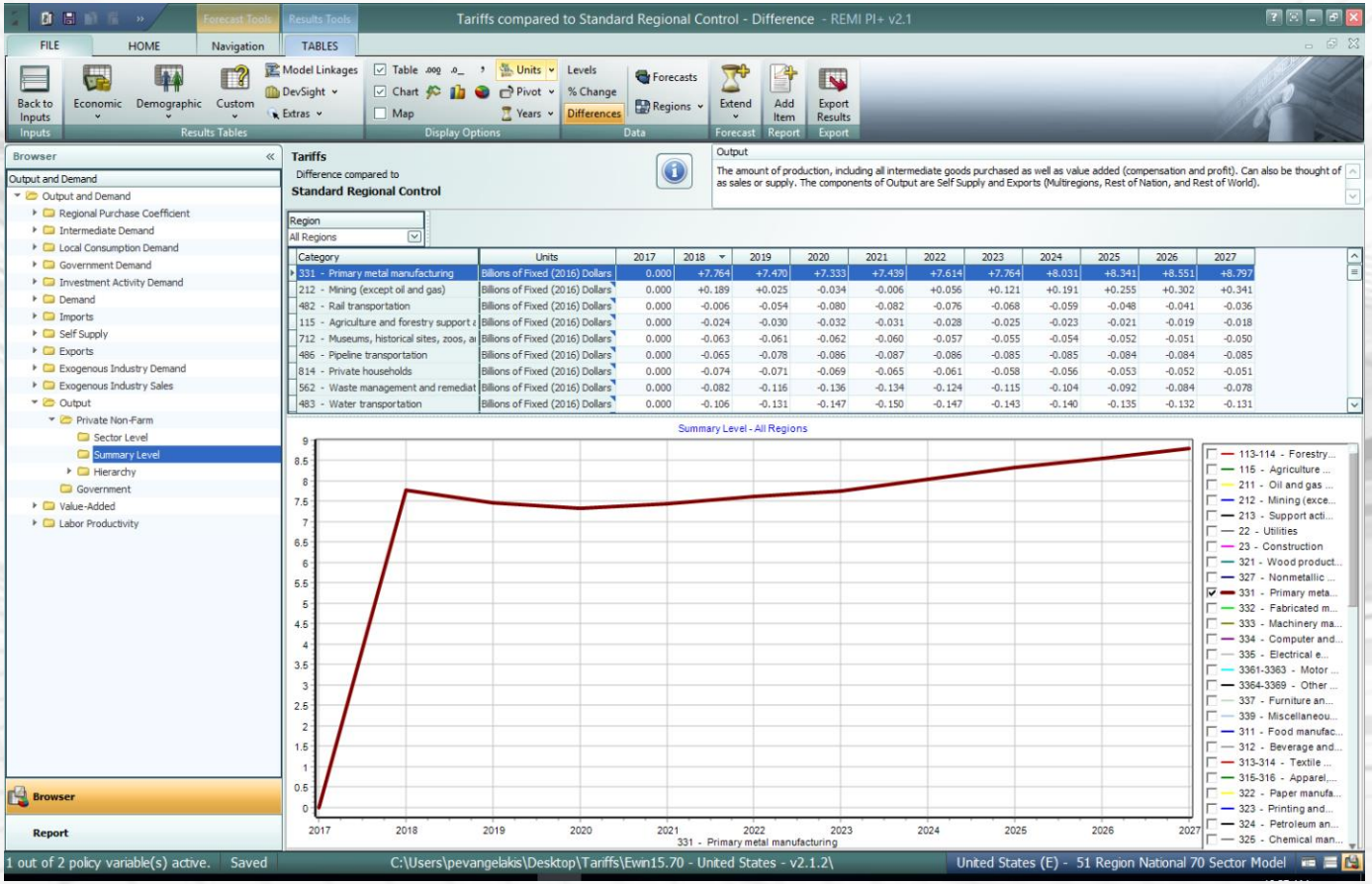
Steel & Aluminum Tariffs

- Primary metal manufacturing output, national



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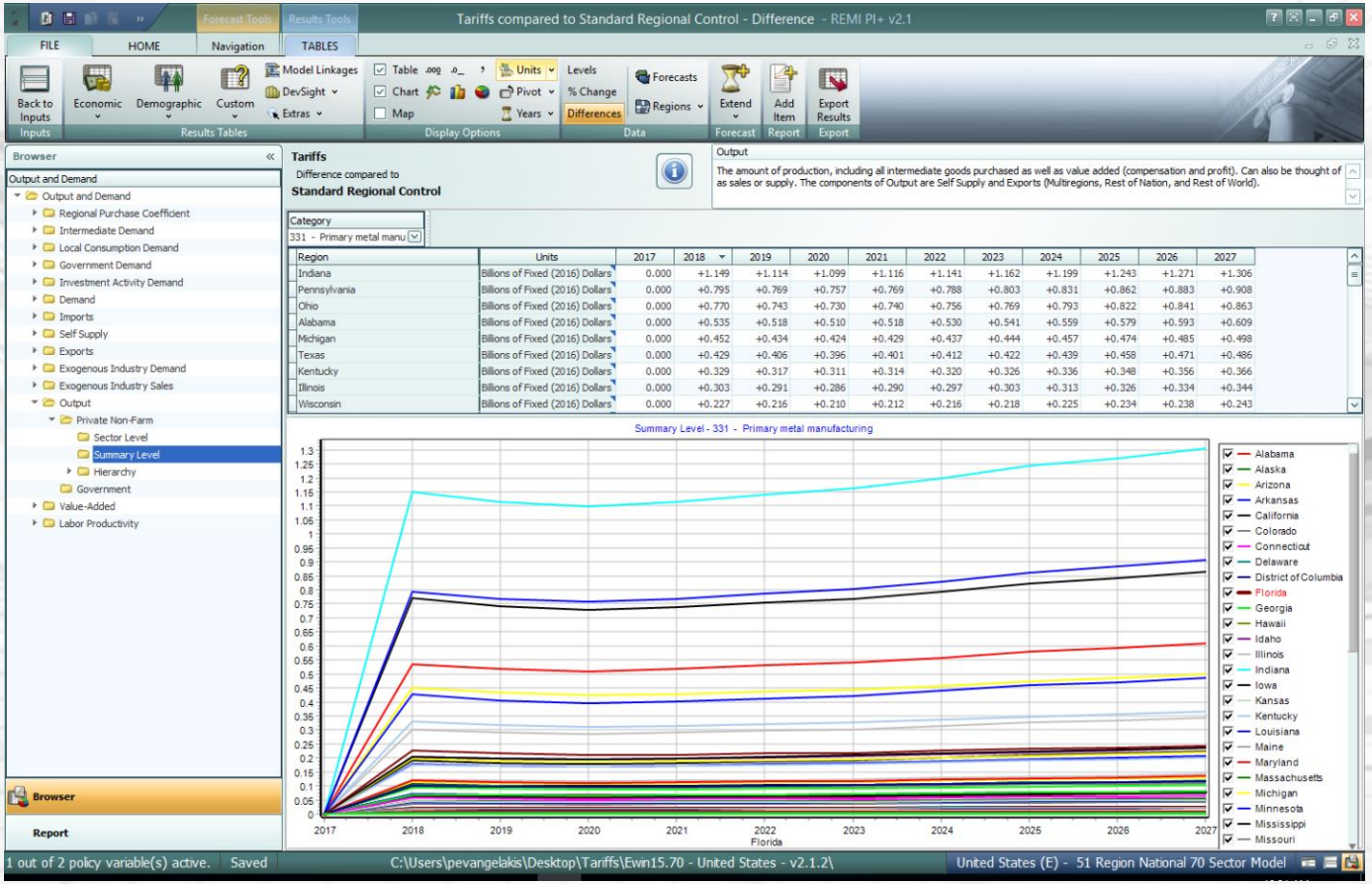
Steel & Aluminum Tariffs

- Primary metal manufacturing output, by state



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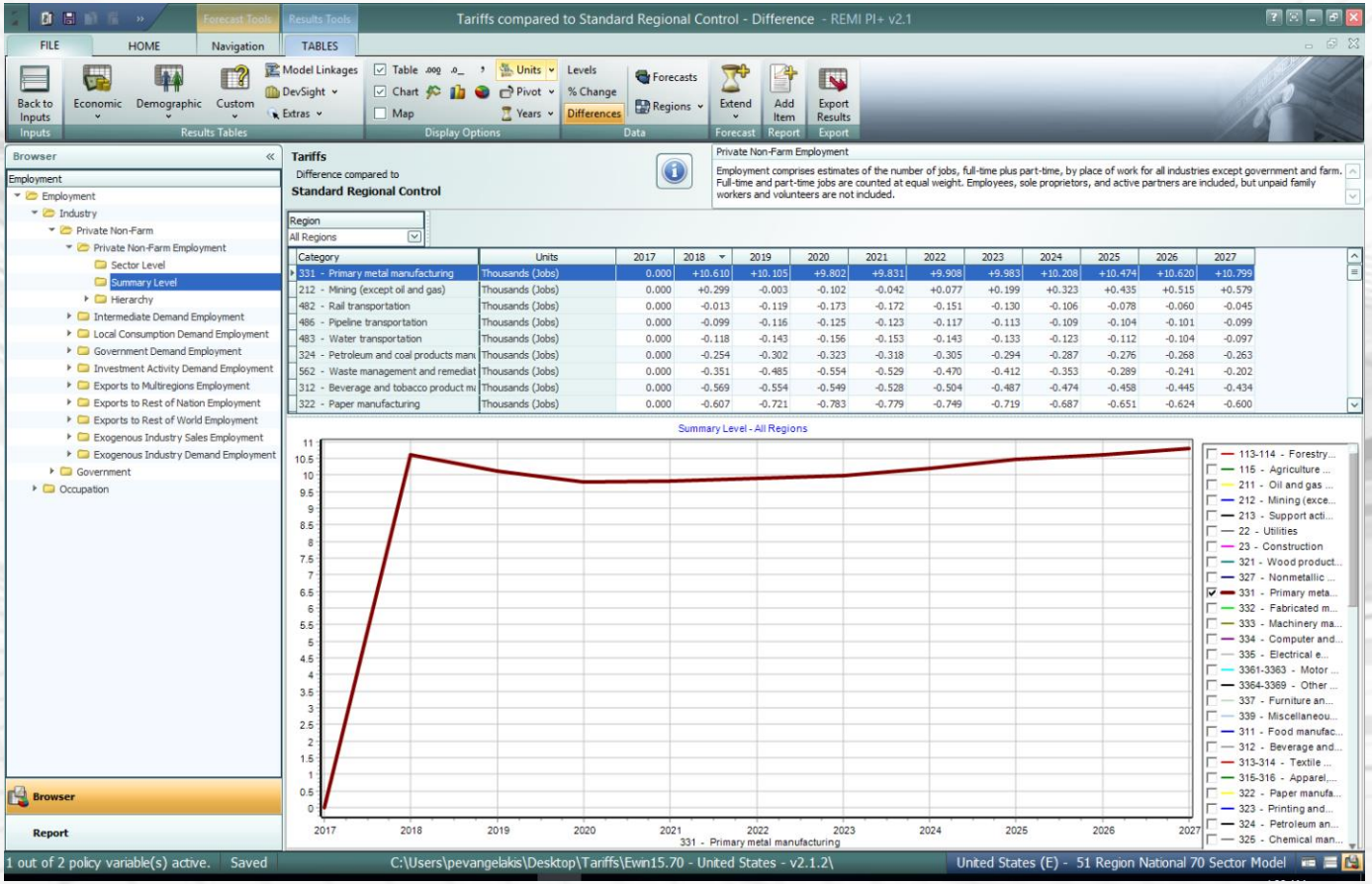
Steel & Aluminum Tariffs

- Primary metal manufacturing employment, national



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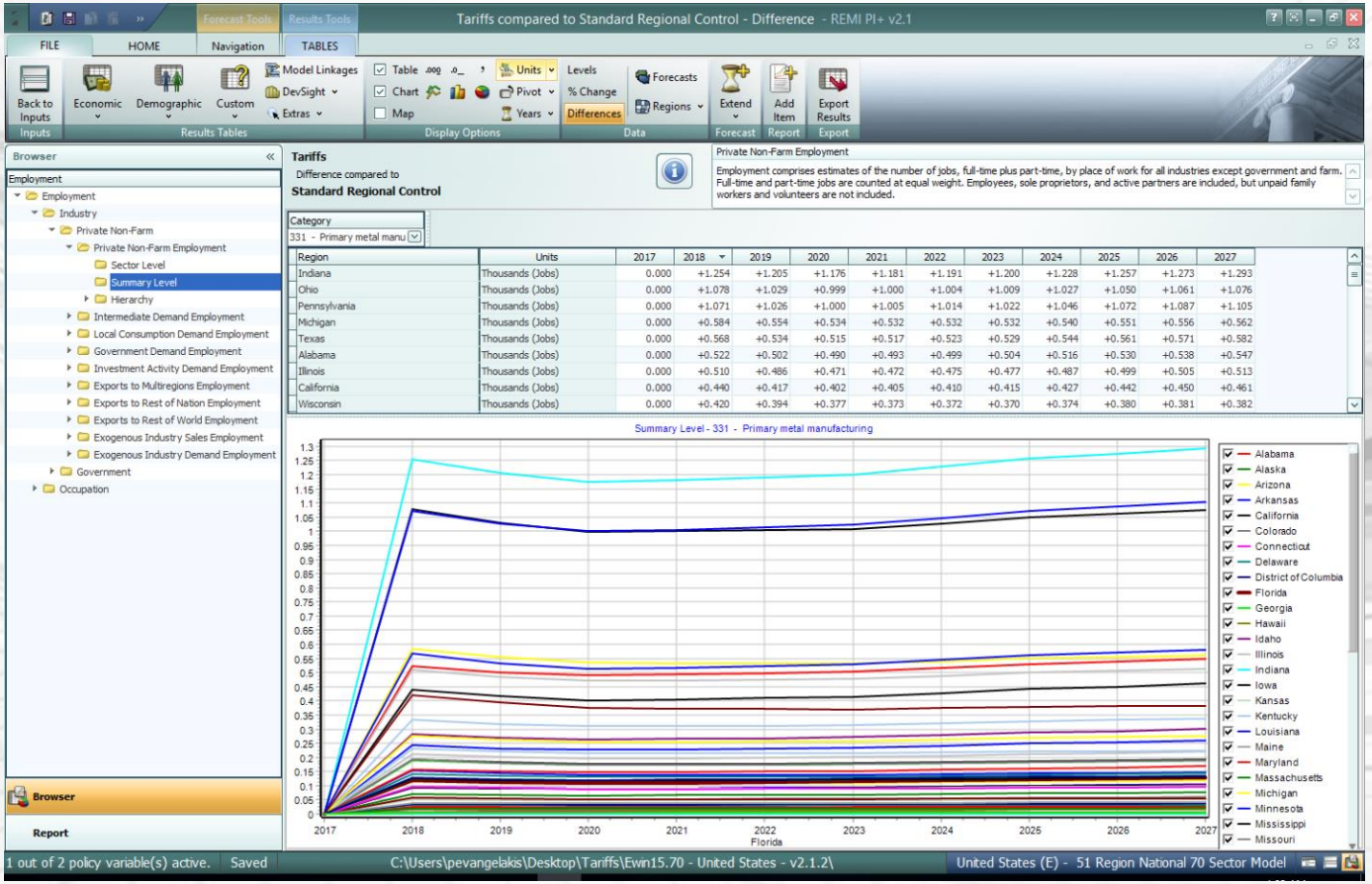
Steel & Aluminum Tariffs

- Primary metal manufacturing employment, by state



Region	Units	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Indiana	Thousands (Jobs)	0.000	+1.254	+1.205	+1.176	+1.181	+1.191	+1.200	+1.228	+1.257	+1.273	+1.293
Ohio	Thousands (Jobs)	0.000	+1.078	+1.029	+0.999	+1.000	+1.004	+1.009	+1.027	+1.050	+1.061	+1.076
Pennsylvania	Thousands (Jobs)	0.000	+1.071	+1.026	+1.000	+1.005	+1.014	+1.022	+1.046	+1.072	+1.087	+1.105
Michigan	Thousands (Jobs)	0.000	+0.584	+0.554	+0.534	+0.532	+0.532	+0.532	+0.540	+0.551	+0.556	+0.562
Texas	Thousands (Jobs)	0.000	+0.568	+0.534	+0.515	+0.517	+0.523	+0.529	+0.544	+0.561	+0.571	+0.582
Alabama	Thousands (Jobs)	0.000	+0.522	+0.502	+0.490	+0.493	+0.499	+0.504	+0.516	+0.530	+0.538	+0.547
Illinois	Thousands (Jobs)	0.000	+0.510	+0.486	+0.471	+0.472	+0.475	+0.477	+0.487	+0.499	+0.505	+0.513
California	Thousands (Jobs)	0.000	+0.440	+0.417	+0.402	+0.405	+0.410	+0.415	+0.427	+0.442	+0.450	+0.461
Wisconsin	Thousands (Jobs)	0.000	+0.420	+0.394	+0.377	+0.373	+0.372	+0.370	+0.374	+0.380	+0.381	+0.382

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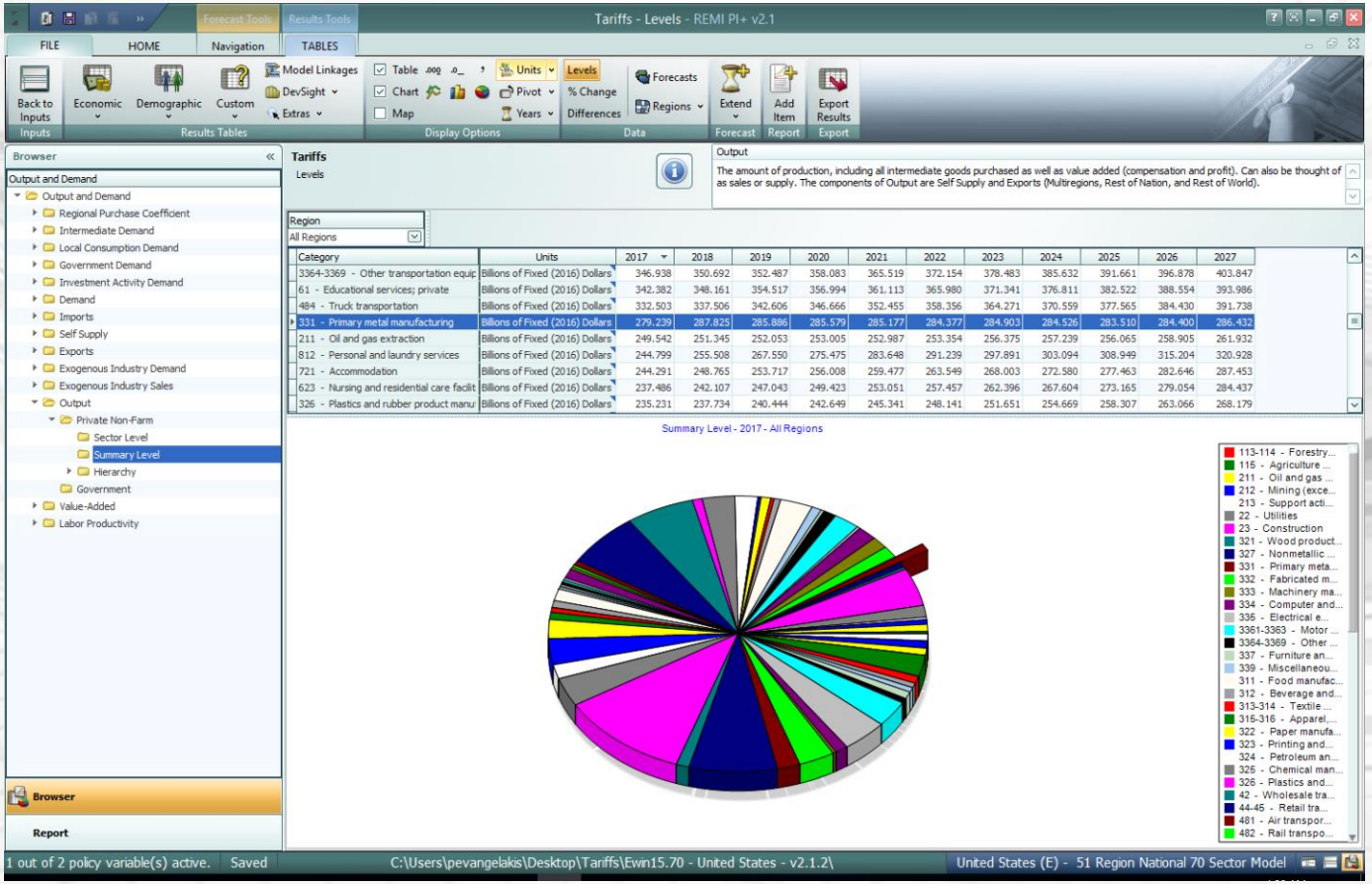
Steel & Aluminum Tariffs

- Size of primary metal manufacturing sector, national



Category	Units	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
3364-3369 - Other transportation equip	Billions of Fixed (2016) Dollars	346.938	350.692	352.487	358.083	365.519	372.154	378.483	385.632	391.661	396.878	403.847
61 - Educational services; private	Billions of Fixed (2016) Dollars	342.382	348.161	354.517	356.994	361.113	365.980	371.341	376.811	382.522	388.554	393.986
484 - Truck transportation	Billions of Fixed (2016) Dollars	332.503	337.506	342.606	346.666	352.455	358.356	364.271	370.559	377.565	384.430	391.738
331 - Primary metal manufacturing	Billions of Fixed (2016) Dollars	279.239	287.825	285.886	285.579	285.177	284.377	284.903	284.526	283.510	284.400	286.432
211 - Oil and gas extraction	Billions of Fixed (2016) Dollars	249.542	251.345	252.053	253.005	252.987	253.354	256.375	257.239	256.065	258.905	261.932
812 - Personal and laundry services	Billions of Fixed (2016) Dollars	244.799	255.508	267.550	275.475	283.648	291.239	297.891	303.094	308.949	315.204	320.928
721 - Accommodation	Billions of Fixed (2016) Dollars	244.291	248.765	253.717	256.008	259.477	263.549	268.003	272.580	277.463	282.646	287.453
623 - Nursing and residential care facilit	Billions of Fixed (2016) Dollars	237.486	242.107	247.043	249.423	253.051	257.457	262.396	267.604	273.165	279.054	284.437
326 - Plastics and rubber product manu	Billions of Fixed (2016) Dollars	235.231	237.734	240.444	242.649	245.341	248.141	251.651	254.669	258.307	263.066	268.179

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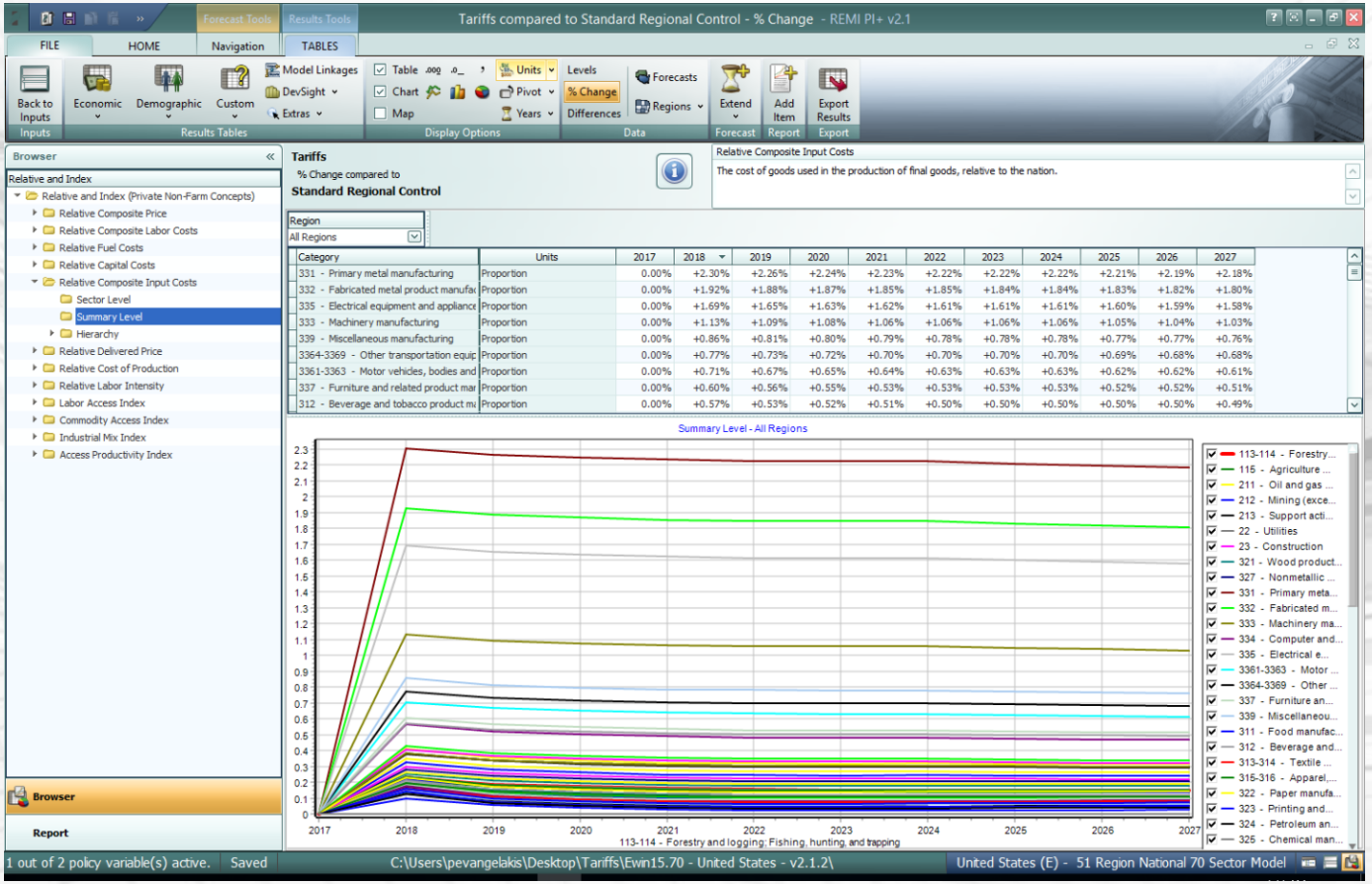
Steel & Aluminum Tariffs

- Input costs, by sector



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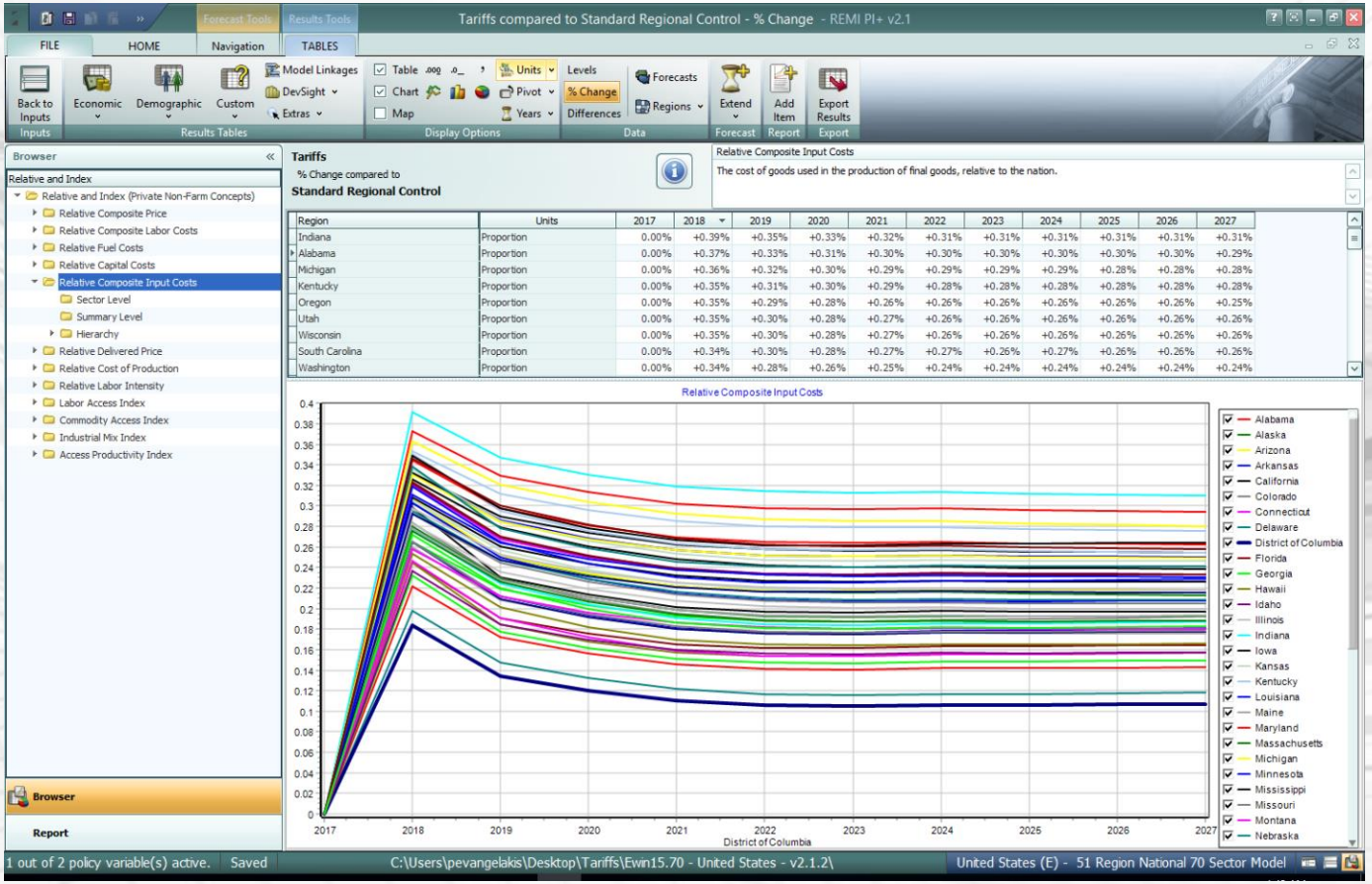
Steel & Aluminum Tariffs

- Input costs, by state



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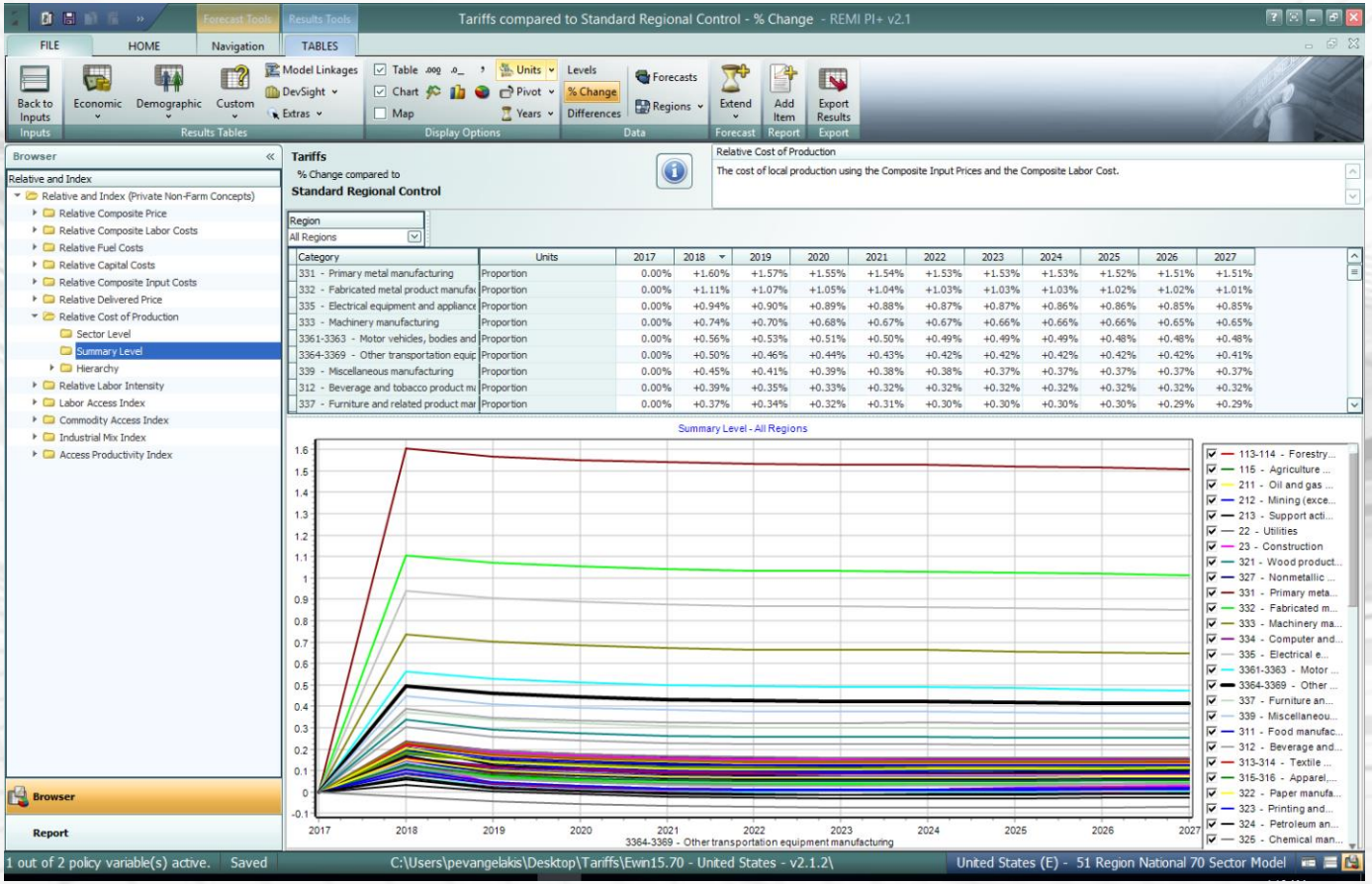
Steel & Aluminum Tariffs

- Production costs, by sector



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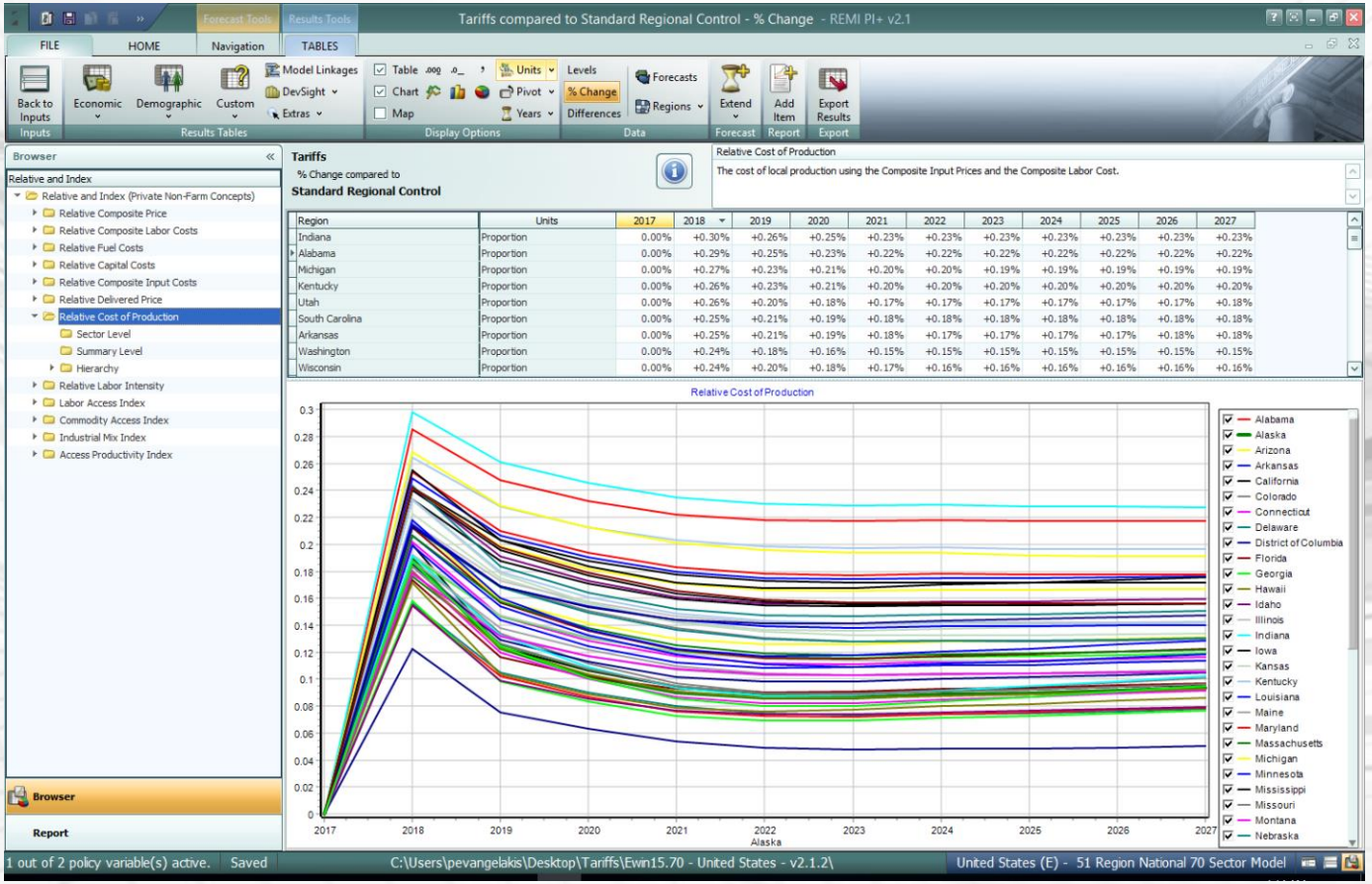
Steel & Aluminum Tariffs

- Production costs, by state

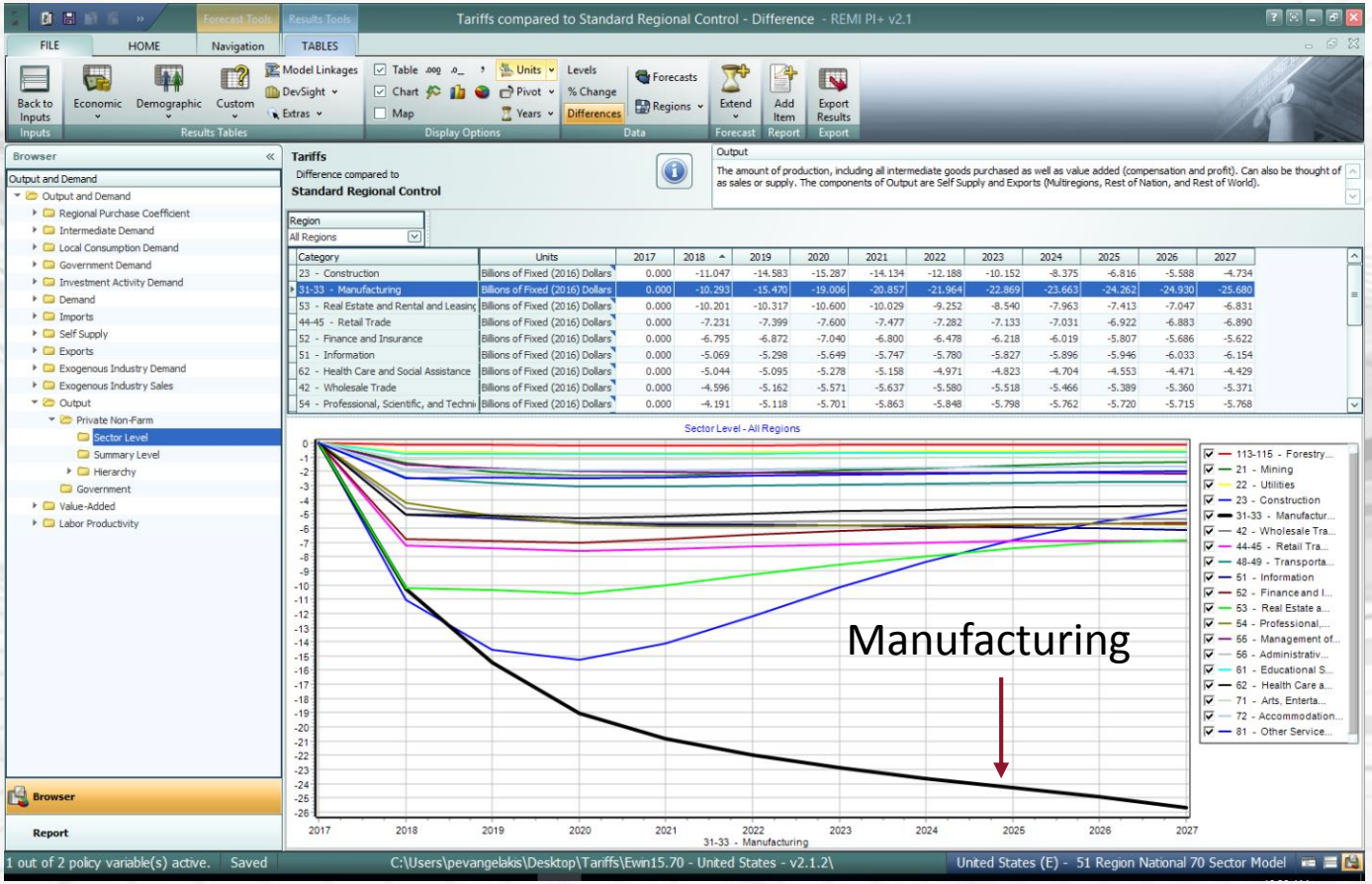


Region	Units	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Indiana	Proportion	0.00%	+0.30%	+0.26%	+0.25%	+0.23%	+0.23%	+0.23%	+0.23%	+0.23%	+0.23%	+0.23%
Alabama	Proportion	0.00%	+0.29%	+0.25%	+0.23%	+0.22%	+0.22%	+0.22%	+0.22%	+0.22%	+0.22%	+0.22%
Michigan	Proportion	0.00%	+0.27%	+0.23%	+0.21%	+0.20%	+0.20%	+0.19%	+0.19%	+0.19%	+0.19%	+0.19%
Kentucky	Proportion	0.00%	+0.26%	+0.23%	+0.21%	+0.20%	+0.20%	+0.20%	+0.20%	+0.20%	+0.20%	+0.20%
Utah	Proportion	0.00%	+0.26%	+0.20%	+0.18%	+0.17%	+0.17%	+0.17%	+0.17%	+0.17%	+0.17%	+0.18%
South Carolina	Proportion	0.00%	+0.25%	+0.21%	+0.19%	+0.18%	+0.18%	+0.18%	+0.18%	+0.18%	+0.18%	+0.18%
Arkansas	Proportion	0.00%	+0.25%	+0.21%	+0.19%	+0.18%	+0.17%	+0.17%	+0.17%	+0.17%	+0.18%	+0.18%
Washington	Proportion	0.00%	+0.24%	+0.18%	+0.16%	+0.15%	+0.15%	+0.15%	+0.15%	+0.15%	+0.15%	+0.15%
Wisconsin	Proportion	0.00%	+0.24%	+0.20%	+0.18%	+0.17%	+0.16%	+0.16%	+0.16%	+0.16%	+0.16%	+0.16%

what does REMI say? [sm]

Steel & Aluminum Tariffs

- Manufacturing output, national



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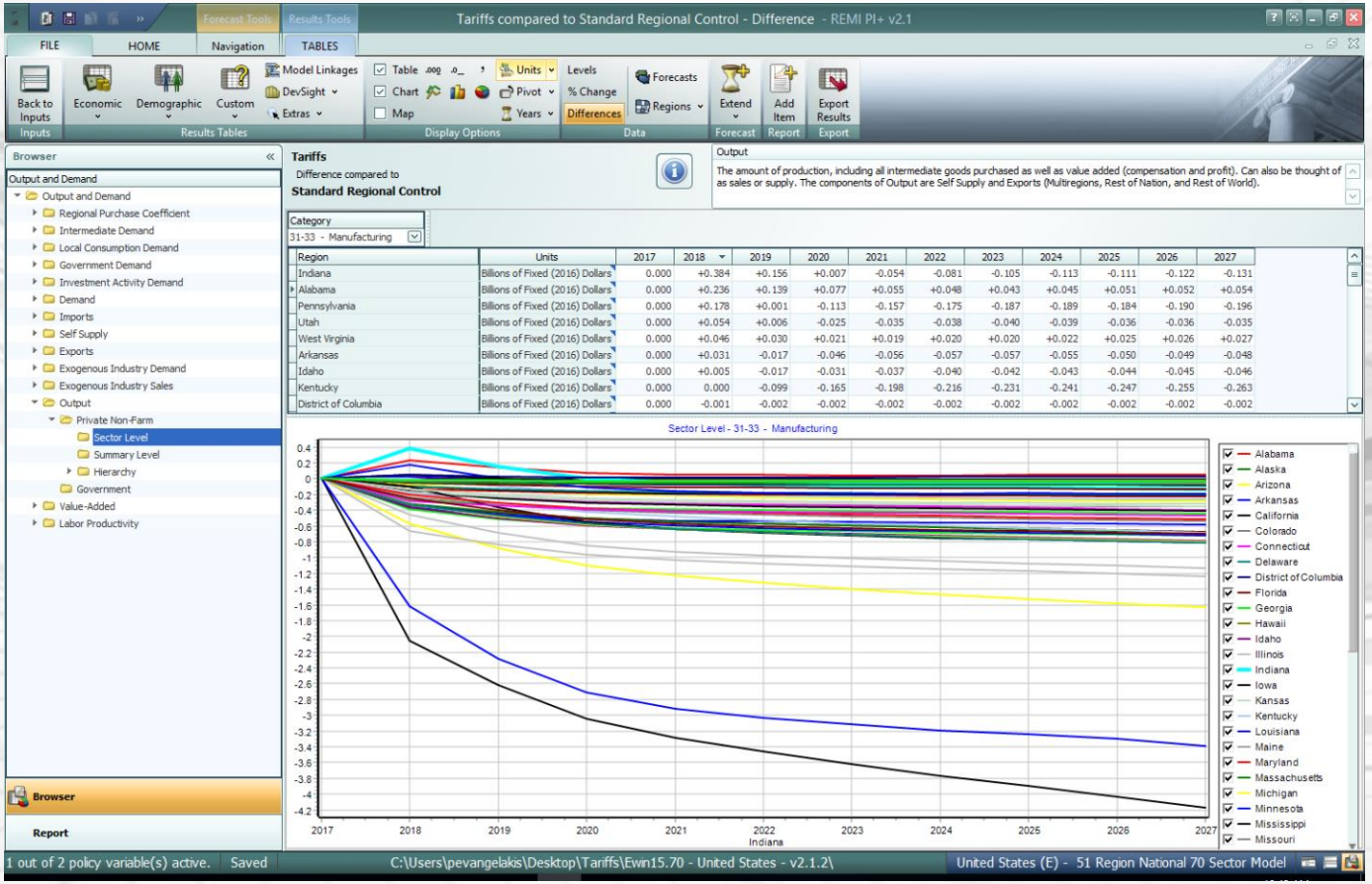
Steel & Aluminum Tariffs

- Manufacturing output, by state



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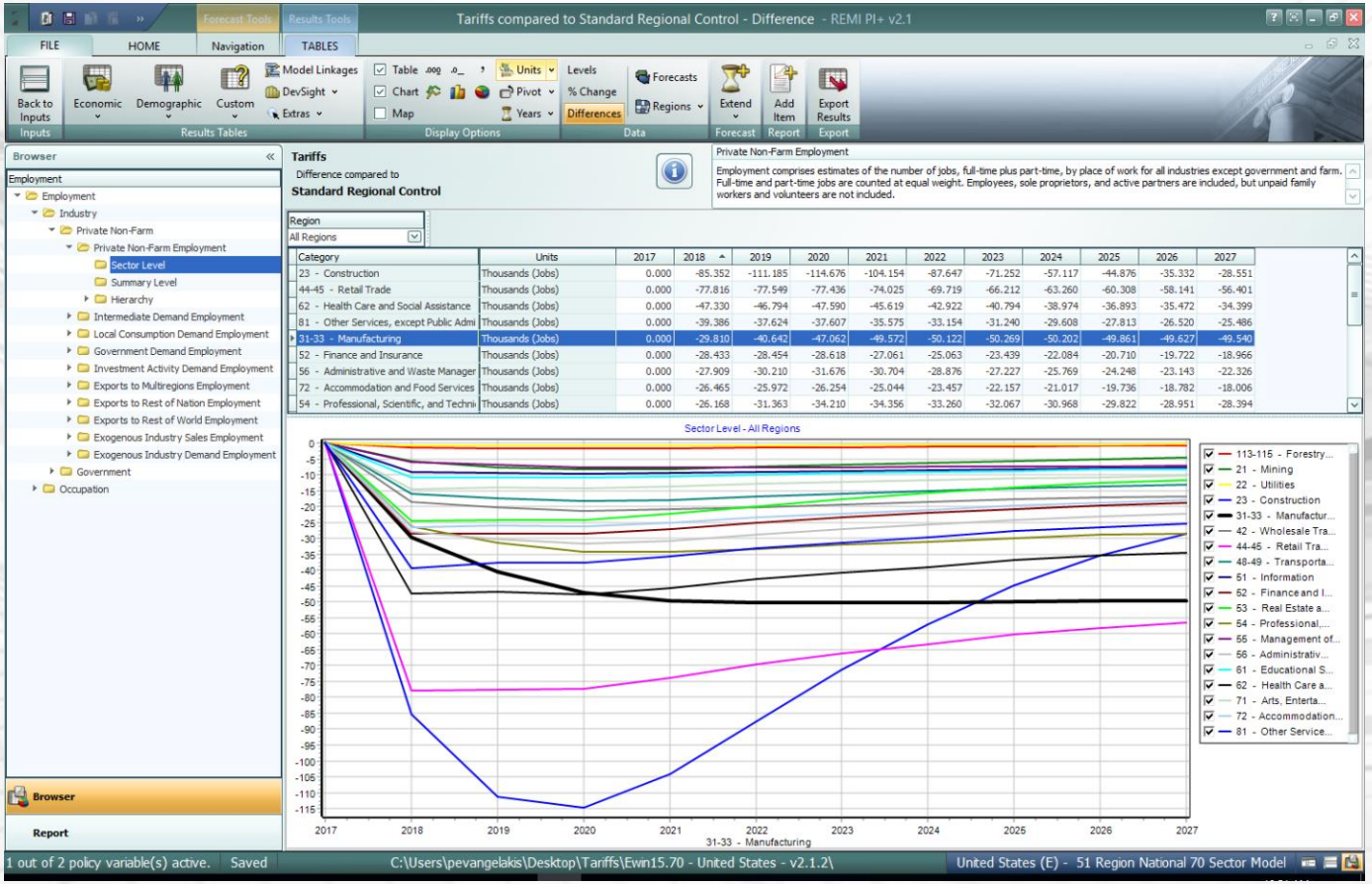
Steel & Aluminum Tariffs

- Manufacturing employment, national



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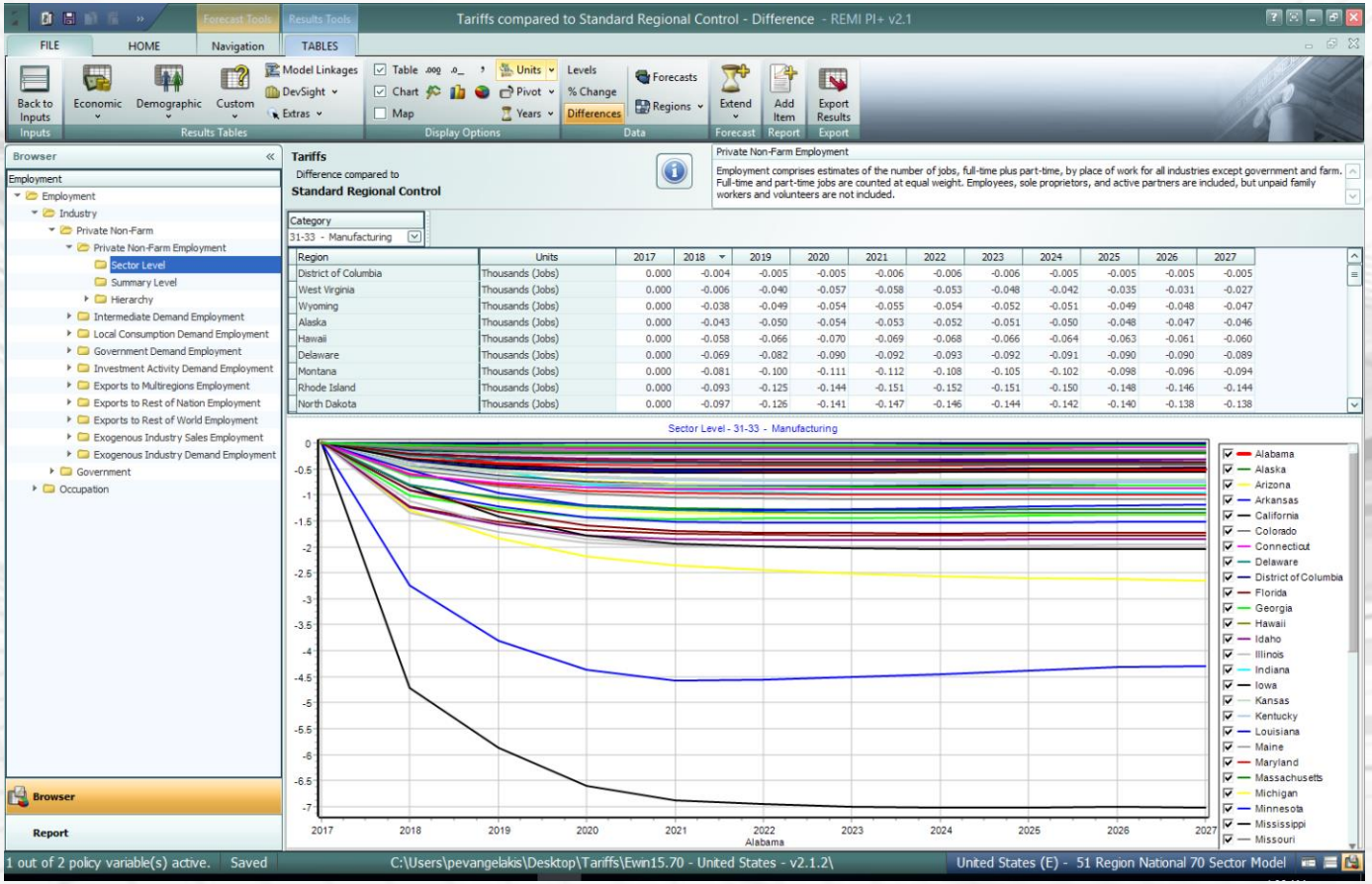
Steel & Aluminum Tariffs

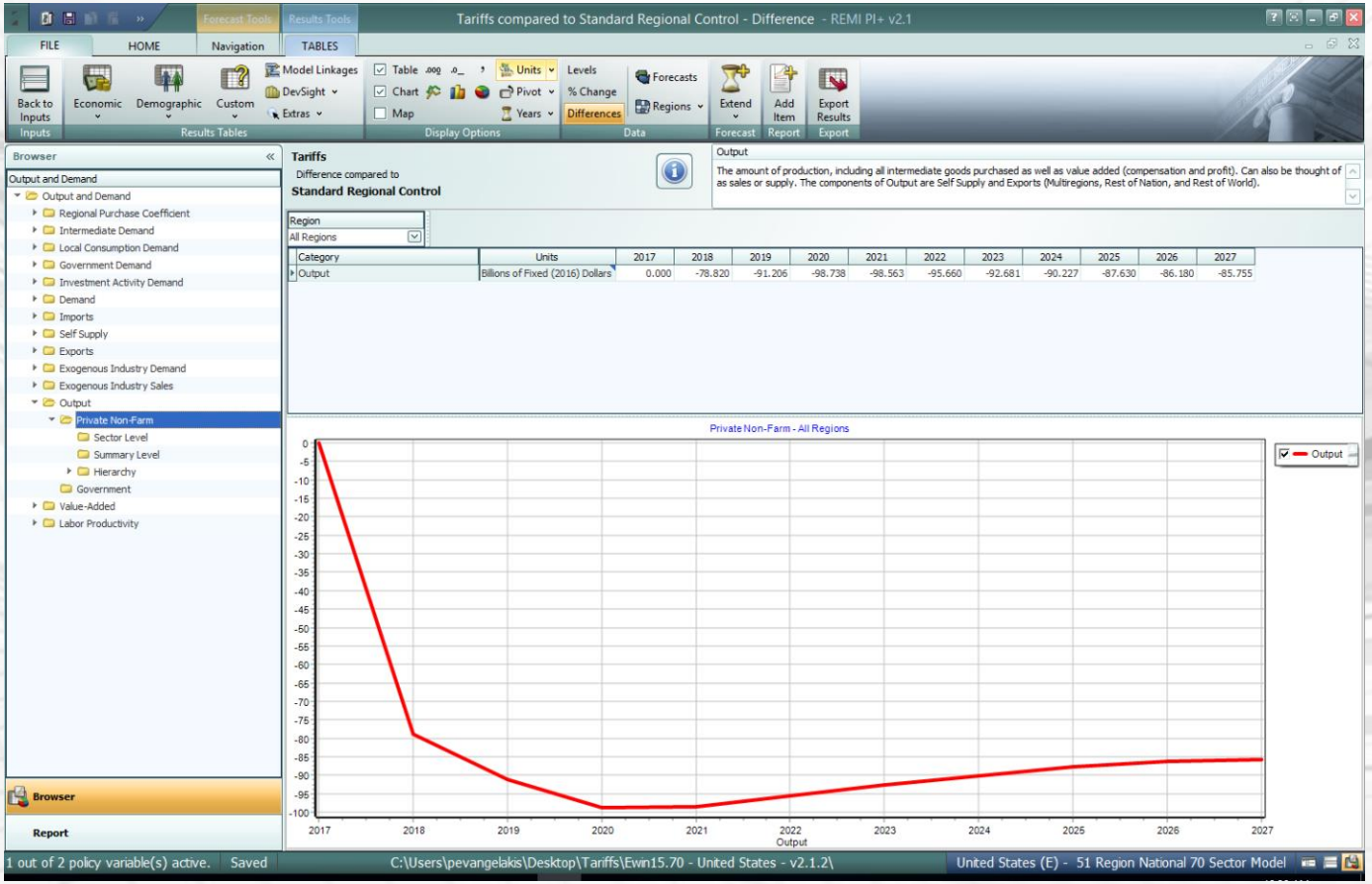
- Manufacturing employment, by state



what does REMI say? [sm]

Steel & Aluminum Tariffs

- Economy-wide output, national



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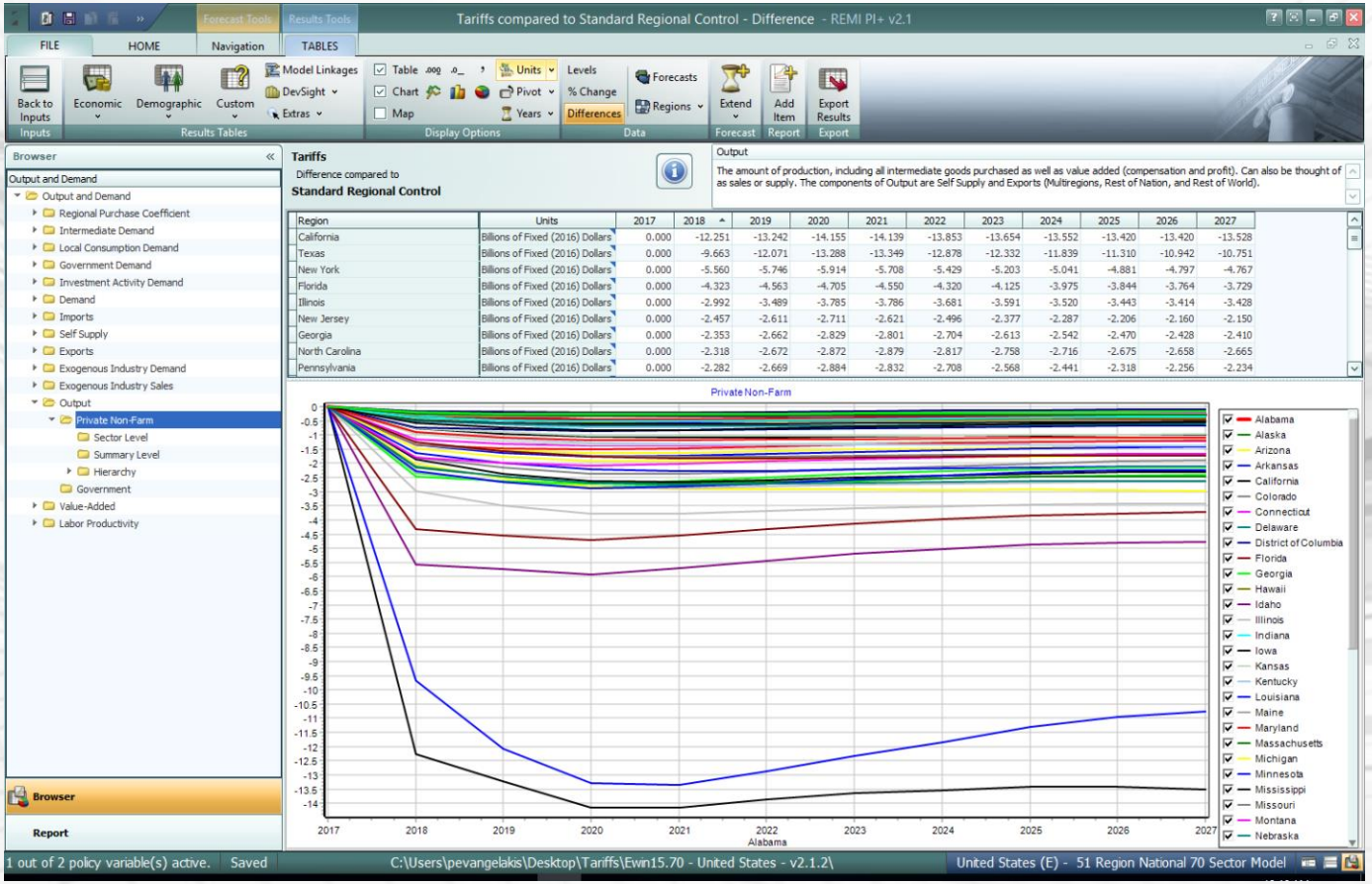
Steel & Aluminum Tariffs

- Economy-wide output, by state



Region	Units	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
California	Billions of Fixed (2016) Dollars	0.000	-12.251	-13.242	-14.155	-14.139	-13.853	-13.654	-13.552	-13.420	-13.420	-13.528
Texas	Billions of Fixed (2016) Dollars	0.000	-9.663	-12.071	-13.288	-13.349	-12.878	-12.332	-11.839	-11.310	-10.942	-10.751
New York	Billions of Fixed (2016) Dollars	0.000	-5.560	-5.746	-5.914	-5.708	-5.429	-5.203	-5.041	-4.881	-4.797	-4.767
Florida	Billions of Fixed (2016) Dollars	0.000	-4.323	-4.563	-4.705	-4.550	-4.320	-4.125	-3.975	-3.844	-3.764	-3.729
Illinois	Billions of Fixed (2016) Dollars	0.000	-2.992	-3.489	-3.785	-3.786	-3.681	-3.591	-3.520	-3.443	-3.414	-3.428
New Jersey	Billions of Fixed (2016) Dollars	0.000	-2.457	-2.611	-2.711	-2.621	-2.496	-2.377	-2.287	-2.206	-2.160	-2.150
Georgia	Billions of Fixed (2016) Dollars	0.000	-2.353	-2.662	-2.829	-2.801	-2.704	-2.613	-2.542	-2.470	-2.428	-2.410
North Carolina	Billions of Fixed (2016) Dollars	0.000	-2.318	-2.672	-2.872	-2.879	-2.817	-2.758	-2.716	-2.675	-2.658	-2.665
Pennsylvania	Billions of Fixed (2016) Dollars	0.000	-2.282	-2.669	-2.884	-2.832	-2.708	-2.568	-2.441	-2.318	-2.256	-2.234

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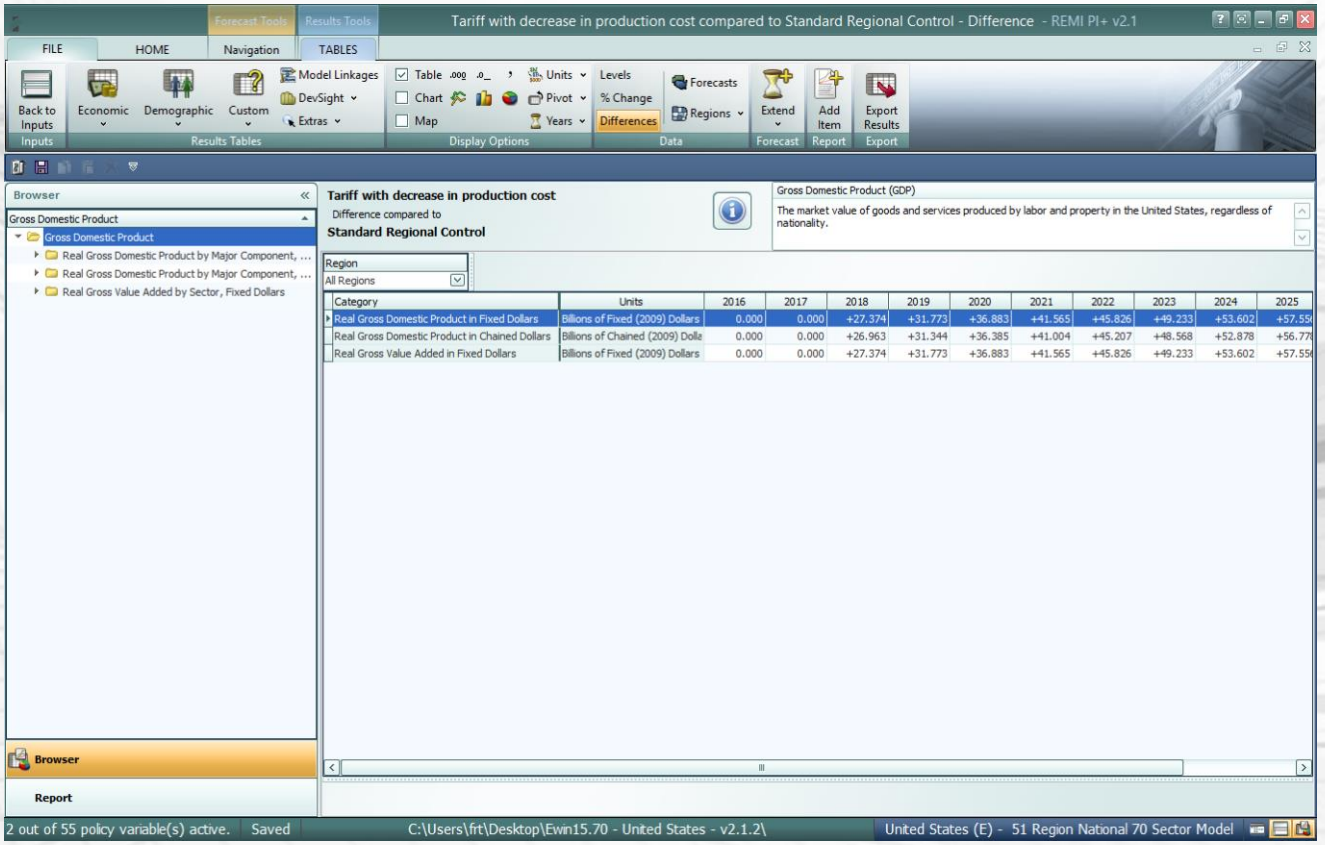
Steel & Aluminum Tariffs

- Economy-wide GDP



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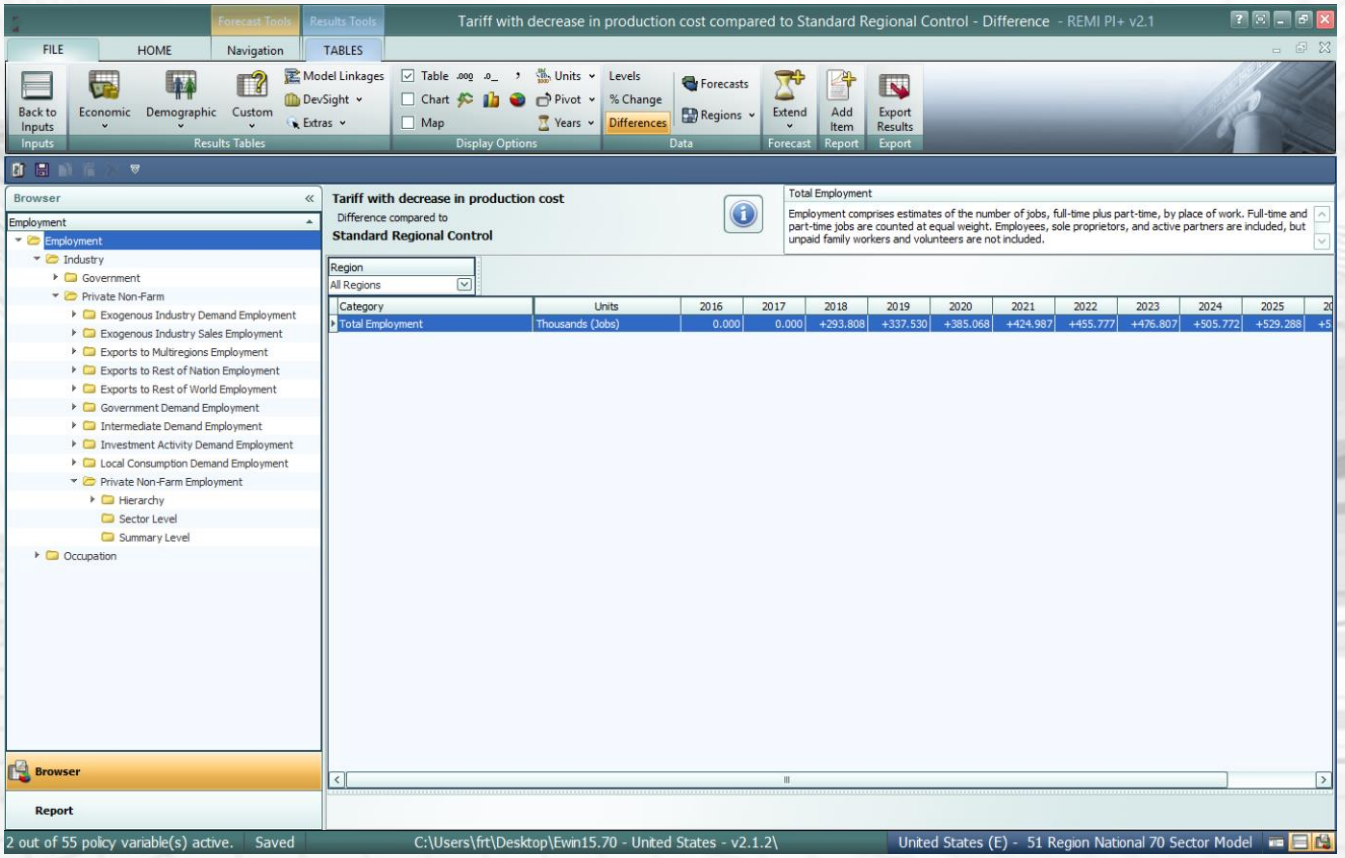
Steel & Aluminum Tariffs

- Economy-wide employment



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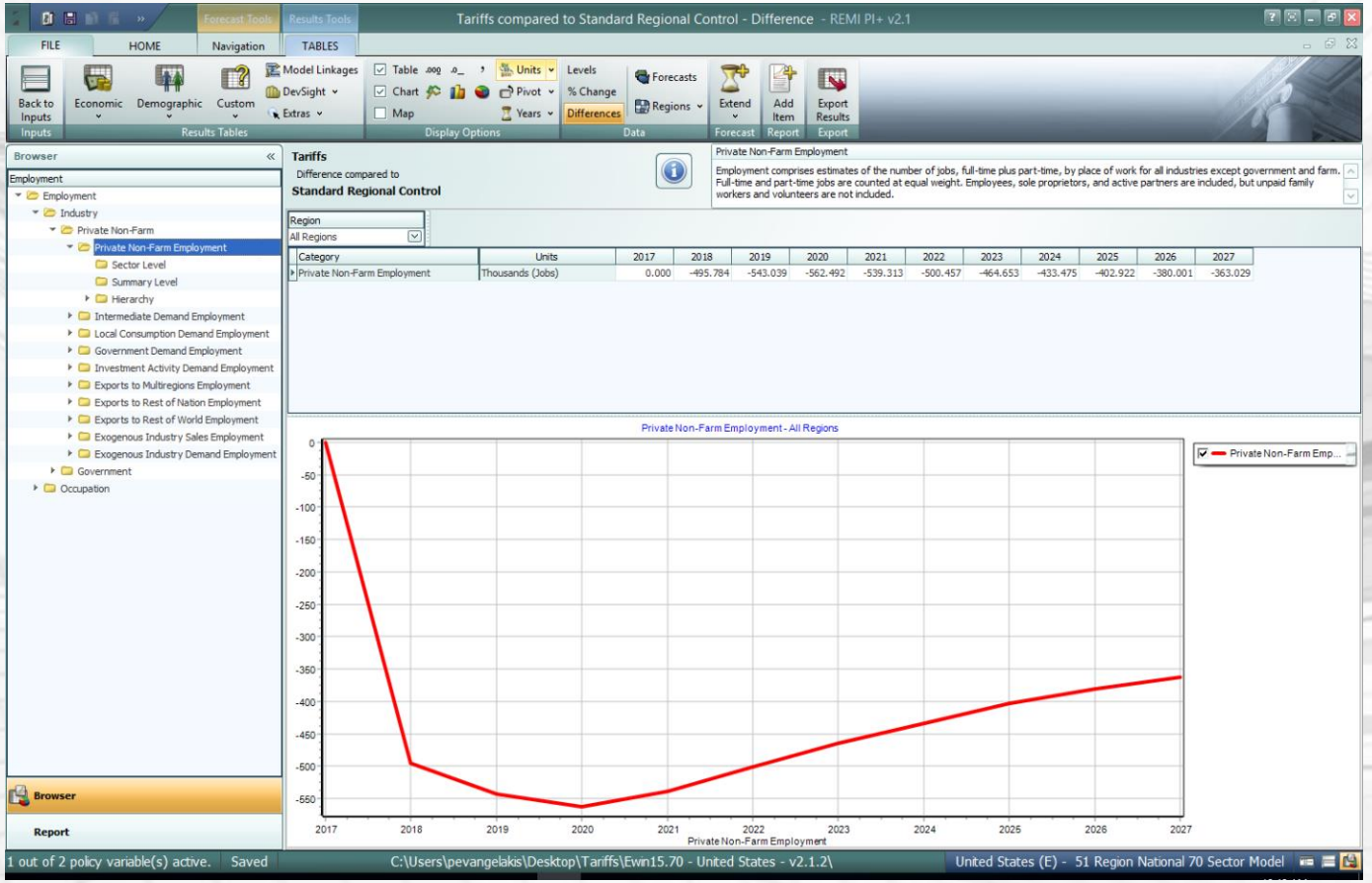
Steel & Aluminum Tariffs

- Economy-wide private non-farm employment, national



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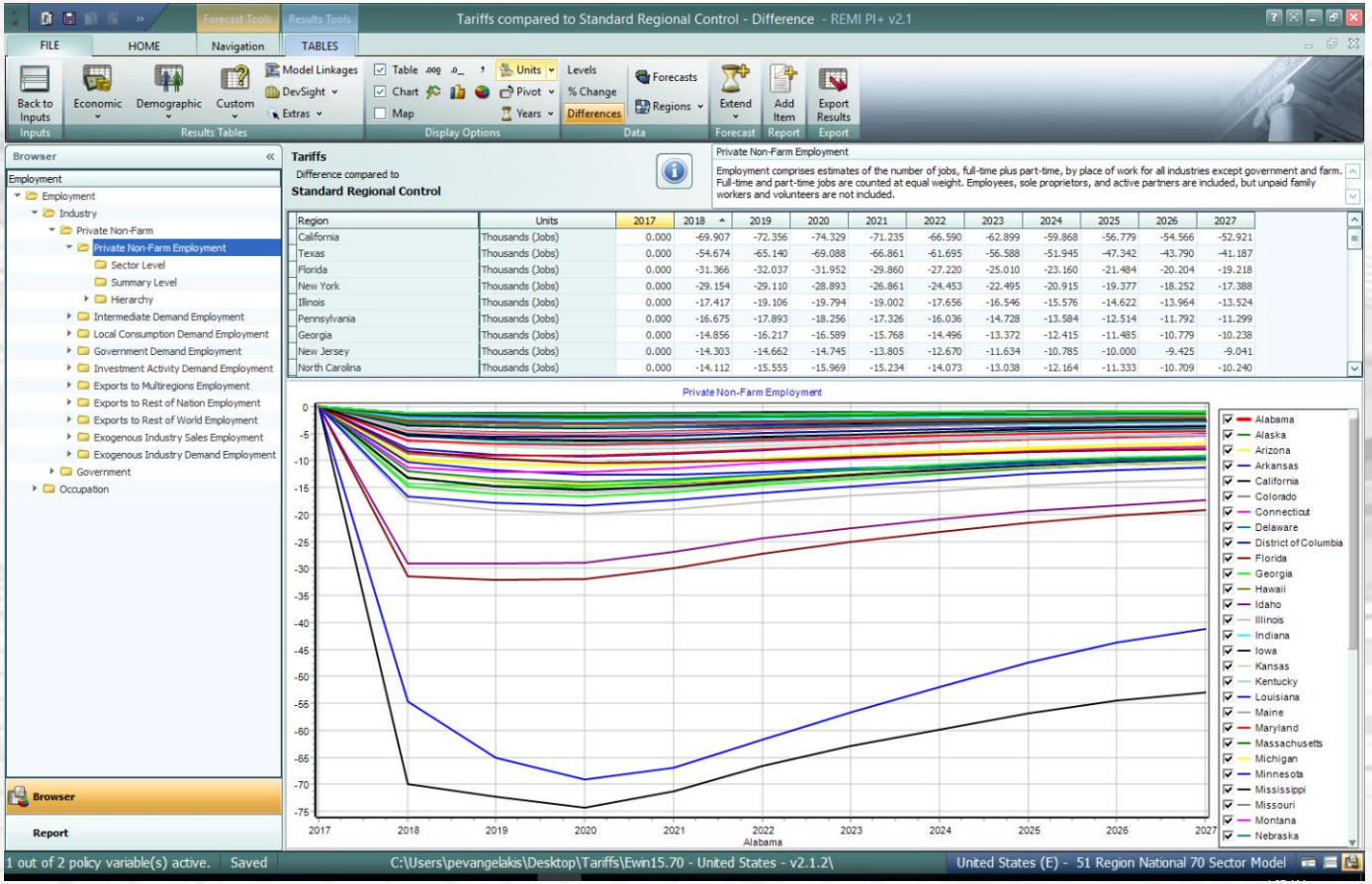
Steel & Aluminum Tariffs

- Economy-wide employment, by state



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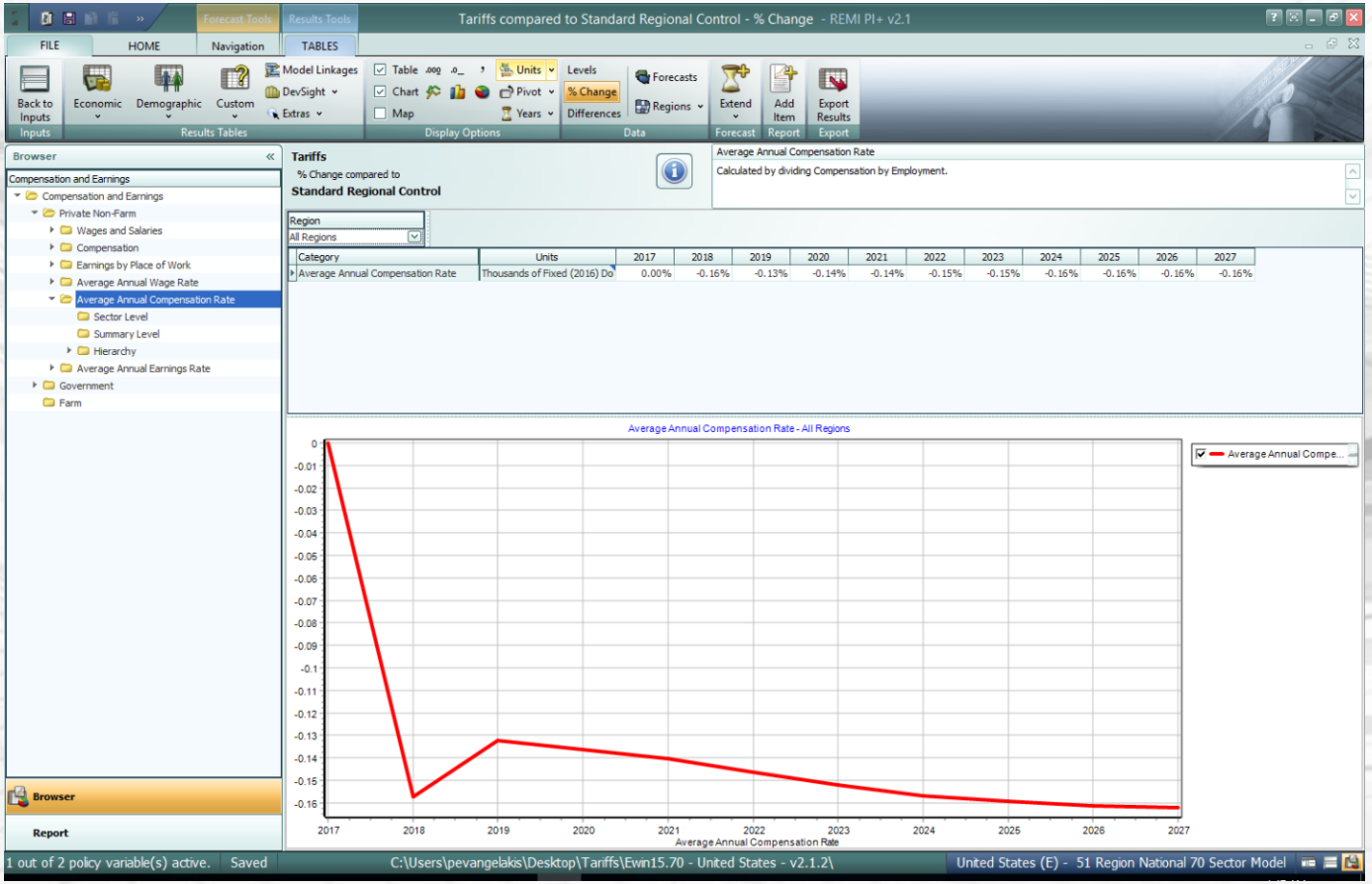
Steel & Aluminum Tariffs

- Compensation, national



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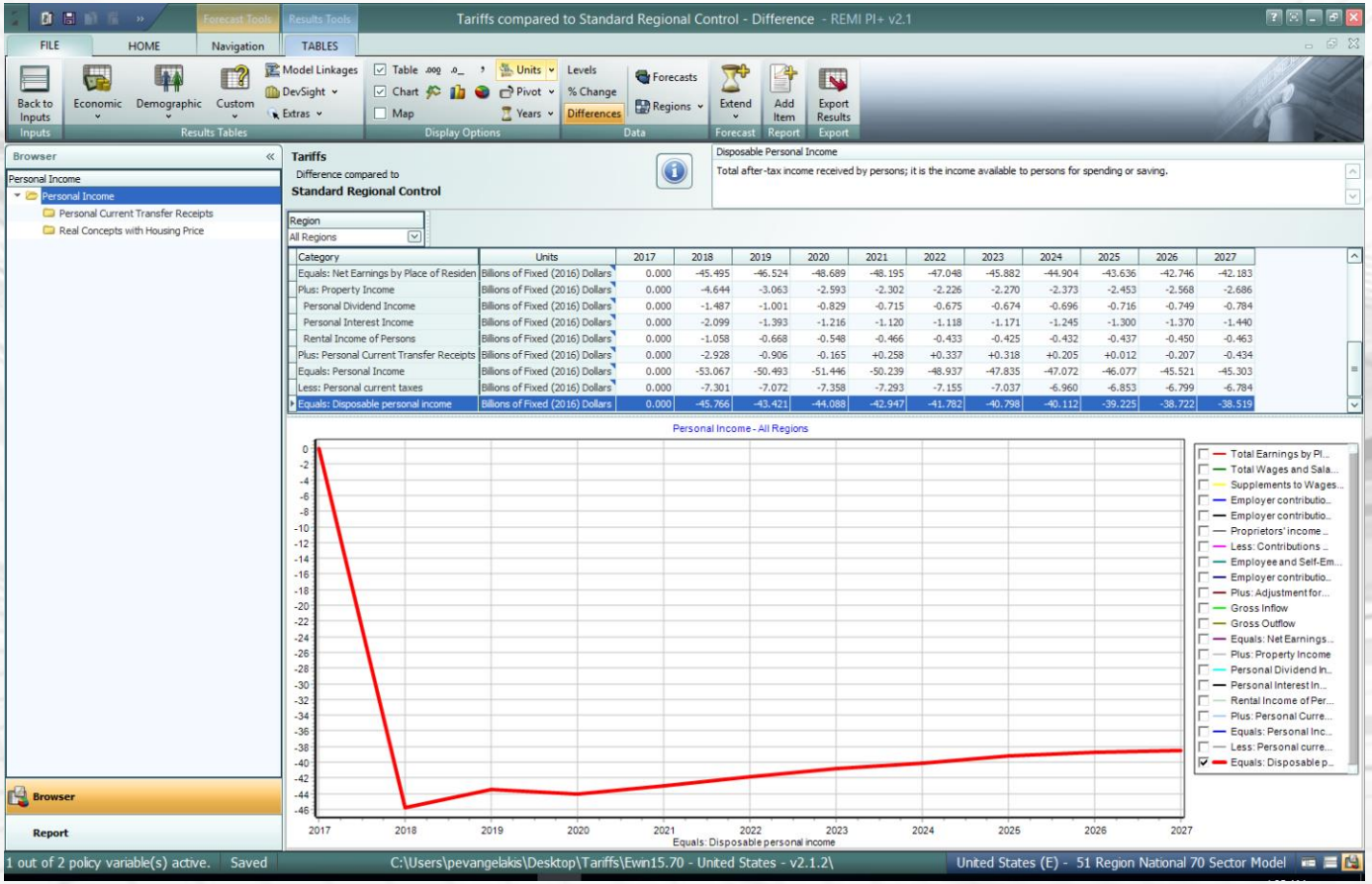
Steel & Aluminum Tariffs

- Disposable personal income, national

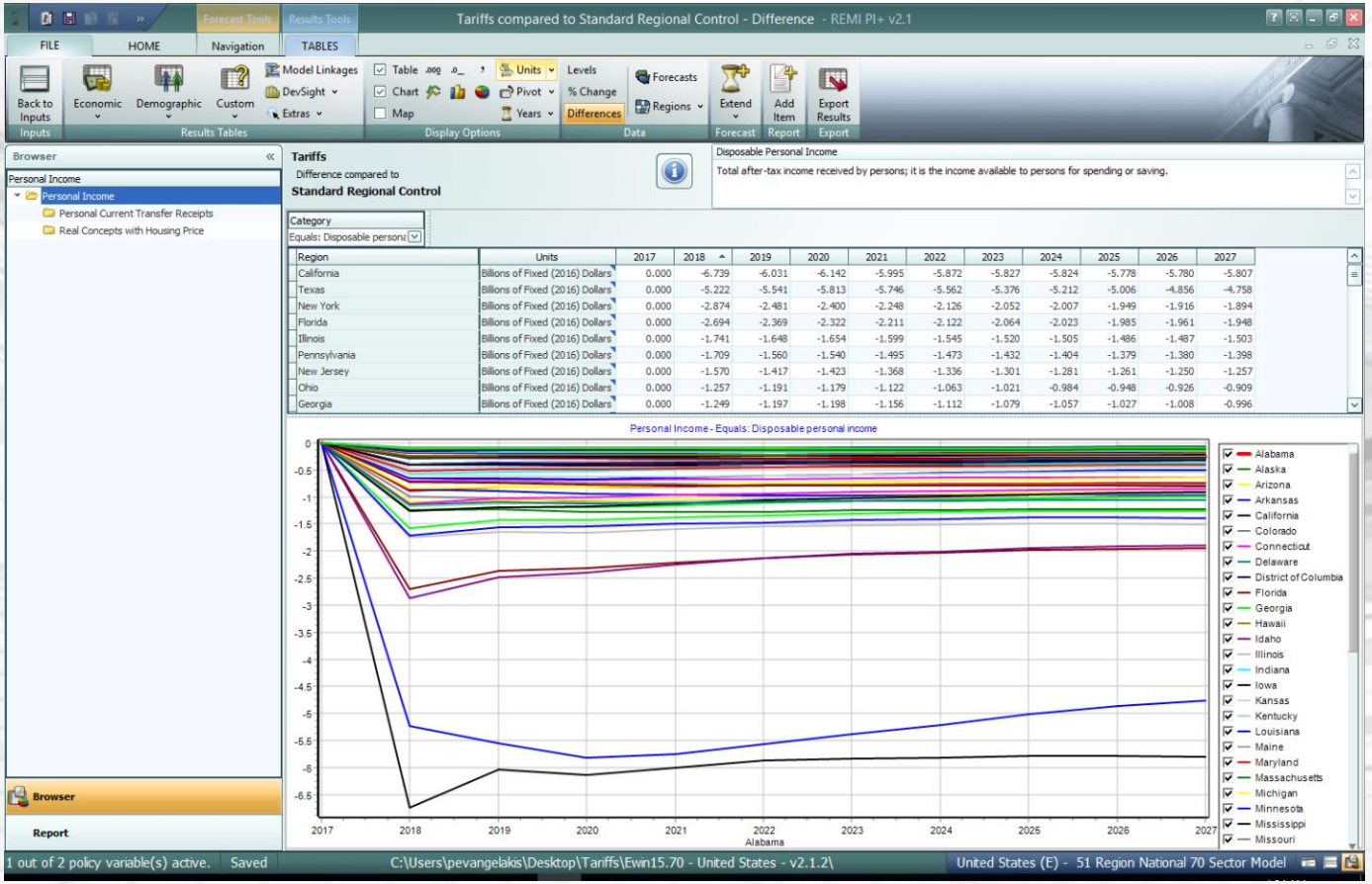


Category	Units	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Equals: Net Earnings by Place of Residen	Billions of Fixed (2016) Dollars	0.000	-45.495	-46.524	-48.689	-48.195	-47.048	-45.882	-44.904	-43.636	-42.746	-42.183
Plus: Property Income	Billions of Fixed (2016) Dollars	0.000	-4.644	-3.063	-2.593	-2.302	-2.226	-2.270	-2.373	-2.453	-2.568	-2.686
Personal Dividend Income	Billions of Fixed (2016) Dollars	0.000	-1.487	-1.001	-0.829	-0.715	-0.675	-0.674	-0.696	-0.716	-0.749	-0.784
Personal Interest Income	Billions of Fixed (2016) Dollars	0.000	-2.099	-1.393	-1.216	-1.120	-1.118	-1.171	-1.245	-1.300	-1.370	-1.440
Rental Income of Persons	Billions of Fixed (2016) Dollars	0.000	-1.058	-0.668	-0.548	-0.466	-0.433	-0.425	-0.432	-0.437	-0.450	-0.463
Plus: Personal Current Transfer Receipts	Billions of Fixed (2016) Dollars	0.000	-2.928	-0.906	-0.165	+0.258	+0.337	+0.318	+0.205	+0.012	-0.207	-0.434
Equals: Personal Income	Billions of Fixed (2016) Dollars	0.000	-53.067	-50.493	-51.446	-50.239	-48.937	-47.835	-47.072	-46.077	-45.521	-45.303
Less: Personal current taxes	Billions of Fixed (2016) Dollars	0.000	-7.301	-7.072	-7.358	-7.293	-7.155	-7.037	-6.960	-6.853	-6.799	-6.784
Equals: Disposable personal income	Billions of Fixed (2016) Dollars	0.000	-45.766	-43.421	-44.088	-42.947	-41.782	-40.798	-40.112	-39.225	-38.722	-38.519

what does REMI say? [sm]

Steel & Aluminum Tariffs

- Disposable personal income, by state



Region	Units	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
California	Billions of Fixed (2016) Dollars	0.000	-6.739	-6.031	-6.142	-5.995	-5.872	-5.827	-5.824	-5.778	-5.780	-5.807
Texas	Billions of Fixed (2016) Dollars	0.000	-5.222	-5.541	-5.813	-5.746	-5.562	-5.376	-5.212	-5.006	-4.856	-4.758
New York	Billions of Fixed (2016) Dollars	0.000	-2.874	-2.481	-2.400	-2.248	-2.126	-2.052	-2.007	-1.949	-1.916	-1.894
Florida	Billions of Fixed (2016) Dollars	0.000	-2.694	-2.369	-2.322	-2.211	-2.122	-2.064	-2.023	-1.985	-1.961	-1.948
Illinois	Billions of Fixed (2016) Dollars	0.000	-1.741	-1.648	-1.654	-1.599	-1.545	-1.520	-1.505	-1.486	-1.487	-1.503
Pennsylvania	Billions of Fixed (2016) Dollars	0.000	-1.709	-1.560	-1.540	-1.495	-1.473	-1.432	-1.404	-1.379	-1.380	-1.398
New Jersey	Billions of Fixed (2016) Dollars	0.000	-1.570	-1.417	-1.423	-1.368	-1.336	-1.301	-1.281	-1.261	-1.250	-1.257
Ohio	Billions of Fixed (2016) Dollars	0.000	-1.257	-1.191	-1.179	-1.122	-1.063	-1.021	-0.984	-0.948	-0.926	-0.909
Georgia	Billions of Fixed (2016) Dollars	0.000	-1.249	-1.197	-1.198	-1.156	-1.112	-1.079	-1.057	-1.027	-1.008	-0.996

what does REMI say? [sm]

Steel & Aluminum Tariffs

- National outcomes with and without subsidies from tariff revenue

	Without Subsidy			With Subsidy		
	Output (Billions $)	Employment (Thousands)	Disposable Income (Billions $)	Output (Billions $)	Employment (Thousands)	Disposable Income (Billions $)
Primary Metal Manufacturing	+7.9 (+2.85%)	+10.2 (+2.83%)	-41.5 (-0.26%)	+8.1 (+2.90%)	+10.4 (+2.87%)	-22.2 (-0.14%)
Manufacturing	-20.9 (-0.32%)	-46.7 (-0.38%)		-17.6 (-0.27%)	-39.5 (-0.33%)	
All Industries	-90.5 (-0.28%)	-468.5 (-0.27%)		-59.2 (-0.18%)	-275.1 (-0.16%)	

what does REMI say? sm

Outcomes reported as 10-year averages, 2018-2027.

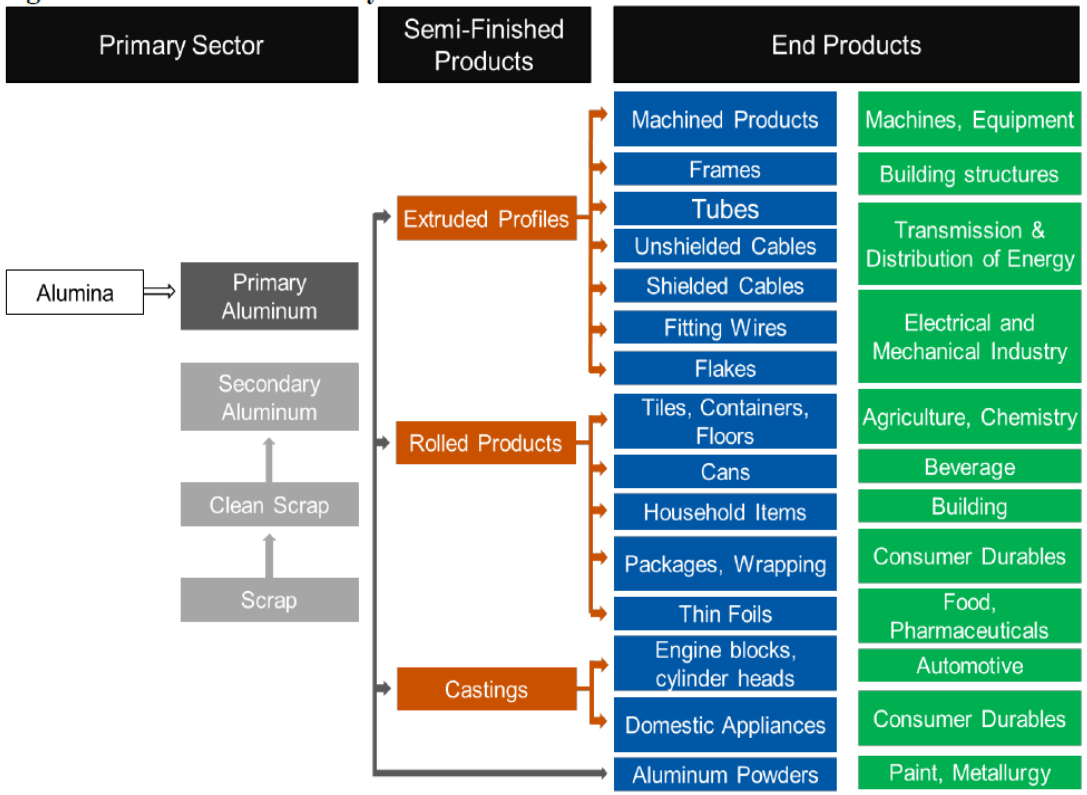
NERA Aluminum Tariff Study

- In 2017, NERA Economic Consulting published: "Impacts of Potential Aluminum Tariffs on the U.S. Economy"
- Provided in-depth research about U.S. aluminum sector production and international trade flows
- Analyzed impacts of hypothetical aluminum tariffs using the REMI model

Aluminum Supply Chain

- Primary Sector Products
  - Alumina refined from bauxite, smelting and casting alumina into aluminum
- Secondary Sector Products
  - Extruded profiles generally for lighter, smaller components
  - Rolled products include things like plates, sheets and foils
  - Castings generally used in bulkier, heavier end products

Figure 1. Aluminum Industry Value Chain



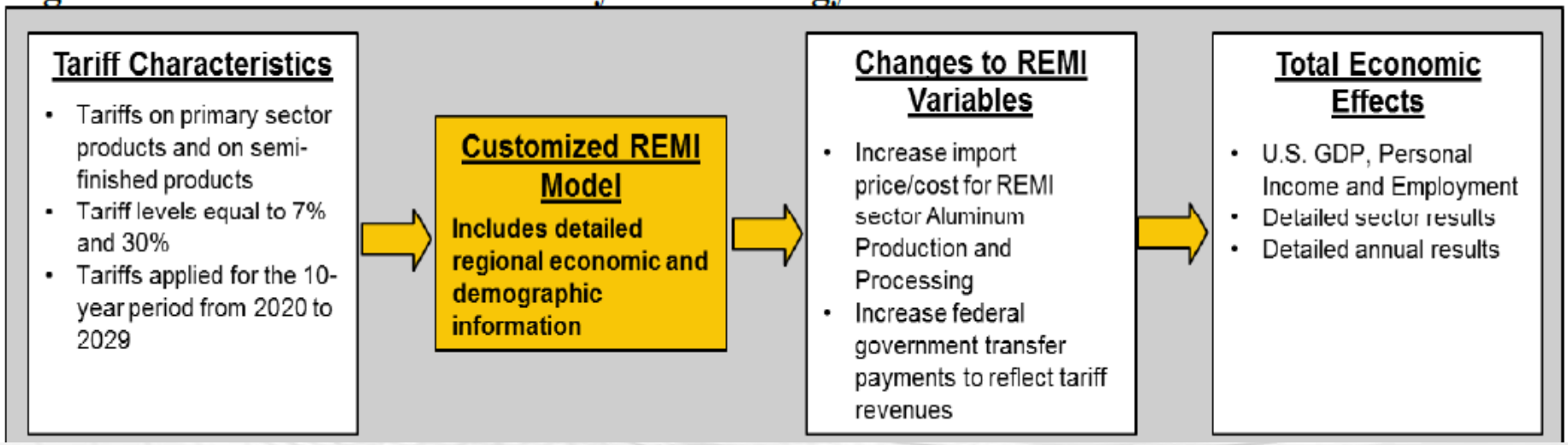
Source: Derived from LUISS (2015)

Source: NERA study, 2017.

Methodology

- Analyze 7% aluminum tariff

Figure 2. Overview of REMI Study Methodology



Source: NERA study, 2017.

Results

Benefits

- Gains in domestic aluminum production and processing
- Increased federal revenues from the tariff

Costs

- Increased production costs (esp. in aluminum-heavy sectors) that increase prices and reduce business competitiveness, which dampens economic activity

Source: NERA study, 2017.

what does REMI say? [sm]

Table 1. Estimated U.S. Economic Impacts of 7% Across-the-Board Tariffs on Imports of Primary and Semi-Finished Aluminum Products

National Output (Billions 2017$)	
Average Annual	-$5.0
Cumulative (3% DR)	-$43.6
Personal Income (Billions 2017$)	
Average Annual	-$2.5
Cumulative (3% DR)	-$22.0
Total Employment (Thousands)	
Average Annual (Jobs)	-$22.6
Cumulative (Job-Years)	-$225.9

Note: Output and personal income values presented in 2017 dollars. Values are annual averages over the period from 2020-2029. Cumulative dollar values are present values over the same period calculated as of January 202 at 3% (real) discount rate. Cumulative employment impacts are measured in job-years and are not discounted

Source: NERA calculations

Table 2. Estimated U.S. Economic Impacts on Aluminum and Other Manufacturing Industries

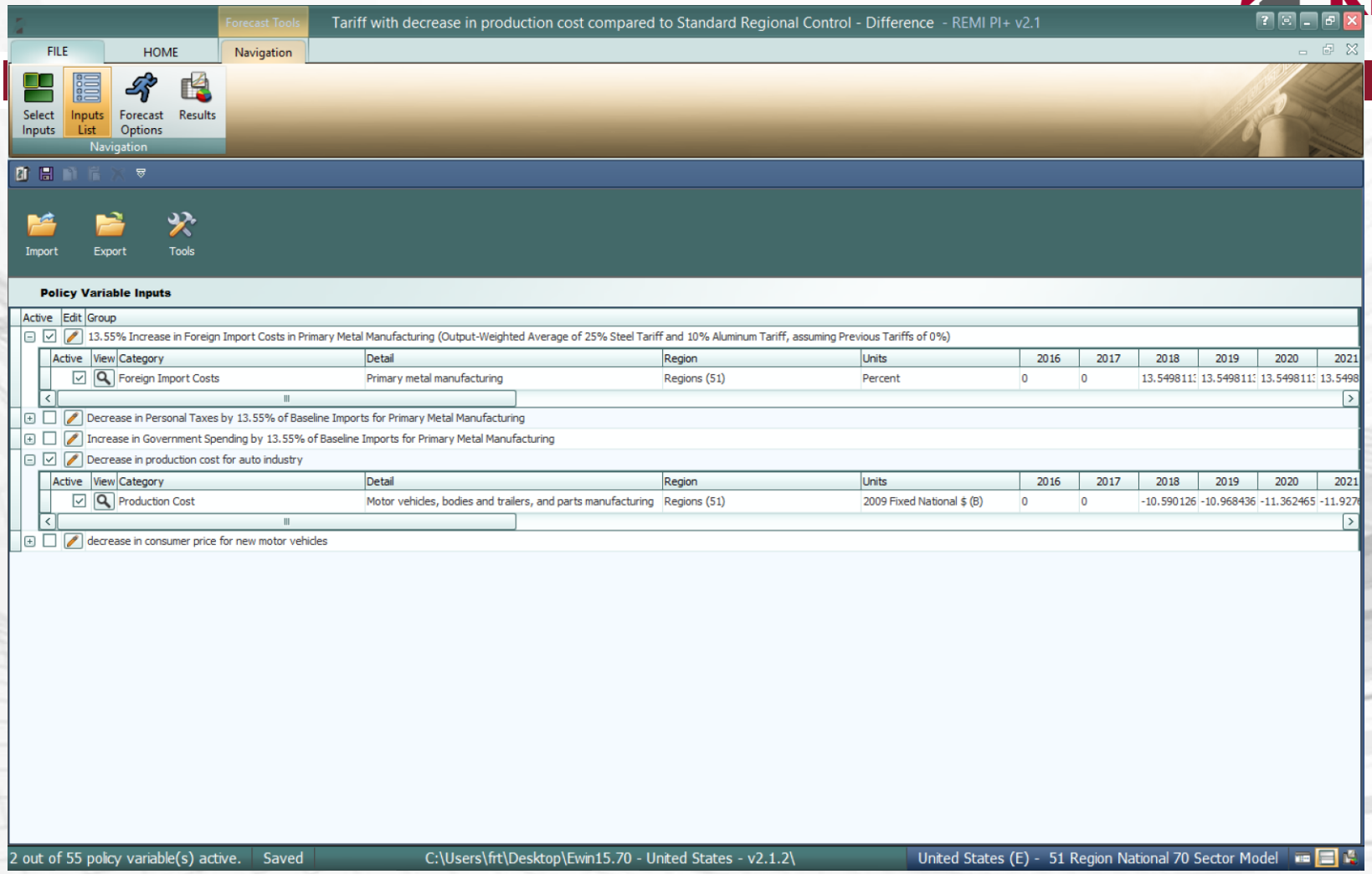
	Average Annual Economic Impacts	
	Employment (Jobs)	**Output (Millions)**
Primary Sector and Semi-finished Aluminum Products	1,000	$850
Other Manufacturing	-4,040	-$2,250
All Manufacturing	-3,040	-$1,400
All Other Industries	-19,600	-$3,600
Total	-22,600	-$5,000

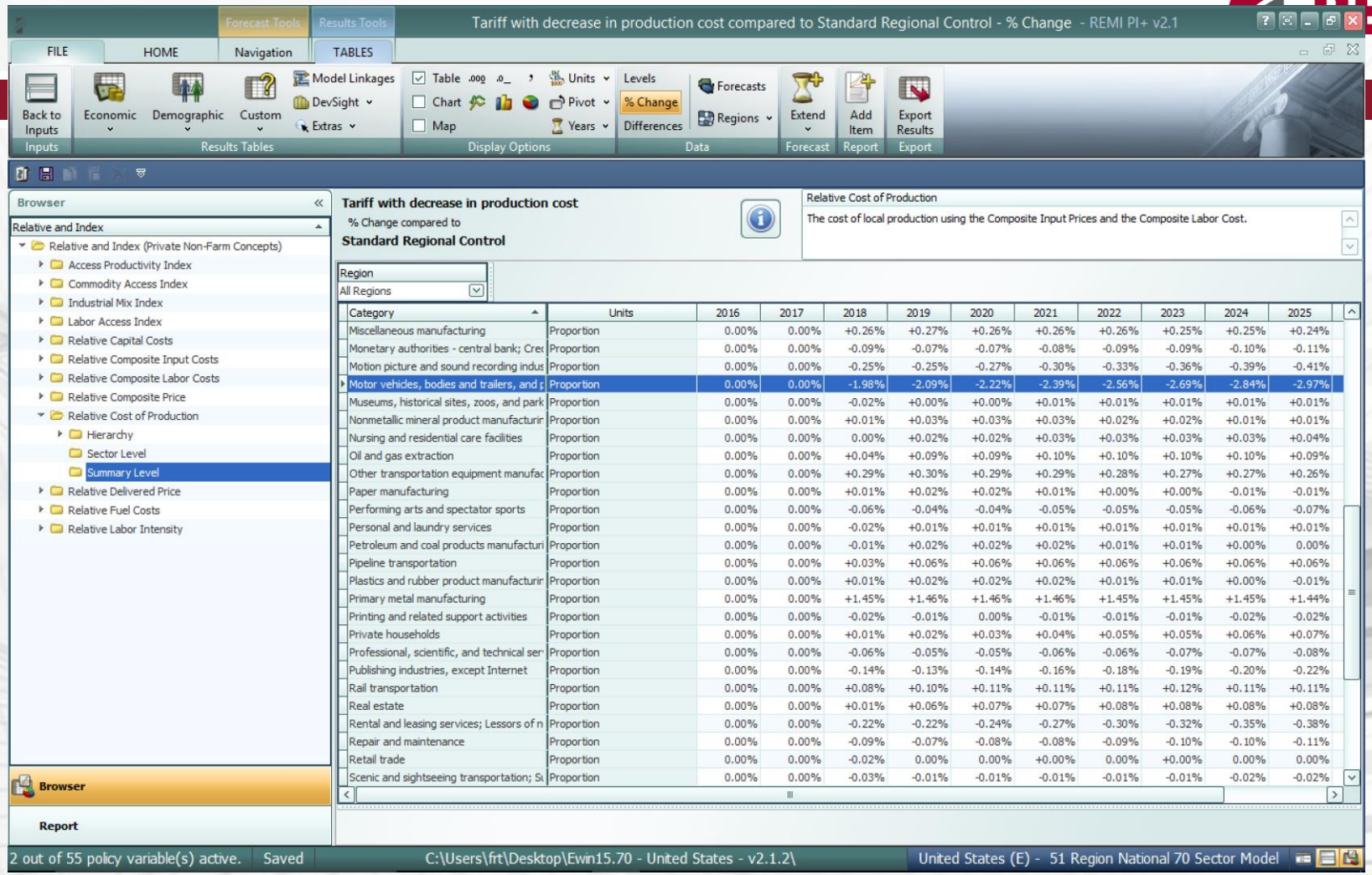
Note: Values may not sum to totals due to rounding.

Source: NERA calculations as explained in text.

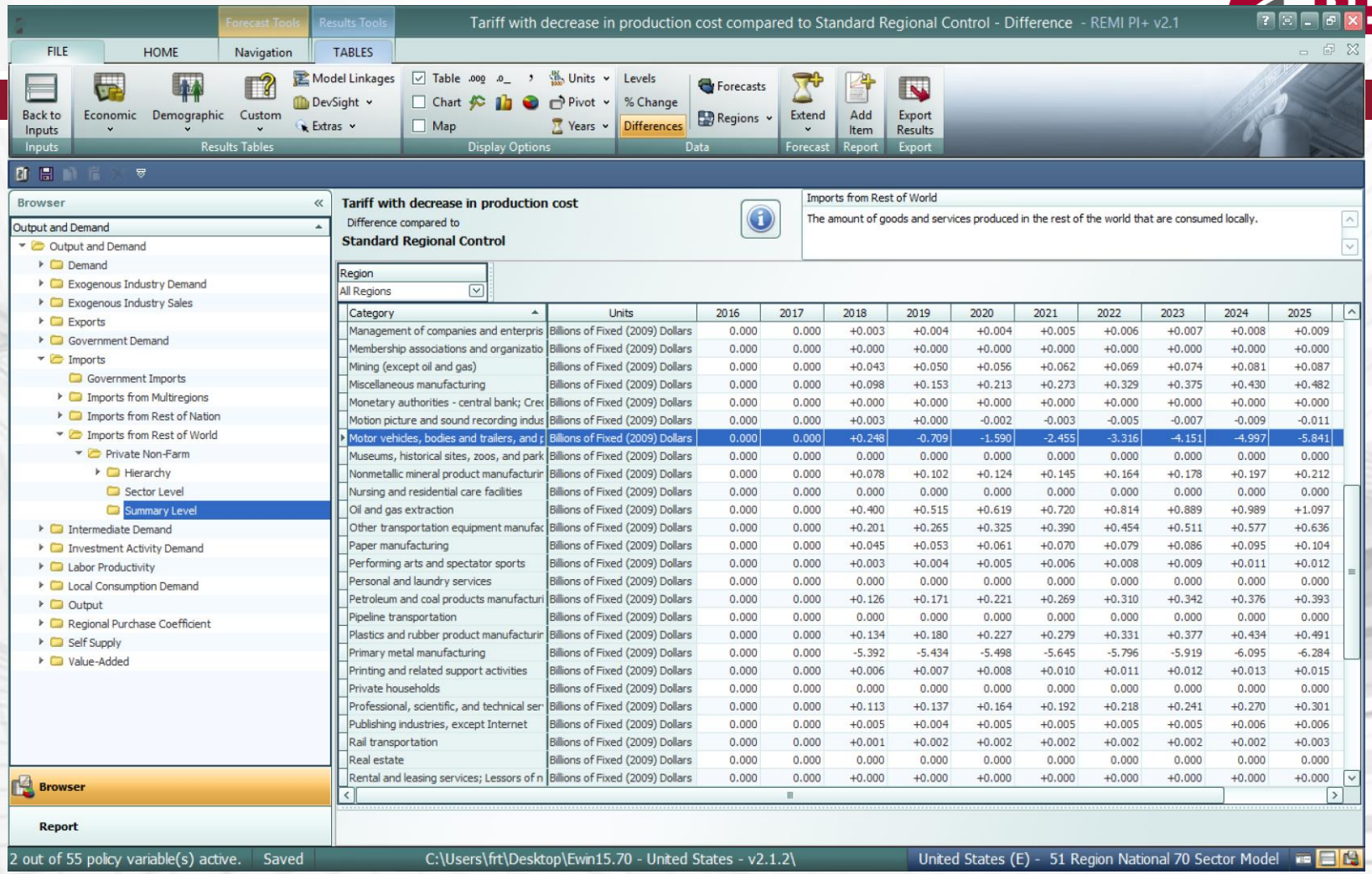
“What if…?”

- Suppose we use the revenue from aluminum and steel tariffs to directly subsidize the domestic auto industry
- Then, U.S. automotive costs go down
- Improves competitiveness vis-à-vis imports
- Motor vehicles prices go down, stimulating consumption
- Further gains supply chain and worker spending (indirect and induced)

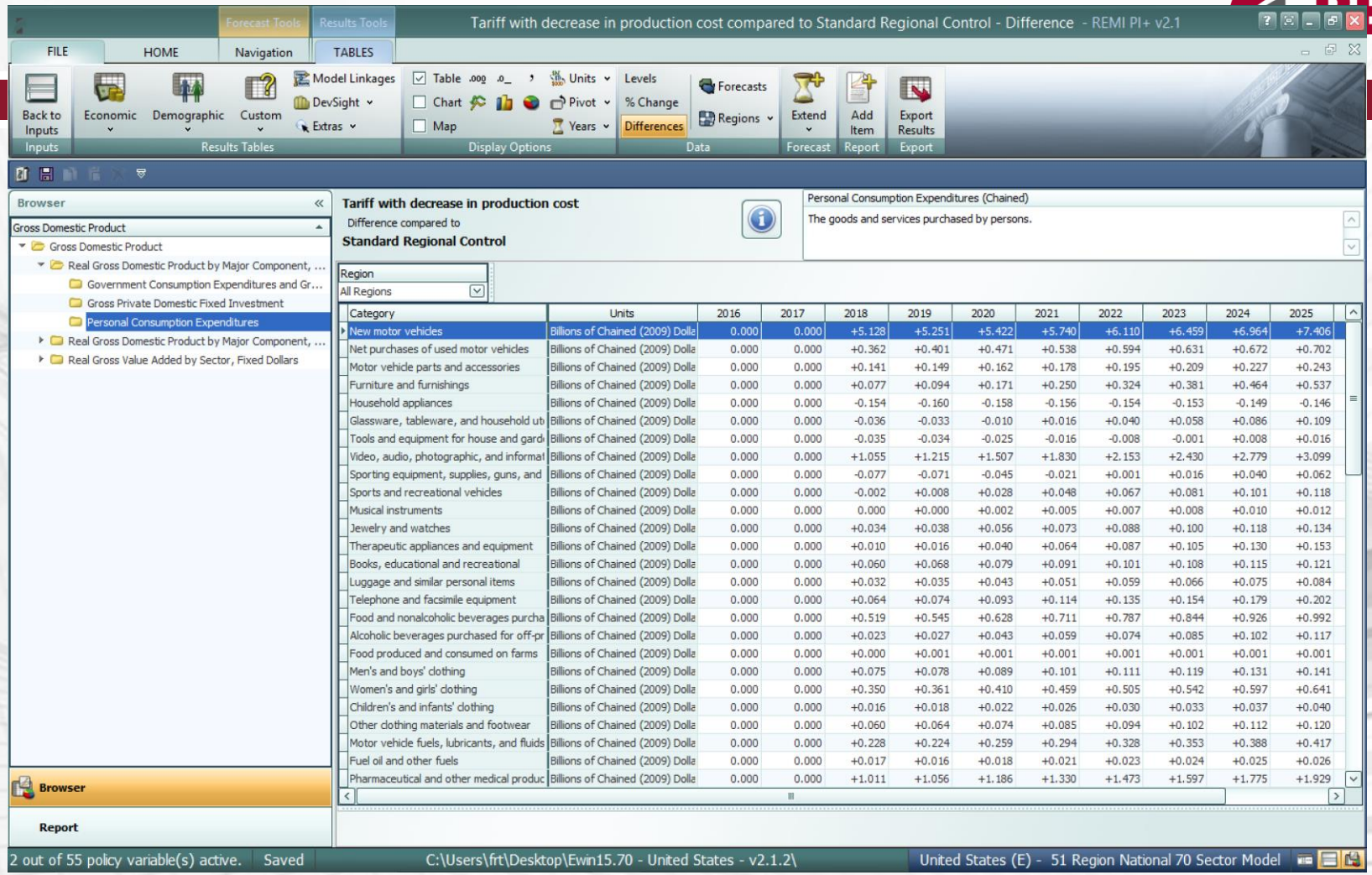

Forecast Tools
Tariff with decrease in production cost compared to Standard Regional Control - Difference - REMI PI+ v2.1
FILE
HOME
Navigation
Select Inputs
Inputs List
Forecast Options
Results
Navigation
Import
Export
Tools
Policy Variable Inputs
Active
Edit
Group
13.55% Increase in Foreign Import Costs in Primary Metal Manufacturing (Output-Weighted Average of 25% Steel Tariff and 10% Aluminum Tariff, assuming Previous Tariffs of 0%)
Active
View
Category
Detail
Region
Units
2016
2017
2018
2019
2020
2021
Foreign Import Costs
Primary metal manufacturing
Regions (51)
Percent
0
0
13.549811
13.549811
13.549811
13.5498
Decrease in Personal Taxes by 13.55% of Baseline Imports for Primary Metal Manufacturing
Increase in Government Spending by 13.55% of Baseline Imports for Primary Metal Manufacturing
Decrease in production cost for auto industry
Active
View
Category
Detail
Region
Units
2016
2017
2018
2019
2020
2021
Production Cost
Motor vehicles, bodies and trailers, and parts manufacturing
Regions (51)
2009 Fixed National $ (B)
0
0
-10.590126
-10.968436
-11.362465
-11.927
decrease in consumer price for new motor vehicles
2 out of 55 policy variable(s) active.
Saved
C:\Users\frt\Desktop\Ewin15.70 - United States - v2.1.2\
United States (E) - 51 Region National 70 Sector Model



what does REMI say? [sm]



what does REMI say? [sm]



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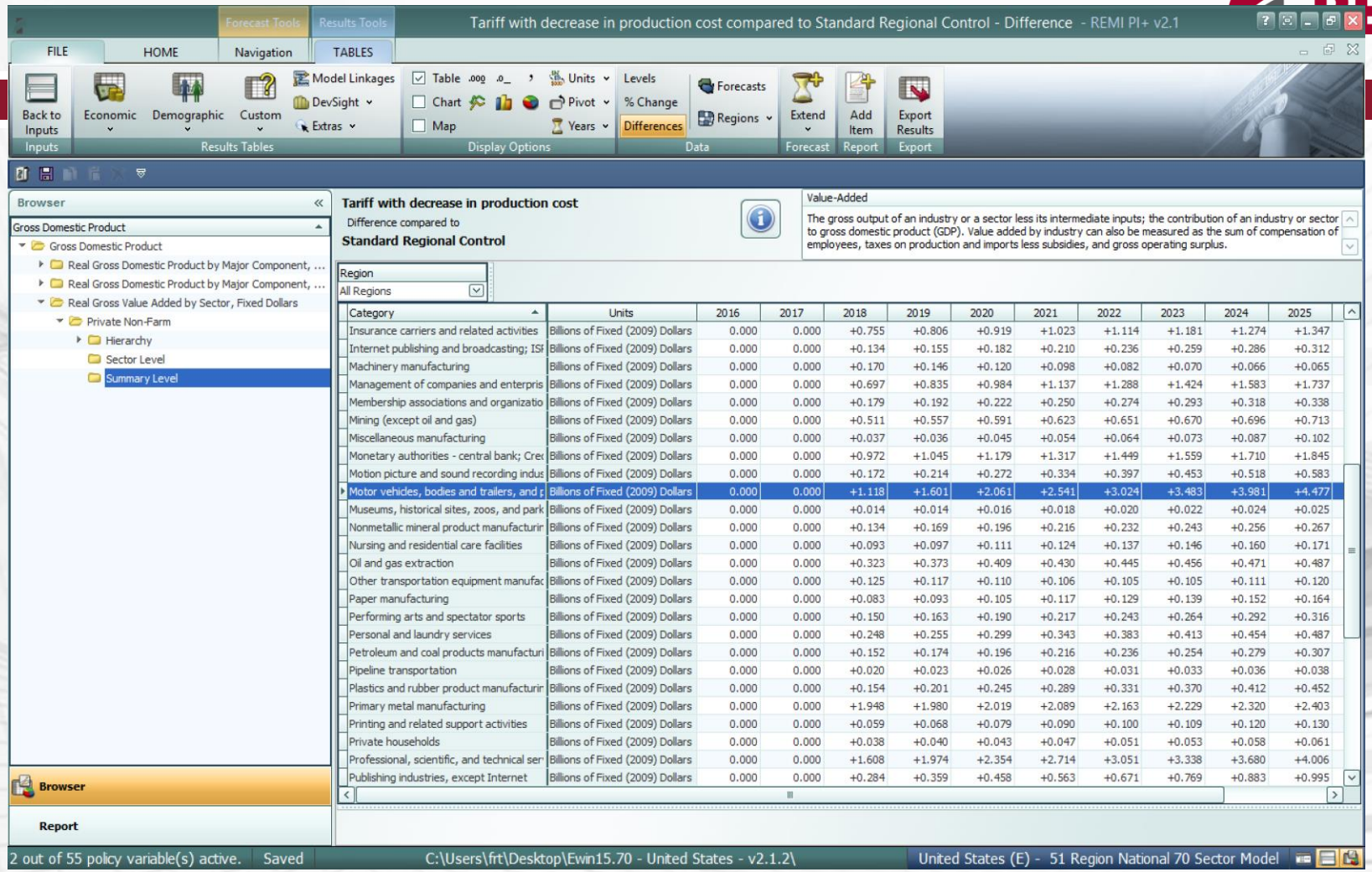
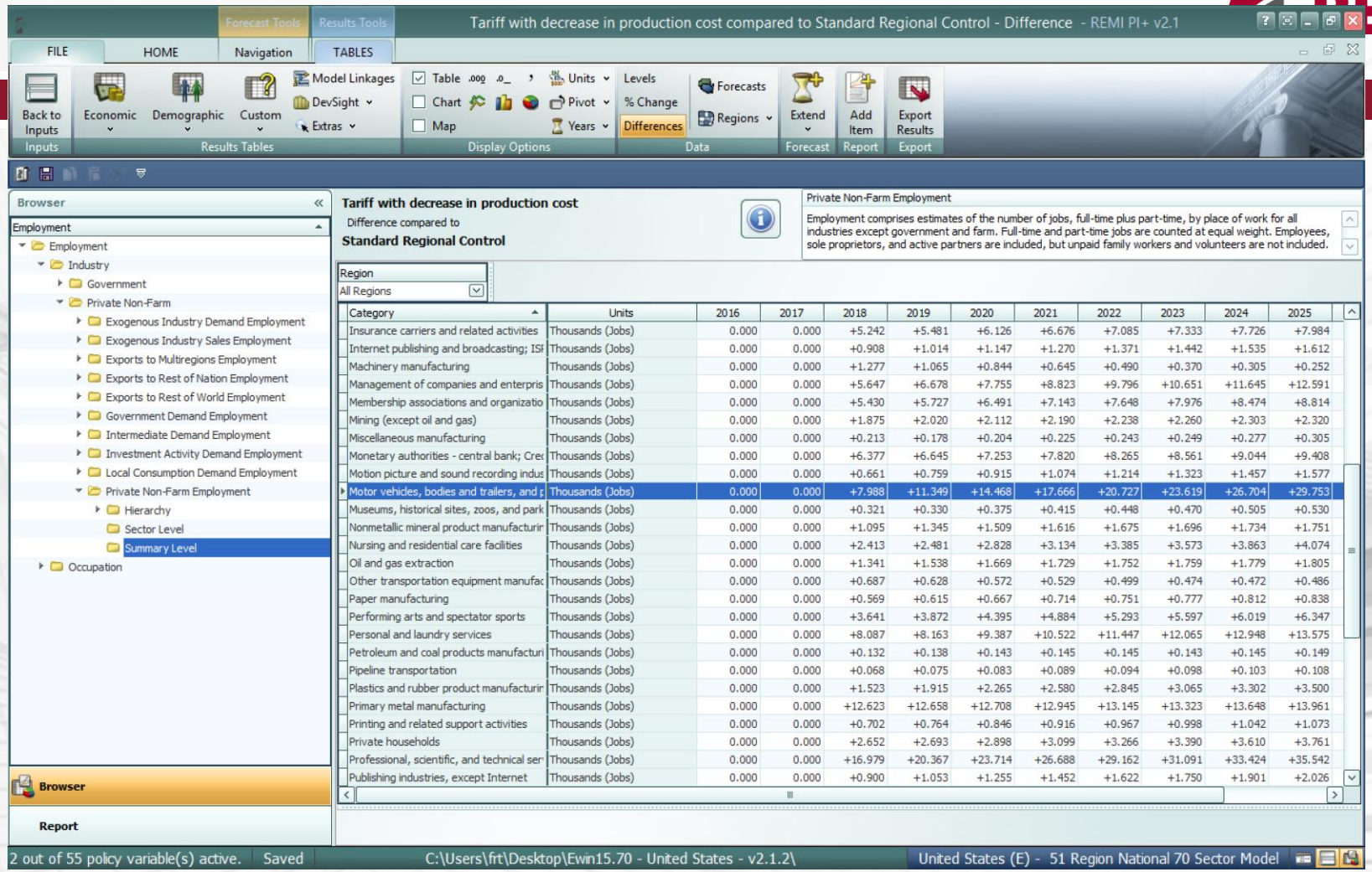


what does REMI say? [sm]



what does REMI say? [sm]

Conclusions

- REMI model "out-of-the-box" supports mainstream economic theory: tariffs help the protected industry, but the downstream industries using the industry's input see cost increases, consumers see higher prices, and the losses across the economy outweigh the gains.
- Low savings rates (including government deficits) are the fundamental cause of trade deficits.
- High trade barrier economies in East Asia have prospered.
- A tariff is a tax; government needs to raise revenue somehow.
- In a voluntary economic transaction, both parties benefit; yet these benefits could be 50/50, 90/10, according to the "art of the deal."