

THE ECONOMIC IMPACT OF HURRICANES: THE FOUR MAJOR IMPACT PHASES

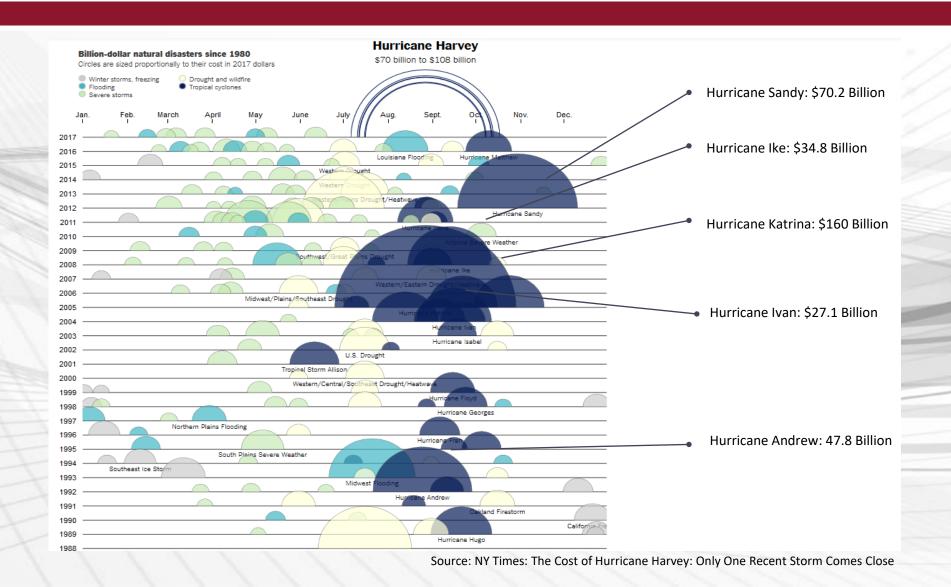
Hurricane Impact Stages



- 4 main stages
 - 1) Baseline (GDP level before the hurricane)
 - 2) Loss (sustained major loss of GDP)
 - □ 3) Recovery (rebuilding efforts take effect)
 - □ 4) New Equilibrium (may be several years later)

Top 5 Costliest Hurricanes





Top 5 Costliest Hurricanes

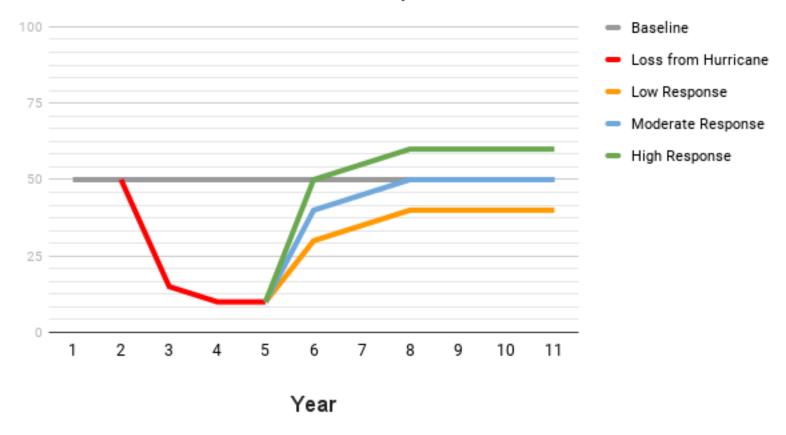


	Early unofficial estimates of Hurricane Harvey range from a low of \$70 billion in damages									
	toal	high of \$108 billion.								
	☐ At Harvey's low, it would fall short of Hurricane Sandy. At Harvey's high, it would excee									
	Sandy but fall short of Katrina.									
☐ Variables included when assessing damages are										
		Disruption to business								
		Unemployment periods lasting up to months								
		Transportation and infrastructure damages								
		Crop loss, including 25 percent of orange crop								
		Increased fuel prices								
		Property damages								

Hurricane Impact Stages







REMI Hurricane Studies

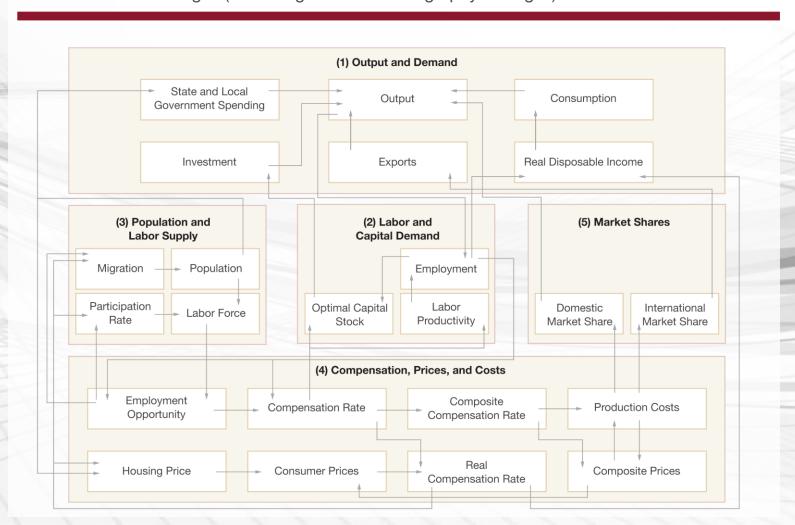


- ☐ Tampa Bay Disaster Resiliency Study
- ☐ Hurricane Sandy Impact on Connecticut's Economy
- ☐ Sandia National Laboratories Impact of Hurricane Katrina
- ☐ Florida's Hurricane Impact System

Model Structure

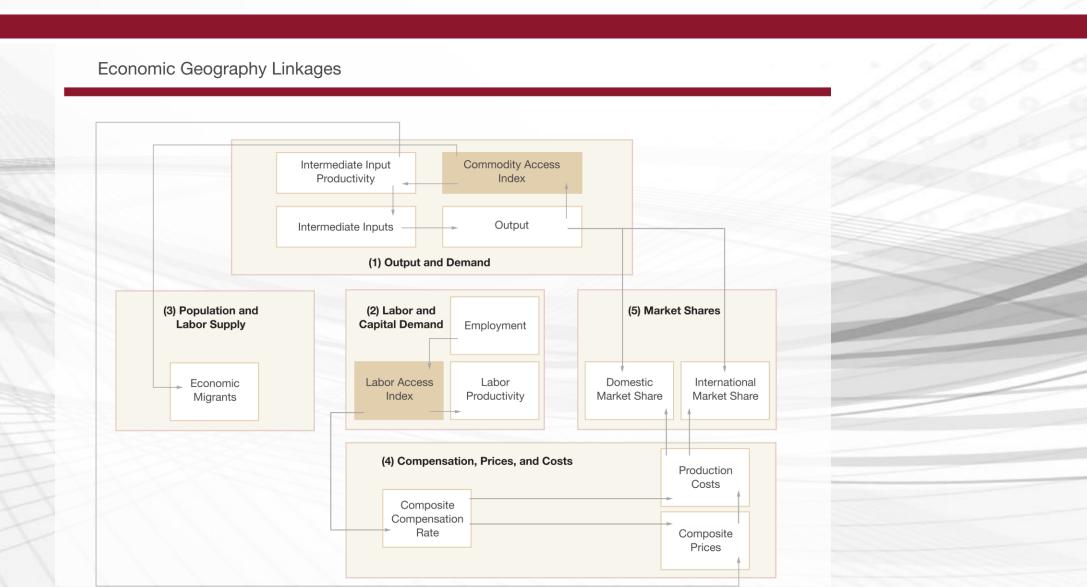


REMI Model Linkages (Excluding Economic Geography Linkages)



New Economic Geography





Static vs. Dynamic Analysis



Static Analysis

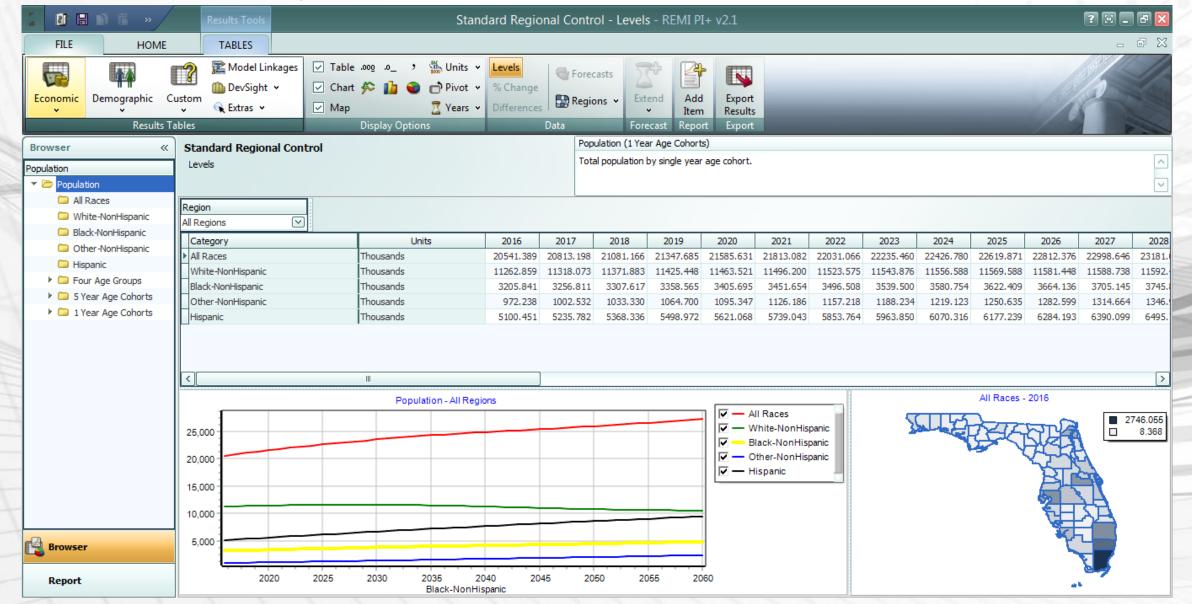
- Construction spending
- Direct and Indirect Employment (Supply Chain)

Dynamic Analysis

- Construction spending
- Direct and Indirect Employment (Supply Chain)
- Employment Change due to Production Cost
- Population
- House Expense
- Employment
- Labor productivity
- Output over time
- Competitiveness



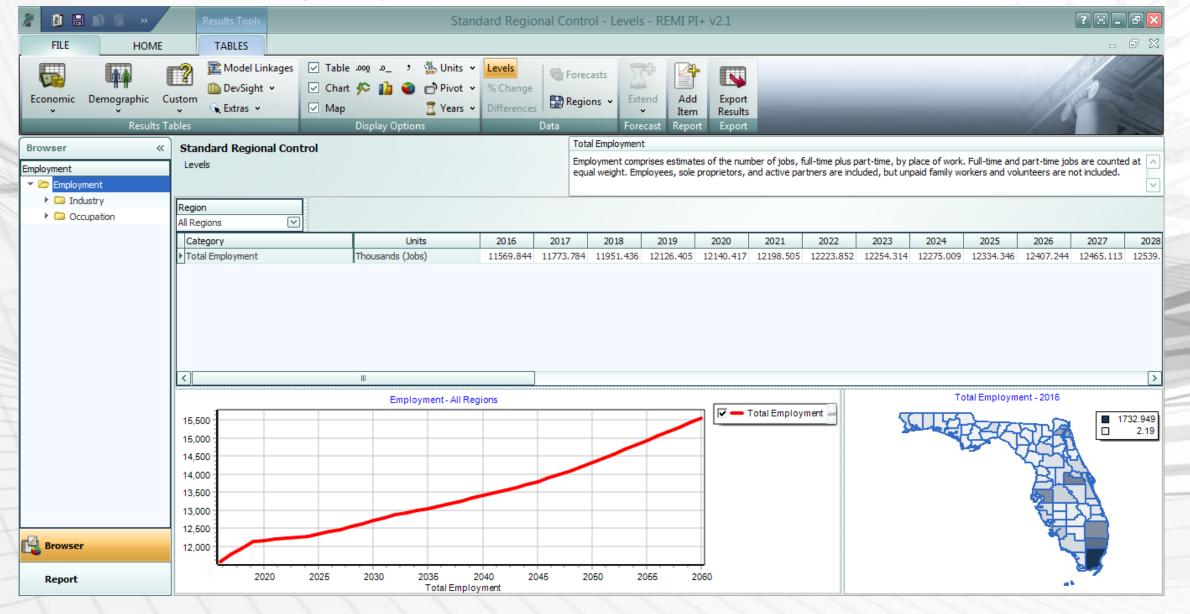






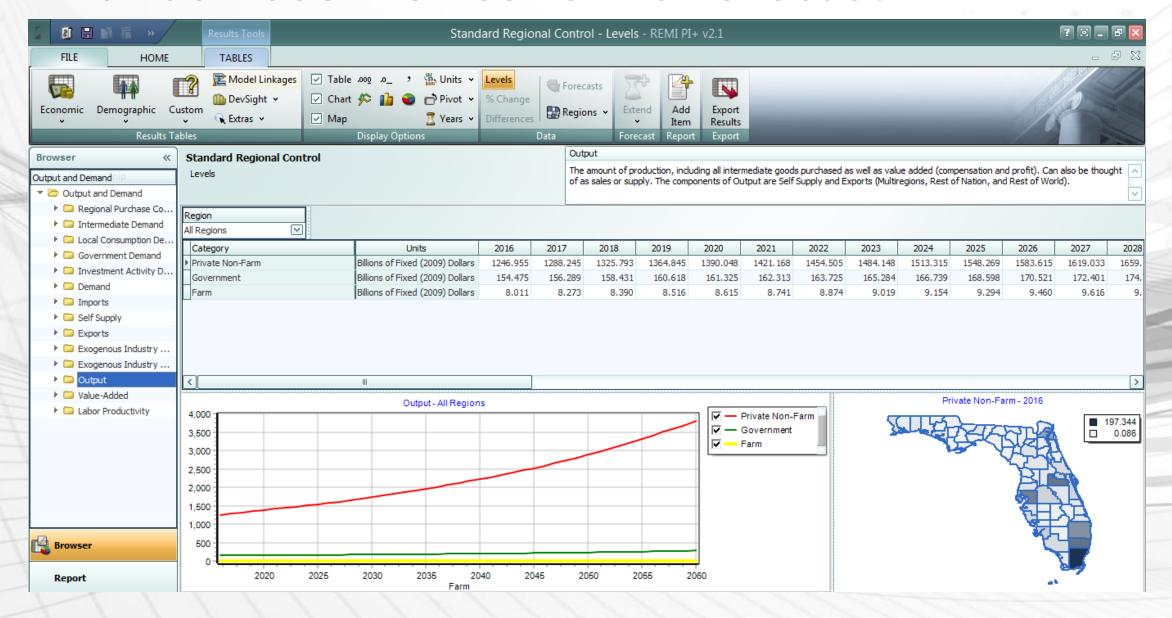


Florida Employment Forecast



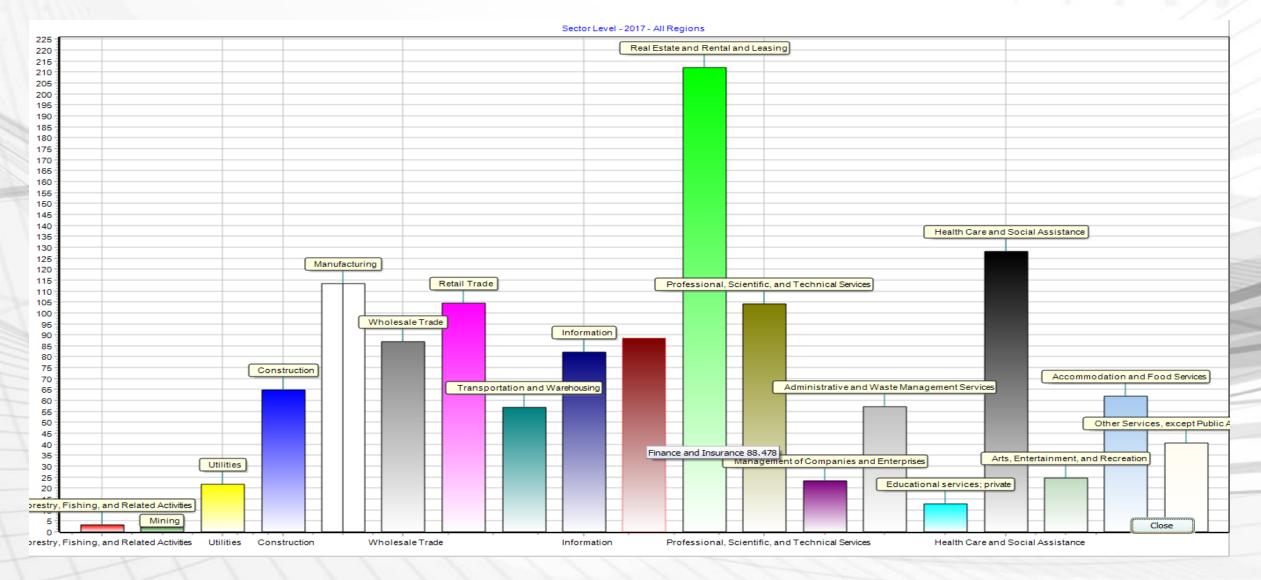


Florida Baseline Economic Forecast



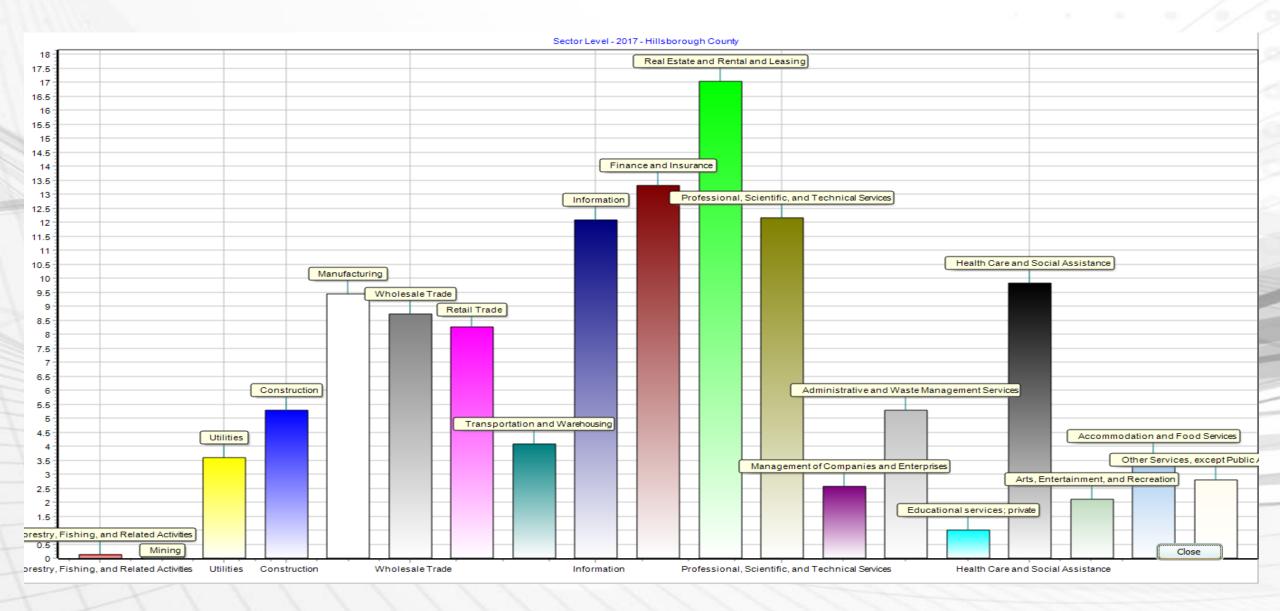


Florida Sector level Output Forecast



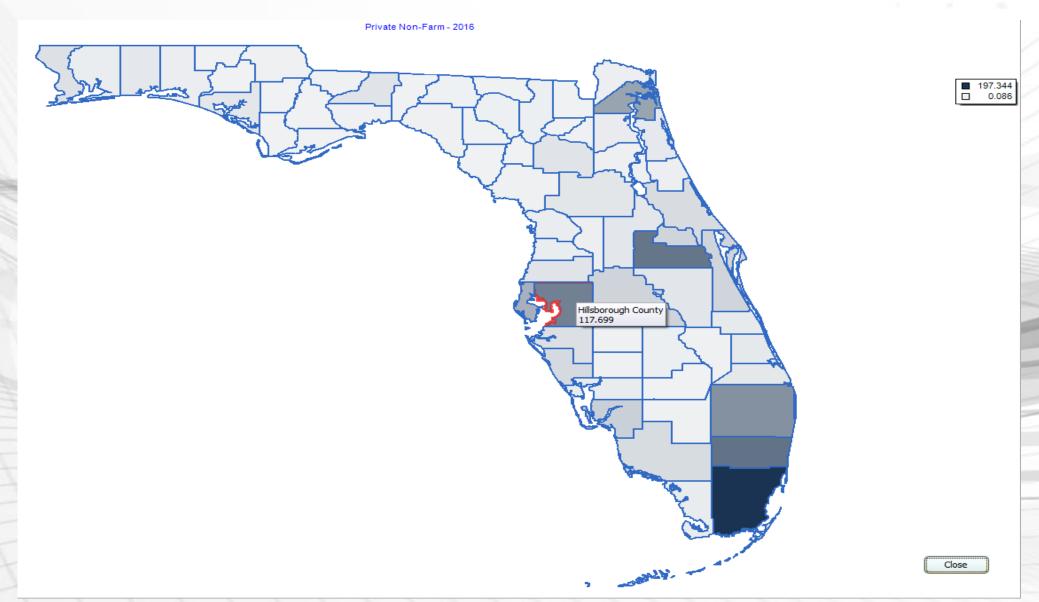
Hillsborough Sector level Output Forecast REMI





Hillsborough's Economy 2016 (\$117 Billion)





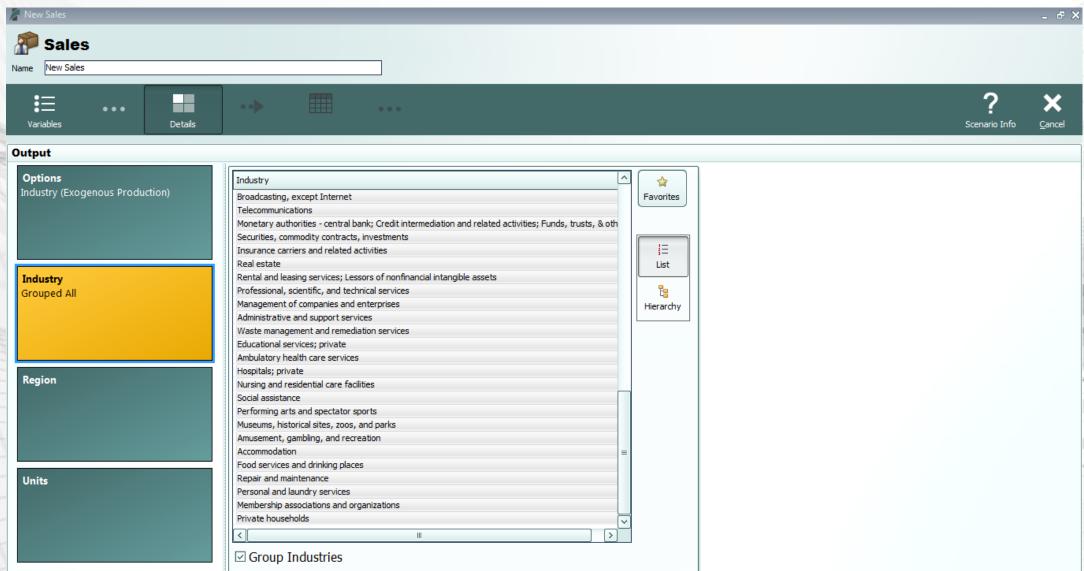
Hurricane Simulation Impact in Hillsborough



- □ 2 Week Economic Shut Down
- □ 10 Billion Loss and Rebuild in Capital Stock
- □ Long term Increase in Insurance cost for Businesses
- □ Long term Increase in Insurance cost for Households
- □ Long term Business and/or Population Loss

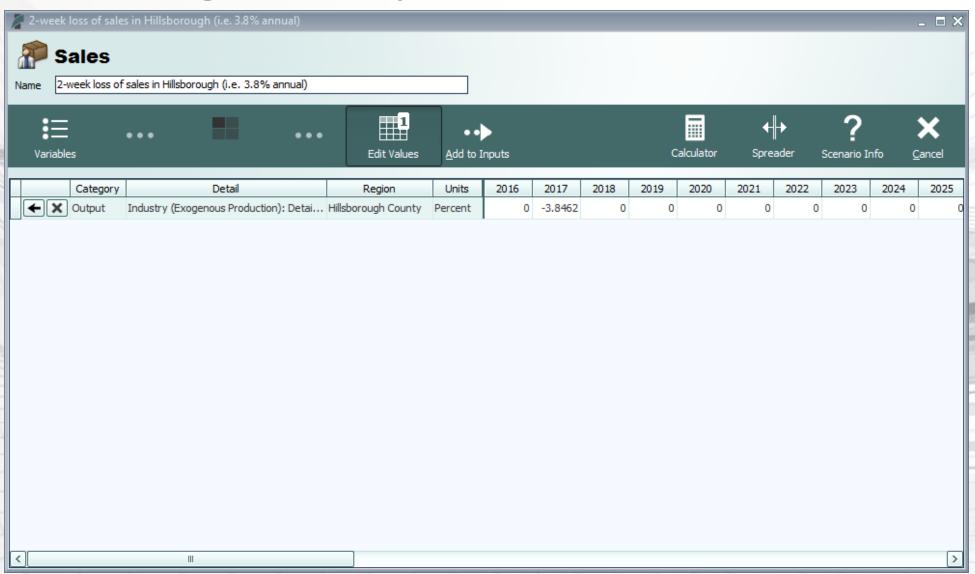
Loss of sales for a 2-week period in Hillsborough County





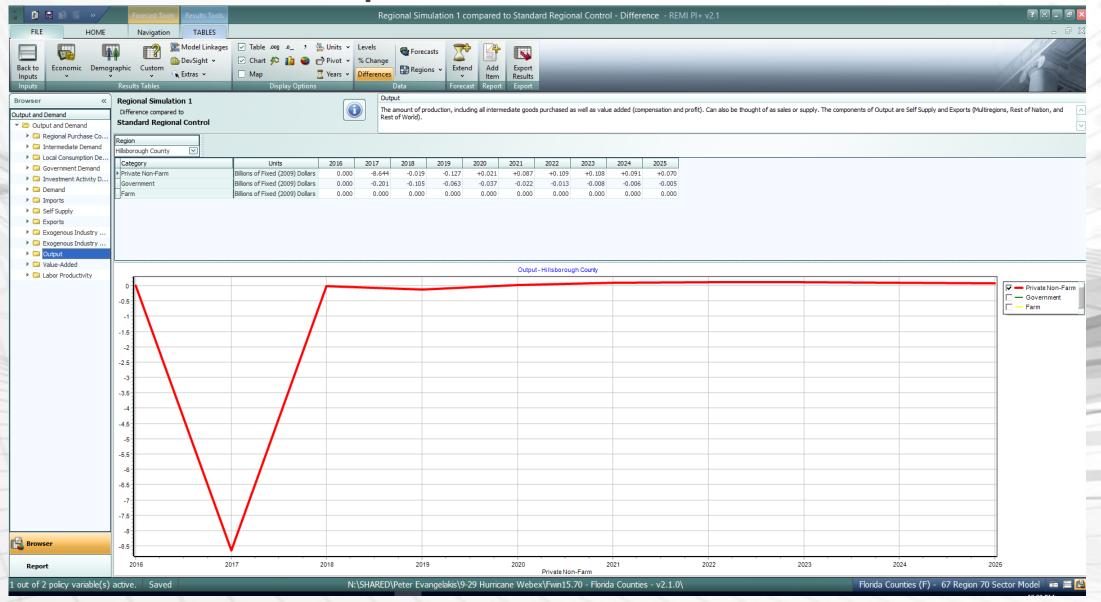
Industry Sales loss for all industries in Hillsborough County





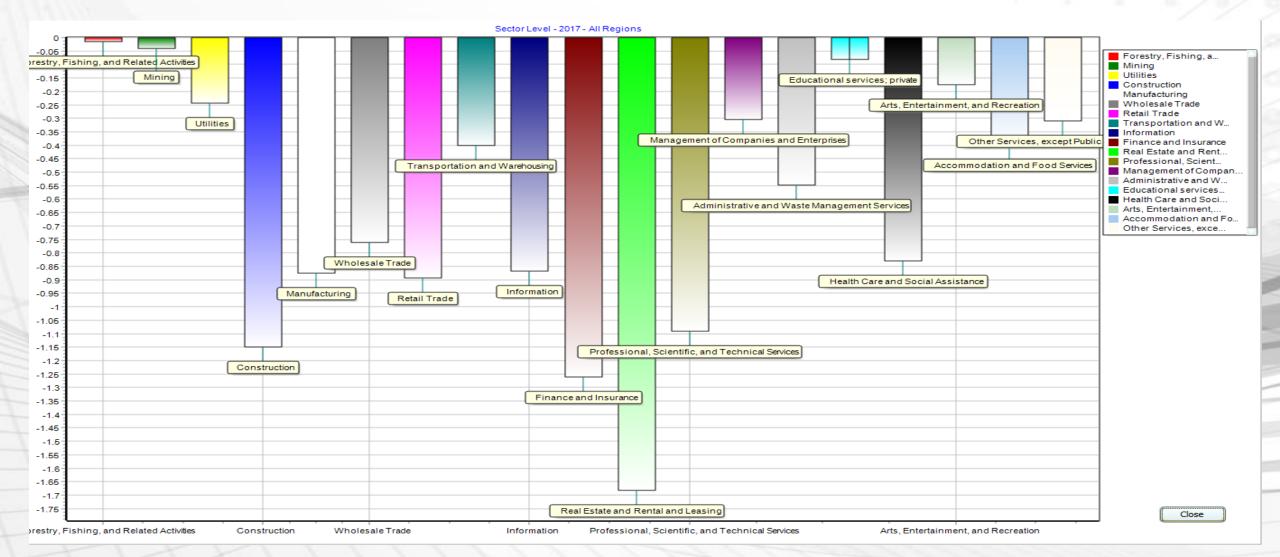
Economic Output Loss





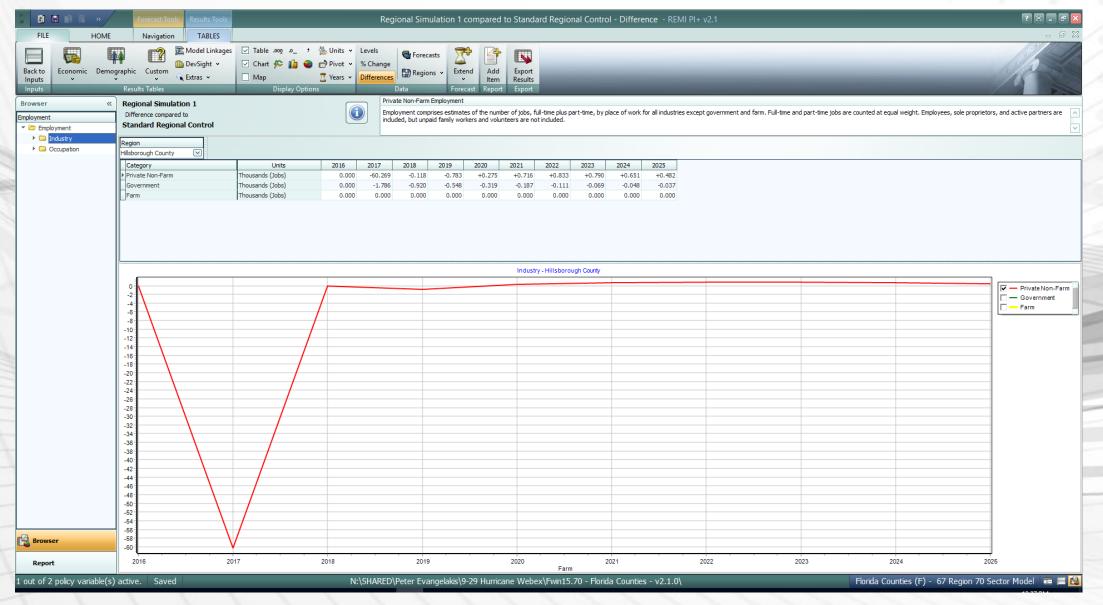
Economic Output Loss by Sector





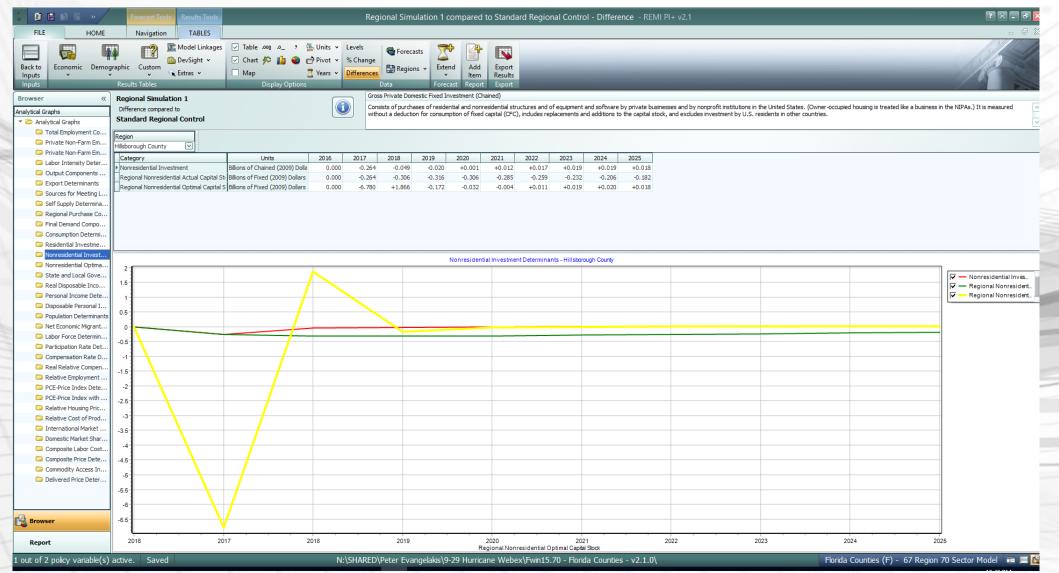






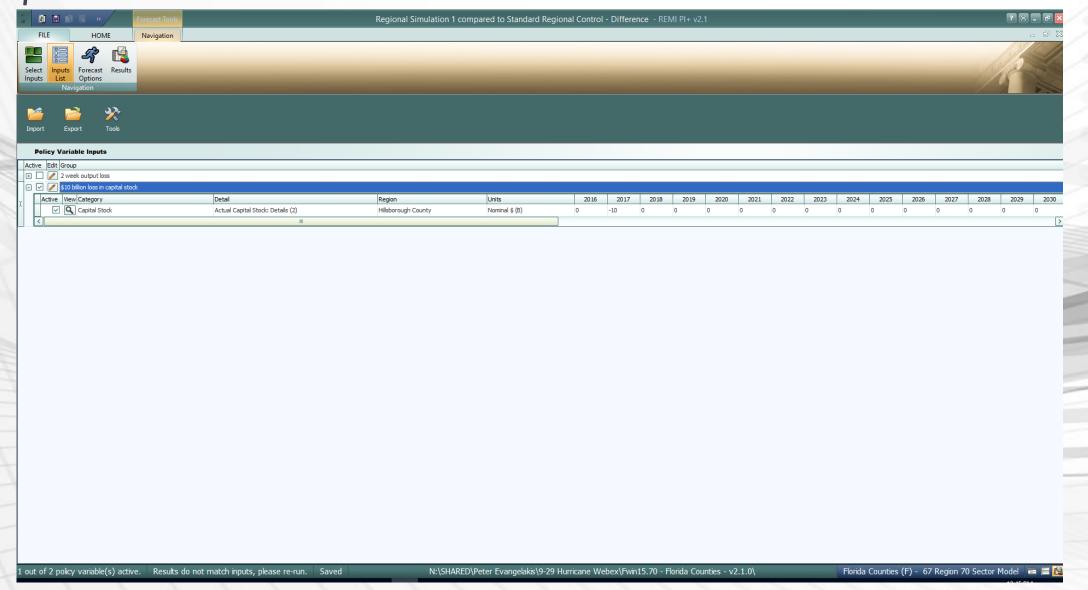
Capital Stock Lose Due to Decrease in Economic Activity





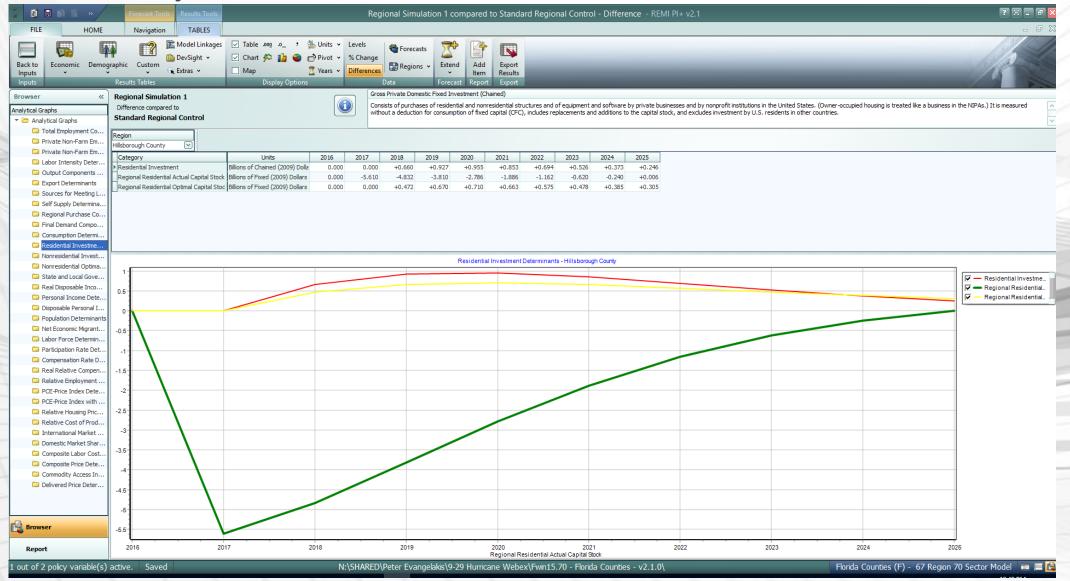
Decrease in additional capital stock to match REMI \$10 billion reduction





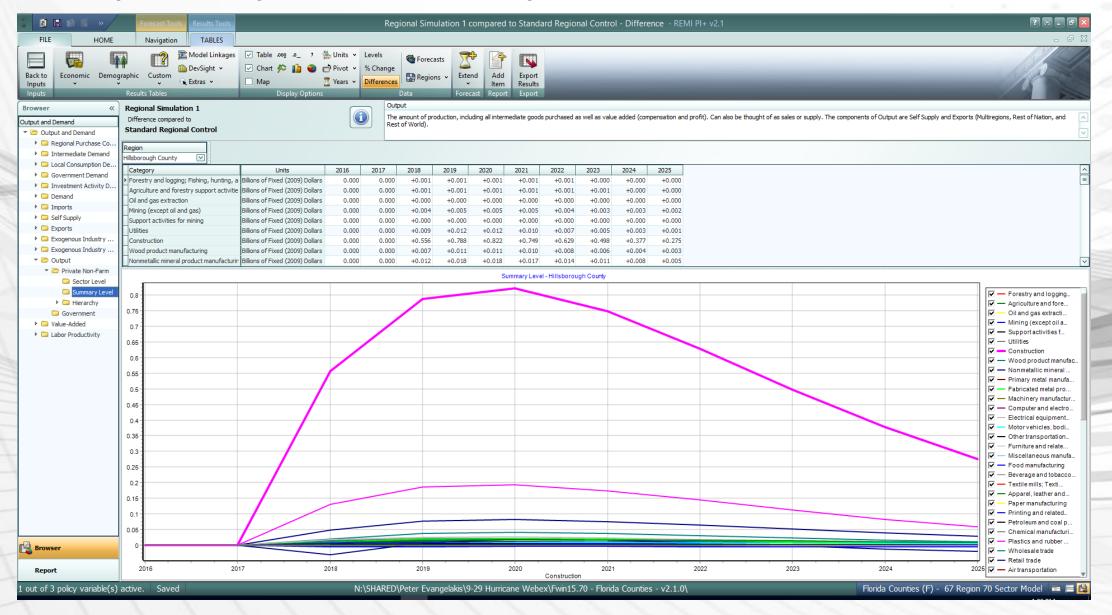
\$10 billion of capital stock loss and its recovery over time





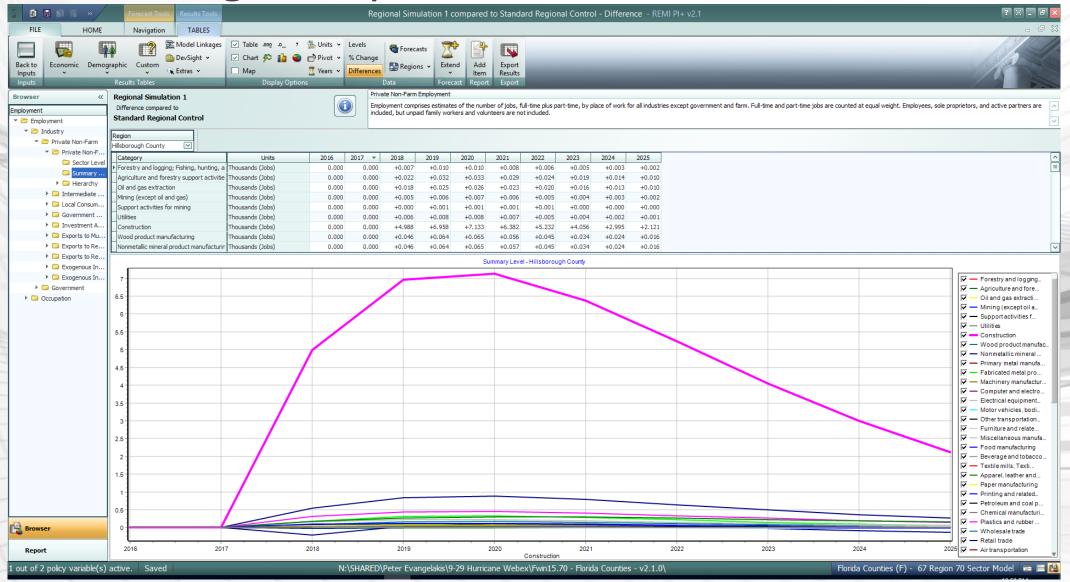


Output impact from capital stock decrease



Positive Employment over time due to Rebuilding of Capital Stock





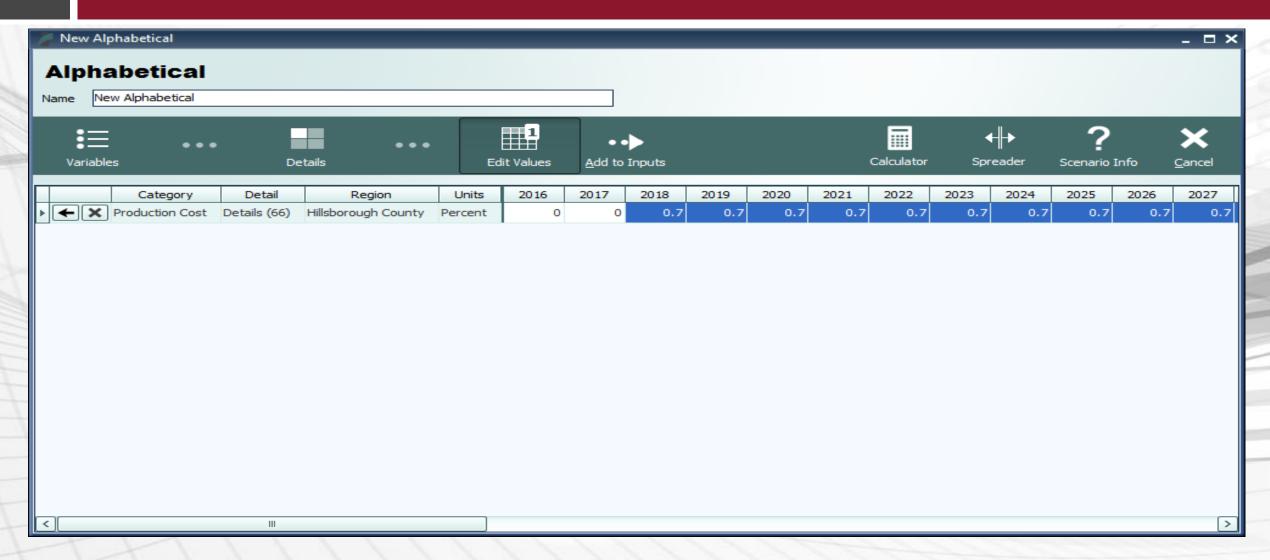
Insurance Input for each Industry (Averaging 1.4%)



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			1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Гуре	Index	Row Names	Forestry and A	Agriculture a	Oil and gas e	Mining (exce	Support activ	Utilities	Construction	Wood product	Nonmetallic r P	rimary meta F	abricated m	Machinery m	Computer an	Electrica		
	23	Paper manufacturing	0.00007	0.00012	0.00014	0.00110	0.00064	0.00011	0.00254	0.00571	0.01079	0.01159	0.00596	0.00603	0.00173	0.00		
	24	Printing and related support activities	0.00008	0.00008	0.00004	0.00011	0.00012	0.00021	0.00038	0.00074	0.00043	0.00213	0.00052	0.00058	0.00032	0.0		
	25	Petroleum and coal products manufacturi	0.01928	0.00272	0.00498	0.03517	0.01911	0.03515	0.03374	0.00916	0.01218	0.00726	0.00341	0.00546	0.00095	0.0		
	26	Chemical manufacturing	0.00104	0.08662	0.01266	0.01182	0.01167	0.00411	0.00870	0.02444	0.04355	0.00865	0.02450	0.01427	0.00846	0.0		
	27	Plastics and rubber product manufacturin	0.00199	0.00269	0.00033	0.00905	0.00247	0.00007	0.01345	0.00648	0.00813	0.00368	0.00594	0.02283	0.00386	0.0		
	28	Wholesale trade	0.03335	0.02158	0.00582	0.02120	0.02088	0.01042	0.04151	0.06445	0.03336	0.05923	0.03363	0.06013	0.02318	0.0		
	29	Retail trade	0.00163	0.00020	0.00019	0.00087	0.00139	0.00119	0.04190	0.00205	0.00159	0.00159	0.00125	0.00181	0.00035	0.0		
	30	Air transportation	0.00006	0.00054	0.00009	0.00033	0.00137	0.00112	0.00115	0.00381	0.00316	0.00197	0.00299	0.00271	0.00059	0.0		
	31	Rail transportation	0.00054	0.00132	0.00067	0.01995	0.00142	0.00388	0.00142	0.00684	0.02185	0.01947	0.00416	0.00209	0.00029	0.0		
	32	Water transportation	0.00032	0.00055	0.00037	0.00240	0.00070	0.00055	0.00149	0.00032	0.00395	0.00325	0.00028	0.00019	0.00010	0.0		
	33	Truck transportation	0.00901	0.00396	0.00101	0.00461	0.00475	0.00096	0.01229	0.02013	0.02457	0.02359	0.00861	0.00989	0.00256	0.0		
	34	Couriers and messengers	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00002	0.00002	0.00002	0.00001	0.00001	0.00000	0.0		
	35	Transit and ground passenger transporta	0.00012	0.00001	0.00000	0.00005	0.00035	0.00021	0.00023	0.00098	0.00080	0.00051	0.00080	0.00069	0.00009	0.0		
	36	Pipeline transportation	0.00015	0.00017	0.01020	0.00027	0.00014	0.01362	0.00017	0.00010	0.00022	0.00017	0.00006	0.00006	0.00001	0.0		
	37	Scenic and sightseeing transportation an	0.01330	0.00038	0.00003	0.00091	0.00008	0.01068	0.00012	0.00344	0.00325	0.00051	0.00027	0.00016	0.00005	0.0		
	38	Warehousing and storage	0.00006	0.00003	0.00001	0.00096	0.00003	0.00089	0.00008	0.00358	0.00213	0.00154	0.00273	0.00160	0.00051	0.0		
ntermediate Inputs (incl. Fuel) / Output	39	Publishing industries, except Internet	0.00021	0.00012	0.00075	0.00018	0.00028	0.00087	0.00067	0.00161	0.00094	0.00062	0.00186	0.00166	0.00096	0.0		
III	40	Motion picture and sound recording indus	0.00001	0.00001	0.00003	0.00003	0.00005	0.00001	0.00010	0.00001	0.00001	0.00001	0.00001	0.00002	0.00003	0.0		
	41	Internet publishing and broadcasting; ISF	0.00012	0.00011	0.00117	0.00023	0.00038	0.00231	0.00103	0.00838	0.00604	0.00362	0.00599	0.00611	0.00138	0.0		
	42	Broadcasting, except Internet	0.00010	0.00004	0.00011	0.00013	0.00037	0.00089	0.00069	0.00206	0.00110	0.00054	0.00163	0.00125	0.00086	0.0		
	43	Telecommunications	0.00144	0.00070	0.00113	0.00283	0.00671	0.00112	0.00708	0.00486	0.00396	0.00261	0.00445	0.00125	0.00213	0.0		
	44	Monetary authorities - central bank; Crec	0.00341	0.00267	0.00175	0.00474	0.00891	0.01112	0.00477	0.00598	0.00823	0.00261	0.00665	0.00541	0.00215	0.0		
	45	Securities, commodity contracts, investm	0.00341	0.00207	0.00239	0.00644	0.00391	0.00220	0.00232	0.000398	0.00323	0.00571	0.00450	0.00341	0.00138	0.0		
	46	Insurance carriers and related activities	0.00288	0.00204	0.00038	0.00044	0.001136	0.000220	0.00232	0.00297	0.00394	0.00371	0.00272	0.00360	0.00038	0.0		
	47	Real estate	0.00327	0.00228	0.002//	0.00494	0.00306	0.00036	0.00668	0.00297	0.00394	0.00312	0.00272	0.00360	0.00580	0.0		
	48	Rental and leasing services; Lessors of n	0.00301	0.00400	0.01009	0.01493	0.02402	0.00170	0.01541	0.00452	0.00687	0.00560	0.00931	0.00848	0.00349	0.0		
	49	Professional, scientific, and technical ser	0.01316	0.02417	0.02344	0.02380	0.04943	0.02429	0.03472	0.03241	0.02748	0.02573	0.03434	0.03402	0.02934	0.0		
	50	Management of companies and enterpris	0.00003	0.00003	0.02144	0.01808	0.01541	0.00011	0.00221	0.03964	0.03641	0.02308	0.02354	0.02554	0.01522	0.0		
	51	Administrative and support services	0.00108	0.00249	0.00164	0.00439	0.01132	0.00902	0.00531	0.01275	0.01238	0.01608	0.02087	0.00914	0.00720	0.0		
	52	Waste management and remediation ser	0.00039	0.00000	0.00316	0.00171	0.00113	0.00086	0.00172	0.00207	0.00235	0.01226	0.00182	0.00094	0.00032	0.0		
	53	Educational services; private	0.00100	0.00051	0.00003	0.00003	0.00011	0.00024	0.00010	0.00018	0.00014	0.00010	0.00016	0.00014	0.00002	0.0		
	54	Ambulatory health care services	0.00009	0.00010	0.00022	0.00034	0.00054	0.00003	0.00062	0.00004	0.00004	0.00003	0.00005	0.00005	0.00001	0.0		

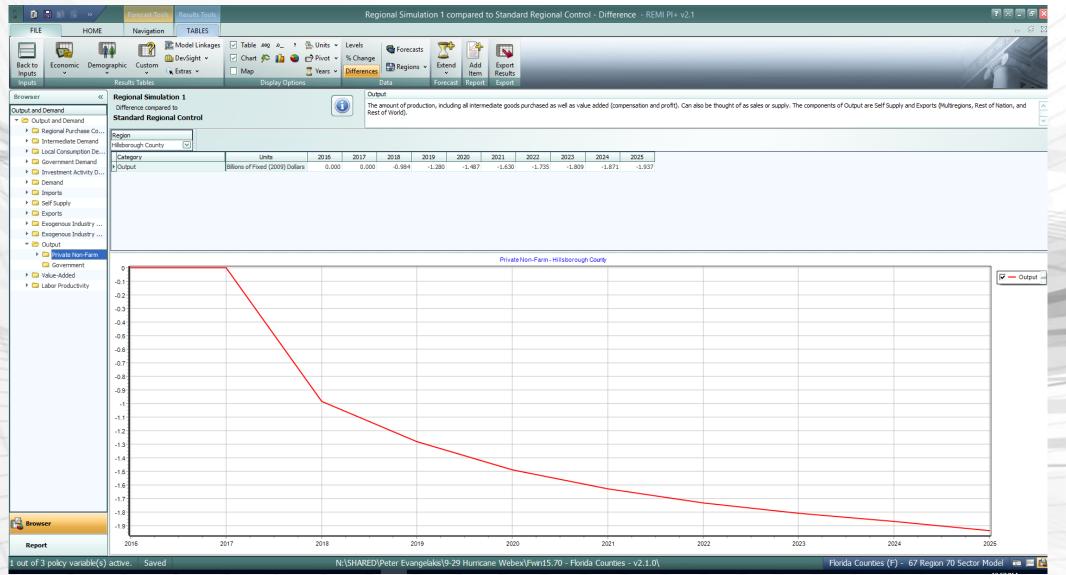
Increased Insurance Cost by 50% (ie production cost by .7%)



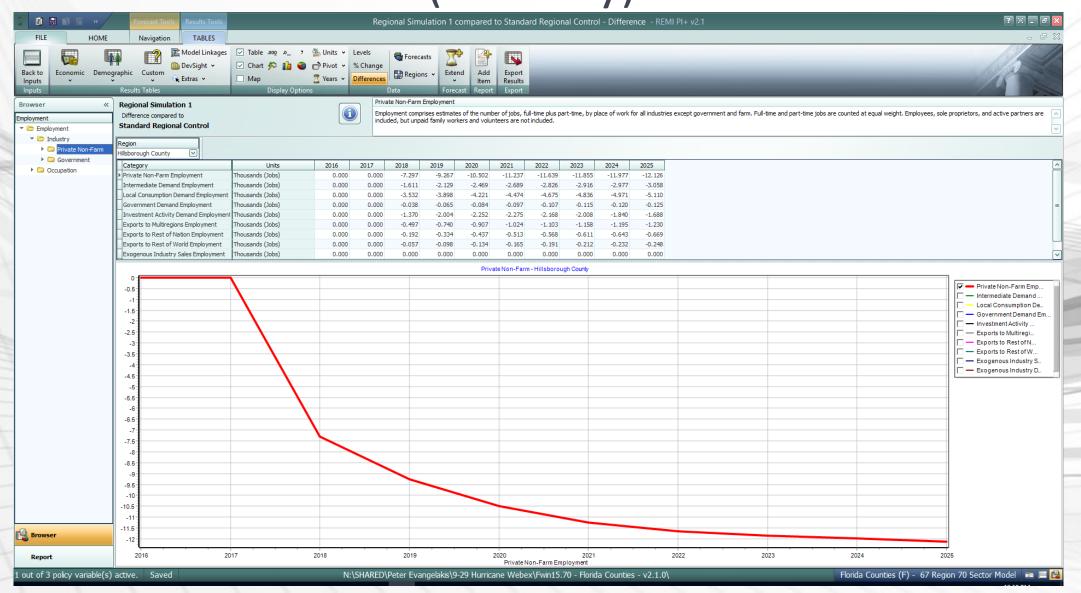


Long term Economic Loss due to Insurance Premium Increase (Industry)



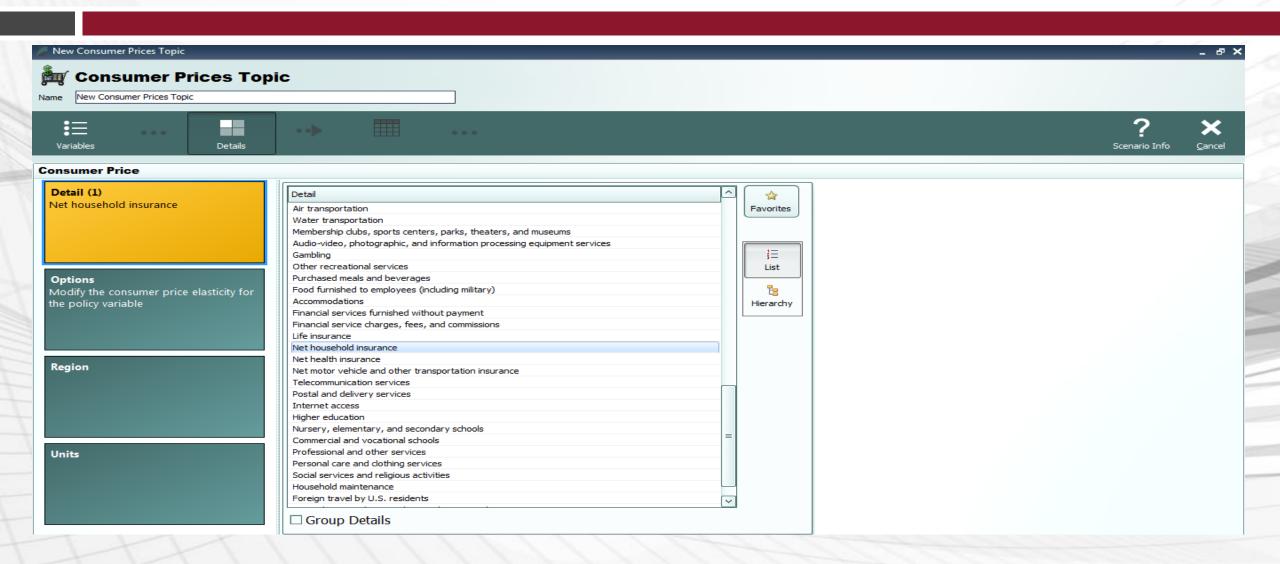


Long term Employment Loss due to Insurance REMI Premium Increase (Industry)



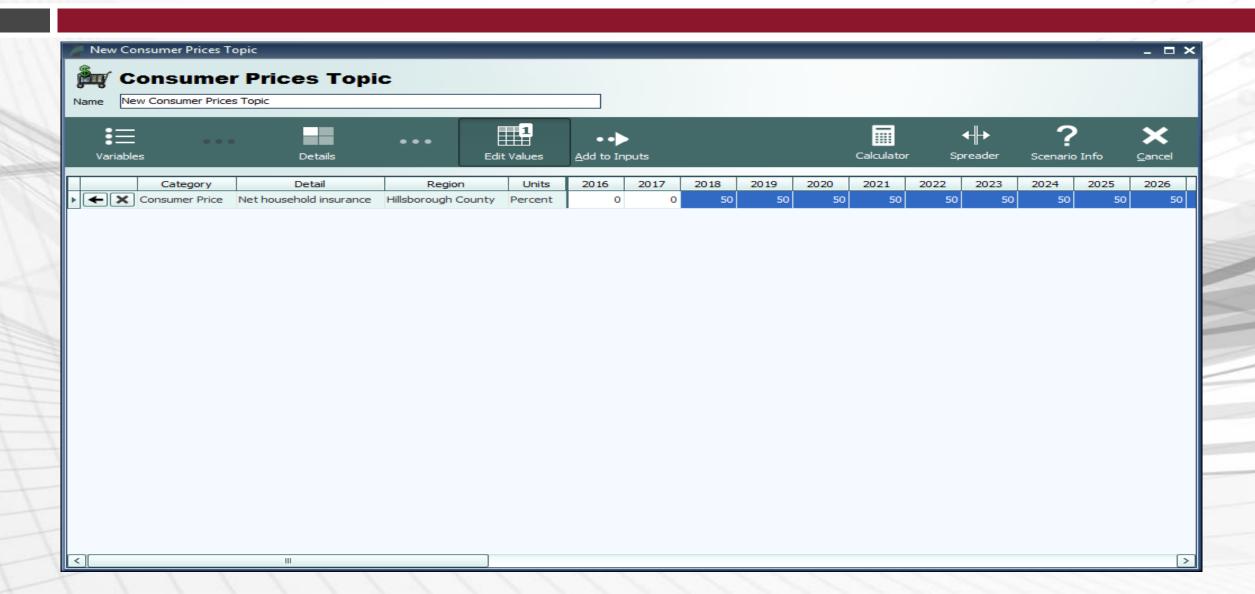
Select Household Insurance Price





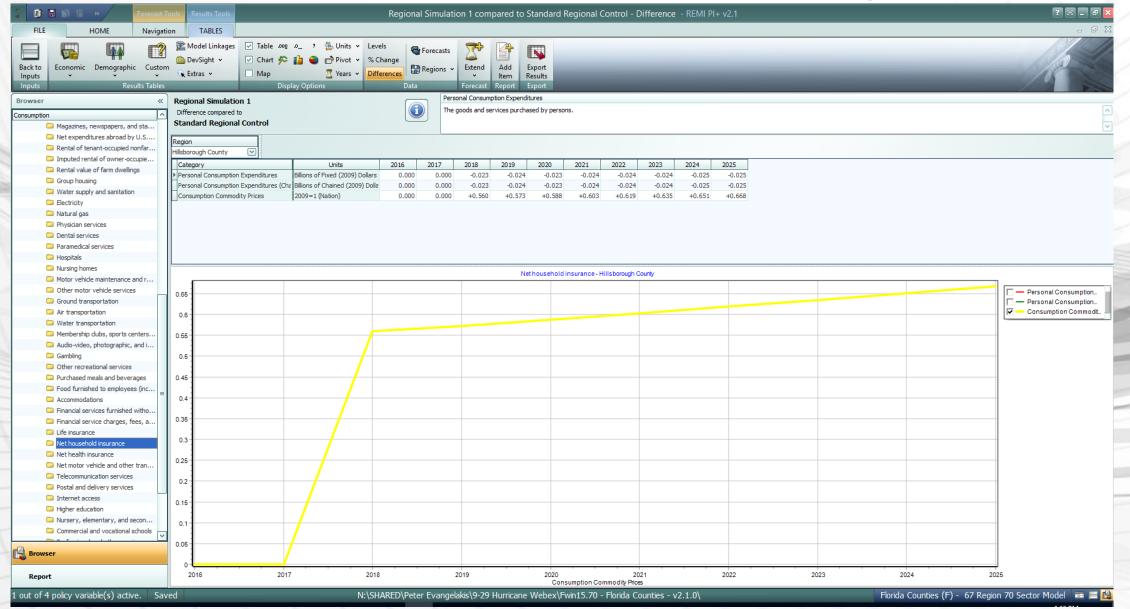
Increase Household Insurance by 50%





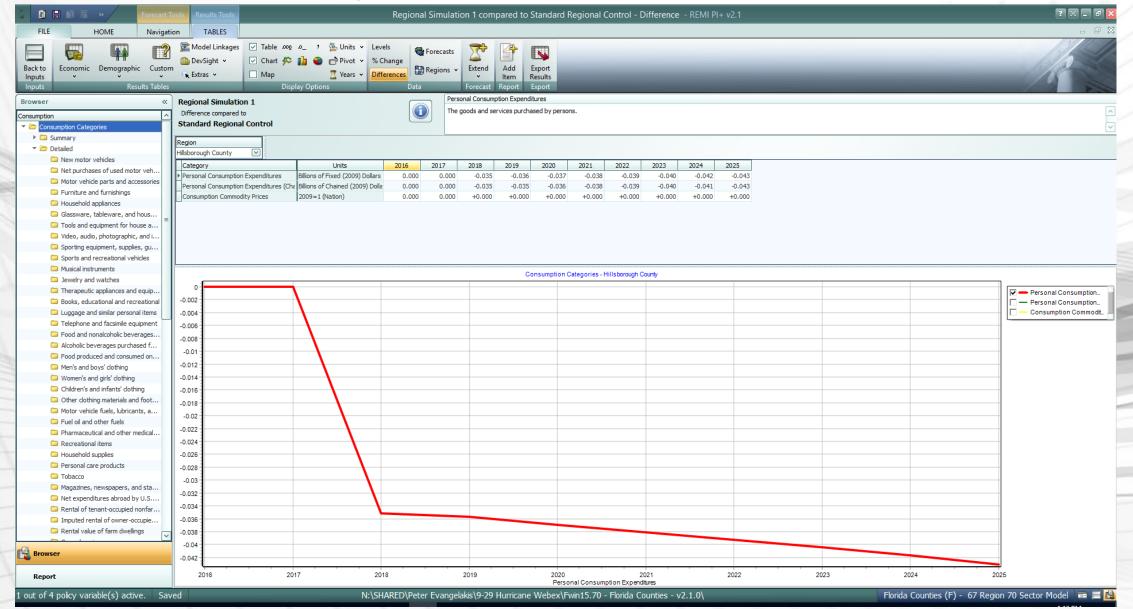


Price of Household Insurance Rising



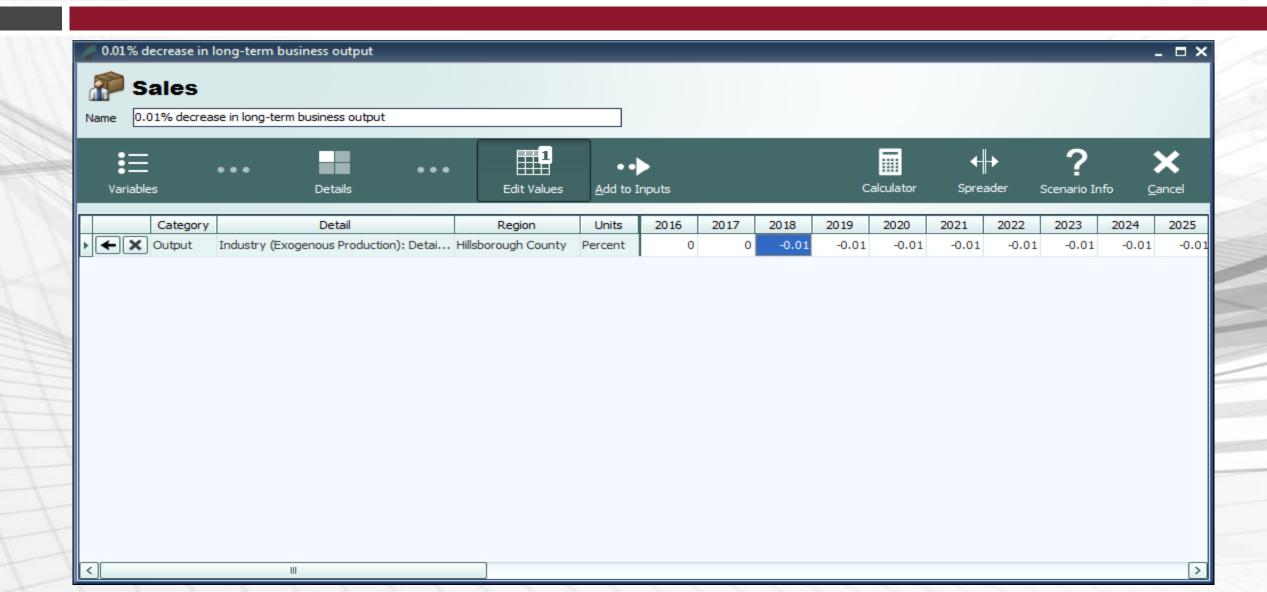


Total Consumption Decrease



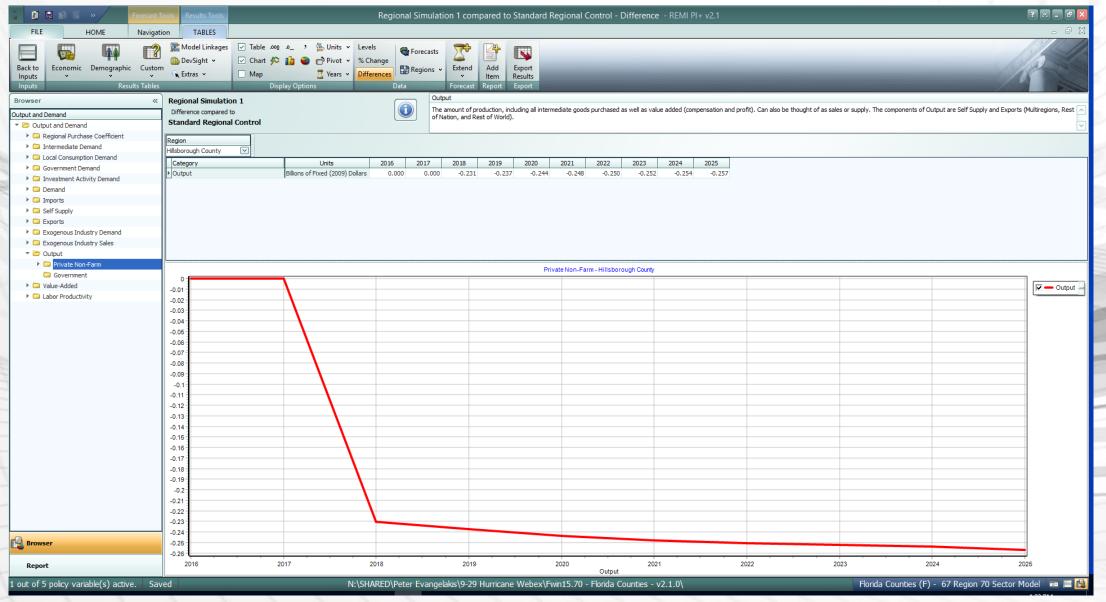
Loss in Business



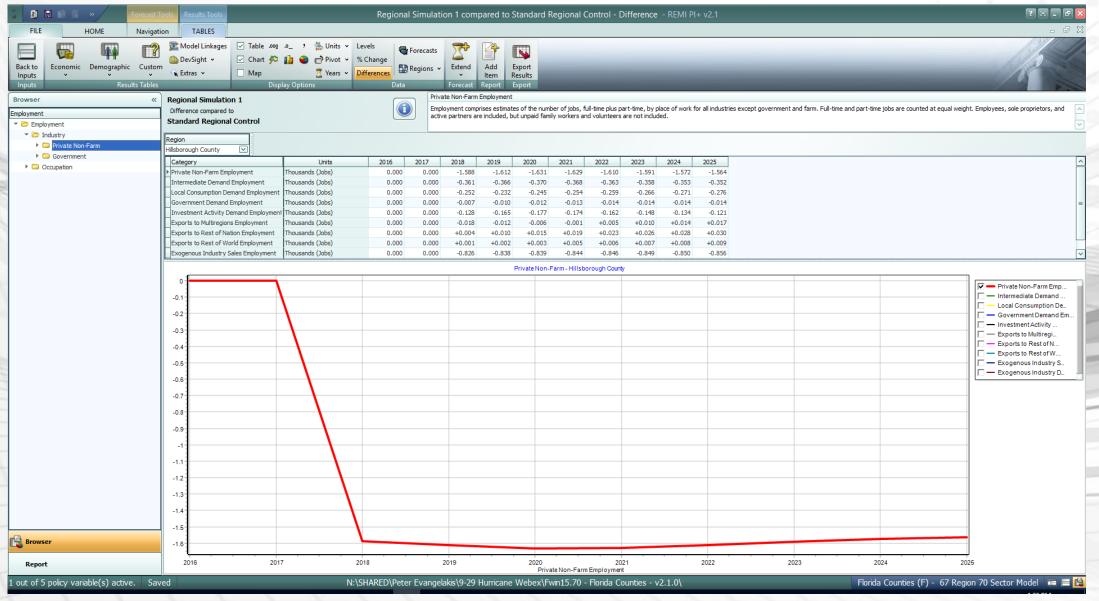




Output Loss due to Business Closing

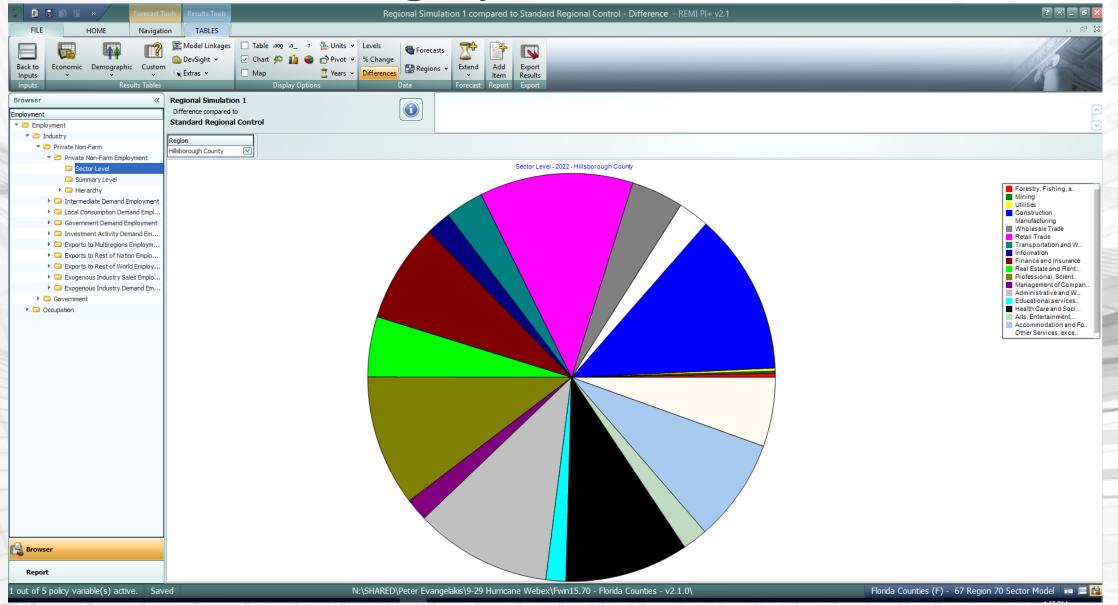


Employment Loss due to Business Closing



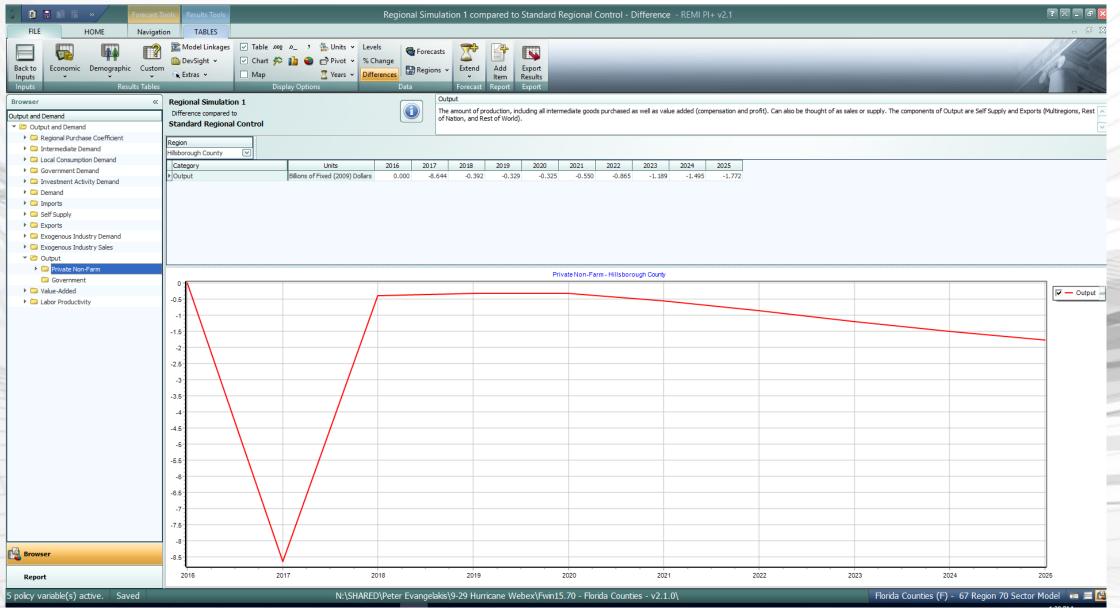
Business Closing by Sector





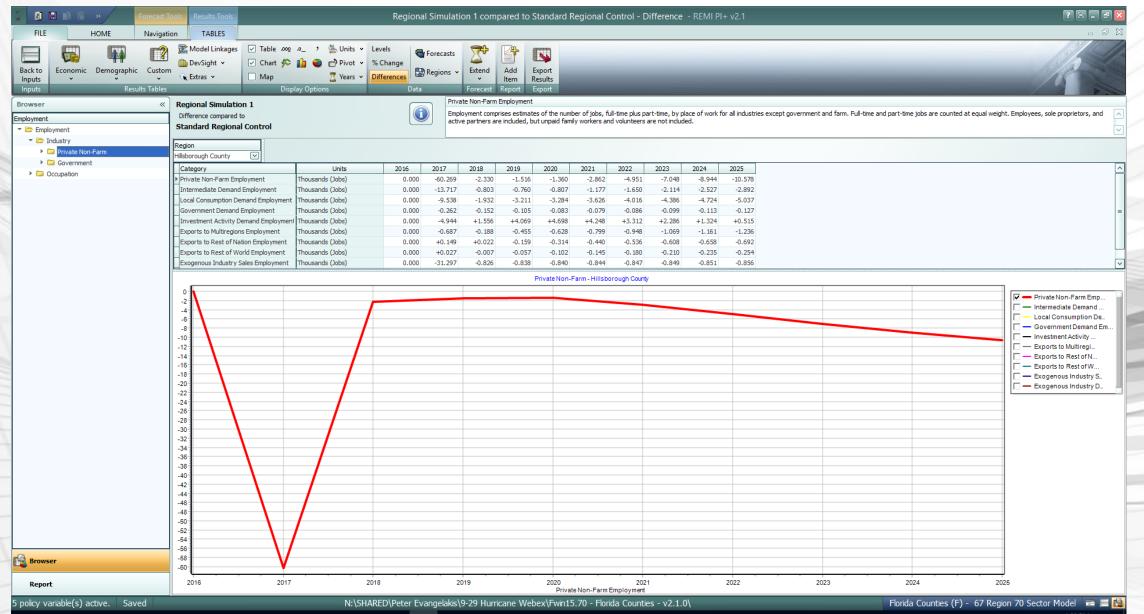


Complete Simulation (Output, Hillsborough County)



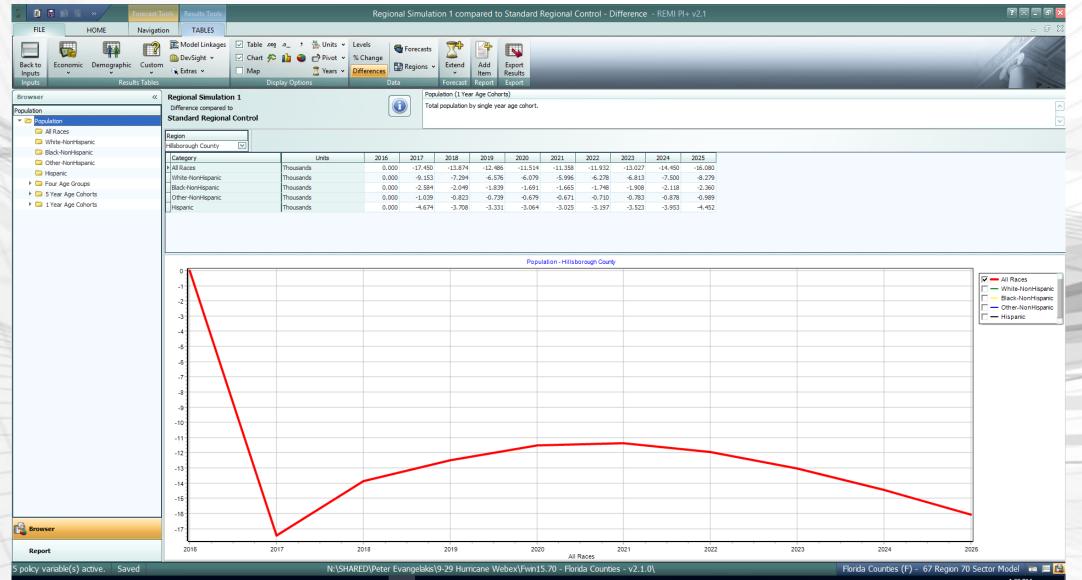


Complete Simulation (Employment, Hillsborough County)



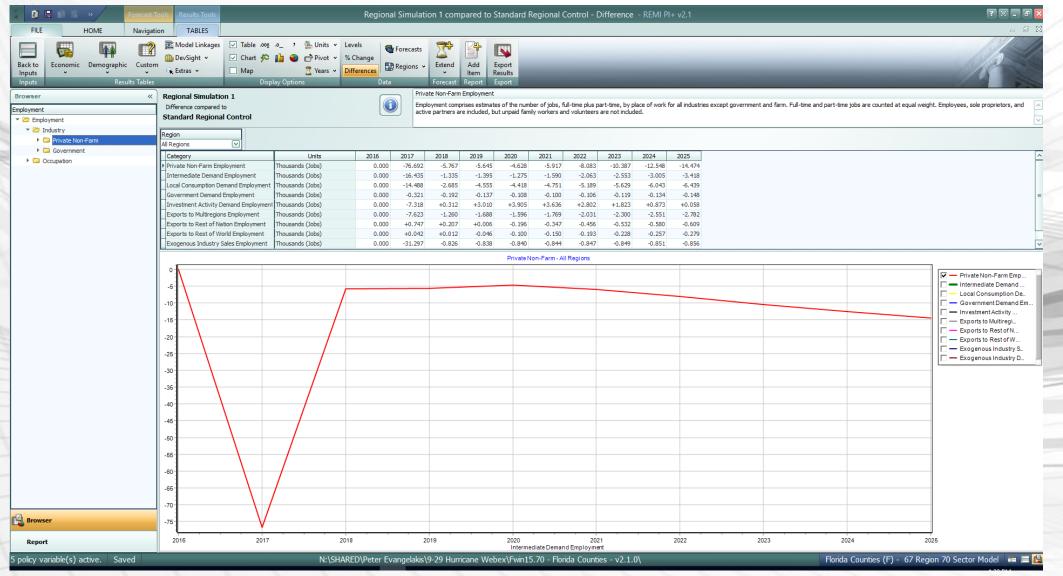
Complete Simulation (Population, Hillsborough County)





Complete Simulation (Employment in all of FL)





Conclusion



- Take into consideration of your existing economic base to understand the impact
- Take into consideration of your existing economic base to plan for recovery
- Duration of recovery is important (economic and population loss, completeness impact)
- 4) Long-term cost and resilience planning