



Macroeconomic and Industry Impacts of 9/11: An Interindustry Macroeconomic Approach

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What We Are Doing

- We identify direct impacts of 9/11, consistent with the findings of other CREATE studies.
- We simulate a terrorist attack of similar magnitude to 9/11.
- We calculate the dynamic, general-equilibrium effects on the macro economy and across industries.

Inforum

- Founded by Clopper Almon in 1967, Inforum stands for Interindustry Forecasting at the University of Maryland. Research Center within the Department of Economics.
- Builds and uses structural economic models of U.S. and other economies. We pioneered the construction of dynamic, interindustry, macroeconomic models which portray the economy in a unique “bottom-up” fashion.
- Works with government and private sector organizations to investigate a variety of issues. Recent issues include energy, homeland security, immigration, and health care.
- Economic projections and analysis using Inforum econometric models distinguished by detail at industrial and product level.
- Inforum serves as a training crucible for University of Maryland graduate students. Students receive valuable training in empirical economics and find fertile ground for dissertation research.
- Inforum maintains active ties with a world-wide network of research associates, each of which uses Inforum modeling methods and software.

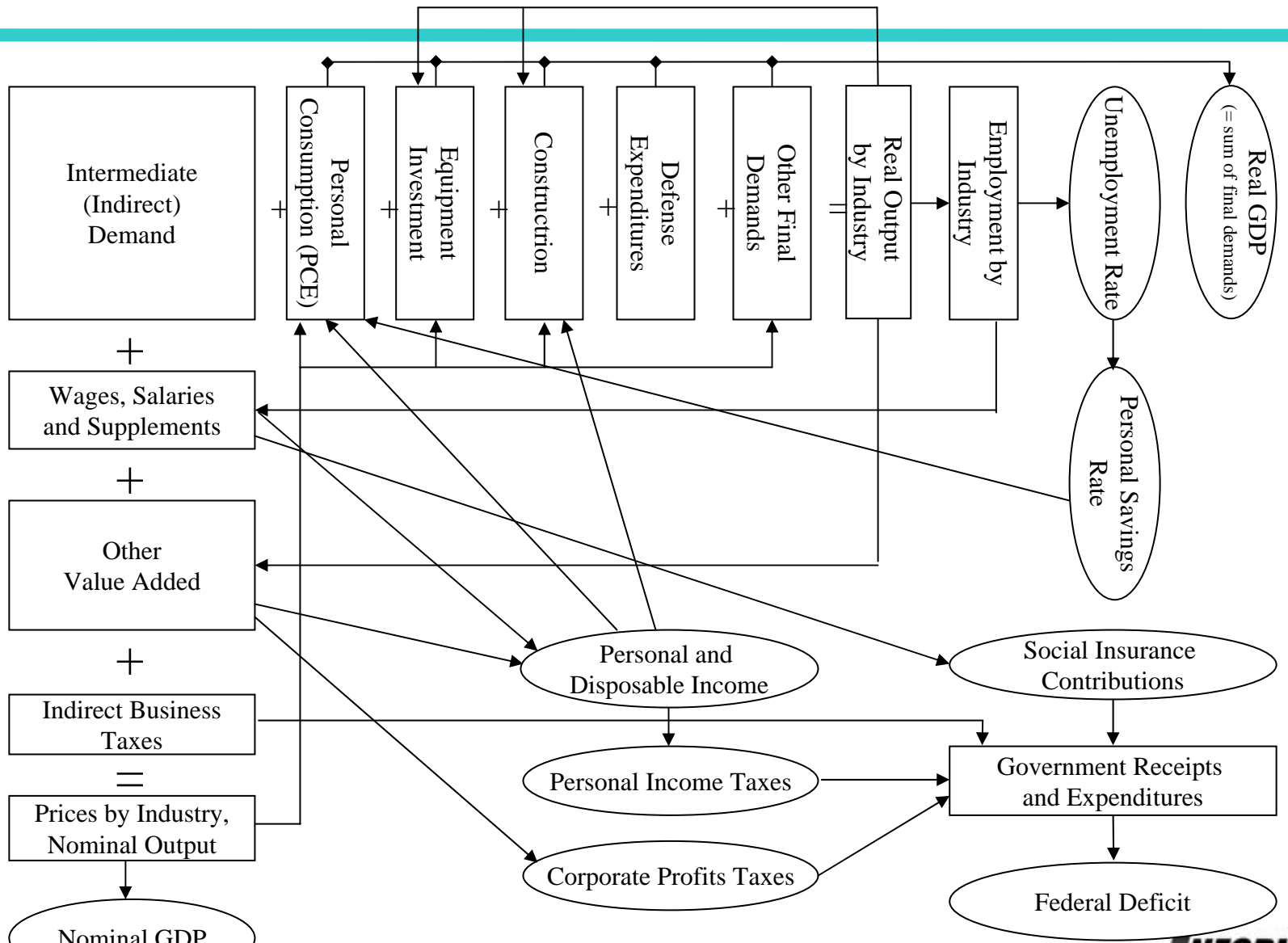
Inforum Interindustry-Macroeconomic (IM) Models

- Combine input-output structure with econometric equations in a dynamic and detailed framework.
- Like a CGE: Contains detailed industry structure and *bottom-up* accounting.
- Like an (macro) econometric or VAR model: Parameters estimated from actual data. Portray dynamic evolution of economies over actual time periods.
- Lift (Long-term interindustry forecasting tool) is 97 sector flagship model. Under continuous development and use for over 30 years.
- Iliad - detailed 360 sectors.
- International System: BTM bilateral trade model, IM models for all major trade partners including China.

LIFT: Inforum's Model of the U.S. Economy

- LIFT stands for Long-term Interindustry Forecasting Tool.
- LIFT is an interindustry-macro (IM) model.
 - Sectoral detail for production, prices jobs, consumer spending, foreign trade and factor income (wages, profits, depreciation, etc).
 - Macrovariables. Many, such as GDP, net exports, the unemployment rate, and the aggregate price level are aggregates of the underlying industry forecasts. Other macrovariables such as the savings rate and interest rates, complete the model.
- LIFT is dynamic, solving year by year, and incorporating investment and capital stocks.
- LIFT is particularly useful in addressing questions involving interactions between industries, as well as the interplay between industry and macroeconomic relationships.

Schematic of the Inforum Lift Model



Recent Studies Using LIFT

- Economic Impact of Energy Policies** – Securing America’s Future Energy (SAFE)
- Sustainability of Long-term Projections** - Centers for Medicare and Medicaid Services
- Impact of Port Closures** – Applied Physics Lab, JHU
- Immigration Impacts on U.S. Economy**– U.S. Department of Commerce
- Impact of U.S. Port Closures on U.S. and Asian Economies** – Booz-Allen Hamilton
- Industrial, Regional & Occupational Impacts of Defense** - Department of Defense
- Impact of High Oil and Natural Gas Prices** – Department of Commerce (ESA)
- Enhanced Medical Insurance Coverage** – MITRE Corporation
- Impact of Container Trade Interruptions** - CBO
- Impact of Currency Fluctuations** – Department of Commerce (ITA)
- Static & Dynamic Effects of Trade Liberalization** – Manufacturers Alliance
- The Digital Economy 2000/2005** - Department of Commerce (ESA)
- Impact of Asian Crisis on the U.S. Industries** - Manufacturers Alliance
- Local Impacts of Electricity Deregulation** – NRECA
- China in the WTO** - U.S. Government
- Clean Energy and Jobs** - Center for a Sustainable Economy`

Scope of this Project

- Assess the economy-wide and industrial impacts of the 9/11 Manhattan Business Interruption (BI) and the Airline related expenditure interruptions.
- We assume that the 9/11 shock might be asymmetric. Therefore, compared to actual history, our counter-factual scenarios assume that 9/11 does not occur.
- We use the direct impacts on several industries to assess the total (direct and indirect) impacts on the economy.
 - FIRE and Other Business Services, including the rail disruption.
 - Air travel and related travel services (hotels, restaurants, etc.)
 - Some policy is endogenous: Counter-cyclical monetary and automatic fiscal stabilizers.
 - Exogenous policy is not considered (excess liquidity used to stabilize financial markets)
- Longer term structural effects are not considered:
 - Productivity effects of new security, changes to inventory or other business behavior.

Direct and Indirect Economic Impacts of Disasters

- Immediate negative GDP impact will be offset later by positive stimulus.
- Path and magnitude of GDP fluctuation can be affected by:
 - Economy's initial conditions,
 - Fiscal and monetary policy reactions,
 - Business and consumer psychology,
 - Foreign investment,
 -
- Is it possible to unscramble these eggs?
- Some options:
 - Compare actual economic outcome during and after disaster with a hypothetical “counterfactual” case with no disaster.
 - Simulate disaster's impact on economy compared to a base-line case.

Supply Side: Manhattan Business Non-Interruption

- Destruction of Capital (and Labor) is a supply shock.
- Rose, et. al. (Chapters 3 and 6) provide estimates of lost transactions net of relocations. We use these output numbers to target output increase as indicated below.
- Simulated in the model by decreasing the supply prices of the effected industries until output and demand is increased the targeted amount.
- Additional value added income taken from capital consumption.
- Price reductions are temporary and it is entirely possible that some of the increased output is reduced from subsequent periods, relative to the 9/11 baseline.

Business Non-Interruption Shocks	Best Estimate		Lower Bound		Upper bound	
	2001	2002	2001	2002	2001	2002
Millions of current (2001) dollars						
Finance, Insurance and Real Estate	7187	7187	625	625	2671	2671
Other Business Services	863	863	75	75	3129	3129

Demand Side: Travel Expenditures Not Affected

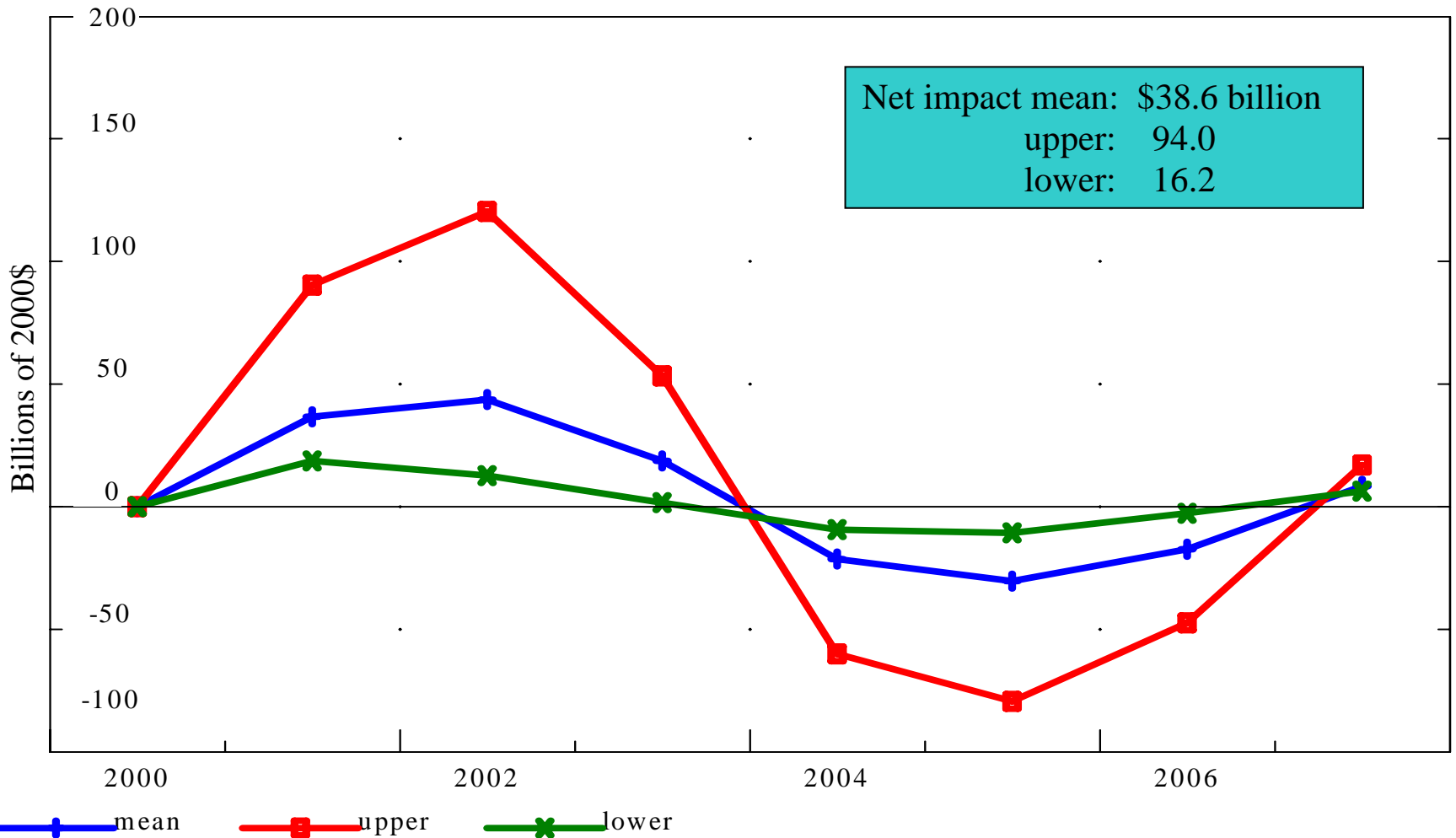
- Increased travel is a demand shock.
- We assume that most of the observed travel PCE expenditure as a result of 9/11 reduction was not redirected elsewhere, at least temporarily.
- Reduced business travel expenditures, however, were spent somewhere else in the supply chain. That is, they did not flow to productivity growth. (There is some evidence to refute this.)
- Asay, et. al. provide estimates of the reduced travel expenditures across several industries. He also estimates the timing of these reductions across quarters from 9/11 to 4Q2005.
- Used as positive final demand shocks to assess effects of no-9/11.

Expenditure Increases - Millions of current (2001) dollars

	Best Estimate				Upper Bound				Lower Bound			
	Total	2001	2002	2003	Total	2001	2002	2003	Total	2001	2002	2003
Air Transport	28476	9898	12701	5877	42292	11547	19342	11402	15282	8305	6344	634
Other Transport	1766	614	788	364	2623	716	1200	707	948	515	393	39
Hotels	17660	6138	7877	3645	26229	7161	11996	7072	9478	5150	3934	393
Gasoline	883	307	394	182	1312	358	600	354	474	258	197	20
Auto rentals	5520	1919	2462	1139	8199	2239	3750	2210	2963	1610	1230	123
Restaurants	10891	3785	4858	2248	16174	4416	7397	4361	5845	3176	2426	242
Retailing	4121	1432	1838	850	6120	1671	2799	1650	2211	1202	918	92
Amusements	4194	1458	1871	866	6229	1701	2849	1680	2251	1223	934	93
Railroad	500	174	223	103	500	137	229	135	500	272	208	21
	<u>73511</u>				<u>109178</u>				<u>39451</u>			

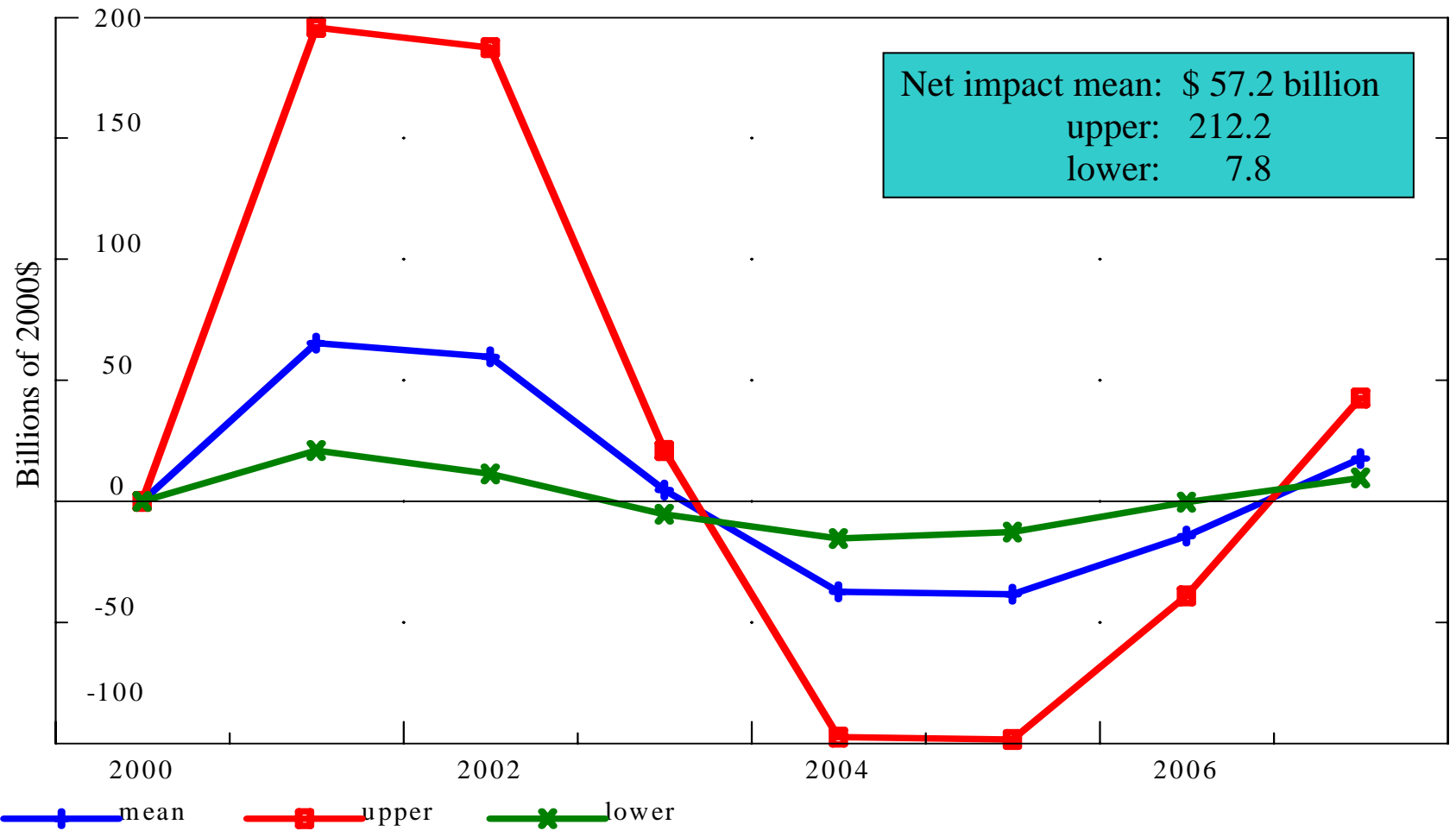
Impacts on GDP: Deviation from 9/11 Baseline

Real GDP



Impacts on Real Income: Deviation from 9/11 Baseline

Real National Income

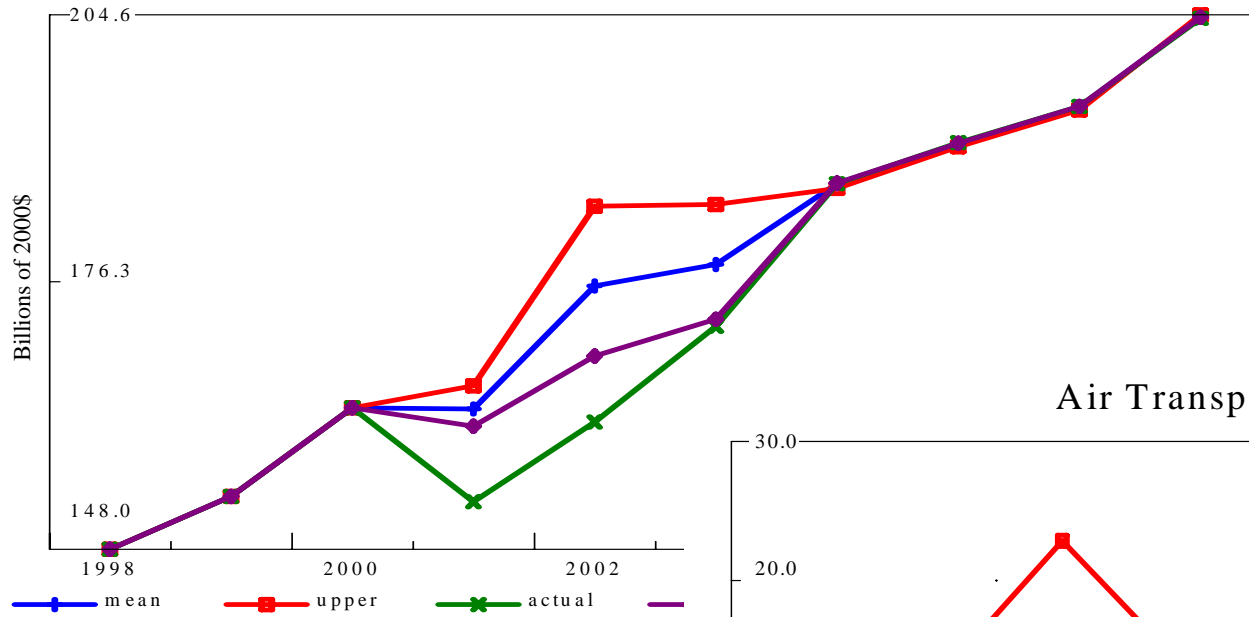


Impacts on Employment: Deviation from 9/11 Baseline

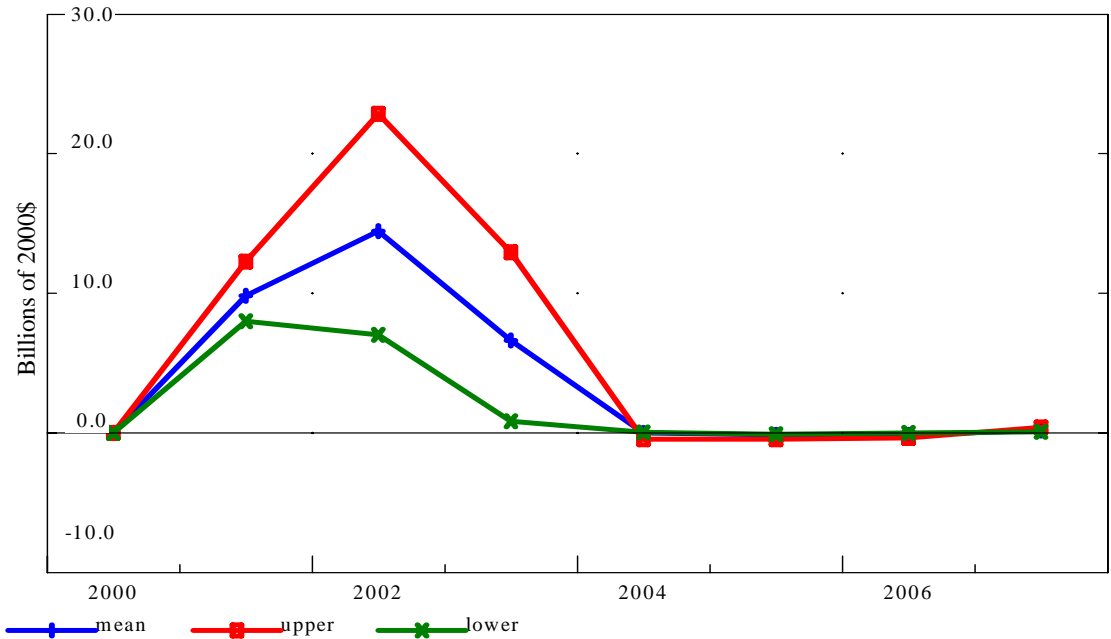


Impact on Air Transportation Output

Air Transport Output

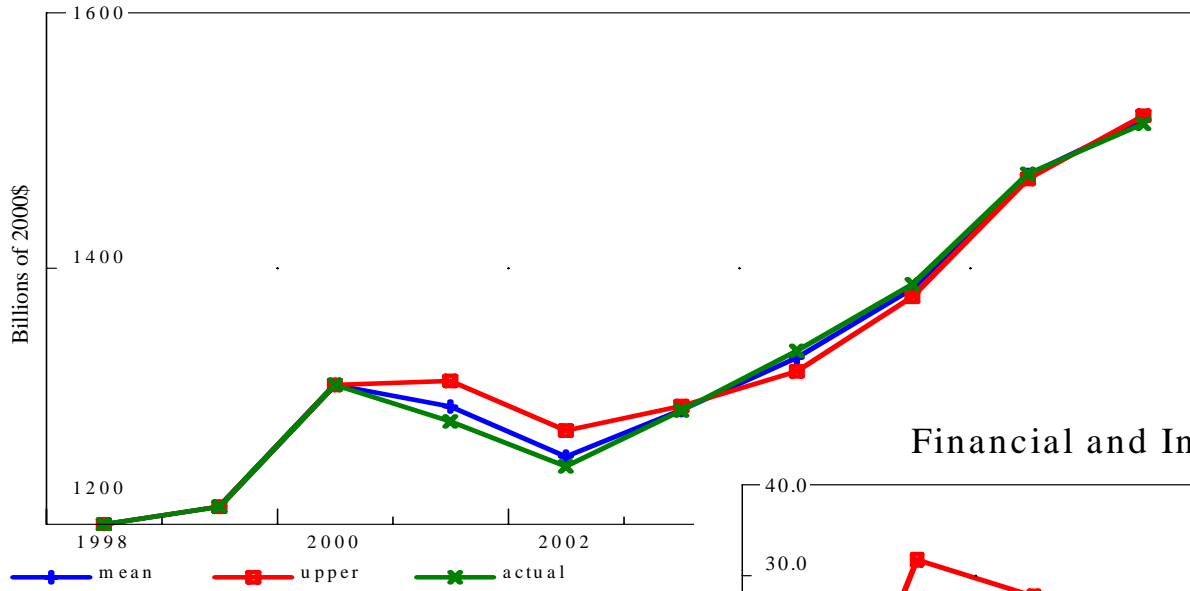


Air Transport Output

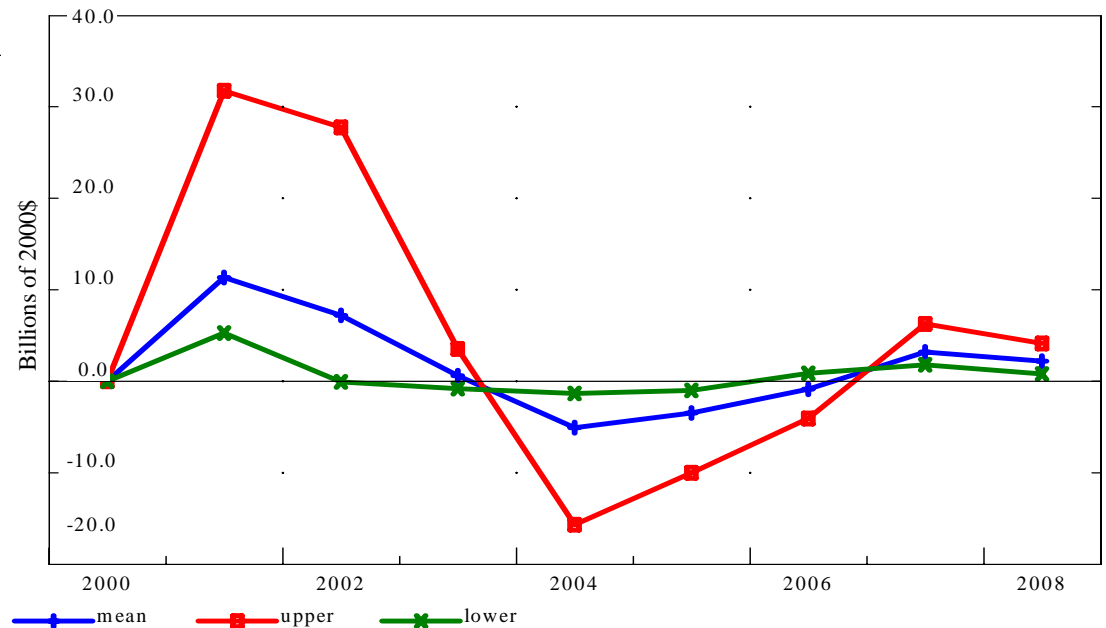


Impacts on FIRE Output

Financial and Insurance Sector Output



Financial and Insurance Sector Output



REAL IMPACTS on GDP, FINAL DEMAND, INCOME, AND EMPLOYMENT

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Net</u>
Gross Domestic Product, billion 2000\$	0.0	18.7	12.8	1.4	-9.4	-10.8	-2.6	10.1
	0.0	36.8	43.6	18.7	-21.5	-30.4	-17.4	29.9
	0.0	90.5	120.5	53.2	-60.0	-79.6	-47.5	77.0
Personal Consumption Expenditures	0.0	22.4	9.7	0.1	-4.7	-4.9	0.4	23.1
	0.0	43.2	43.1	14.7	-13.2	-12.9	-5.8	69.0
	0.0	101.7	123.1	44.9	-38.5	-33.7	-17.1	180.5
Gross Private Fixed Investment	0.0	0.3	7.9	3.3	-7.8	-10.4	-4.8	-11.6
	0.0	2.1	14.4	12.6	-13.7	-29.3	-19.4	-33.3
	0.0	7.7	32.4	31.1	-37.0	-76.9	-50.5	-93.1
Real Net Exports	0.0	-3.4	-3.7	-1.4	2.2	3.3	1.3	-1.7
	0.0	-7.2	-10.7	-6.0	4.2	8.8	5.9	-5.0
	0.0	-17.5	-28.1	-15.7	12.7	23.2	15.4	-9.9
Government	0.0	0.1	-0.1	-0.2	0.0	0.0	0.2	0.0
	0.0	0.4	-0.2	-0.7	-0.4	-0.2	0.1	-1.0
	0.0	2.7	0.8	-2.2	-1.6	-0.9	0.2	-0.9
Real Disp Income	0.0	21.7	23.2	10.4	-6.7	-14.2	-6.6	27.8
	0.0	49.1	72.3	44.9	-7.0	-35.7	-29.1	94.6
	0.0	130.6	203.2	119.9	-22.5	-93.7	-77.8	259.6
Total Employment, millions	0.0	0.3	0.3	0.1	-0.1	-0.2	-0.1	0.3
	0.0	0.6	0.8	0.4	-0.3	-0.4	-0.3	0.8
	0.0	1.4	2.0	1.0	-0.7	-1.2	-0.8	1.7

PRICES, INTEREST RATES, and the SAVINGS RATE

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>
GDP Deflator	100.0	102.4	104.2	106.4	109.5	113.0	116.6
	0.0	0.1	0.1	0.0	0.0	0.0	0.0
	0.0	0.1	0.2	0.1	0.0	0.0	0.0
	0.0	0.1	0.3	0.3	0.2	0.1	0.0
PCE Deflator	100.0	102.1	103.5	105.6	108.4	111.6	114.7
	0.0	0.0	0.1	0.0	0.0	0.0	0.0
	0.0	0.0	0.1	0.1	0.1	0.0	0.0
	0.0	-0.2	0.0	0.3	0.3	0.2	0.1
3-Month Treasury Bill Rate	0.00	0.18	0.19	0.03	-0.09	-0.11	-0.04
	0.00	0.30	0.45	0.25	-0.14	-0.29	-0.18
	0.00	0.66	1.04	0.69	-0.32	-0.74	-0.47
10 Year Treasury Bond Rate	0.00	0.08	0.13	0.03	-0.06	-0.07	-0.03
	0.00	0.11	0.24	0.18	-0.06	-0.20	-0.13
	0.00	0.21	0.48	0.46	-0.12	-0.49	-0.33
Personal Savings Rate	0.00	-0.08	0.12	0.11	-0.02	-0.10	-0.08
	0.00	-0.03	0.24	0.31	0.09	-0.24	-0.25
	0.00	0.16	0.71	0.78	0.26	-0.64	-0.65

Industry Impacts, I

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Net</u>
Aerospace Equipment	0	242	1618	530	-680	-456	-149	1104
	0	290	2133	1702	-416	-1221	-526	1962
	0	335	2776	2969	-206	-2177	-957	2740
Other Manufacturing	0	3280	5264	1239	-5009	-5278	-1643	-2146
	0	9238	14753	7482	-8784	-14898	-8608	-817
	0	26452	40548	20490	-22381	-37602	-22440	5067
Air Transportation	0	8010	7036	813	36	-96	6	15805
	0	9819	14452	6605	-28	-152	-135	30560
	0	12256	22870	12917	-478	-471	-383	46711
Other Transportation	0	2202	1622	497	-91	-423	-106	3702
	0	3168	3868	2013	-303	-1007	-747	6991
	0	5620	8026	4305	-1583	-2856	-2053	11460

Industry Impacts, II

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Net</u>
Finance & insurance	0	5283	-63	-797	-1332	-984	828	2935
	0	11361	7221	569	-5063	-3502	-870	9716
	0	31747	27779	3508	-15664	-10008	-4058	33304
Real estate and royalties	0	1081	515	-99	-796	-748	-27	-74
	0	2662	2877	890	-1899	-2238	-964	1327
	0	7441	9510	3298	-5206	-5893	-2700	6451
Other Services	0	18288	13070	1651	-6808	-8195	-2294	15712
	0	34837	42619	19300	-13612	-22372	-13709	47063
	0	79913	113854	56325	-36219	-57988	-36486	119400
Ag, Mining, Cst, Utilities	0	611	46	25	-761	-704	40	-744
	0	2013	1995	906	-1798	-2259	-1043	-187
	0	7144	8737	3322	-5139	-6202	-3263	4599