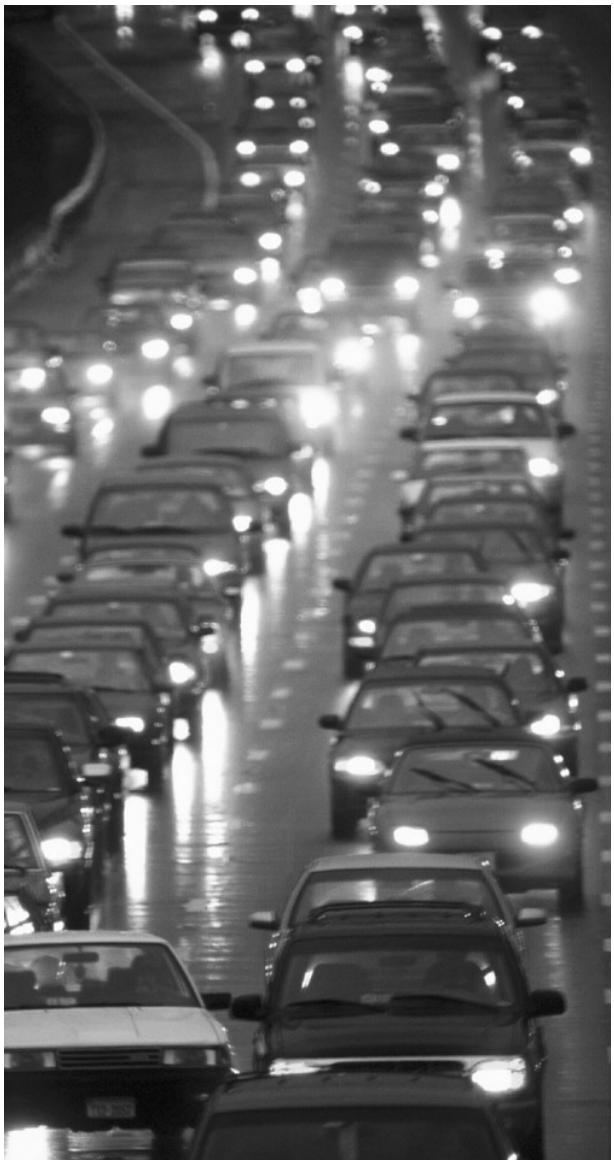

Creating Jobs, Saving Energy, and Protecting the Environment

An Analysis of the Potential Benefits of Investing in Efficient Cars and Trucks

A 2007 Update

Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

Creating Jobs, Saving Energy, and Protecting the Environment

An Analysis of the Potential Benefits of Investing in Efficient Cars and Trucks

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The economic growth of our nation is tied to technology. From the steam engine and the automobile to the microchip and the Internet, a "can do" attitude of aggressive technology development and implementation has created millions of jobs and enormous wealth. Investments in technology to make cars and trucks more fuel-efficient provide the country with yet another opportunity to continue this trend.

Many technologies already exist, such as efficient engines and transmissions, high-strength steel and aluminum, better tires, and hybrid-electric powertrains. The investments required to deliver these more efficient products to consumers will pay off in the form of new jobs for the U.S. automotive sector and other industries throughout the country. In addition, consumers will save billions of dollars on gasoline, U.S. dependence on oil will be reduced, and emissions of global warming pollution will be cut significantly.

In order to quantify these benefits, the Union of Concerned Scientists estimated the effect of moving existing technologies into cars and trucks with the modest goal of reaching a fleetwide average of 35 miles per gallon (mpg) by 2018.[1] We found that:

- In 2020, the benefits from investments in fuel economy would lead to 241,000 more jobs throughout the country, with California, Texas, Florida, New York, Michigan, Ohio, and Illinois all seeing more than 10,000 new jobs.
- In the automotive sector, projected jobs would grow by 23,900 in 2020.
- For consumers, the cost of the new technology would more than pay for itself, saving a net $37 billion dollars in 2020 alone.
- In 2020, we would cut our national oil use by 1.6 million barrels per day—more than we currently import from Saudi Arabia[2]—and we would reduce emissions of global warming pollution from cars and trucks by 260 million metric tons of carbon dioxide—equivalent to taking about 40 million of today's average cars and trucks off the road.

A less aggressive case, 35 mpg by 2020, was also evaluated and is included in Appendix B.

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[1]This report represents an update from a version published in 2004, which focused on the benefits of 40 mpg by 2015. While 40 mpg is still quite attainable, this study shifts focus to lower and later targets.

[2]During 2006 we imported 1.46 million barrels per day from the Saudi Arabia according to data from the Energy Information Administration. (*http://tonto.eia.doe.gov/dnav/pet/pet_move_neti_a_ep00_IMN_mbblpd_m.htm*)

FUEL ECONOMY AND JOB CREATION

Investments in technology to make cars and trucks more efficient will create jobs in two ways:

Consumer Investments and Respending. Cars and trucks that go farther on a gallon of gasoline will save consumers money. Less money spent at the gas pump means more money available to spend on goods and services in other sectors of the economy. Some of that shift in spending would go back to the automobile industry to pay for the fuel economy improvement, creating jobs in the motor vehicle sector. The remainder benefits a variety of industries, creating jobs in manufacturing, agriculture, construction, and the service industry, among others.

Automotive Industry Investments. To improve fuel economy, automobile manufacturers and their suppliers would invest in new tooling and machinery, putting the technology they have developed to work. These investments would create jobs throughout the auto and finance industries. Passing these costs on to consumers—whose gasoline savings would outstrip the small increase in vehicle price—would more than cover the costs of increasing the workforce. When combined with jobs from consumer respending, these investments would boost the motor vehicle industry by 23,900 new jobs in 2020.

Consider this example: Under a 35 mpg fleetwide average with size as the attribute used for establishing fuel economy requirements, a pickup truck with the same performance, comfort, and safety available today would have to reach about 28 mpg. This improved pickup would save its owner about $6,000 over the life of the vehicle, compared with a retail price increase of $1,500 for the conventional technology needed to reach this goal. The improvements would pay for themselves in less than two years at $2.55 per gallon. That leaves more than $4,500 to spend elsewhere in the economy. The $1,500 price increase goes back to the automotive industry to cover investments and labor, with room for increased profit.

NATIONAL SECTOR-BY-SECTOR JOBS ANALYSIS

Table 1 shows the jobs that would be created in various industries by using technology to make vehicles that raise fuel economy to 35 mpg by 2018. The motor vehicle industry, for example, could add 23,900 jobs beyond adjusted Bureau of Labor Statistics and Bureau of Economic Analysis projections. The national economy as a whole would gain 241,000 jobs. Only the oil industry and those industries tied to it (such as wholesale trade) would likely have fewer jobs than projected. But these jobs would not be lost; they would simply shift to other parts of the economy.

Table 1. Job Growth (by Industry) in 2020 from Using Technology to Reach 35 mpg by 2018.

Industry	Net Increase in Jobs
Agriculture and Food Processing	9,700
Construction	16,500
Finance, Insurance, Real Estate	33,100
Government and Education	28,600
Manufacturing (excluding Motor Vehicles)	17,800
Mineral/Resource Mining and Petroleum Refining	-21,000
Motor Vehicles	23,900
Retail Trade	44,400
Services	82,900
Transportation, Communication, Utilities	12,500
Wholesale Trade	-7,400
Total	**241,000**

STATE-BY-STATE JOBS ANALYSIS

Our estimates suggest that every state would see job increases ranging from 300 to more than 30,000, as shown in Table 2.

In all states, job growth would be linked to consumers respending the savings they accrue from improved fuel economy. Moreover, some states could experience even greater job growth because they have a large share of the industries that see more job growth. Our results suggest that in 2020 California would show the largest growth with 32,500 jobs, followed by Texas with 14,700, Florida with 14,300, and New York with 13,100. Three key auto industry states round out the top 7 states, each with more than 10,000 new jobs: Michigan, Ohio, and Illinois.

Table 2. Job Growth (by State) in 2020 from Using Technology to Reach 35 mpg by 2018.

State	New Jobs	State	New Jobs
Alabama	3,800	Montana	700
Alaska	300	Nebraska	1,400
Arizona	4,500	Nevada	1,800
Arkansas	2,100	New Hampshire	1,100
California	32,500	New Jersey	7,000
Colorado	3,500	New Mexico	1,200
Connecticut	3,200	New York	13,100
Delaware	800	North Carolina	7,400
Dist. of Col.	700	North Dakota	500
Florida	14,300	Ohio	10,500
Georgia	7,400	Oklahoma	1,700
Hawaii	1,000	Oregon	2,900
Idaho	1,000	Pennsylvania	9,900
Illinois	10,300	Rhode Island	700
Indiana	6,200	South Carolina	3,700
Iowa	2,600	South Dakota	600
Kansas	1,900	Tennessee	5,400
Kentucky	3,600	Texas	14,700
Louisiana	2,500	Utah	1,900
Maine	1,100	Vermont	500
Maryland	4,600	Virginia	6,500
Mass.	5,500	Washington	5,100
Michigan	11,000	West Virginia	1,100
Minnesota	4,600	Wisconsin	4,800
Mississippi	2,100	Wyoming	300
Missouri	5,400		
United States		**241,000**	

NATIONAL SECURITY, CONSUMER, AND ENVIRONMENTAL BENEFITS

Table 3 shows the energy, economic, and environmental impacts of cars and trucks used in the United States today. Currently, the United States imports about 60 percent of its oil and other petroleum products. To purchase that oil at just $60 per barrel, we send more than $500,000 every minute to other countries. Our oil imports are expected to increase by nearly 20 percent by 2020, with the largest growth in oil demand coming from our cars and trucks.

The direct economic impact on consumers is significant. Consumers spent more than $350 billion on gasoline in 2006, and that spending is expected to grow more than 20 percent by 2020. Finally, our cars and trucks result in more emissions of the heat-trapping gases that cause global warming than most countries produce from their transportation, residential, commercial, and industrial sectors combined. This amounted to nearly 1,600 million metric tons of carbon dioxide-equivalent emissions in 2006, and these emissions are also expected to grow more than 20 percent by 2020.

Table 3. Baseline Energy and Economic Indicators of U.S. Light-Duty Vehicles.

	2006	2020
Gasoline		
Annual Fuel Use (billions of gallons)	140	173
Annual Fuel Costs (billions)	$361	$441
Oil and Other Petroleum Products		
National Oil Demand (millions of barrels per day)	21	25
Oil Imports (millions of barrels per day)	12.5	14.4
Light-Duty Vehicle Share of Oil Use	41%	52%
Global Warming Pollution		
Annual Global Warming Pollution (millions of metric tons of carbon dioxide equivalents, or MMTCO2-E)	1,571	1,918

However, a different picture of the future emerges if investments are made in technology to make cars and trucks more fuel-efficient. If investments were made to reach a fuel economy of 35 mpg by 2018 (Table 4), consumers would cut their 2020 gasoline consumption by 23 billion gallons per year, saving $61 billion at the gas pump. Of course this new technology will cost more, but after paying for the vehicle technology, net consumer savings would still amount to $37 billion in 2020. Furthermore, we would reduce our oil dependence by 1.6 million barrels per day and cut emissions of global warming pollutants by 264 million metric tons per year.

Table 4. Benefits from Using Technology to Reach 35 mpg by 2018.

Gasoline	**2020**
Annual Fuel Savings (billions of gallons)	23
Annual Fuel Cost Savings (billions)	$61
Net Savings (billions)	$37
Oil and Other Petroleum Products	
National Oil Savings (mbd)	1.6
Global Warming Pollution	
Annual Global Warming Pollution Reduction (MMTCO2-e)	264

STATE-BY-STATE CONSUMER BENEFITS

Table 5 shows that the benefits of putting technology to work to make more efficient vehicles will reach every state. California leads the pack with the largest consumer savings, at more than $4 billion. However, due to their heavy fuel demand, Texas and Florida save enough on fuel to jump up to second and third, with New York, Illinois, Pennsylvania, Ohio and Michigan close behind.

Table 5. Consumer Savings (by State) in 2020 from Using Technology to Reach 35 mpg by 2018.

State	Net Savings (millions)	State	Net Savings (millions)
Alabama	$708	Montana	$112
Alaska	$75	Nebraska	$224
Arizona	$746	Nevada	$298
Arkansas	$373	New Hampshire	$186
California	$4,324	New Jersey	$1,156
Colorado	$559	New Mexico	$261
Connecticut	$447	New York	$1,528
Delaware	$112	North Carolina	$1,156
Dist. of Col.	$37	North Dakota	$75
Florida	$2,311	Ohio	$1,379
Georgia	$1,379	Oklahoma	$485
Hawaii	$112	Oregon	$410
Idaho	$149	Pennsylvania	$1,379
Illinois	$1,379	Rhode Island	$112
Indiana	$857	South Carolina	$671
Iowa	$410	South Dakota	$112
Kansas	$298	Tennessee	$820
Kentucky	$596	Texas	$3,131
Louisiana	$634	Utah	$261
Maine	$186	Vermont	$112
Maryland	$708	Virginia	$1,081
Mass.	$783	Washington	$746
Michigan	$1,342	West Virginia	$224
Minnesota	$708	Wisconsin	$671
Mississippi	$447	Wyoming	$75
Missouri	$857		
United States		**$ 37,203**	

ANALYSIS METHODOLOGY

To estimate the potential impact on employment resulting from investments in fuel economy technology, we used industry-specific data derived from a macroeconomic impact analysis tool, IMPLAN (Impact Analysis for PLANning).[3] This model incorporates interactions among 528 industrial sectors using 21 economic variables to trace supply linkages and evaluate how changes in spending affect employment, wages, and the national gross domestic product.

To estimate the costs and savings from increasing fuel economy to 35 mpg by 2018, we used a modified version of the LEAP vehicle stock model from Tellus and our own cost/performance analyses.[4] The energy use analysis includes the following key assumptions: a mileage rebound of 10 percent; a vehicle price elasticity of one; a real discount rate of five percent; an average gasoline price of $2.55 per gallon;[5] an average 15-year, 170,000-mile vehicle lifetime; a discount factor of about 0.8 to convert federal test fuel economy values to real-world values; and combined vehicle and upstream emissions of 11.1 kg/gallon of gasoline (24.5 pounds per gallon of gasoline).[6]

With these costs and savings and the industry-specific data from IMPLAN, we analyzed both the direct and indirect investments generated by technology improvements, as well as the respending of fuel cost savings. The analysis provided a national industry-by-industry breakdown of job impacts for the years 2020 and 2030. We allocated the national impacts among the states using gasoline consumption data and prices in each state, along with state employment projections for each industry from the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA).[7] All job projections are evaluated as changes above and below an adjusted baseline. The adjusted baseline uses BLS and BEA values and then adjusts for a gasoline price of $2.55 per gallon. State-by-state consumer savings were apportioned based on annual state gasoline use data for 2005 from the Federal Highway Administration's Highway Statistics 2005, Table MF-21.

Both industry-specific and state-by-state analysis results represent estimates of the magnitude of employment impacts based on historical relationships. These estimates are subject to changing economic conditions, but indicate the strong positive directional effects of improving fuel economy.

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For more information about this analysis contact David Friedman at (202) 223-6133.

[3]Initially developed by the U.S. Department of Agriculture. Data available from Minnesota IMPLAN Group (*http://www.mig-inc.com*).

[4]Friedman, D. 2003. *A New Road: The Technology and Potential of Hybrid Vehicles.* UCS.

[5]2006 average gasoline price of $2.55 per gallon in 2005 dollars, U.S. Energy Information Administration.

[6]Data from Argonne National Laboratory's GREET model. (*http://www.transportation.anl.gov/greet*)

[7]Data sources: U.S. Department of Labor, Bureau of Labor Statistics. Office of Occupational Statistics and Employment Projections. December 2005. *Employment and Output by Industry, 1994, 2004, and Projected 2014.* U.S. Department of Commerce, Bureau of Economic Analysis (BEA), Regional Economic Analysis Division. 1995. *BEA Regional Projections to 2045: States*. U.S. Department of Energy, Energy Information Administration. June 2007. *State Consumption, Prices, and Expenditure Estimates 2004*. U.S. Department of Energy, Energy Information Administration.

APPENDIX A: 2030 BENEFITS FROM A 35 MPG FLEET BY 2018

Table A-1. Baseline Energy and Economic Indicators of U.S. Light-Duty Vehicles.

	2006	2020	2030
Gasoline			
Annual Fuel Use (billions of gallons)	140	173	191
Annual Fuel Costs (billions)	$361	$441	$487
Oil and Other Petroleum Products			
National Oil Demand (millions of barrels per day)	21	25	27.6
Oil Imports (millions of barrels per day)	12.5	14.4	17.2
Light-Duty Vehicle Share of Oil Use	43%	45%	45%
Global Warming Pollution			
Annual Global Warming Pollution (millions of metric tons of carbon dioxide equivalents, or MMTCO2-E)	1,571	1,918	2,119

Table A-2. Benefits from Using Technology to Reach 35 mpg by 2018.

Gasoline	**2020**	**2030**
Annual Fuel Savings (billions of gallons)	24	40
Annual Fuel Cost Savings (billions)	$61	$106
Net Savings (billions)	$37	$78
Oil and Other Petroleum Products		
National Oil Savings (mbd)	1.6	2.7
Global Warming Pollution		
Annual Global Warming Pollution Reduction (MMTCO2-e)	264	459

Table A-3. Job Growth (by Industry) in 2030 from Using Technology to Reach 35 mpg by 2018.

Industry	**Net Increase in Jobs**
Agriculture and Food Processing	15,100
Construction	29,400
Finance, Insurance, Real Estate	44,200
Government and Education	59,300
Manufacturing (excluding Motor Vehicles)	18,300
Mineral/Resource Mining and Petroleum Refining	-27,000
Motor Vehicles	21,100
Retail Trade	68,200
Services	121,800
Transportation, Communication, Utilities	26,200
Wholesale Trade	-6,300
Total	**370,300**

Table A-4. Job Growth and Consumer Savings (by State) in 2030 from Using Technology to Reach 35 mpg by 2018.

State	Net Savings (millions)	New Jobs	State	Net Savings (millions)	New Jobs
Alabama	$ 1,493	5,800	Montana	$ 236	1,100
Alaska	$ 157	600	Nebraska	$ 472	2,200
Arizona	$ 1,572	6,900	Nevada	$ 629	2,800
Arkansas	$ 786	3,200	New Hampshire	$ 393	1,700
California	$ 9,117	50,600	New Jersey	$ 2,436	10,900
Colorado	$ 1,179	5,600	New Mexico	$ 550	2,000
Connecticut	$ 943	4,900	New York	$ 3,222	20,000
Delaware	$ 236	1,100	North Carolina	$ 2,436	11,300
Dist. of Col.	$ 79	1,100	North Dakota	$ 157	800
Florida	$ 4,873	22,400	Ohio	$ 2,908	15,300
Georgia	$ 2,908	11,600	Oklahoma	$ 1,022	3,000
Hawaii	$ 236	1,600	Oregon	$ 865	4,400
Idaho	$ 314	1,500	Pennsylvania	$ 2,908	15,200
Illinois	$ 2,908	15,600	Rhode Island	$ 236	1,100
Indiana	$ 1,808	8,800	South Carolina	$ 1,415	5,700
Iowa	$ 865	3,900	South Dakota	$ 236	1,000
Kansas	$ 629	3,000	Tennessee	$ 1,729	24,200
Kentucky	$ 1,258	5,400	Texas	$ 6,602	3,000
Louisiana	$ 1,336	4,200	Utah	$ 550	800
Maine	$ 393	1,700	Vermont	$ 236	10,100
Maryland	$ 1,493	7,200	Virginia	$ 2,279	8,000
Mass.	$ 1,651	8,600	Washington	$ 1,572	1,800
Michigan	$ 2,829	14,800	West Virginia	$ 472	7,200
Minnesota	$ 1,493	7,000	Wisconsin	$ 1,415	500
Mississippi	$ 943	3,200	Wyoming	$ 157	1,100
Missouri	$ 1,808	8,100			
			United States	**$78,439**	**370,300**

APPENDIX B: BENEFITS FROM A 35 MPG FLEET BY 2020

Table B-1. Benefits from Using Technology to Reach 35 mpg by 2020.

Gasoline	**2020**	**2030**
Annual Fuel Savings (billions of gallons)	19	38
Annual Fuel Cost Savings (billions)	$47	$98
Net Savings (billions)	$25	$72
Oil and Other Petroleum Products		
National Oil Savings (mbd)	1.2	2.5
Global Warming Pollution		
Annual Global Warming Pollution Reduction (MMTCO2-e)	206	427

Table B-2. Job Growth (by Industry) in from Using Technology to Reach 35 mpg by 2020.

Industry	**2020 Net Increase in Jobs**	**2030 Net Increase in Jobs**
Agriculture	6,700	14,100
Construction	11,200	27,200
Finance, Insurance, Real Estate	25,600	41,200
Government and Education	16,800	54,600
Manufacturing (excluding Motor Vehicles)	14,600	17,300
Mineral/Resource Mining and Petroleum Refining	-17,100	-25,200
Motor Vehicles	22,300	20,000
Retail Trade	27,200	62,900
Services	60,700	113,100
Transportation, Communication, Utilities	9,000	24,300
Wholesale Trade	-6,200	-5,900
Total	**170,800**	**343,600**

Table B-3. Job Growth and Consumer Savings (by State) in 2020 from Using Technology to Reach 35 mpg by 2020.

State	Net Savings (millions)	New Jobs	State	Net Savings (millions)	New Jobs
Alabama	$ 474	2,700	Montana	$ 75	500
Alaska	$ 50	200	Nebraska	$ 150	1,000
Arizona	$ 499	3,200	Nevada	$ 200	1,200
Arkansas	$ 250	1,500	New Hampshire	$ 125	700
California	$ 2,895	22,800	New Jersey	$ 774	4,900
Colorado	$ 374	2,400	New Mexico	$ 175	800
Connecticut	$ 299	2,300	New York	$ 1,023	9,400
Delaware	$ 75	600	North Carolina	$ 774	5,300
Dist. of Col.	$ 25	500	North Dakota	$ 50	300
Florida	$ 1,547	10,100	Ohio	$ 923	7,700
Georgia	$ 923	5,200	Oklahoma	$ 324	1,100
Hawaii	$ 75	700	Oregon	$ 274	2,000
Idaho	$ 100	700	Pennsylvania	$ 923	7,000
Illinois	$ 923	7,300	Rhode Island	$ 75	500
Indiana	$ 574	4,600	South Carolina	$ 449	2,700
Iowa	$ 274	1,900	South Dakota	$ 75	500
Kansas	$ 200	1,300	Tennessee	$ 549	3,900
Kentucky	$ 399	2,600	Texas	$ 2,096	9,900
Louisiana	$ 424	1,600	Utah	$ 175	1,400
Maine	$ 125	800	Vermont	$ 75	400
Maryland	$ 474	3,200	Virginia	$ 724	4,600
Mass.	$ 524	3,900	Washington	$ 499	3,600
Michigan		8,500	West Virginia	$ 150	800
Minnesota	$ 474	3,200	Wisconsin	$ 449	3,400
Mississippi	$ 299	1,500	Wyoming	$ 50	200
Missouri	$ 574	3,900			
			United States	**$24,904**	**170,800**

Table B-4. Job Growth and Consumer Savings (by State) in 2030 from Using Technology to Reach 35 mpg by 2020.

State	Net Savings (millions)	New Jobs	State	Net Savings (millions)	New Jobs
Alabama	$ 1,377	5,300	Montana	$ 217	1,000
Alaska	$ 145	500	Nebraska	$ 435	2,000
Arizona	$ 1,450	6,400	Nevada	$ 580	2,600
Arkansas	$ 725	3,000	New Hampshire	$ 362	1,500
California	$ 8,407	47,000	New Jersey	$ 2,247	10,100
Colorado	$ 1,087	5,200	New Mexico	$ 507	1,800
Connecticut	$ 870	4,600	New York	$ 2,972	18,600
Delaware	$ 217	1,000	North Carolina	$ 2,247	10,400
Dist. of Col.	$ 72	1,000	North Dakota	$ 145	700
Florida	$ 4,494	20,700	Ohio	$ 2,682	14,200
Georgia	$ 2,682	10,700	Oklahoma	$ 942	2,700
Hawaii	$ 217	1,500	Oregon	$ 797	4,100
Idaho	$ 290	1,400	Pennsylvania	$ 2,682	14,100
Illinois	$ 2,682	14,500	Rhode Island	$ 217	1,000
Indiana	$ 1,667	8,200	South Carolina	$ 1,305	5,300
Iowa	$ 797	3,700	South Dakota	$ 217	900
Kansas	$ 580	2,800	Tennessee	$ 1,594	7,300
Kentucky	$ 1,160	5,000	Texas	$ 6,088	22,400
Louisiana	$ 1,232	3,800	Utah	$ 507	2,800
Maine	$ 362	1,600	Vermont	$ 217	800
Maryland	$ 1,377	6,700	Virginia	$ 2,102	9,400
Mass.	$ 1,522	8,000	Washington	$ 1,450	7,400
Michigan	$ 2,609	13,800	West Virginia	$ 435	1,600
Minnesota	$ 1,377	6,500	Wisconsin	$ 1,305	6,700
Mississippi	$ 870	3,000	Wyoming	$ 145	400
Missouri	$ 1,667	7,500			
			United States	**$72,332**	**343,600**

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