Kansas Bioscience Index 2012

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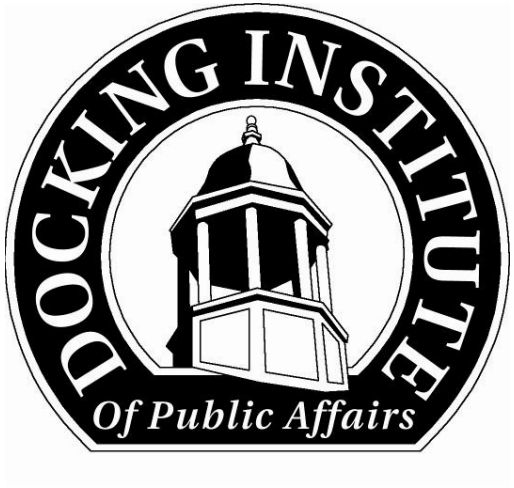
Hays, Kansas 67601

Prepared For
Kansas Bioscience Authority

By

The Docking Institute of Public Affairs



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Mission:

To Facilitate Effective Public Policy Decision-Making.

The staff of the Docking Institute of Public Affairs and its University Center for Survey Research are dedicated to serving the people of Kansas and surrounding states.

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Acknowledgements

The first Kansas Bioscience Index report was completed in 2008, resulting from the efforts of a team of the staff and policy fellows at the Docking Institute of Public Affairs. This report adopted most of the bioscience indicators examined in the 2008 report as well as the methodology used in that report. We appreciate the contribution of the team members who worked on the inaugural report. The members were:

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Kansas Bioscience Index 2012

Executive Summary

The Kansas Bioscience Authority (KBA) contracted the Docking Institute of Public Affairs to produce a Kansas Bioscience Index. The index is constructed around eighteen indicators, which are grouped into four categories: industrial output, research and development capacity, innovation capacity, and workforce capacity. The indicators describe bioscience industry change in Kansas since 2004 as compared with the nation and six peer states: California, Massachusetts, Missouri, North Carolina, Ohio, and Texas. This report finds:

- Kansas' gross domestic product (GDP) was $130.9 billion in 2011. It grew by 31.3% from 2004 to 2011, lower than the growth rates of Texas and North Carolina, but higher than those of other comparison states and the national average.
- In 2011, the per capita real GDP of Kansas was $39,484 (in year 2000 dollars), which increased by 4.9% from 2004. The per capita real GDP of the nation growth was only 0.87% from 2004 to 2011.
- The per capita income in Kansas was $40,481 in 2011, lower than the national average, but higher than those of Texas, Missouri, Ohio and North Carolina.
- Excluding the General Medical and Surgical Hospital sector, Kansas had 956 private bioscience companies in 2010, increasing 8.3% from 2004.
- Excluding the General Medical and Surgical Hospital sector, there were 16,898 employees in the bioscience industry in Kansas in 2010, which accounted for 1.2% of the total employed workforce. The United States had 1.6% of its employed workforce in the private bioscience industry in 2010.
- Excluding the General Medical and Surgical Hospital sector, employment in the bioscience industry rose 19.5% from 2004 to 2010 in Kansas, which was the greatest increase among the study states.
- Excluding the General Medical and Surgical Hospital sector, the average wage in the bioscience industry in Kansas was $47,836 in 2010, lowest among all the study states.
- Except for the General Medical and Surgical Hospital sector, the Veterinary Services sector was the largest bioscience industrial sector in Kansas in terms of employment. The Veterinary Services sector in Kansas had 433 establishments and 3,714 employees in 2010.

- Except for the General Medical and Surgical Hospital sector, the Medical Laboratories sector was the second largest bioscience industrial sector in Kansas in terms of employment. The Medical Laboratories sector in Kansas had 119 establishments and 3,086 employees in 2010.
- Except for the General Medical and Surgical Hospital sector, the Research and Development in the Physical, Engineering, and Life Sciences sector was the third largest bioscience industrial sector in Kansas in terms of employment. The Research and Development in the Physical, Engineering, and Life Sciences Laboratories sector in Kansas had 123 establishments and 2,339 employees in 2010.
- When considering employment, the Research and Development in the Physical, Engineering, and Life Sciences sector was the fastest growing bioscience industrial sector in Kansas. Employment in that sector grew 211% from 2004, and reached 2,339 employees in 2010.
- When considering employment, the Pharmaceutical Preparation Manufacturing sector was the second fastest growing bioscience industrial sector in Kansas. Employment in that sector grew 103.2% from 2004, and reached 1,329 employees in 2010.
- When considering employment, the Testing Laboratories sector was the third fastest growing bioscience industrial sector in Kansas. Employment in that sector grew 103.2% from 2004, and reached 1,083 employees in 2010.
- In terms of employment, the Industrial Process Furnace and Oven Manufacturing sector was the most rapidly declining bioscience industry sector in Kansas. The sector had 270 employees in 2010, down by 20.8% from 2004.
- In terms of employment, the Ophthalmic Goods Manufacturing sector was the second most rapidly declining bioscience industry sector in Kansas. The sector had 267 employees in 2010, down by 19.1% from 2004.
- In terms of employment, the Surgical Appliance and Supplies Manufacturing sector was the third most rapidly declining bioscience industry sector in Kansas. The sector had 511 employees in 2010, down by 18.8% from 2004.
- When considering the number of establishments, Kansas had the second largest Ethyl Alcohol Manufacturing sector among the study states. There were 12 ethyl alcohol manufacturing companies in Kansas in 2010, which increased by 71.4% from 2004.
- In Kansas, the total academic research and development (R&D) spending was $441 million in 2009. Of the total spending, 59.9% was spent in life sciences, 21.9% was spent in engineering, 6.2% in physical sciences, and 3.7% in environmental sciences.

- The academic R&D spending in bioscience increased 31.8% from 2004 to 2009 in Kansas, reaching $243 million in 2009. The academic R&D spending in bioscience shared about 55% of the total academic R&D spending from 2004 to 2009. In the United States, the share was about 59%.
- In Kansas, the academic R&D spending in bioscience accounted for 0.2% of the state GDP in 2009. The national average was 0.23% in 2009. In North Carolina, the percentage was 0.38%, which was the highest among the study states.
- In Kansas, the academic R&D spending in biological sciences always had the largest share in total bioscience R&D spending from 2004 to 2009. In 2009, 53.3% of the total bioscience R&D spending was in biological sciences, 24.3% spent in agricultural sciences, 21.9% in medical sciences, and 0.3% in bioengineering/biomedical engineering.
- Academic R&D spending in bioscience at the university of Kansas and Kansas State University accounted for more than 99% of the total academic R&D spending in bioscience in Kansas. In 2009, a total of $146 million was spent on bioscience research and development at the University of Kansas, and $96 million was spent at Kansas State University.
- From 2004 to 2009, 318 bioscience-related patents from Kansas were granted by the U.S. Patent and Trademark Office. In 2009, 62 bioscience-related patents from Kansas were granted, which accounted for 14.25% of all the granted patents from Kansas in that year.
- In Kansas, $6 million venture capital was invested in bioscience in 2009. From 2004 to 2009, a total of $120 million in bioscience-related venture capital was invested in Kansas.
- In Kansas, 0.3% of its employed workforce was comprised of science and engineering doctorate holders in 2003, 2006 and 2008.
- In 2010, life and physical scientists accounted for 0.41% of the employed workforce in Kansas.

Introduction

The Kansas Economic Growth Act of 2004 created the Kansas Bioscience Authority (KBA) to promote the expansion of the state's bioscience clusters and research capacity, the growth of bioscience startups, and bioscience business expansion and attraction. To monitor the growth of the bioscience industry, the KBA contracted the Docking Institute of Public Affairs at Fort Hays State University to produce a Kansas Bioscience Index. The index is designed to give a complete description of the bioscience industry growth in the state of Kansas since 2004.

Wherever the data is available, Kansas is compared with the nation and six peer states: California, Massachusetts, Missouri, North Carolina, Ohio, and Texas. Among those six peer states, Missouri is a neighboring state of Kansas and recently initiated the effort to develop its bioscience industry. All other comparison states are known for leading the development of the bioscience industry in the United States. The bioscience index is built around a set of eighteen indicators, representing key components of the bioscience industry. They are organized into four categories: industrial output, research and development capacity, innovative capacity, and workforce capacity. A summary of indicators in each category can be found in Table 1. This report includes four sections presenting the analysis results for those categories.

Industrial Output

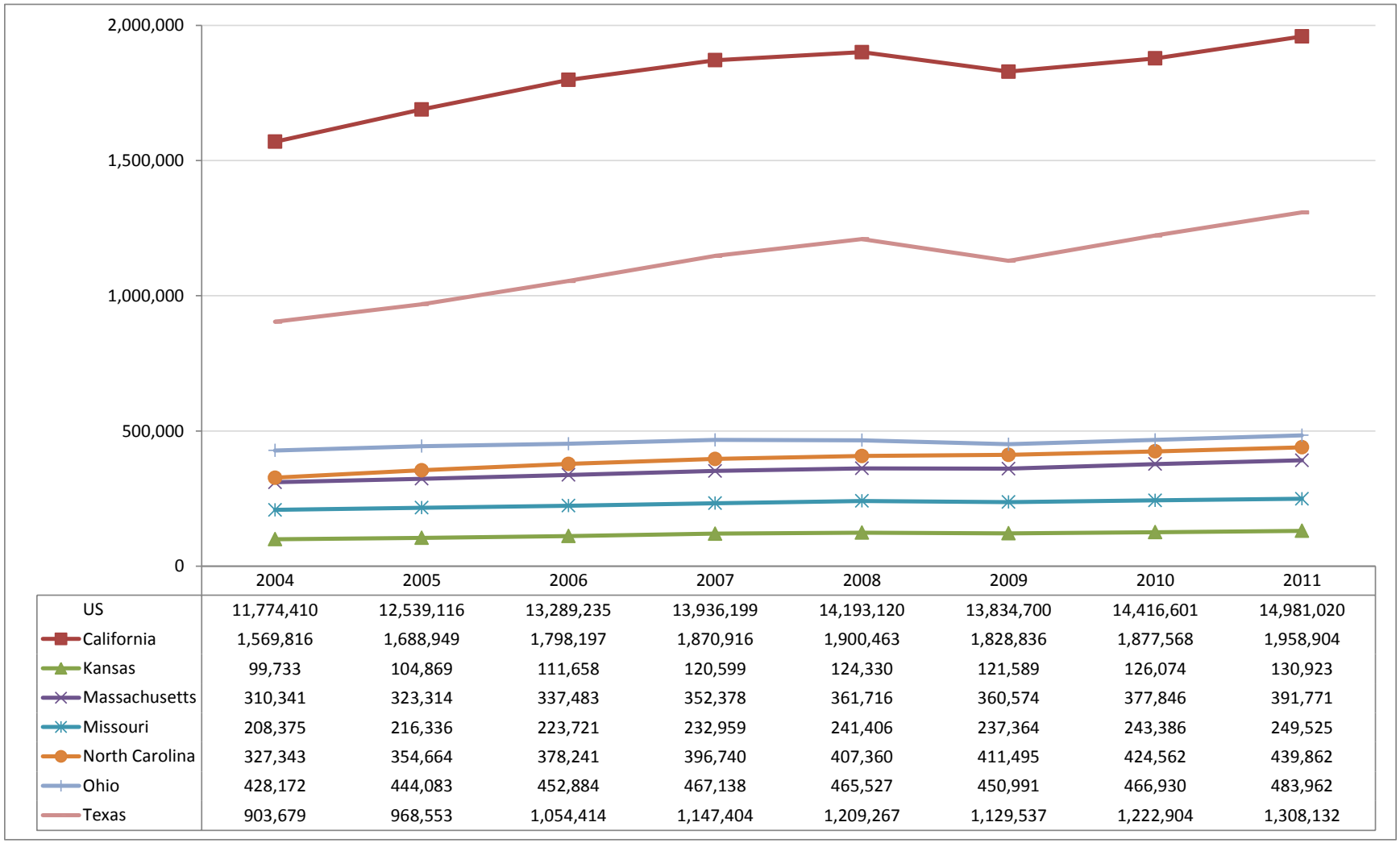
A robust bioscience industrial base provides a strong foundation for future growth. This section contains measures of ultimate economic outcomes (including gross domestic product and per capita income) and outputs in the bioscience industry (including private bioscience establishments, employment, and average wage).

Gross domestic product (GDP) measures the total market value of all final goods and services produced by a state during a given time period. It indicates the overall economic strength of a state. Figure 1 shows that the overall economic strength of Kansas ranks the lowest among all seven states under study. However, the GDP of Kansas increased 31.3% from 2004 to 2011, which made Kansas the third fastest growing state (behind Texas and North Carolina). Kansas' per capita real GDP was also higher than those of Ohio and Missouri since 2006 (Figure 2). In 2011, the per capita real GDP of Kansas was $39,484 (in year 2000 dollars), a 4.9% increase from 2004. The growth rate of Kansas was lower than those of Massachusetts and Ohio but higher than other comparison states. The per capital real GDP of the nation grew only 0.87% from 2004 to 2011.

Table 1: Bioscience Indicators

Indicators	Description
Industrial Output	
Gross Domestic Product by State	Total market value of all final goods and services produced by a state during a given time period
Per Capita Gross Domestic Product	Value of GSP in a given time period divided by total population
Per Capita Income	Measure of individual wealth and quality of life
Establishment in Private Bioscience Industry	Number of establishments in the private bioscience industry
Employment in Private Bioscience Industry	Number of employees in the private bioscience industry
Employment in Private Bioscience Industry as a Percentage of Workforce	Relative scale of the bioscience industry as compared to the total economic size
Average Wage in Private Bioscience Industry	Total annual wages made by employees in bioscience divided by bioscience employment
Research & Development (R&D) Capacity	
Academic R&D Spending by Field	R&D spending on life sciences, physical sciences, engineering, environmental sciences, etc. at universities and colleges
Academic R&D Spending in Bioscience	Bioscience R&D expenditure at universities and colleges
Academic R&D Spending in Bioscience as a Percentage of Total Academic R&D Spending	Bioscience R&D expenditure divided by total R&D expenditure at universities and colleges times 100
Academic R&D Spending in Bioscience as a Percentage of Gross Domestic Product	Bioscience R&D expenditure at universities and colleges divided by gross domestic product times 100
Kansas Academic R&D Spending in Bioscience by University	Bioscience R&D expenditure at universities in Kansas
Innovation Capacity	
Bioscience-related Patents	Number of bioscience-related patents awarded
Bioscience-related Patents as a Percentage of Total Patent Awarded	Number of bioscience-related patents awarded divided by total patents awarded times 100
Bioscience Venture Capital Investment	Venture capital invested in bioscience-related industries
Workforce Capacity	
Employed Workforce	Number of employed workers
Employed Science and Engineering Doctorate Holder as a Percentage of Workforce	Number of employed science and engineering doctorate holders divided by total number of employed workforce times 100
Life and Physical Scientists as a Percentage of Workforce	Number of life and physical scientists divided by total number of employed workforce times 100

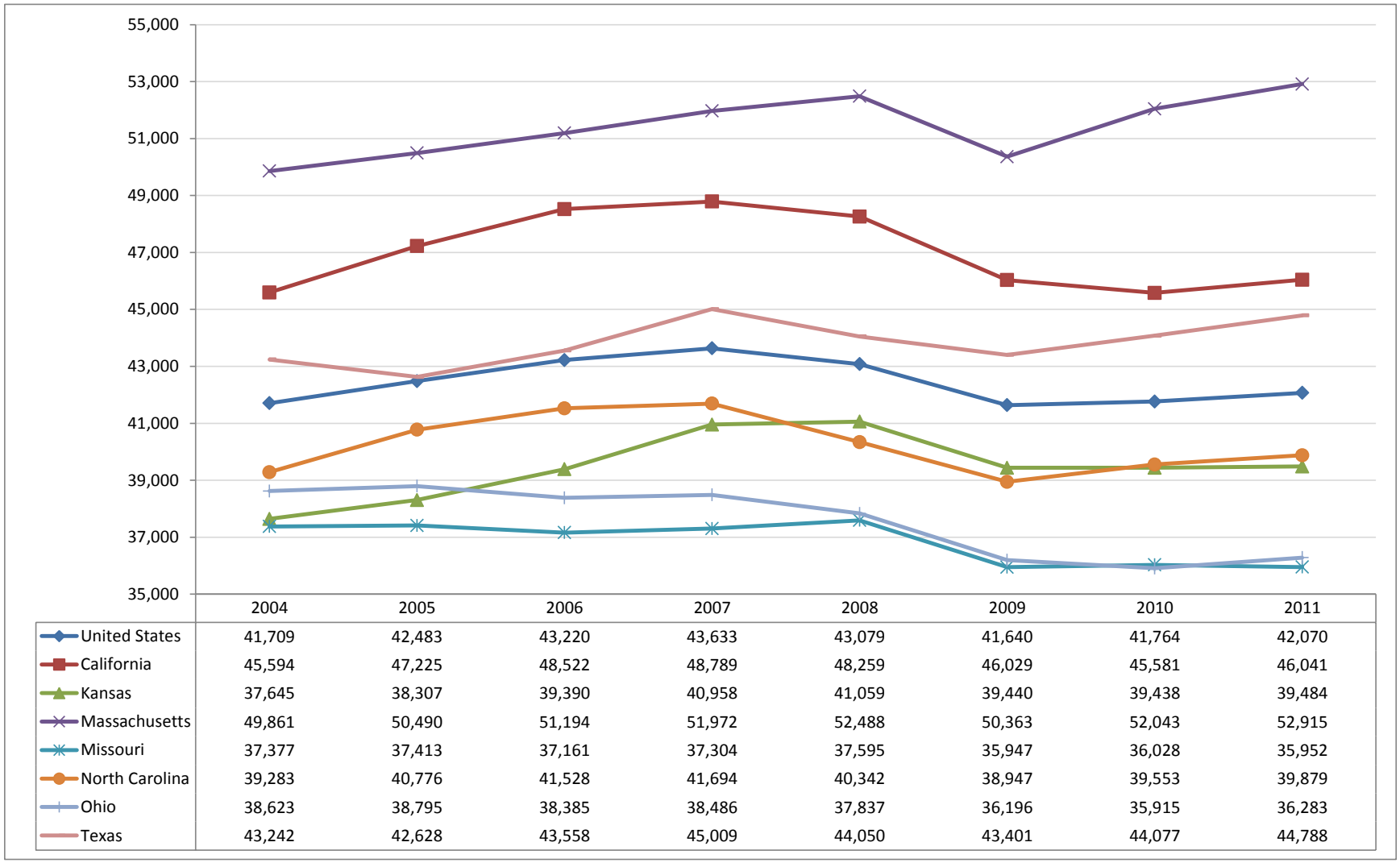
Figure 1: Current Dollar Gross Domestic Product by State (in Millions)



	2004	2005	2006	2007	2008	2009	2010	2011
US	11,774,410	12,539,116	13,289,235	13,936,199	14,193,120	13,834,700	14,416,601	14,981,020
California	1,569,816	1,688,949	1,798,197	1,870,916	1,900,463	1,828,836	1,877,568	1,958,904
Kansas	99,733	104,869	111,658	120,599	124,330	121,589	126,074	130,923
Massachusetts	310,341	323,314	337,483	352,378	361,716	360,574	377,846	391,771
Missouri	208,375	216,336	223,721	232,959	241,406	237,364	243,386	249,525
North Carolina	327,343	354,664	378,241	396,740	407,360	411,495	424,562	439,862
Ohio	428,172	444,083	452,884	467,138	465,527	450,991	466,930	483,962
Texas	903,679	968,553	1,054,414	1,147,404	1,209,267	1,129,537	1,222,904	1,308,132

Source: U.S. Bureau of Economic Analysis

Figure 2: Per Capita Real GDP (in year 2000 dollars)

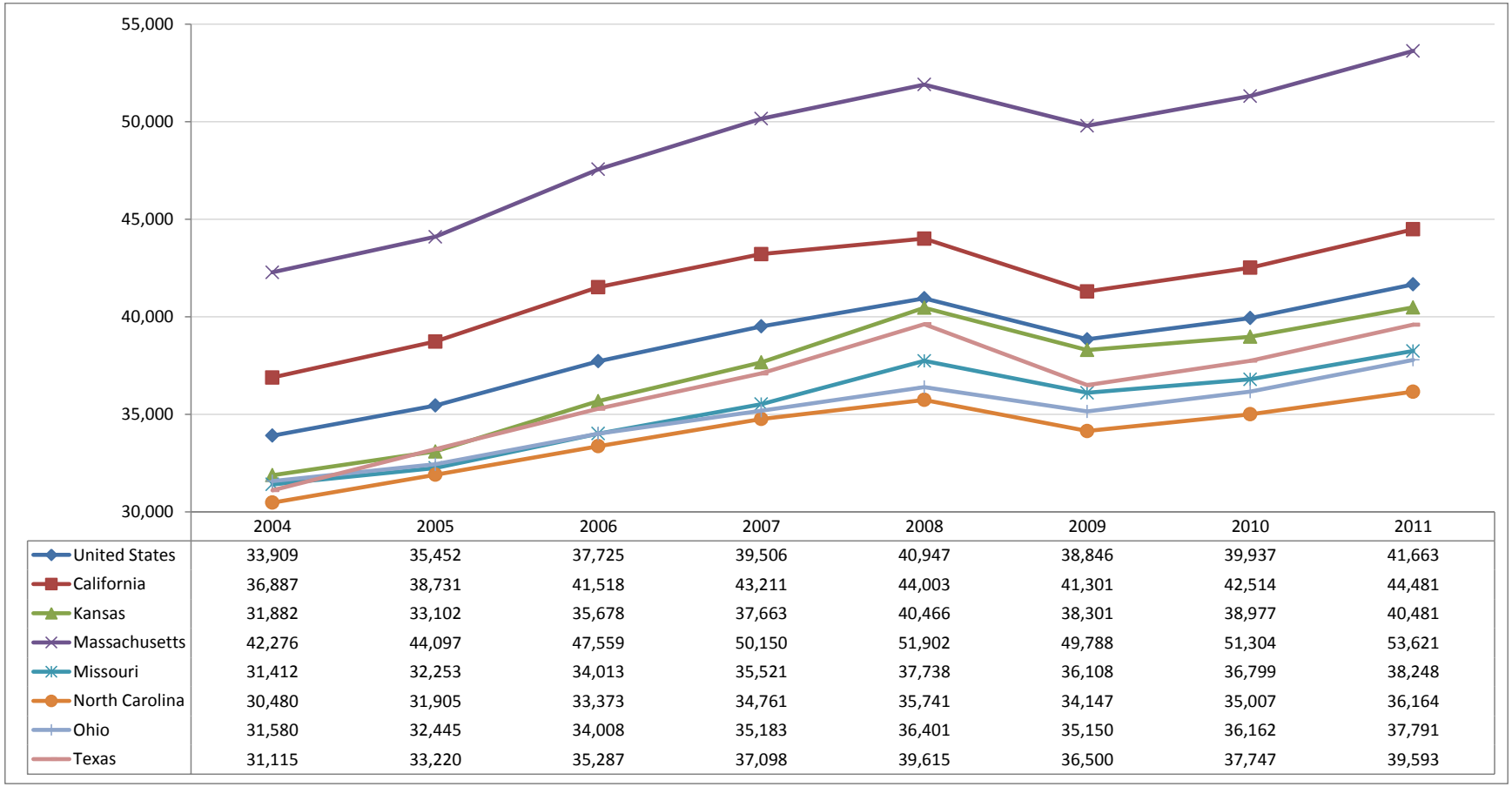


	2004	2005	2006	2007	2008	2009	2010	2011
United States	41,709	42,483	43,220	43,633	43,079	41,640	41,764	42,070
California	45,594	47,225	48,522	48,789	48,259	46,029	45,581	46,041
Kansas	37,645	38,307	39,390	40,958	41,059	39,440	39,438	39,484
Massachusetts	49,861	50,490	51,194	51,972	52,488	50,363	52,043	52,915
Missouri	37,377	37,413	37,161	37,304	37,595	35,947	36,028	35,952
North Carolina	39,283	40,776	41,528	41,694	40,342	38,947	39,553	39,879
Ohio	38,623	38,795	38,385	38,486	37,837	36,196	35,915	36,283
Texas	43,242	42,628	43,558	45,009	44,050	43,401	44,077	44,788

Source: U.S. Bureau of Economic Analysis

Per capita income measures the ultimate outcome of economic development: increase of personal wealth and improvement of quality of life. Kansas' per capita income has been lower than the national average, but higher than those of Texas, Missouri, Ohio, and North Carolina. In 2011, Kansas' per capita income was $40,481 (Figure 3).

Figure 3: Current Dollar Per Capita Income ($)



	2004	2005	2006	2007	2008	2009	2010	2011
United States	33,909	35,452	37,725	39,506	40,947	38,846	39,937	41,663
California	36,887	38,731	41,518	43,211	44,003	41,301	42,514	44,481
Kansas	31,882	33,102	35,678	37,663	40,466	38,301	38,977	40,481
Massachusetts	42,276	44,097	47,559	50,150	51,902	49,788	51,304	53,621
Missouri	31,412	32,253	34,013	35,521	37,738	36,108	36,799	38,248
North Carolina	30,480	31,905	33,373	34,761	35,741	34,147	35,007	36,164
Ohio	31,580	32,445	34,008	35,183	36,401	35,150	36,162	37,791
Texas	31,115	33,220	35,287	37,098	39,615	36,500	37,747	39,593

Source: U.S. Bureau of Economic Analysis

According to the Kansas Economic Growth Act, a bioscience company is "a corporation, limited liability company, S-corporation, partnership, registered limited liability partnership, foundation, association, nonprofit entity, sole proprietorship, business trust, person, group, or other entity that is engaged in the business of bioscience in the state and has business operations in the state, including, without limitation, research, development, sales, services, distribution or production directed towards developing or providing bioscience products or processes for specific commercial or public purposes, but shall not include entities engaged in the distribution or retail sale of pharmaceuticals or other bioscience products." According to this definition, 26 bioscience industry sectors with their NAICS codes are identified and listed in Table 2.

Table 3 shows the total establishment, employment, and wage information for those bioscience industries. The total establishment and employment indicate the size of the bioscience industry. The wage in the bioscience industry is crucial for a state to attract and retain professionals and workers in the bioscience industry. In this study, average wage is computed by dividing total annual wage by annual average employment in the industry sector. Total wage includes bonuses, stock options, severance pay, the cash value of meals and lodging, tips and other gratuities, and – in some states – employer contributions to certain deferred compensation plans, such as 401(k) plans. Table 3 also shows the share of bioscience employment in the employed workforce. Among seven study states, California has the strongest bioscience industry. There were 10,961 private bioscience companies in California in 2010, and 664,706 employees worked in those companies. In 2010, there were 1,046 private bioscience companies in Kansas. A total of 59,735 employees worked in those bioscience companies in Kansas, which accounted for 4.28% of the total employed workforce. Kansas' average wage in the private bioscience industry was $46,485 in 2010, which was the lowest among the study states.

The General Medical and Surgical Hospitals sector (NAICS code 622100) is identified by the Kansas Economic Growth Act as a bioscience sector. However, work done by many employees in this sector is not bioscience related. Figures 4, 5, 6, and 7 show the establishment, employment, and wage information excluding the General Medical and Surgical Hospital sector. Excluding the General Medical and Surgical Hospital sector, Kansas had 956 private bioscience companies with a total of 16,898 employees in 2010. The bioscience employment (excluding NAICS 622100) in Kansas rose 19.5% from 2004 to 2010, faster than the nation and comparison states; California, which had the largest bioscience employment among study states, had a 14.2% increase. In 2010, bioscience employment in Kansas accounted for 1.2% of the total employed workforce. The average wage in the bioscience industry in Kansas (excluding NAICS 622100) was $47,836 in 2010, lowest among all the study states.

Table 2: NAICS Codes for Bioscience Companies

NAICS Code	NAICS Title
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
325193	Ethyl Alcohol Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
334516	Analytical Laboratory Instrument Manufacturing
333298	All Other Industrial Machinery Manufacturing (Lab Distilling Equipment)
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing (Lab Freezers)
333994	Industrial Process Furnace and Oven Manufacturing (Lab Furnaces and Ovens)
333997	Scale and Balance Manufacturing (Lab Scales and Balances)
333999	All Other Miscellaneous General Purpose Machinery Manufacturing (Lab Centrifuges)
337127	Institutional Furniture Manufacturing (Lab Furniture)
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing (All Other Lab Apparatus)
334510	Electro-medical and Electrotherapeutic Apparatus Manufacturing
334517	Irradiation Apparatus Manufacturing
339115	Ophthalmic Goods Manufacturing
621511	Medical Laboratories
621512	Diagnostic Imaging Centers
541710	Research and Development in the Physical, Engineering, and Life Sciences
541380	Testing Laboratories
541940	Veterinary Services
622100	General Medical and Surgical Hospitals

Source: U.S. Census Bureau

Table 3: Establishments, Employment, Employment as a Share of Employed Workforce, and Average Wage in Private Bioscience Industry

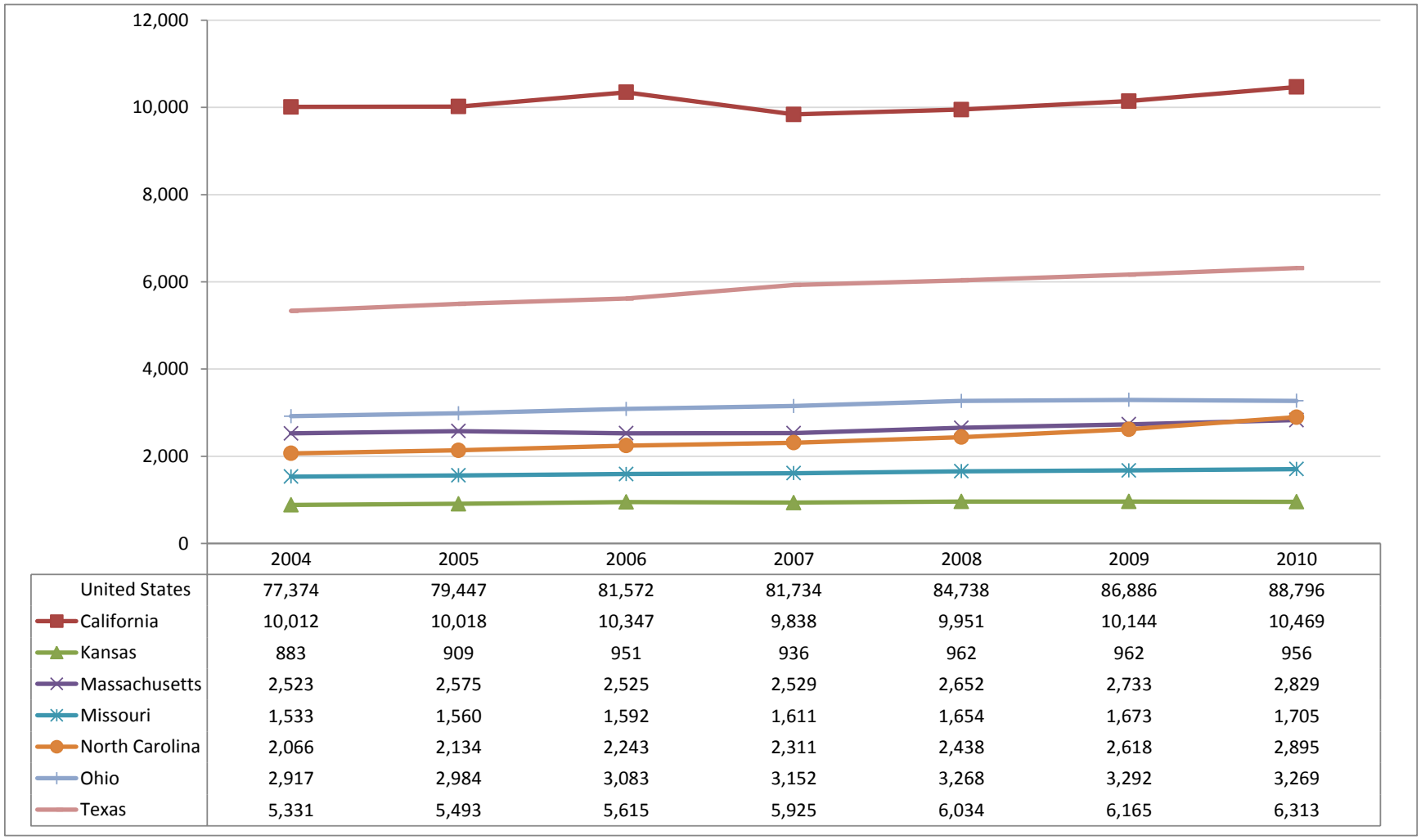
		2004	2005	2006	2007	2008	2009	2010
United States	Establishment	82,920	84,960	87,116	87,265	90,481	92,750	94,593
	Employment	5,962,185	6,060,624	6,178,874	6,307,554	6,441,612	6,434,300	6,435,580
	Employment Share	4.61%	4.61%	4.62%	4.66%	4.78%	5.00%	5.03%
	Average Wage	48,698	50,786	53,079	55,573	57,474	59,091	60,125
California	Establishment	10,682	10,719	11,034	10,457	10,638	10,817	10,961
	Employment	626,597	635,406	647,680	664,489	681,496	690,733	664,706
	Employment Share	3.83%	3.83%	3.85%	3.92%	4.03%	4.28%	4.14%
	Average Wage	63,375	67,279	70,306	74,254	77,298	81,229	80,720
Kansas	Establishment	977	1,004	1,046	1,029	1,054	1,055	1,046
	Employment	53,783	53,893	55,057	57,181	59,223	59,849	59,735
	Employment Share	3.89%	3.88%	3.92%	4.05%	4.18%	4.28%	4.28%
	Average Wage	36,705	38,207	40,040	42,416	44,120	45,757	46,485
Massachusetts	Establishment	2,644	2,703	2,635	2,636	2,758	2,835	2,941
	Employment	217,781	223,969	232,075	240,309	246,552	247,735	252,446
	Employment Share	6.80%	6.96%	7.13%	7.33%	7.52%	7.78%	7.94%
	Average Wage	59,933	63,195	65,097	69,787	73,268	73,771	77,232
Missouri	Establishment	1,643	1,673	1,707	1,730	1,766	1,788	1,828
	Employment	136,703	140,063	143,553	146,132	148,063	146,381	154,559
	Employment Share	4.85%	4.91%	4.97%	5.05%	5.16%	5.26%	5.59%
	Average Wage	42,971	44,010	45,779	47,572	50,044	52,071	51,596

Table 3 (cont.): Establishments, Employment, Employment as a Share of Employed Workforce, and Average Wage in Private Bioscience Industry

		2004	2005	2006	2007	2008	2009	2010
North Carolina	Establishment	2,153	2,219	2,332	2,405	2,535	2,727	2,997
	Employment	148,970	152,939	158,077	162,488	174,923	179,202	181,520
	Employment Share	3.70%	3.71%	3.71%	3.79%	4.09%	4.39%	4.41%
	Average Wage	47,485	48,740	50,864	53,457	55,142	55,891	57,336
Ohio	Establishment	3,124	3,174	3,266	3,332	3,459	3,484	3,461
	Employment	279,293	285,253	288,726	290,641	298,620	296,428	299,567
	Employment Share	5.08%	5.15%	5.15%	5.18%	5.37%	5.56%	5.68%
	Average Wage	41,802	43,231	45,349	46,648	47,882	49,633	50,800
Texas	Establishment	5,768	5,934	6,049	6,375	6,485	6,622	6,789
	Employment	350,920	354,629	361,641	375,418	383,811	387,623	390,720
	Employment Share	3.38%	3.36%	3.36%	3.44%	3.46%	3.50%	3.47%
	Average Wage	45,231	47,332	49,193	51,515	53,173	53,991	56,060

Source: U.S. Bureau of Labor Statistics

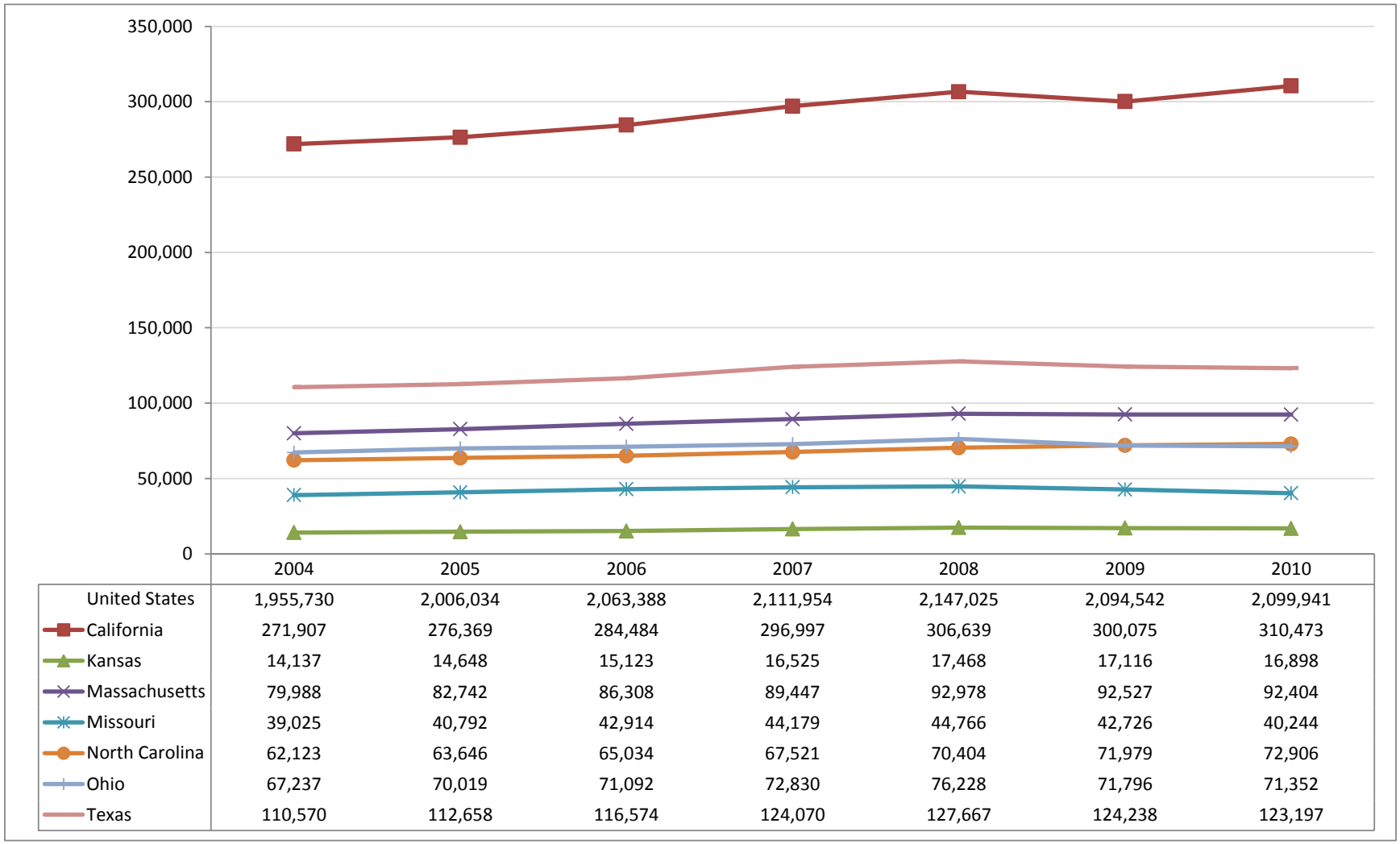
Figure 4: Establishments in Private Bioscience Industry (NAICS Code 622100 not Included)



	2004	2005	2006	2007	2008	2009	2010
United States	77,374	79,447	81,572	81,734	84,738	86,886	88,796
California	10,012	10,018	10,347	9,838	9,951	10,144	10,469
Kansas	883	909	951	936	962	962	956
Massachusetts	2,523	2,575	2,525	2,529	2,652	2,733	2,829
Missouri	1,533	1,560	1,592	1,611	1,654	1,673	1,705
North Carolina	2,066	2,134	2,243	2,311	2,438	2,618	2,895
Ohio	2,917	2,984	3,083	3,152	3,268	3,292	3,269
Texas	5,331	5,493	5,615	5,925	6,034	6,165	6,313

Source: U.S. Bureau of Labor Statistics

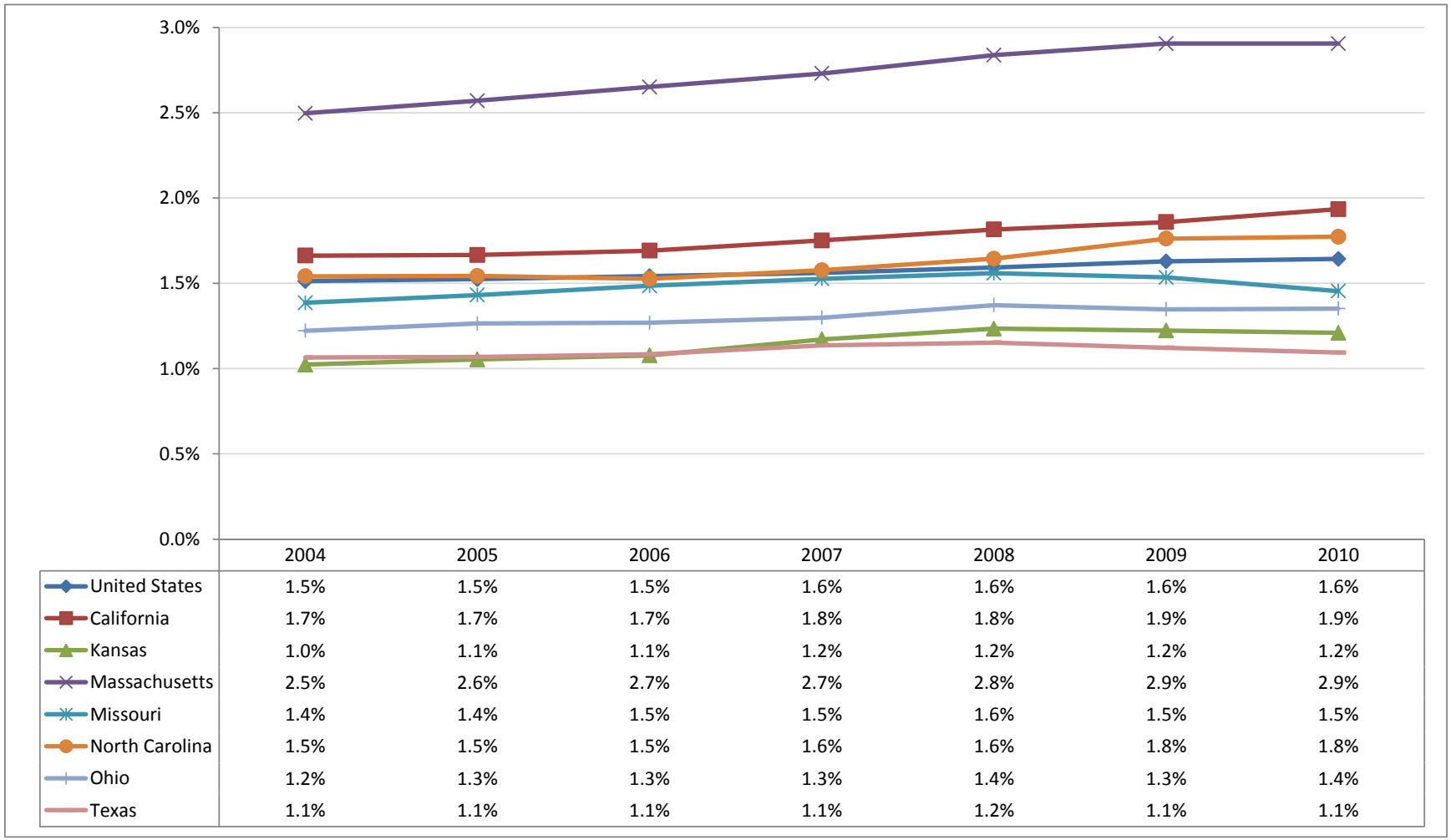
Figure 5: Employment in Private Bioscience Industry (NAICS Code 622100 not Included)



	2004	2005	2006	2007	2008	2009	2010
United States	1,955,730	2,006,034	2,063,388	2,111,954	2,147,025	2,094,542	2,099,941
California	271,907	276,369	284,484	296,997	306,639	300,075	310,473
Kansas	14,137	14,648	15,123	16,525	17,468	17,116	16,898
Massachusetts	79,988	82,742	86,308	89,447	92,978	92,527	92,404
Missouri	39,025	40,792	42,914	44,179	44,766	42,726	40,244
North Carolina	62,123	63,646	65,034	67,521	70,404	71,979	72,906
Ohio	67,237	70,019	71,092	72,830	76,228	71,796	71,352
Texas	110,570	112,658	116,574	124,070	127,667	124,238	123,197

Source: U.S. Bureau of Labor Statistics

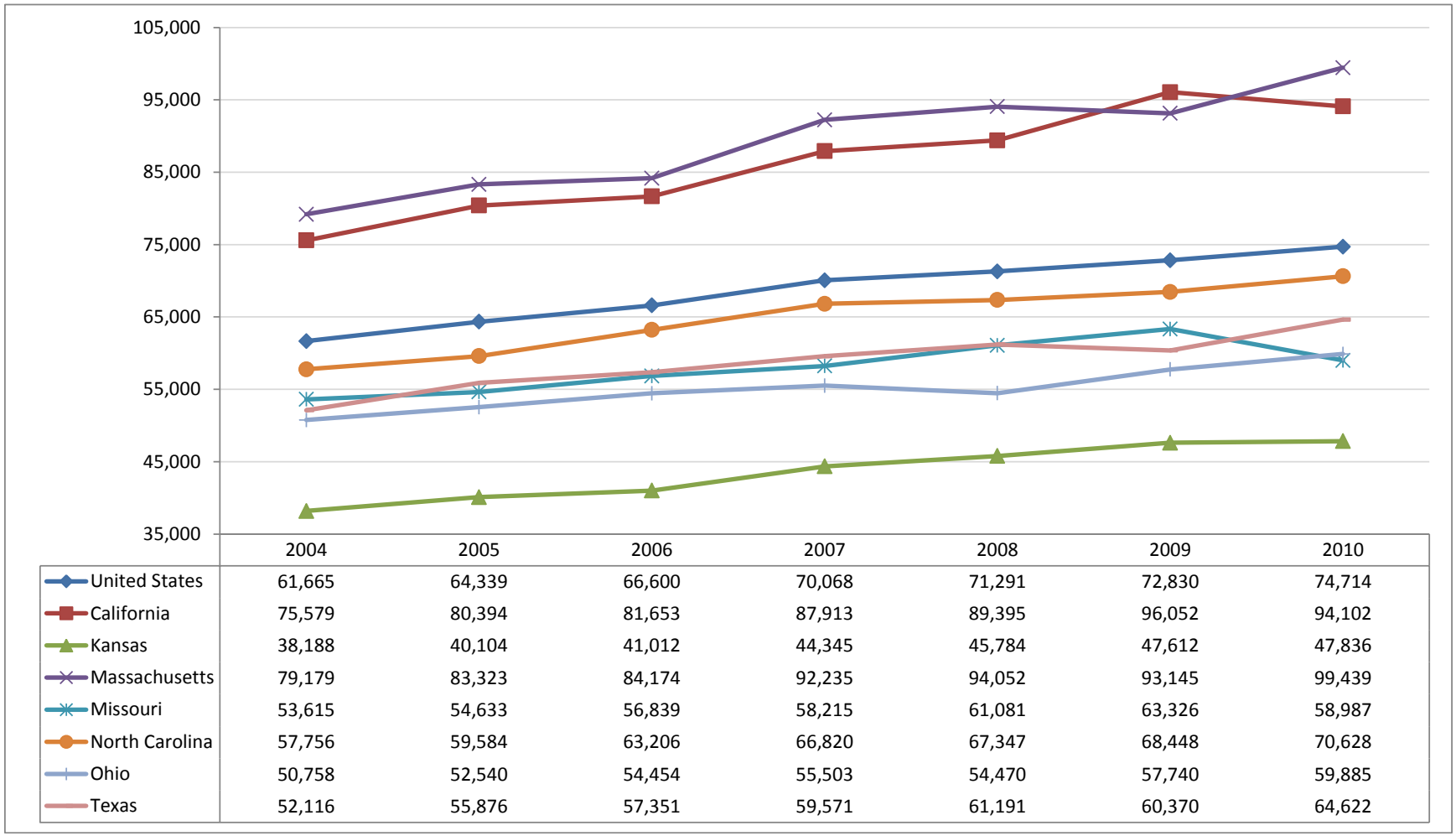
Figure 6: Employment in Private Bioscience Industry as a Percentage of Employed Workforce (NAICS Code 622100 not Included)



	2004	2005	2006	2007	2008	2009	2010
United States	1.5%	1.5%	1.5%	1.6%	1.6%	1.6%	1.6%
California	1.7%	1.7%	1.7%	1.8%	1.8%	1.9%	1.9%
Kansas	1.0%	1.1%	1.1%	1.2%	1.2%	1.2%	1.2%
Massachusetts	2.5%	2.6%	2.7%	2.7%	2.8%	2.9%	2.9%
Missouri	1.4%	1.4%	1.5%	1.5%	1.6%	1.5%	1.5%
North Carolina	1.5%	1.5%	1.5%	1.6%	1.6%	1.8%	1.8%
Ohio	1.2%	1.3%	1.3%	1.3%	1.4%	1.3%	1.4%
Texas	1.1%	1.1%	1.1%	1.1%	1.2%	1.1%	1.1%

Source: U.S. Bureau of Labor Statistics

Figure 7: Average Wage in Private Bioscience Industry (NAICS Code 622100 not Included)



	2004	2005	2006	2007	2008	2009	2010
United States	61,665	64,339	66,600	70,068	71,291	72,830	74,714
California	75,579	80,394	81,653	87,913	89,395	96,052	94,102
Kansas	38,188	40,104	41,012	44,345	45,784	47,612	47,836
Massachusetts	79,179	83,323	84,174	92,235	94,052	93,145	99,439
Missouri	53,615	54,633	56,839	58,215	61,081	63,326	58,987
North Carolina	57,756	59,584	63,206	66,820	67,347	68,448	70,628
Ohio	50,758	52,540	54,454	55,503	54,470	57,740	59,885
Texas	52,116	55,876	57,351	59,571	61,191	60,370	64,622

Source: U.S. Bureau of Labor Statistics

Table 3 and Figures 4, 5, 6 and 7 present aggregately the establishment, employment, and wage information of those 26 bioscience industry sectors. Establishment and employment in each industrial sector indicate the size and potential of such sector and comparison of those sectors reveals which sector(s) dominate a state's bioscience industry. Figures 8 to 59 show the establishments and employments of all those 26 industrial sectors.

Except for the General Medical and Surgical Hospital sector, the largest five bioscience industrial sectors in terms of employment in Kansas were Veterinary Services, Medical Laboratories, Research and Development in the Physical, Engineering, and Life Sciences, Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing, and Pharmaceutical Preparation Manufacturing. The Veterinary Services sector, the largest bioscience sector in Kansas in terms of employment, had 433 establishments and 3,714 employees in 2010 (Figure 57). There were 3,086 employees in the Medical Laboratories sector (Figure 49), 2,339 employees in the Research and Development in the Physical, Engineering, and Life Sciences sector (Figure 53), 1,581 employees in the Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing sector (Figure 29), and 1,329 employees in the Pharmaceutical Preparation Manufacturing sector (Figure 11).

When considering employment, the three fastest growing bioscience industry sectors in Kansas were Research and Development in the Physical, Engineering, and Life Sciences, Pharmaceutical Preparation Manufacturing, and Testing Laboratories. The Research and Development in the Physical, Engineering, and Life Sciences sector in Kansas had 2,339 employees in 2010, increasing by 211% from 2004 (Figure 53). Employment in the Pharmaceutical Preparation Manufacturing sector in Kansas had an increase of 103.2% from 2004 to 2010, and reached 1,329 in 2010 (Figure 11). After a 28.9% increase from 2004, Kansas' employment in the Testing Laboratories sector reached 1,083 in 2010 (Figure 55).

In terms of employment, the three most rapidly declining bioscience industry sectors in Kansas were Industrial Process Furnace and Oven Manufacturing, Ophthalmic Goods Manufacturing, and Surgical Appliance and Supplies Manufacturing. Employment in the Industrial Process Furnace and Oven Manufacturing sector in Kansas was 270 in 2010, after a 20.8% decline from 2004 (Figure 31). There were 267 employees in

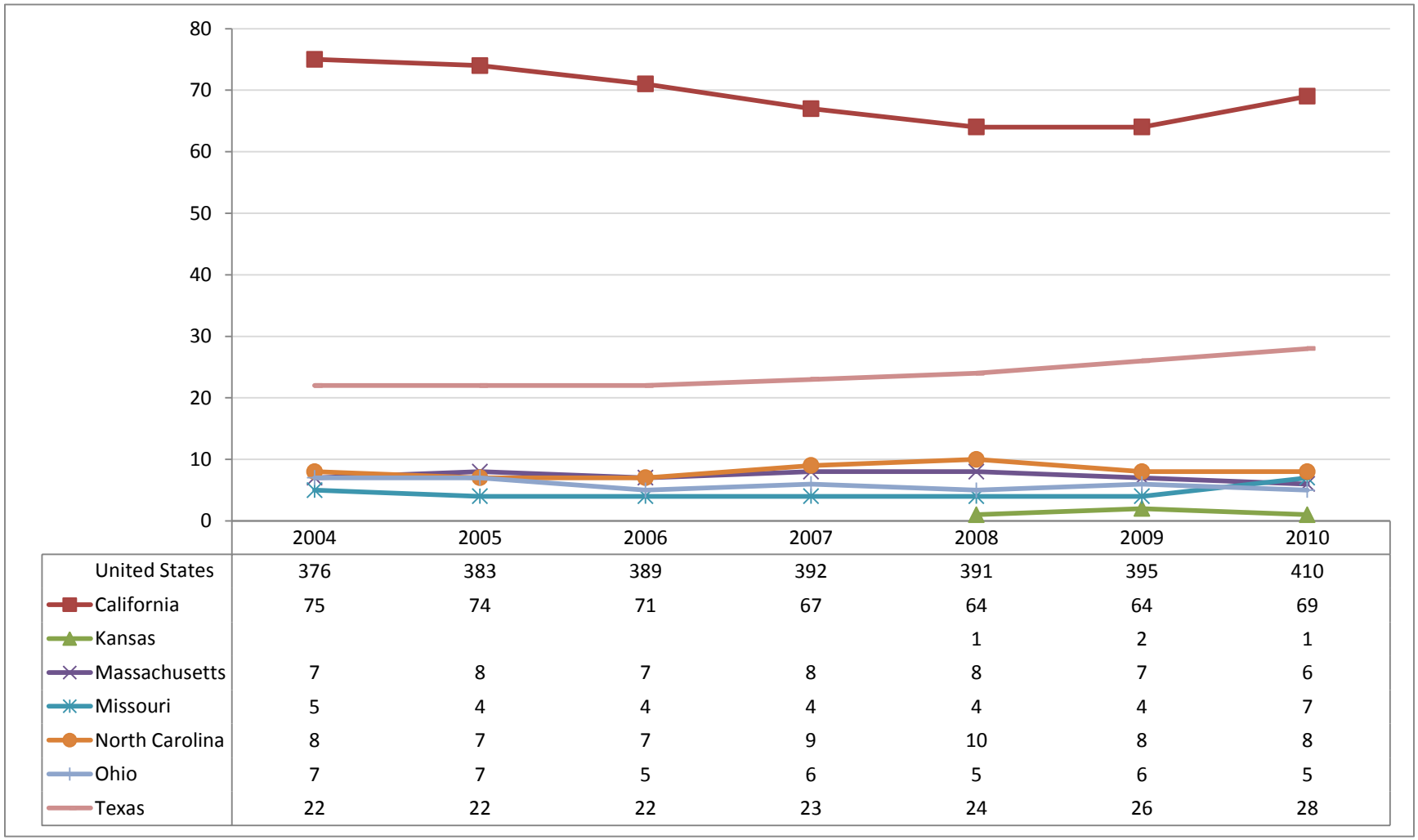
the Ophthalmic Goods Manufacturing sector in Kansas in 2010, down by 19.1% from 2004 (Figure 47). Employment in the Surgical Appliance and Supplies Manufacturing sector dropped by 18.8% from 2004 to 2010 (Figure 41).

When considering employment in 2010, Texas ranked the highest among the study states in five bioscience industry sectors: Ethyl Alcohol Manufacturing, All Other Basic Organic Chemical Manufacturing, Pesticide and Other Agricultural Chemical Manufacturing, Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment, and Institutional Furniture Manufacturing. Ohio ranked the highest in four sectors: Nitrogenous Fertilizer Manufacturing, All Other Industrial Machinery Manufacturing, Industrial Process Furnace and Oven Manufacturing, and Scale and Balance Manufacturing. California ranked the highest in the remaining 17 bioscience industry sectors in 2010.

Although the ranking of the study states based on the number of establishments varied greatly across years, the ranking in employment was relatively stable, in general, with a few variations. Texas and North Carolina experienced great employment increases in the All Other Industrial Machinery Manufacturing sector in 2006 and 2007 (Figure 27). Employment in the Institutional Furniture Manufacturing sector in Ohio increased by 75.5% from 2006 to 2007, and Ohio's rank in that sector moved up to second and has remained so since 2007 (Figure 37). Before 2010, Texas had the largest number of employees in the Diagnostic Imaging Centers sector; but California's employment in that sector exceeded Texas' in 2010 (Figure 51). In 2010, Massachusetts' employment in the Testing Laboratories sector dropped by 51.9% from 2009, decreasing Massachusetts' rank from third to fourth (Figure 55).

Kansas' ranking, considering either the number of establishments or employment, was low in most of the bioscience industry sectors. However, Kansas had the second largest Ethyl Alcohol Manufacturing sector (considering the number of establishments) among all the study states. There were 12 ethyl alcohol manufacturing companies in Kansas in 2010, which increased by 71.4% from 2004 (Figure 16).

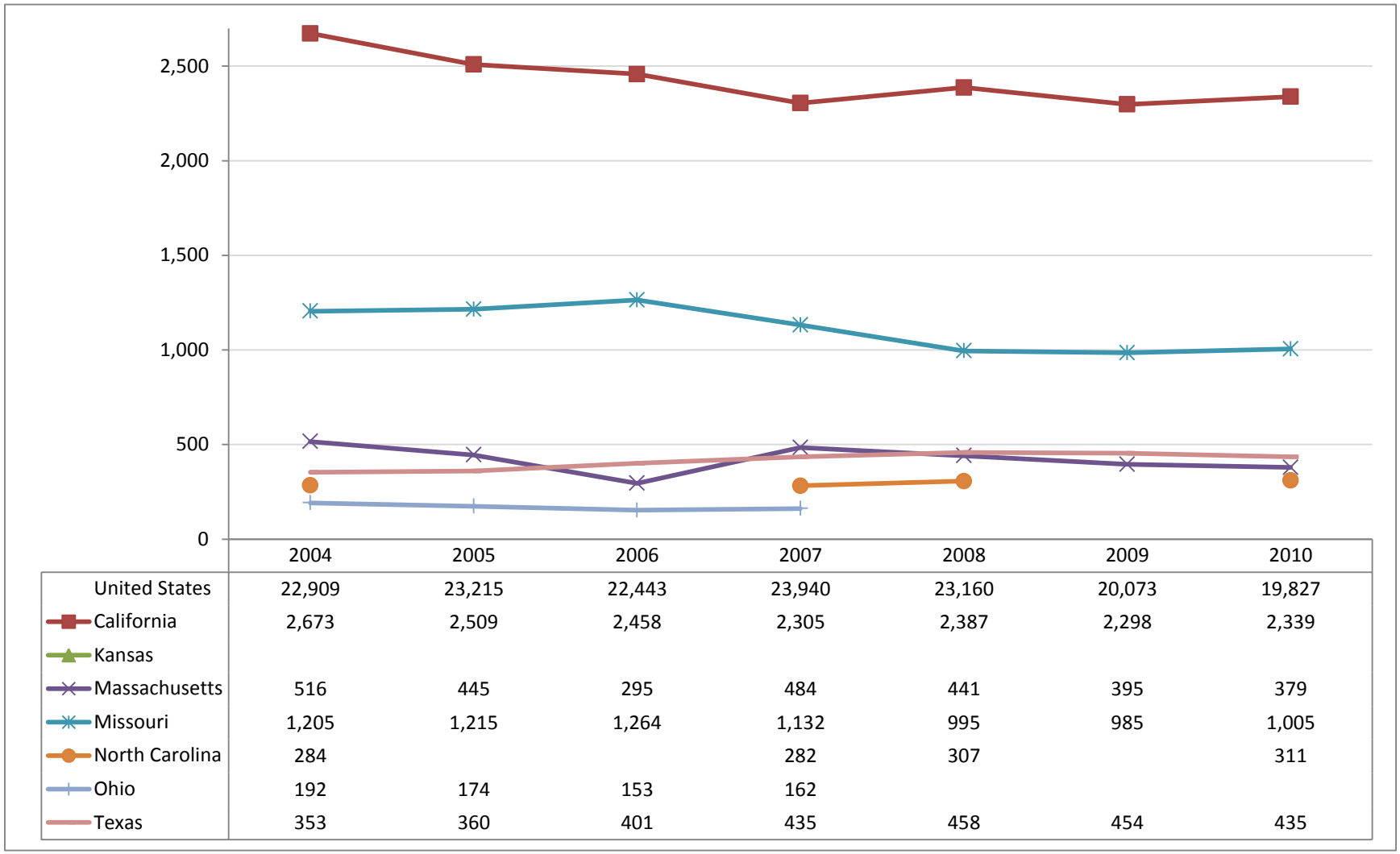
Figure 8: Establishments in Medical and Botanical Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	376	383	389	392	391	395	410
California	75	74	71	67	64	64	69
Kansas					1	2	1
Massachusetts	7	8	7	8	8	7	6
Missouri	5	4	4	4	4	4	7
North Carolina	8	7	7	9	10	8	8
Ohio	7	7	5	6	5	6	5
Texas	22	22	22	23	24	26	28

* Data not available for Kansas from 2004 to 2007
Source: U.S. Bureau of Labor Statistics

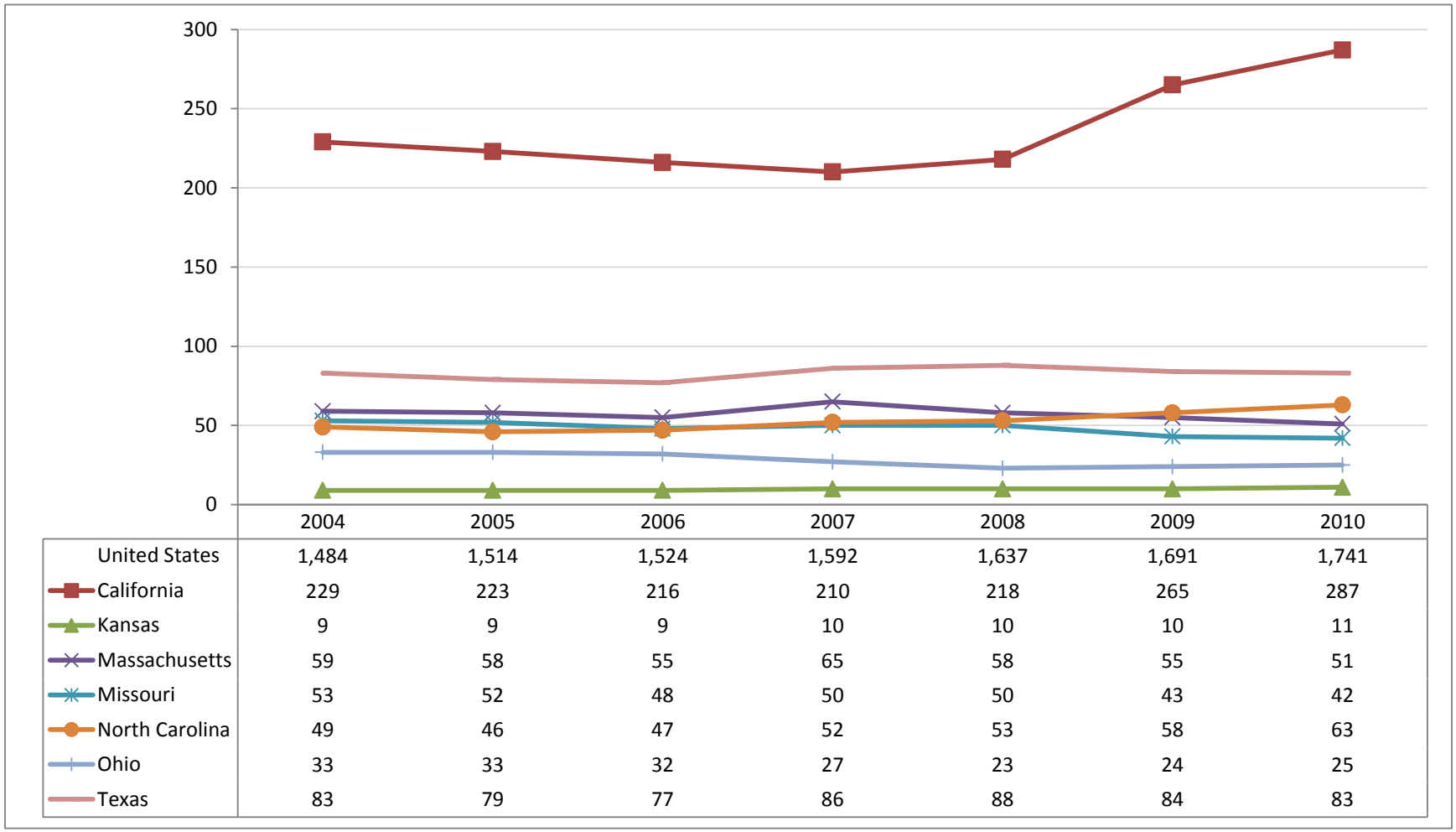
Figure 9: Employment in Medical and Botanical Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	22,909	23,215	22,443	23,940	23,160	20,073	19,827
California	2,673	2,509	2,458	2,305	2,387	2,298	2,339
Kansas							
Massachusetts	516	445	295	484	441	395	379
Missouri	1,205	1,215	1,264	1,132	995	985	1,005
North Carolina	284			282	307		311
Ohio	192	174	153	162			
Texas	353	360	401	435	458	454	435

*Data not available for Kansas from 2004 to 2010, not available for North Carolina in 2005, 2006 and 2009, and not available for Ohio from 2008 to 2010
Source: U.S. Bureau of Labor Statistics

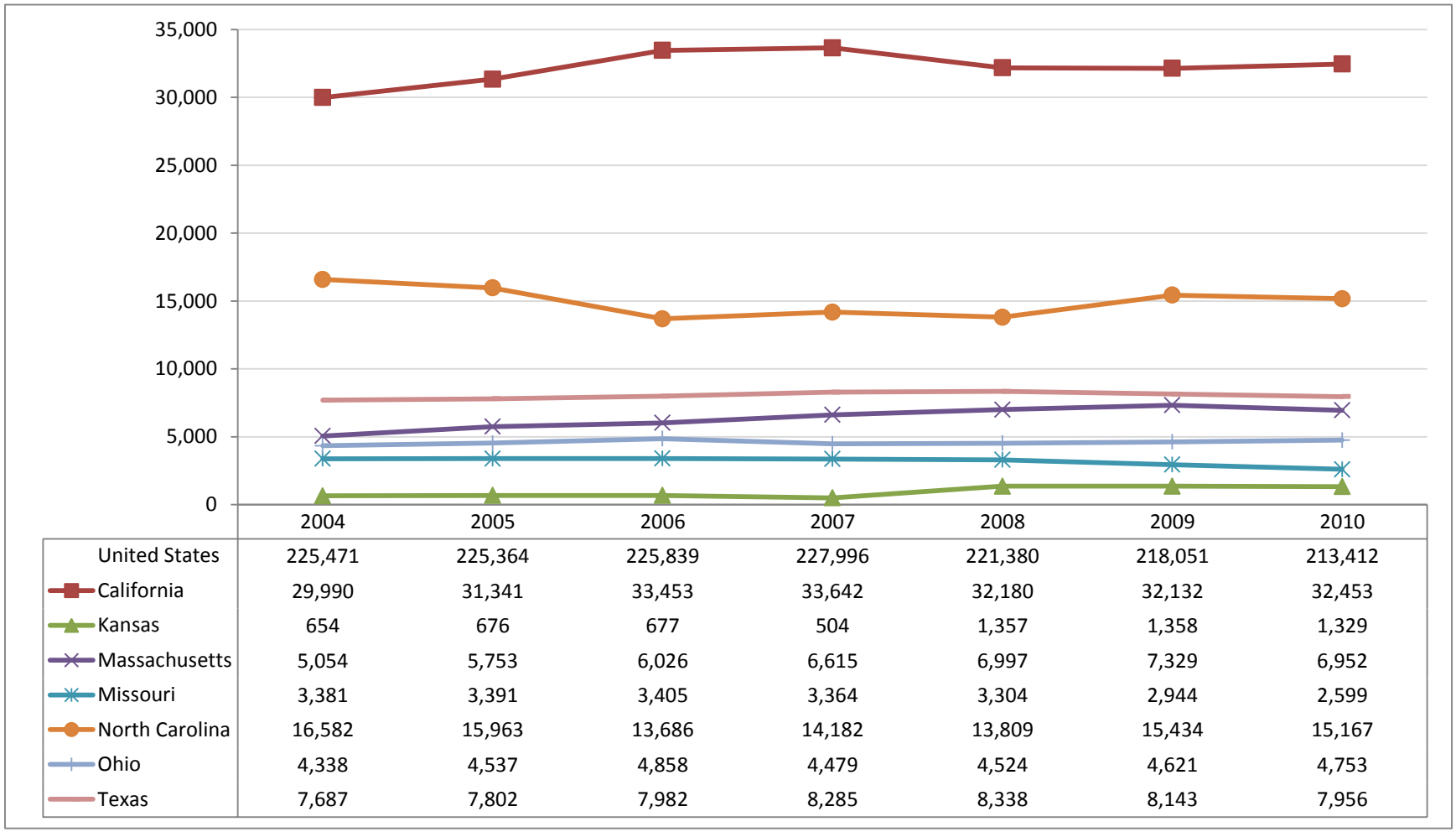
Figure 10: Establishments in Pharmaceutical Preparation Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	1,484	1,514	1,524	1,592	1,637	1,691	1,741
California	229	223	216	210	218	265	287
Kansas	9	9	9	10	10	10	11
Massachusetts	59	58	55	65	58	55	51
Missouri	53	52	48	50	50	43	42
North Carolina	49	46	47	52	53	58	63
Ohio	33	33	32	27	23	24	25
Texas	83	79	77	86	88	84	83

Source: U.S. Bureau of Labor Statistics

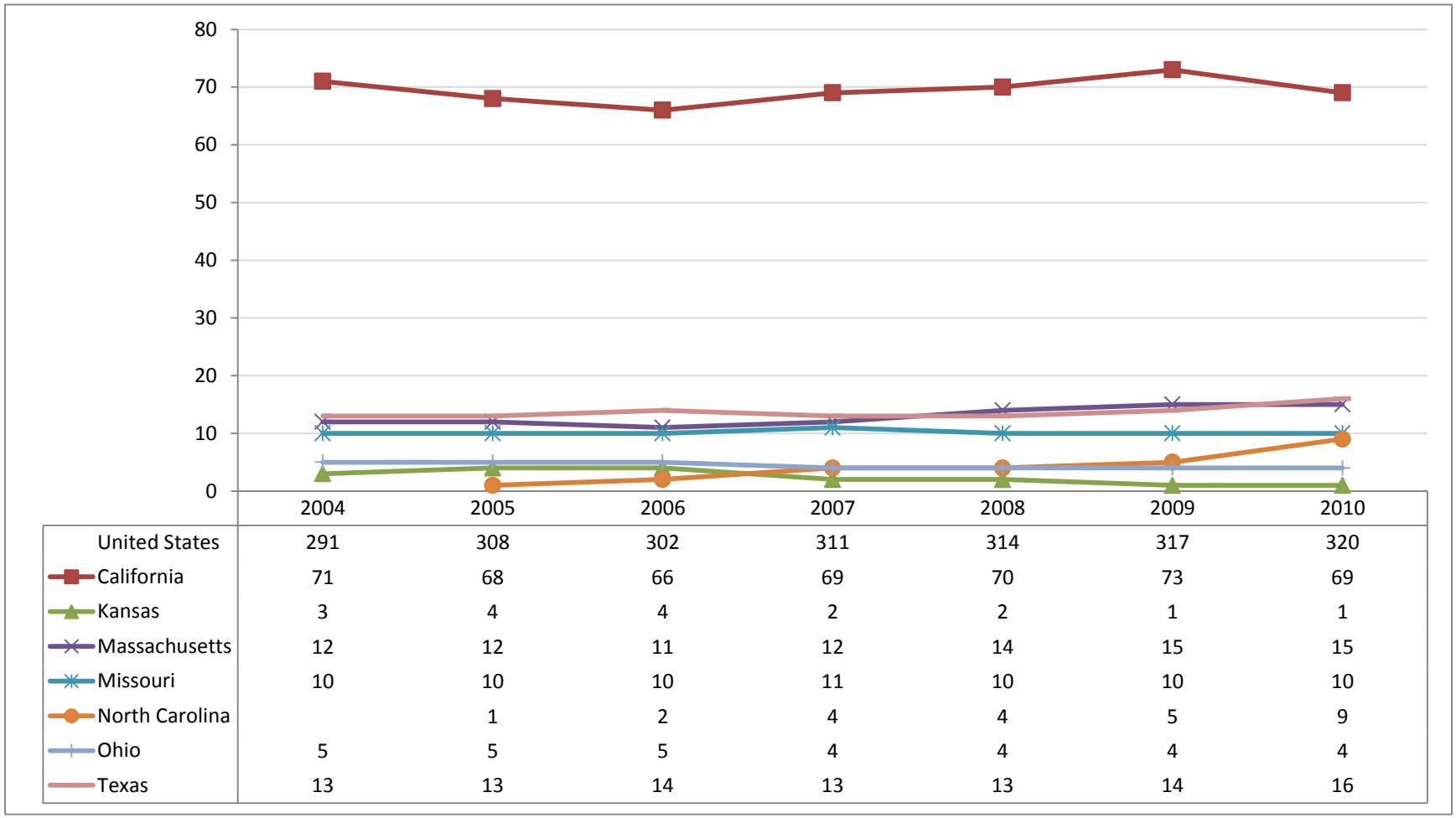
Figure 11: Employment in Pharmaceutical Preparation Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	225,471	225,364	225,839	227,996	221,380	218,051	213,412
California	29,990	31,341	33,453	33,642	32,180	32,132	32,453
Kansas	654	676	677	504	1,357	1,358	1,329
Massachusetts	5,054	5,753	6,026	6,615	6,997	7,329	6,952
Missouri	3,381	3,391	3,405	3,364	3,304	2,944	2,599
North Carolina	16,582	15,963	13,686	14,182	13,809	15,434	15,167
Ohio	4,338	4,537	4,858	4,479	4,524	4,621	4,753
Texas	7,687	7,802	7,982	8,285	8,338	8,143	7,956

Source: U.S. Bureau of Labor Statistics

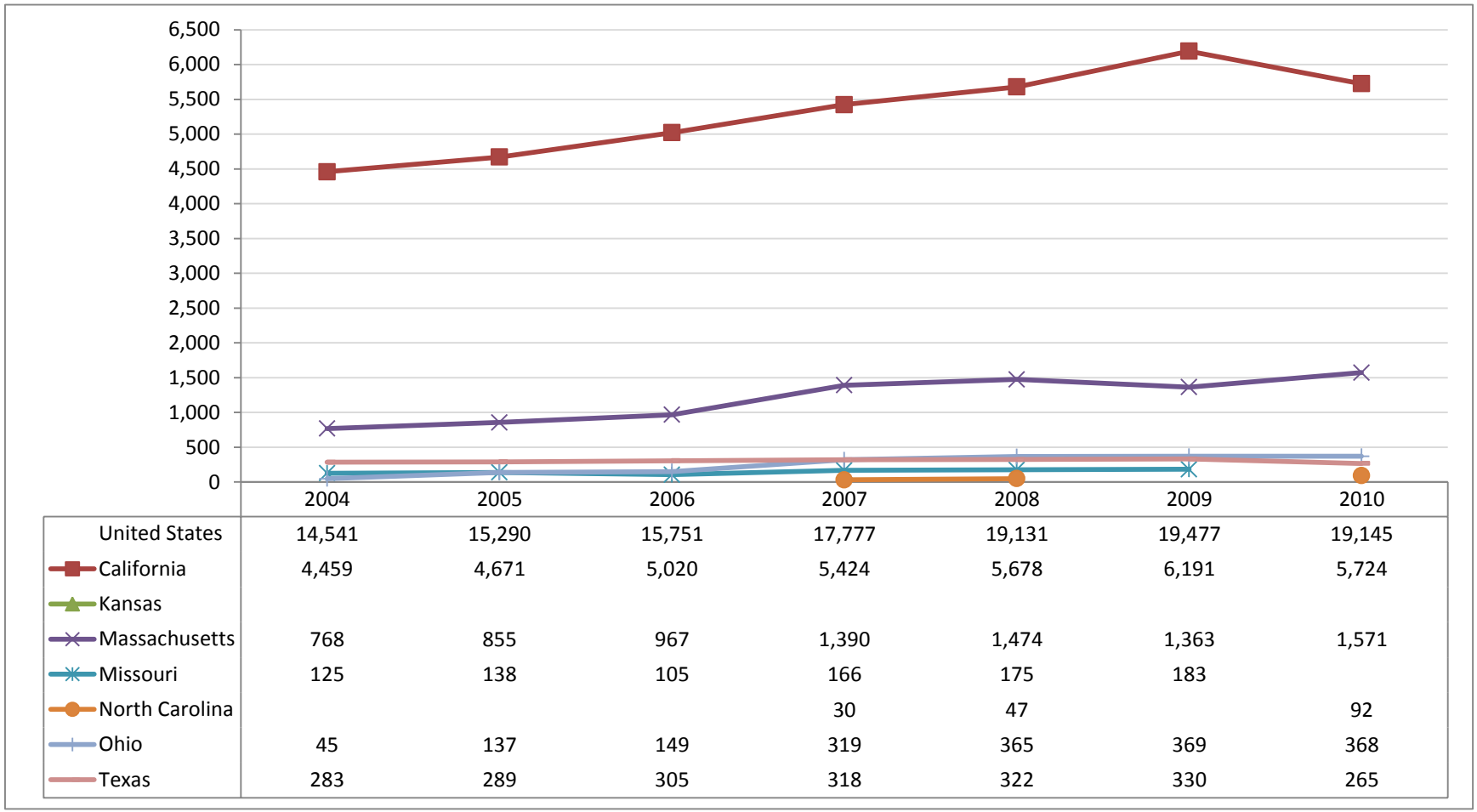
Figure 12: Establishments in In-vitro Diagnostic Substance Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	291	308	302	311	314	317	320
California	71	68	66	69	70	73	69
Kansas	3	4	4	2	2	1	1
Massachusetts	12	12	11	12	14	15	15
Missouri	10	10	10	11	10	10	10
North Carolina		1	2	4	4	5	9
Ohio	5	5	5	4	4	4	4
Texas	13	13	14	13	13	14	16

*Data not available for North Carolina in 2004
Source: U.S. Bureau of Labor Statistics

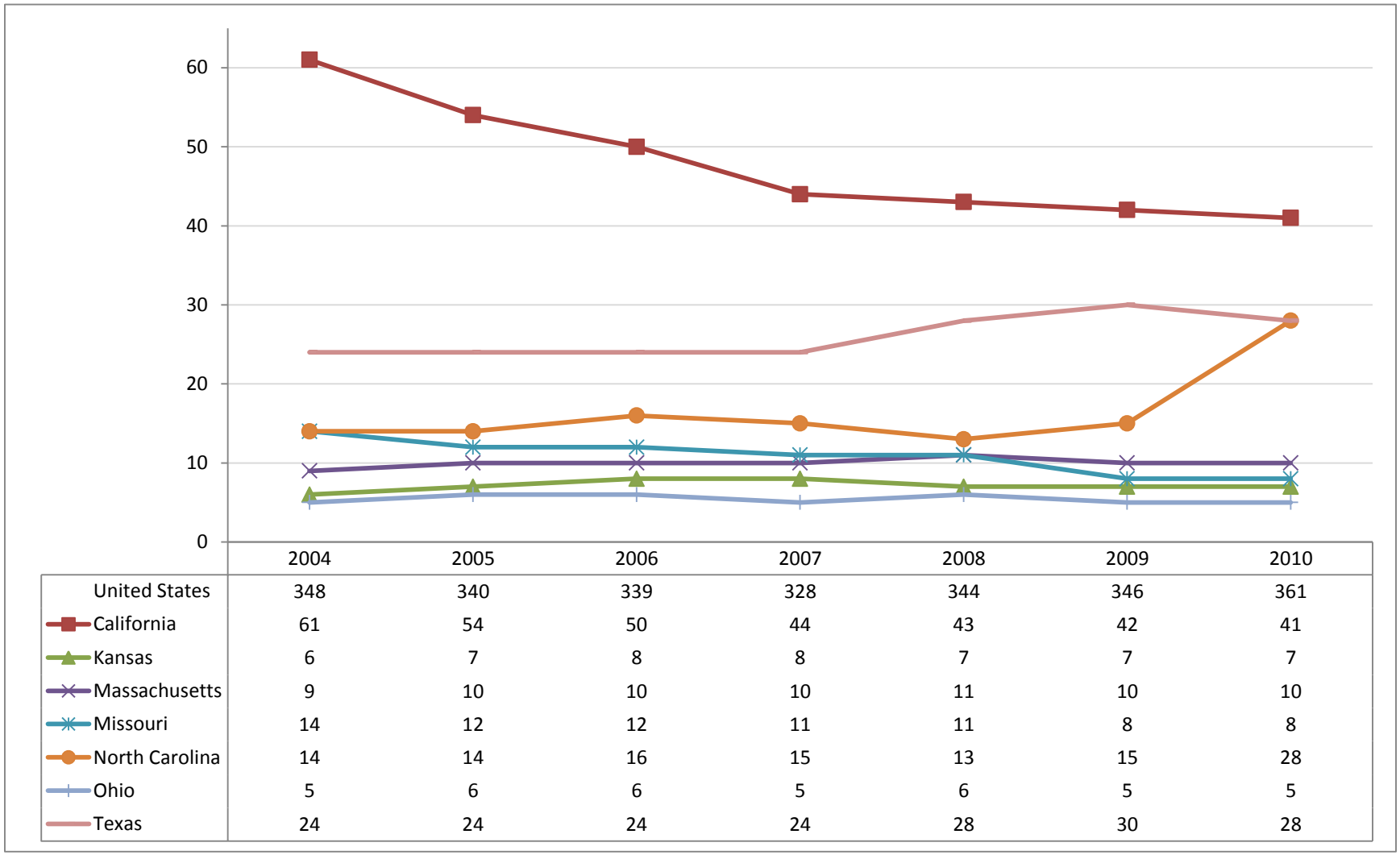
Figure 13: Employment in In-vitro Diagnostic Substance Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	14,541	15,290	15,751	17,777	19,131	19,477	19,145
California	4,459	4,671	5,020	5,424	5,678	6,191	5,724
Kansas							
Massachusetts	768	855	967	1,390	1,474	1,363	1,571
Missouri	125	138	105	166	175	183	
North Carolina				30	47		92
Ohio	45	137	149	319	365	369	368
Texas	283	289	305	318	322	330	265

*Data not available for Kansas from 2004 to 2010, not available for Missouri in 2010, and not available for North Carolina in 2004, 2005, 2006 and 2009
Source: U.S. Bureau of Labor Statistics

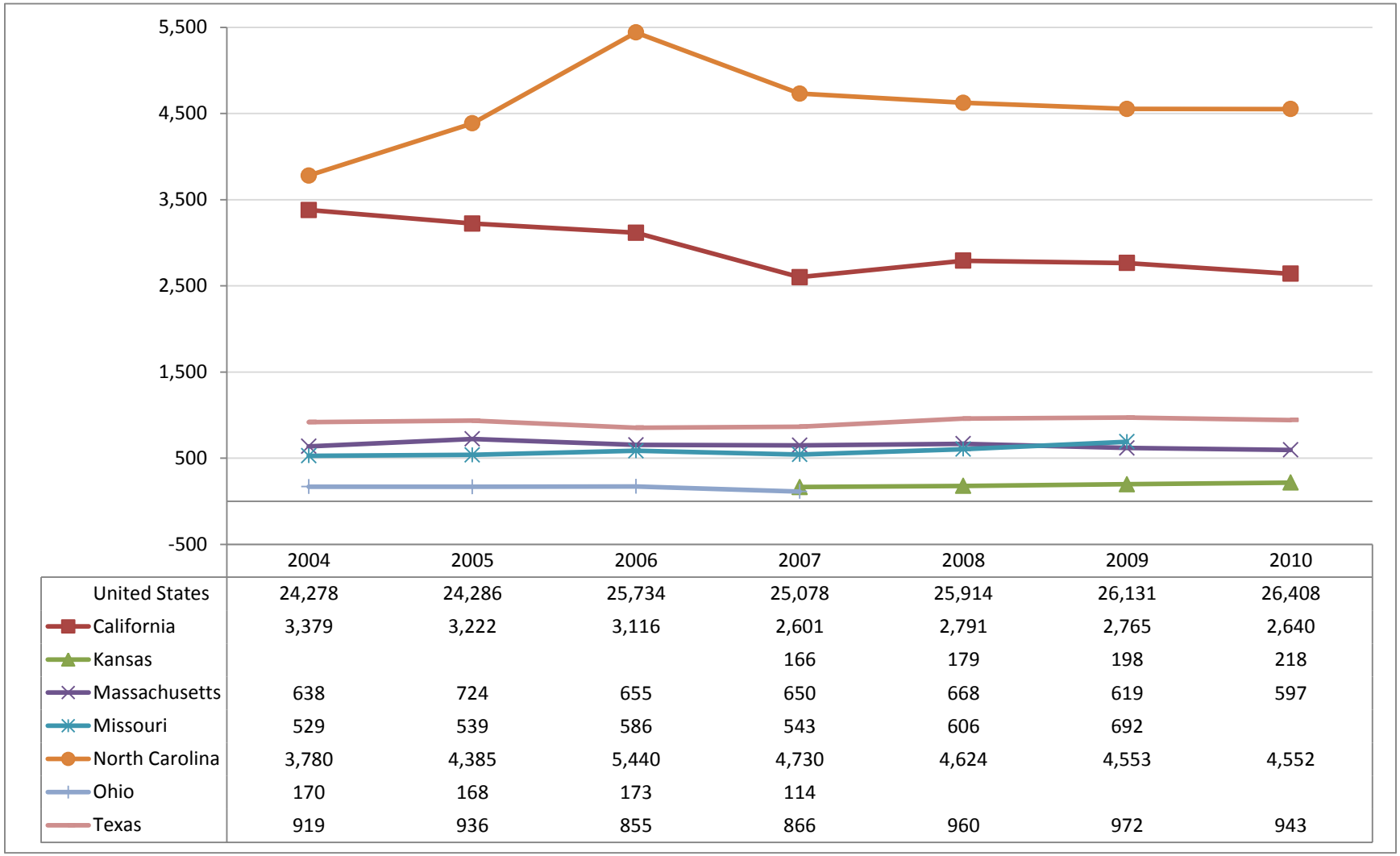
Figure 14: Establishments in Biological Product (except Diagnostic) Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	348	340	339	328	344	346	361
California	61	54	50	44	43	42	41
Kansas	6	7	8	8	7	7	7
Massachusetts	9	10	10	10	11	10	10
Missouri	14	12	12	11	11	8	8
North Carolina	14	14	16	15	13	15	28
Ohio	5	6	6	5	6	5	5
Texas	24	24	24	24	28	30	28

Source: U.S. Bureau of Labor Statistics

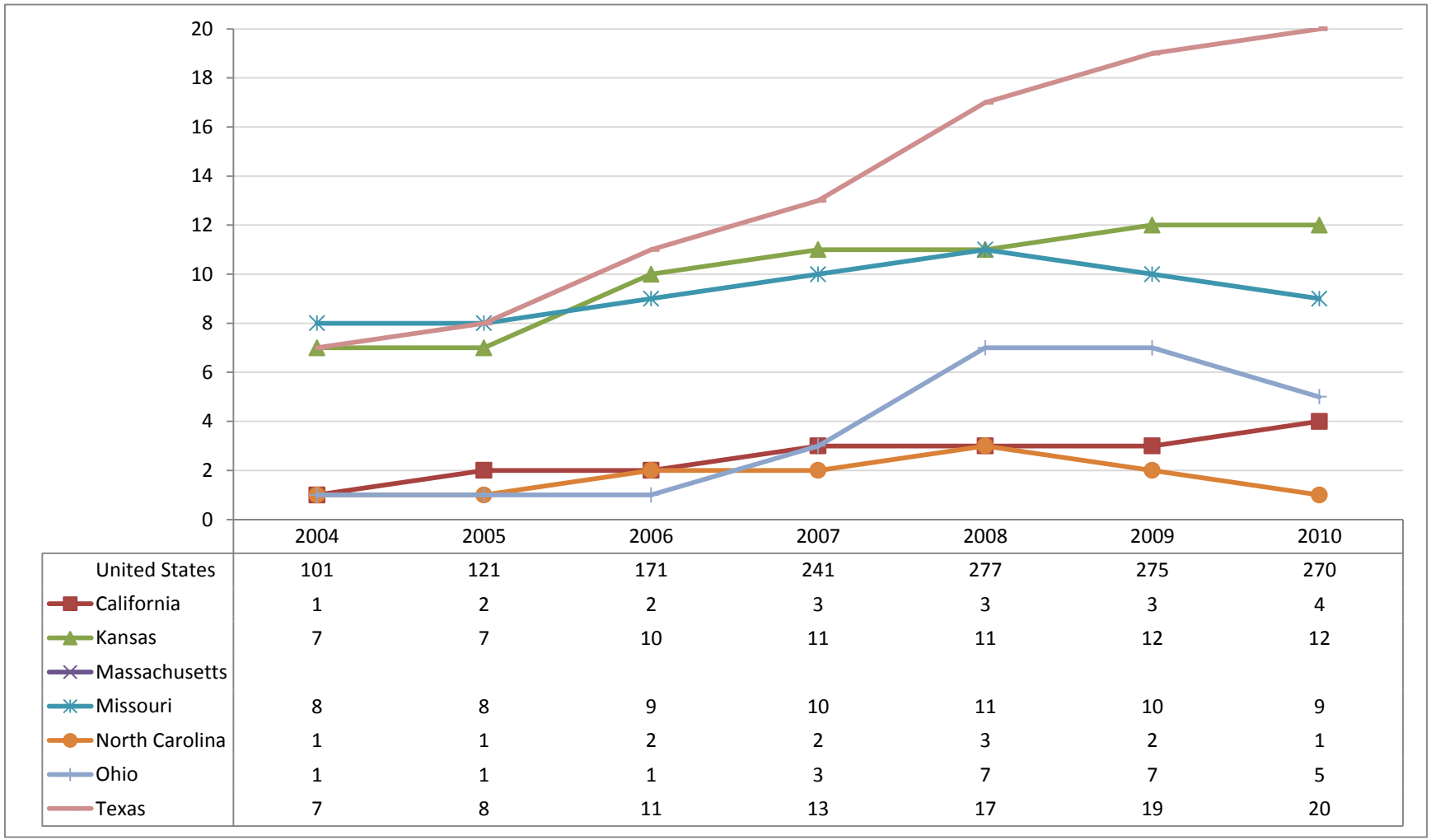
Figure 15: Employment in Biological Product (except Diagnostic) Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	24,278	24,286	25,734	25,078	25,914	26,131	26,408
California	3,379	3,222	3,116	2,601	2,791	2,765	2,640
Kansas				166	179	198	218
Massachusetts	638	724	655	650	668	619	597
Missouri	529	539	586	543	606	692	
North Carolina	3,780	4,385	5,440	4,730	4,624	4,553	4,552
Ohio	170	168	173	114			
Texas	919	936	855	866	960	972	943

*Data not available for Kansas from 2004 to 2006, not available for Missouri in 2010, and not available for Ohio from 2008 to 2010
Source: U.S. Bureau of Labor Statistics

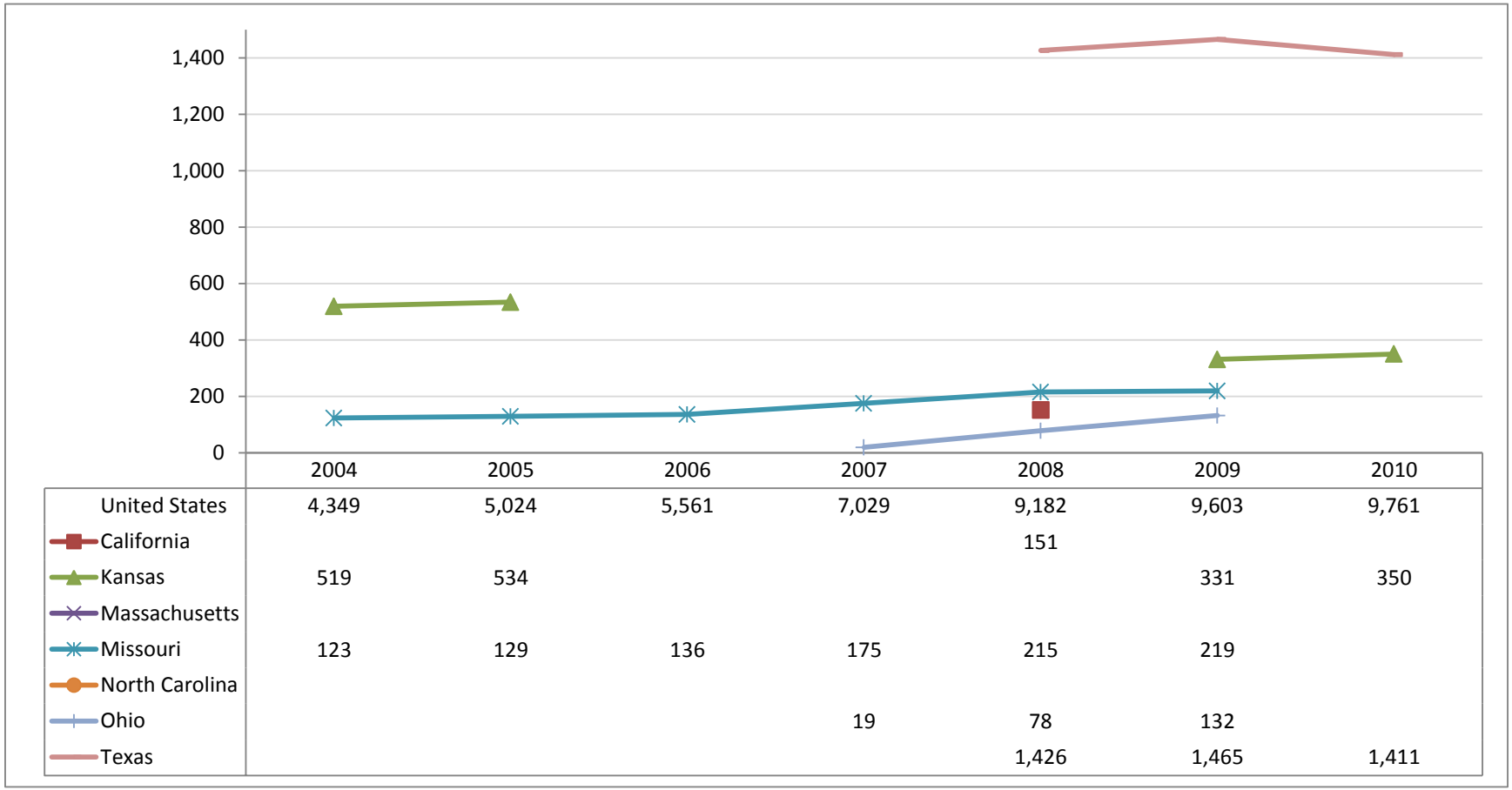
Figure 16: Establishments in Ethyl Alcohol Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	101	121	171	241	277	275	270
California	1	2	2	3	3	3	4
Kansas	7	7	10	11	11	12	12
Massachusetts							
Missouri	8	8	9	10	11	10	9
North Carolina	1	1	2	2	3	2	1
Ohio	1	1	1	3	7	7	5
Texas	7	8	11	13	17	19	20

*Data not available for Massachusetts from 2004 to 2010
Source: U.S. Bureau of Labor Statistics

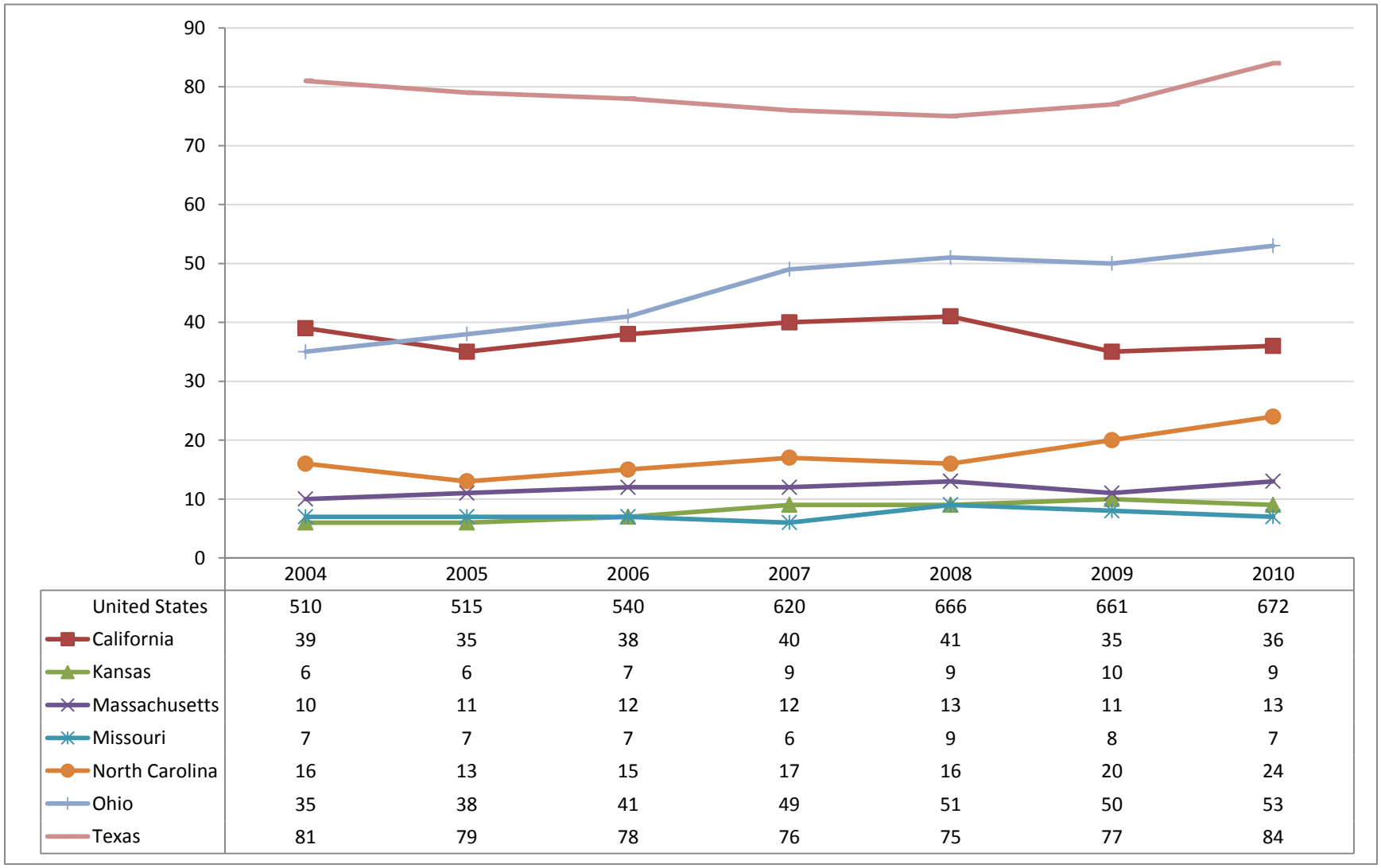
Figure 17: Employment in Ethyl Alcohol Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	4,349	5,024	5,561	7,029	9,182	9,603	9,761
California					151		
Kansas	519	534				331	350
Massachusetts							
Missouri	123	129	136	175	215	219	
North Carolina							
Ohio				19	78	132	
Texas					1,426	1,465	1,411

*Data not available for California since 2004 except 2008, not available for Kansas from 2006 to 2008, not available for Massachusetts and North Carolina since 2004, not available for Ohio in 2004, 2005, 2006 and 2010, and not available for Texas from 2004 to 2007
Source: U.S. Bureau of Labor Statistics

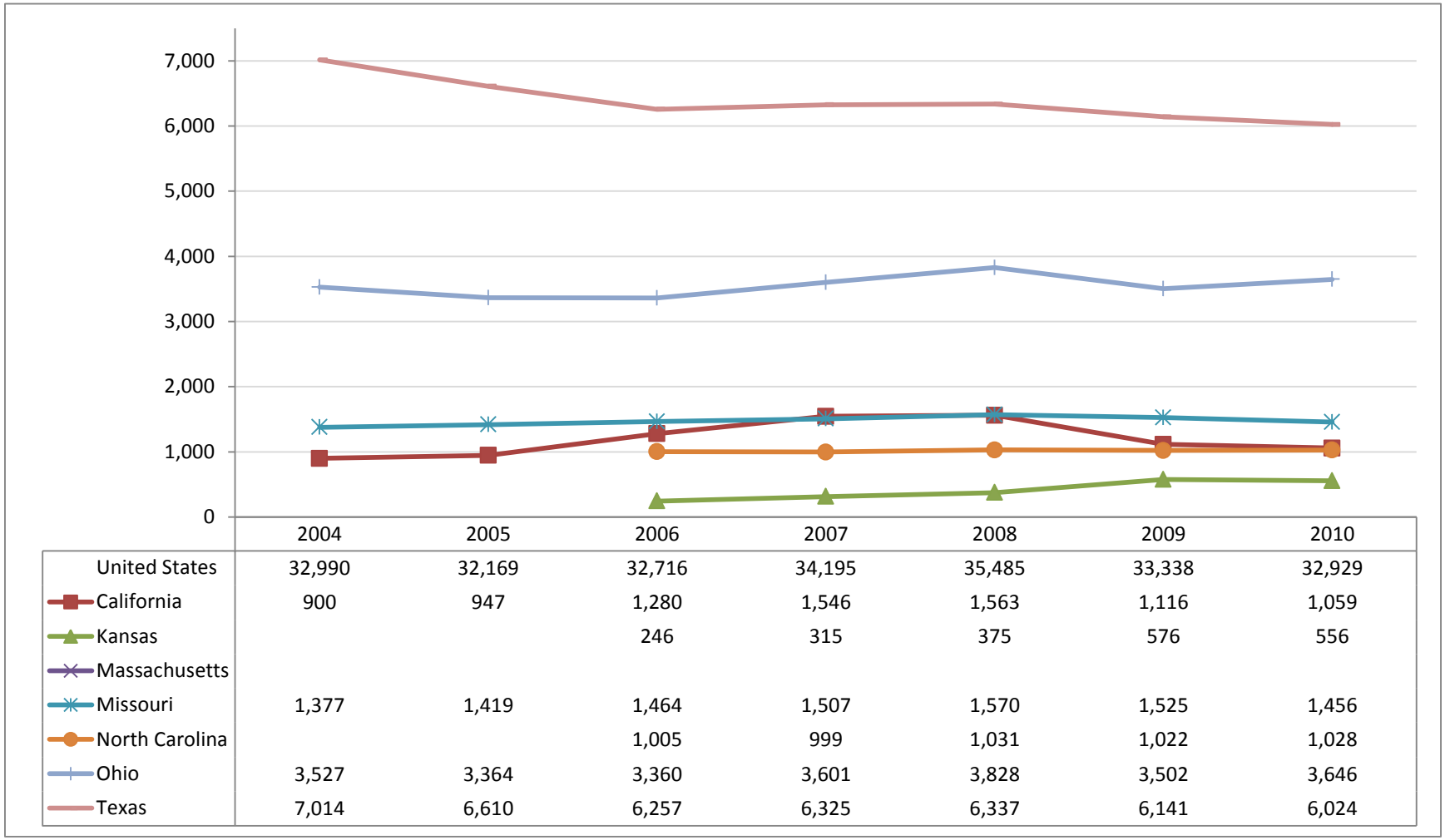
Figure 18: Establishments in All Other Basic Organic Chemical Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	510	515	540	620	666	661	672
California	39	35	38	40	41	35	36
Kansas	6	6	7	9	9	10	9
Massachusetts	10	11	12	12	13	11	13
Missouri	7	7	7	6	9	8	7
North Carolina	16	13	15	17	16	20	24
Ohio	35	38	41	49	51	50	53
Texas	81	79	78	76	75	77	84

Source: U.S. Bureau of Labor Statistics

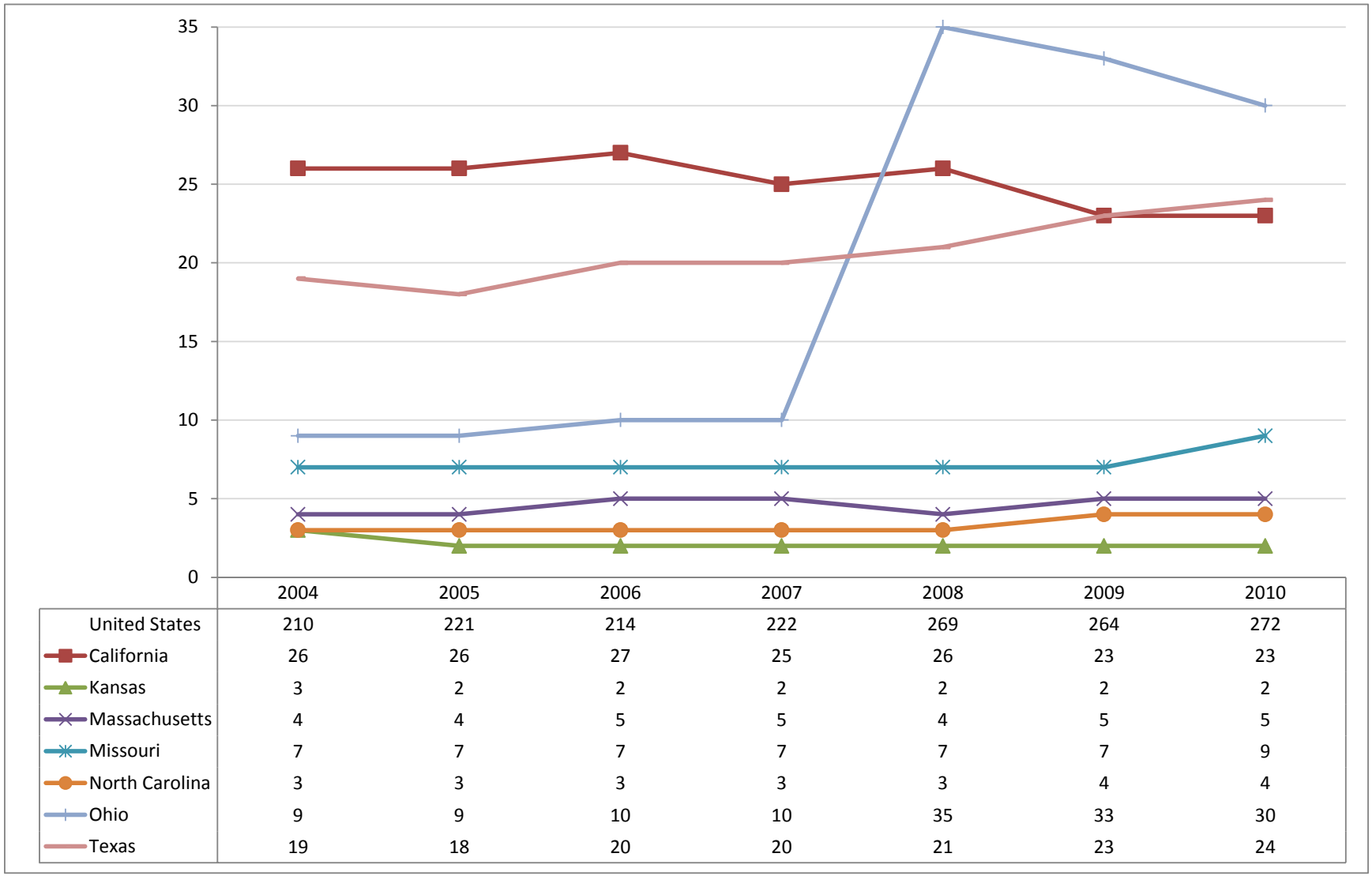
Figure 19: Employment in All Other Basic Organic Chemical Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	32,990	32,169	32,716	34,195	35,485	33,338	32,929
California	900	947	1,280	1,546	1,563	1,116	1,059
Kansas			246	315	375	576	556
Massachusetts							
Missouri	1,377	1,419	1,464	1,507	1,570	1,525	1,456
North Carolina			1,005	999	1,031	1,022	1,028
Ohio	3,527	3,364	3,360	3,601	3,828	3,502	3,646
Texas	7,014	6,610	6,257	6,325	6,337	6,141	6,024

*Data not available for Kansas and North Carolina in 2004 and 2005, and not available for Massachusetts since 2004
Source: U.S. Bureau of Labor Statistics

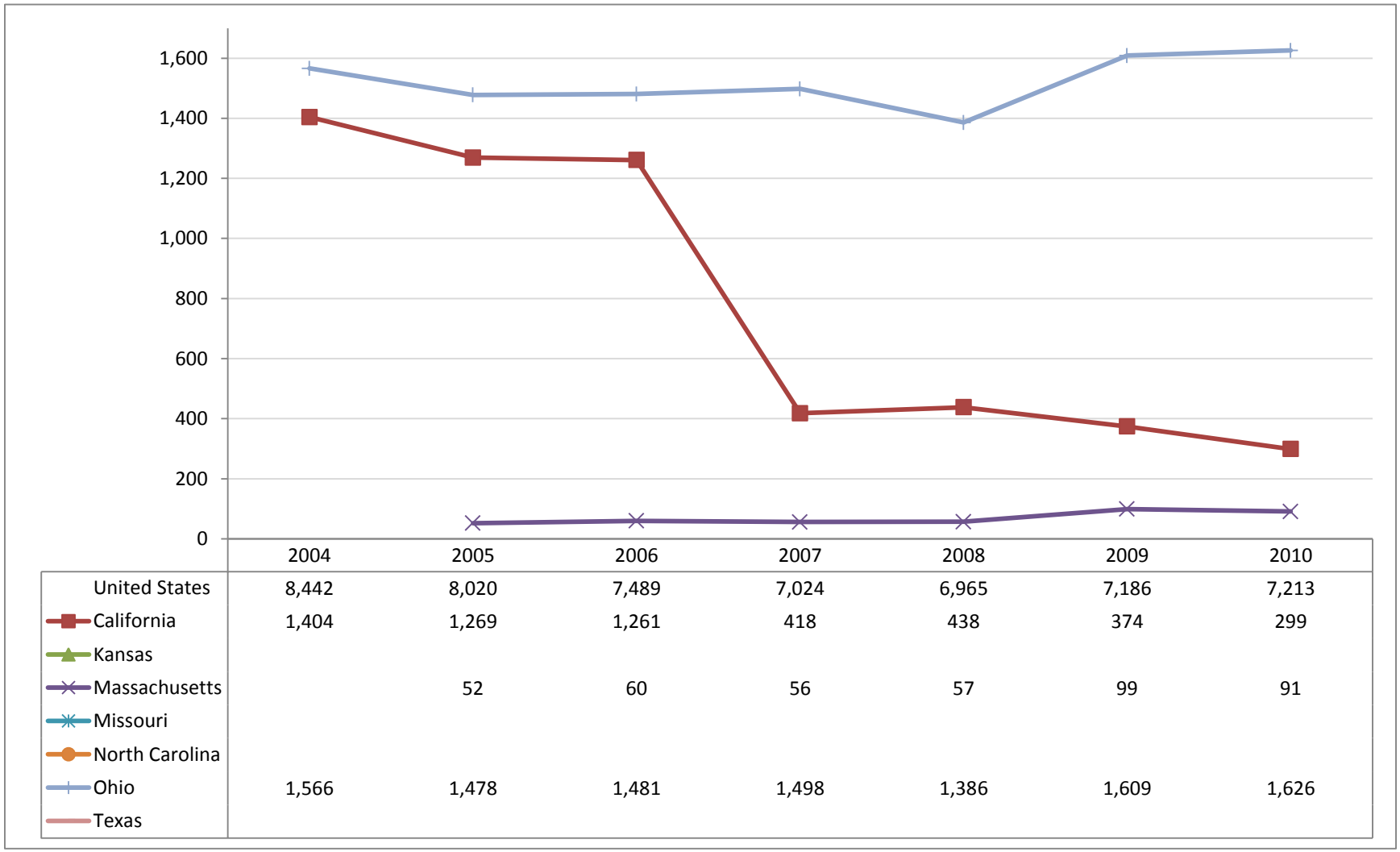
Figure 20: Establishments in Nitrogenous Fertilizer Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	210	221	214	222	269	264	272
California	26	26	27	25	26	23	23
Kansas	3	2	2	2	2	2	2
Massachusetts	4	4	5	5	4	5	5
Missouri	7	7	7	7	7	7	9
North Carolina	3	3	3	3	3	4	4
Ohio	9	9	10	10	35	33	30
Texas	19	18	20	20	21	23	24

Source: U.S. Bureau of Labor Statistics

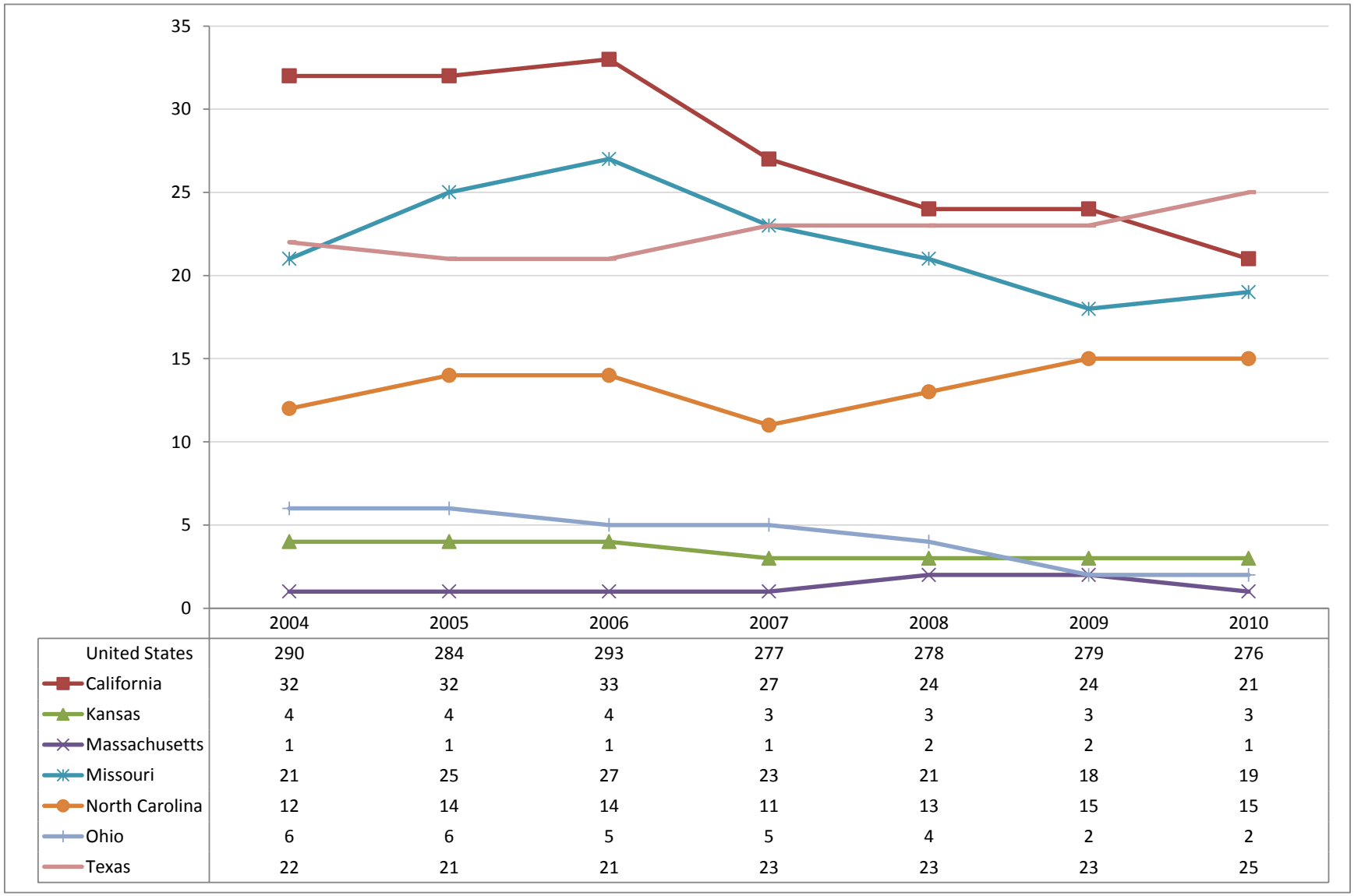
Figure 21: Employment in Nitrogenous Fertilizer Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	8,442	8,020	7,489	7,024	6,965	7,186	7,213
California	1,404	1,269	1,261	418	438	374	299
Kansas							
Massachusetts		52	60	56	57	99	91
Missouri							
North Carolina							
Ohio	1,566	1,478	1,481	1,498	1,386	1,609	1,626
Texas							

*Data not available for Kansas, Missouri, North Carolina, and Texas since 2004, and not available for Massachusetts in 2004
Source: U.S. Bureau of Labor Statistics

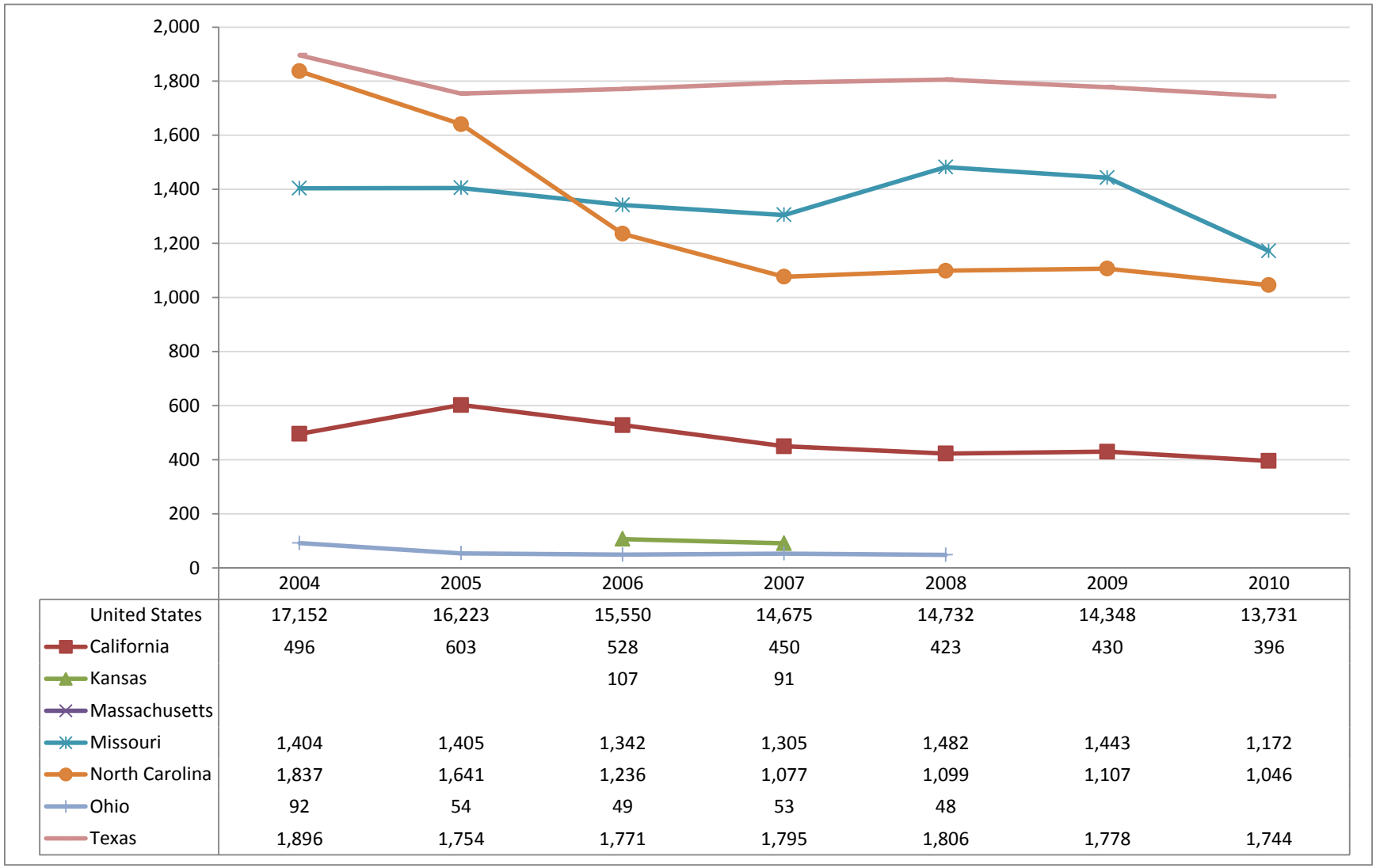
Figure 22: Establishments in Pesticide and Other Agricultural Chemical Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	290	284	293	277	278	279	276
California	32	32	33	27	24	24	21
Kansas	4	4	4	3	3	3	3
Massachusetts	1	1	1	1	2	2	1
Missouri	21	25	27	23	21	18	19
North Carolina	12	14	14	11	13	15	15
Ohio	6	6	5	5	4	2	2
Texas	22	21	21	23	23	23	25

Source: U.S. Bureau of Labor Statistics

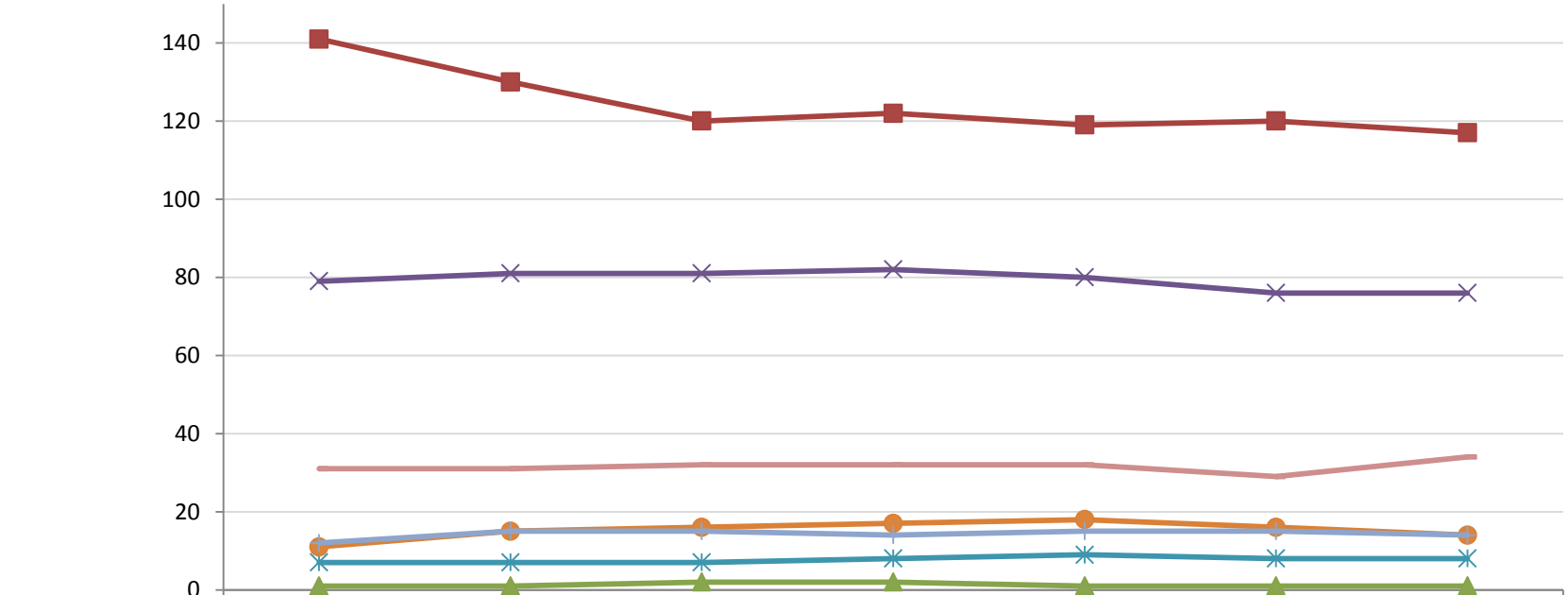
Figure 23: Employment in in Pesticide and Other Agricultural Chemical Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	17,152	16,223	15,550	14,675	14,732	14,348	13,731
California	496	603	528	450	423	430	396
Kansas			107	91			
Massachusetts							
Missouri	1,404	1,405	1,342	1,305	1,482	1,443	1,172
North Carolina	1,837	1,641	1,236	1,077	1,099	1,107	1,046
Ohio	92	54	49	53	48		
Texas	1,896	1,754	1,771	1,795	1,806	1,778	1,744

*Data not available for Kansas in 2004, 2005, 2008, 2009 and 2010, not available for Massachusetts since 2004, and not available for Ohio in 2009 and 2010
Source: U.S. Bureau of Labor Statistics

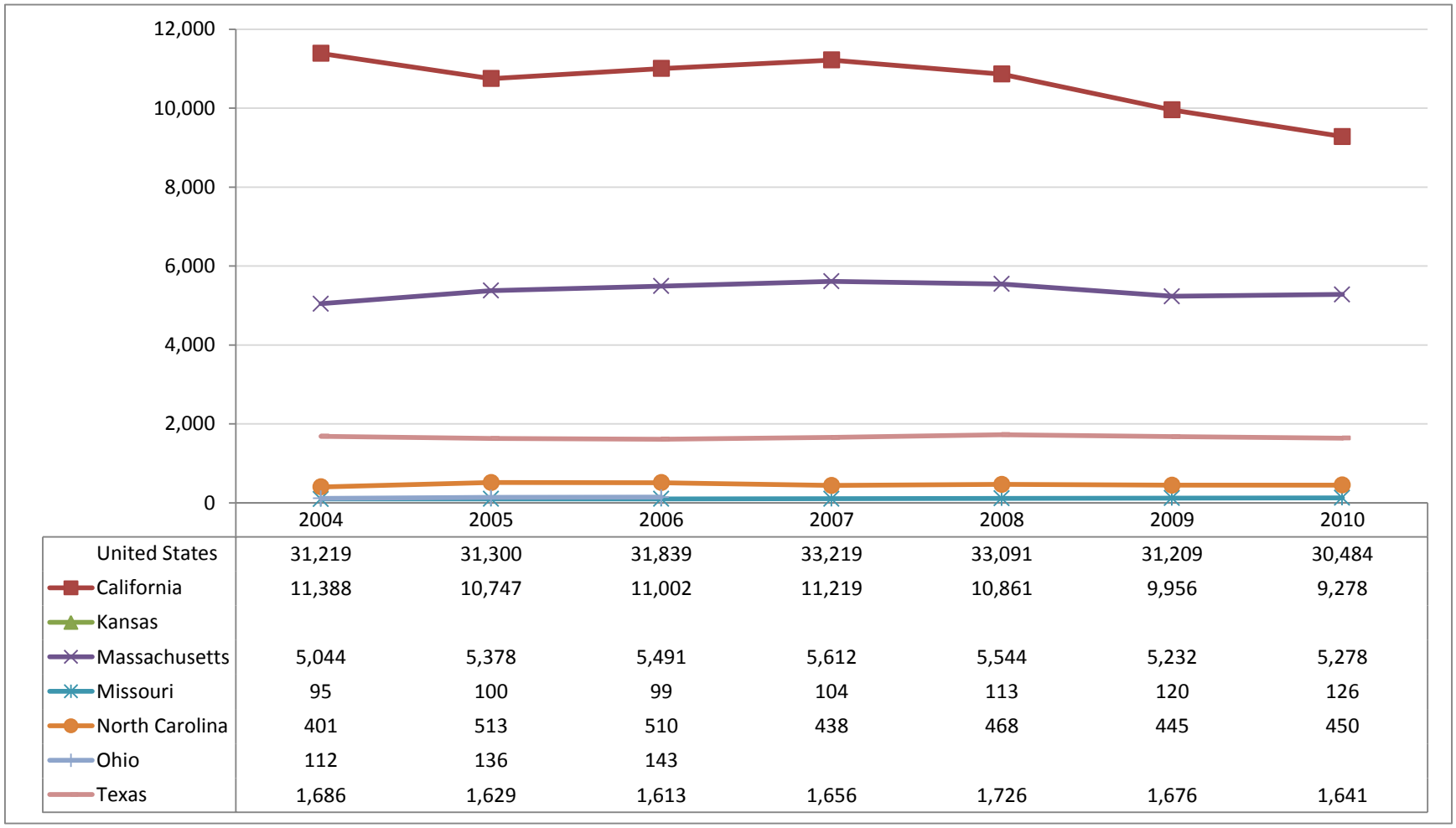
Figure 24: Establishments in Analytical Laboratory Instrument Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	651	648	630	651	682	688	708
California	141	130	120	122	119	120	117
Kansas	1	1	2	2	1	1	1
Massachusetts	79	81	81	82	80	76	76
Missouri	7	7	7	8	9	8	8
North Carolina	11	15	16	17	18	16	14
Ohio	12	15	15	14	15	15	14
Texas	31	31	32	32	32	29	34

Source: U.S. Bureau of Labor Statistics

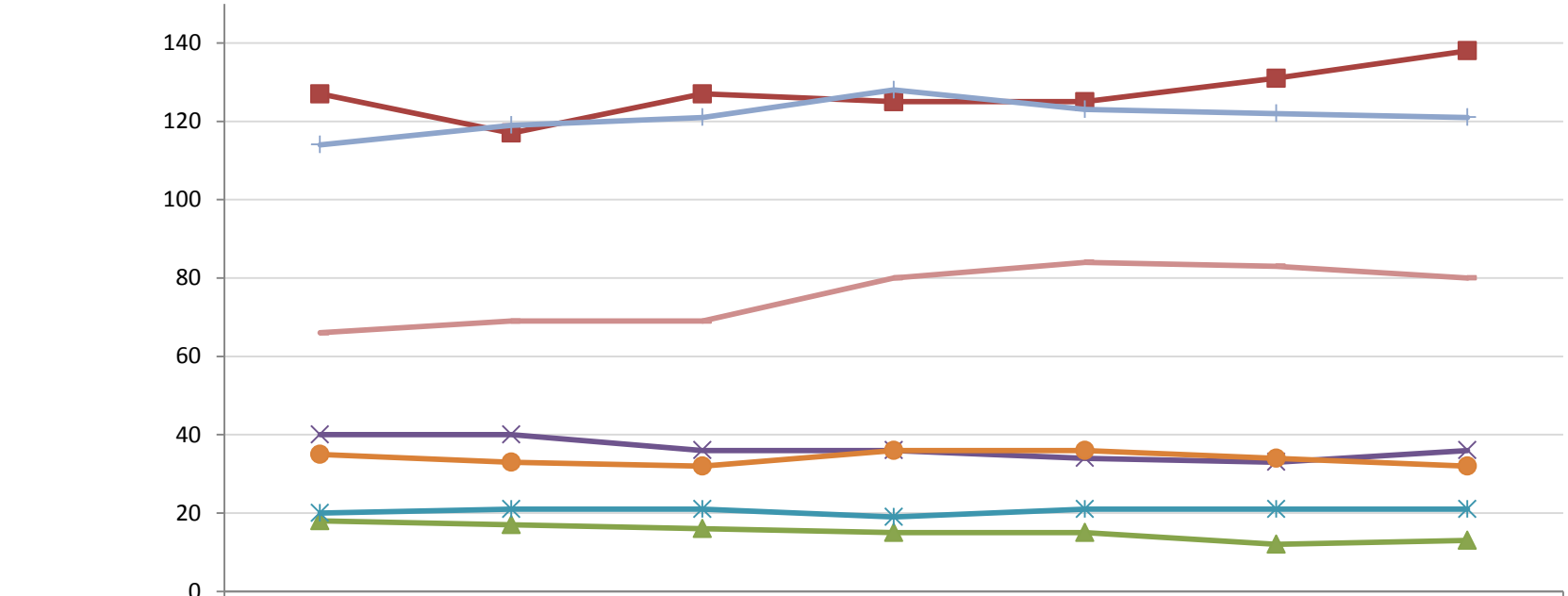
Figure 25: Employment in Analytical Laboratory Instrument Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	31,219	31,300	31,839	33,219	33,091	31,209	30,484
California	11,388	10,747	11,002	11,219	10,861	9,956	9,278
Kansas							
Massachusetts	5,044	5,378	5,491	5,612	5,544	5,232	5,278
Missouri	95	100	99	104	113	120	126
North Carolina	401	513	510	438	468	445	450
Ohio	112	136	143				
Texas	1,686	1,629	1,613	1,656	1,726	1,676	1,641

*Data not available for Kansas since 2004, not available for Ohio from 2007 to 2010
Source: U.S. Bureau of Labor Statistics

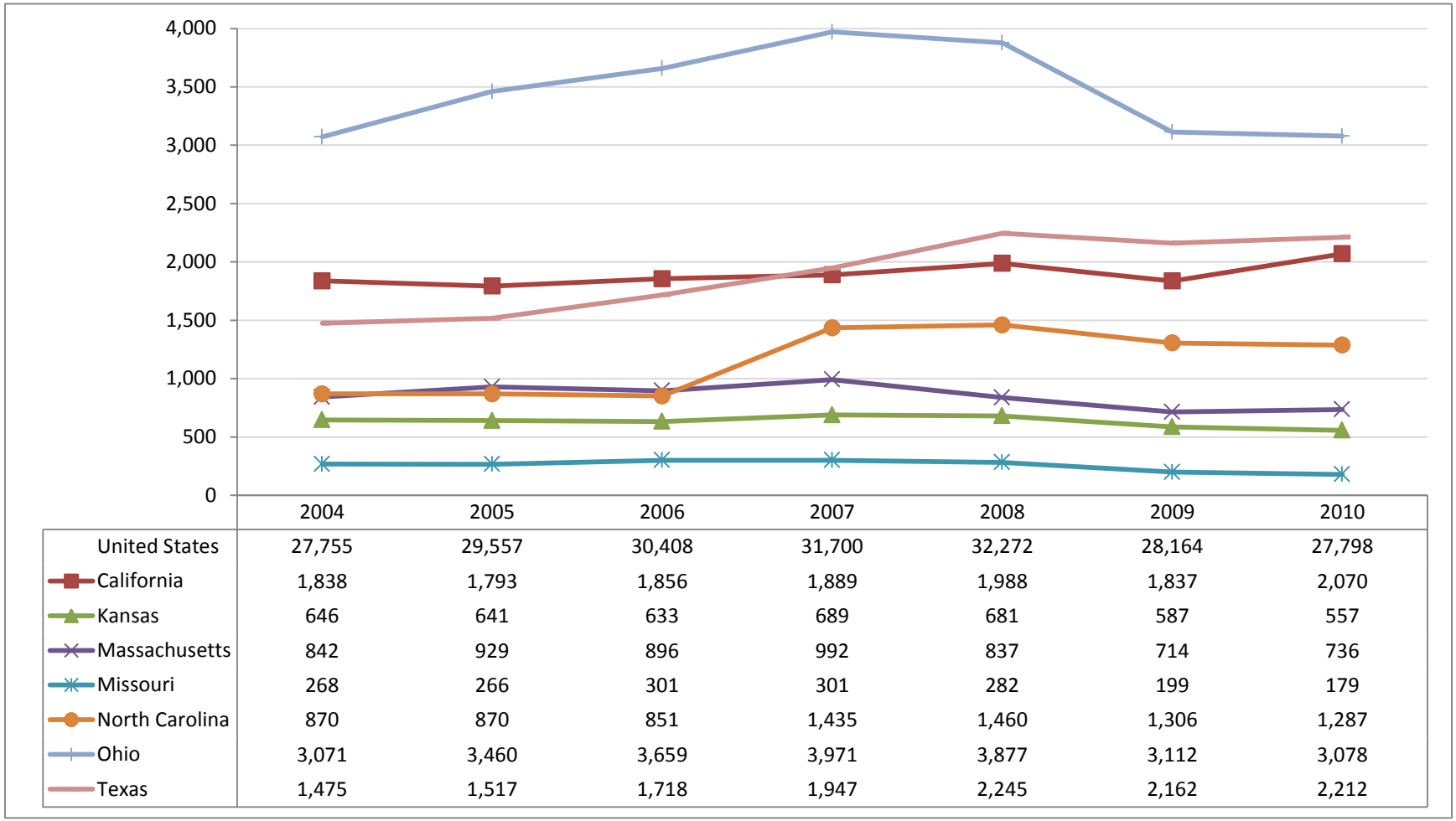
Figure 26: Establishments in All Other Industrial Machinery Manufacturing (Lab Distilling Equipment)



	2004	2005	2006	2007	2008	2009	2010
United States	1,223	1,210	1,218	1,260	1,264	1,252	1,259
California	127	117	127	125	125	131	138
Kansas	18	17	16	15	15	12	13
Massachusetts	40	40	36	36	34	33	36
Missouri	20	21	21	19	21	21	21
North Carolina	35	33	32	36	36	34	32
Ohio	114	119	121	128	123	122	121
Texas	66	69	69	80	84	83	80

Source: U.S. Bureau of Labor Statistics

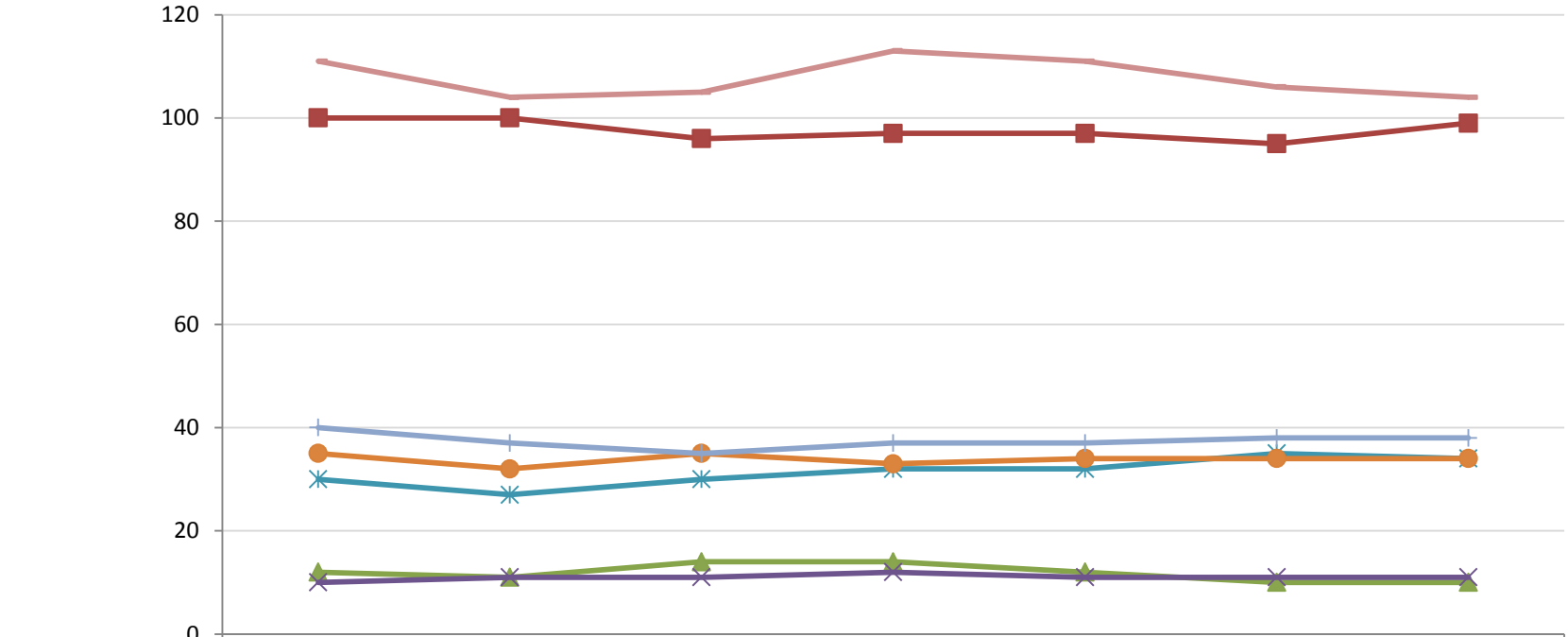
Figure 27: Employment in All Other Industrial Machinery Manufacturing (Lab Distilling Equipment)



	2004	2005	2006	2007	2008	2009	2010
United States	27,755	29,557	30,408	31,700	32,272	28,164	27,798
California	1,838	1,793	1,856	1,889	1,988	1,837	2,070
Kansas	646	641	633	689	681	587	557
Massachusetts	842	929	896	992	837	714	736
Missouri	268	266	301	301	282	199	179
North Carolina	870	870	851	1,435	1,460	1,306	1,287
Ohio	3,071	3,460	3,659	3,971	3,877	3,112	3,078
Texas	1,475	1,517	1,718	1,947	2,245	2,162	2,212

Source: U.S. Bureau of Labor Statistics

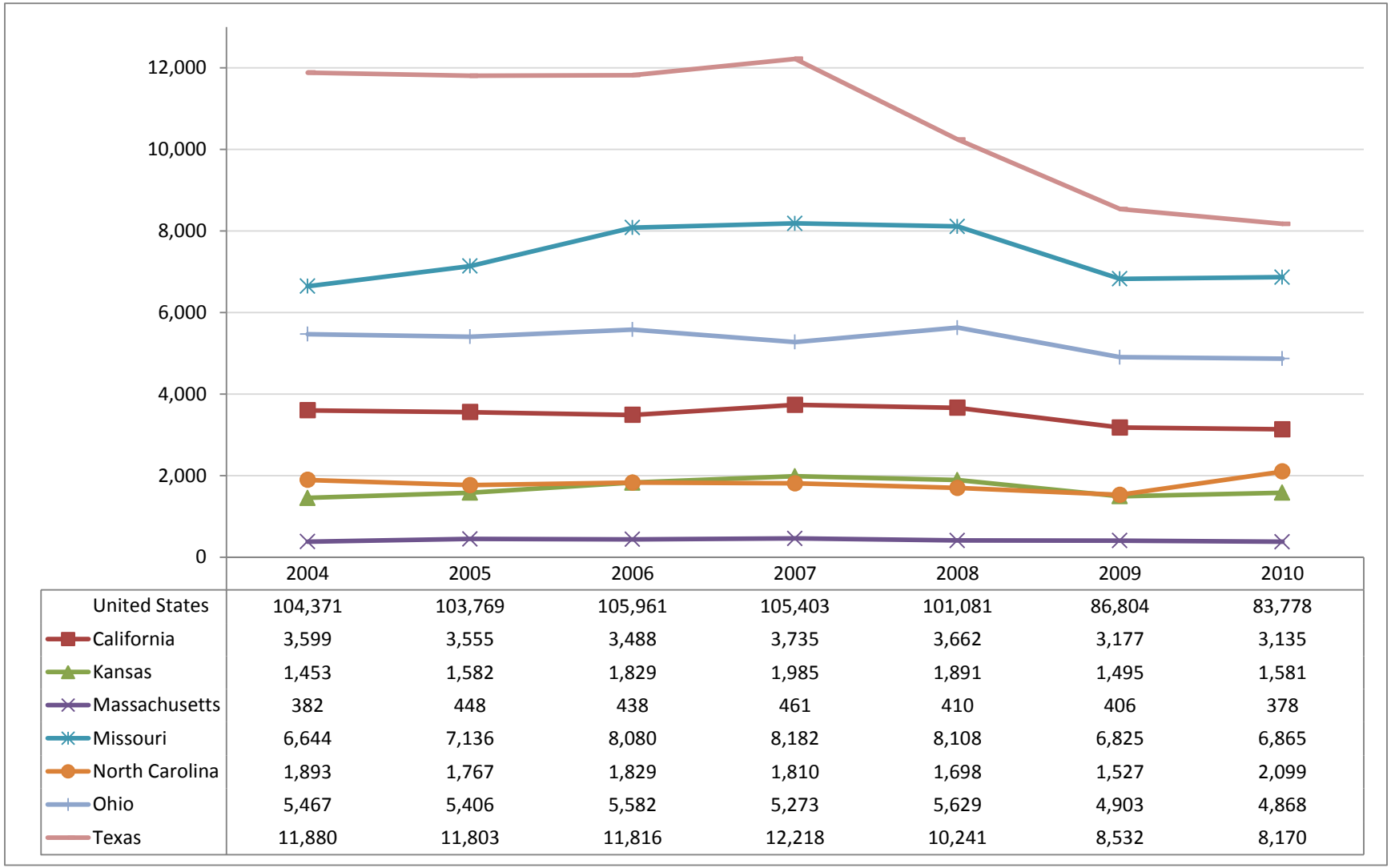
Figure 28: Establishments in Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing (Lab Freezers)



	2004	2005	2006	2007	2008	2009	2010
United States	1,069	1,052	1,042	1,045	1,056	1,065	1,054
California	100	100	96	97	97	95	99
Kansas	12	11	14	14	12	10	10
Massachusetts	10	11	11	12	11	11	11
Missouri	30	27	30	32	32	35	34
North Carolina	35	32	35	33	34	34	34
Ohio	40	37	35	37	37	38	38
Texas	111	104	105	113	111	106	104

Source: U.S. Bureau of Labor Statistics

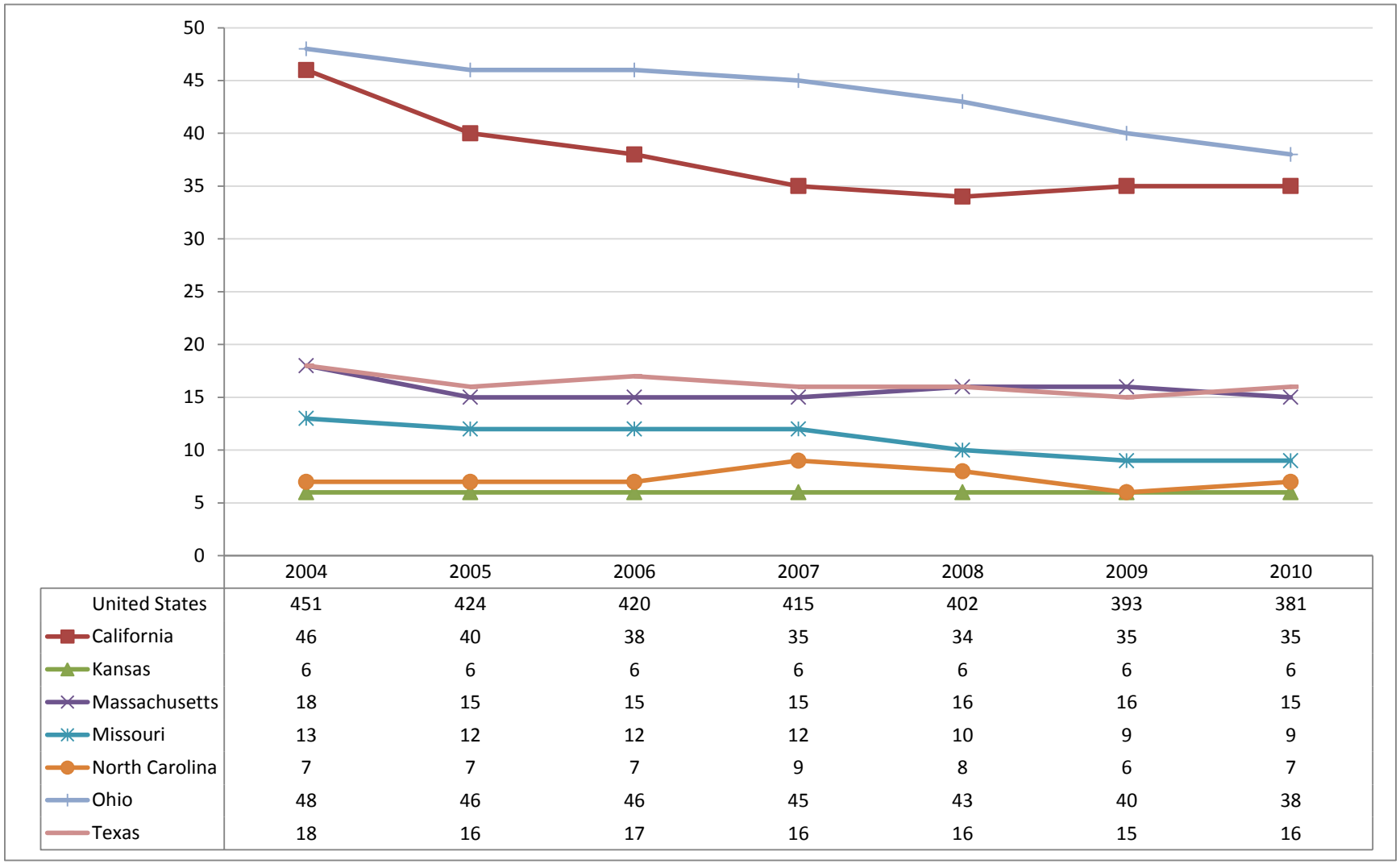
Figure 29: Employment in Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing (Lab Freezers)



	2004	2005	2006	2007	2008	2009	2010
United States	104,371	103,769	105,961	105,403	101,081	86,804	83,778
California	3,599	3,555	3,488	3,735	3,662	3,177	3,135
Kansas	1,453	1,582	1,829	1,985	1,891	1,495	1,581
Massachusetts	382	448	438	461	410	406	378
Missouri	6,644	7,136	8,080	8,182	8,108	6,825	6,865
North Carolina	1,893	1,767	1,829	1,810	1,698	1,527	2,099
Ohio	5,467	5,406	5,582	5,273	5,629	4,903	4,868
Texas	11,880	11,803	11,816	12,218	10,241	8,532	8,170

Source: U.S. Bureau of Labor Statistics

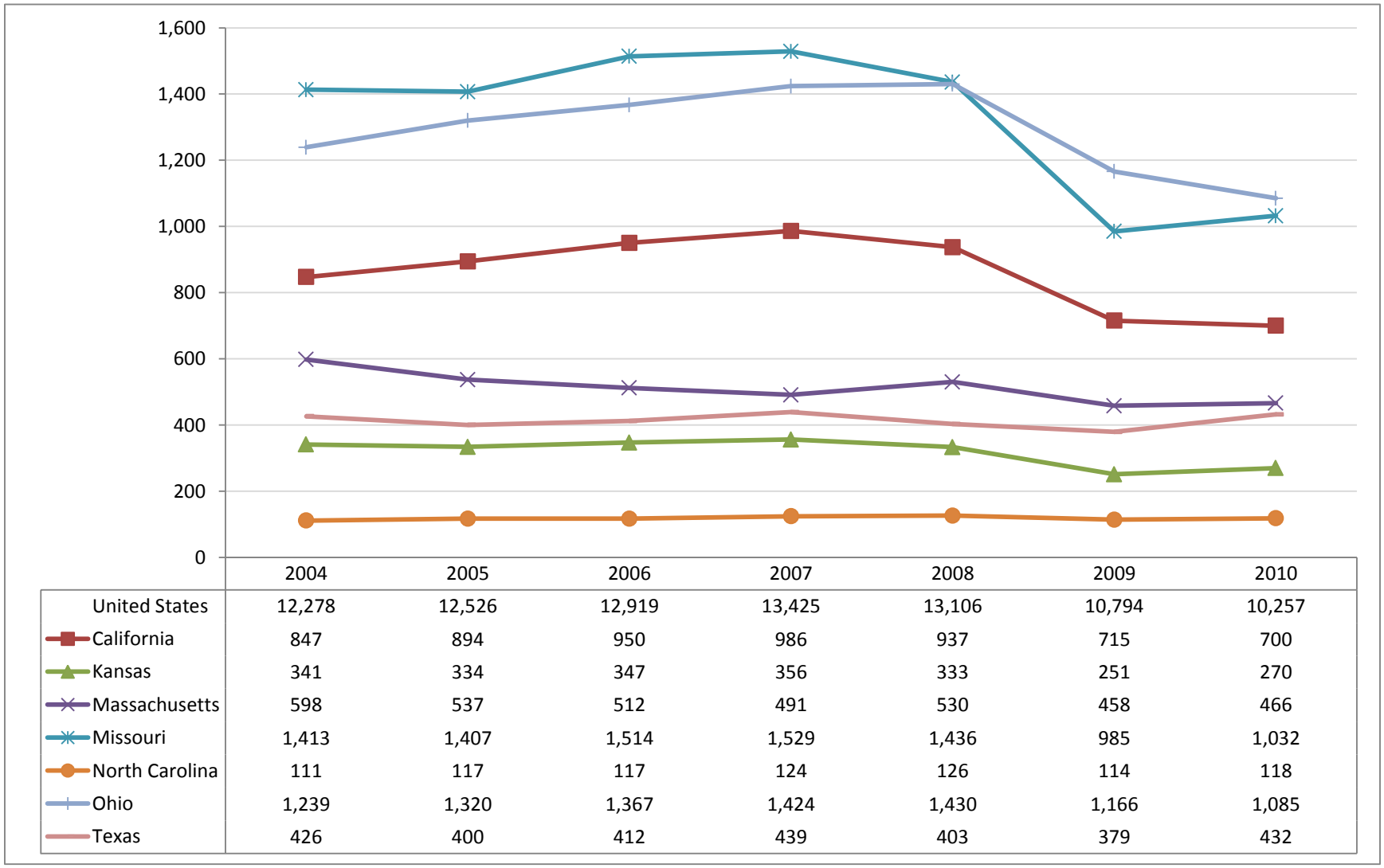
Figure 30: Establishments in Industrial Process Furnace and Oven Manufacturing (Lab Furnaces and Ovens)



	2004	2005	2006	2007	2008	2009	2010
United States	451	424	420	415	402	393	381
California	46	40	38	35	34	35	35
Kansas	6	6	6	6	6	6	6
Massachusetts	18	15	15	15	16	16	15
Missouri	13	12	12	12	10	9	9
North Carolina	7	7	7	9	8	6	7
Ohio	48	46	46	45	43	40	38
Texas	18	16	17	16	16	15	16

Source: U.S. Bureau of Labor Statistics

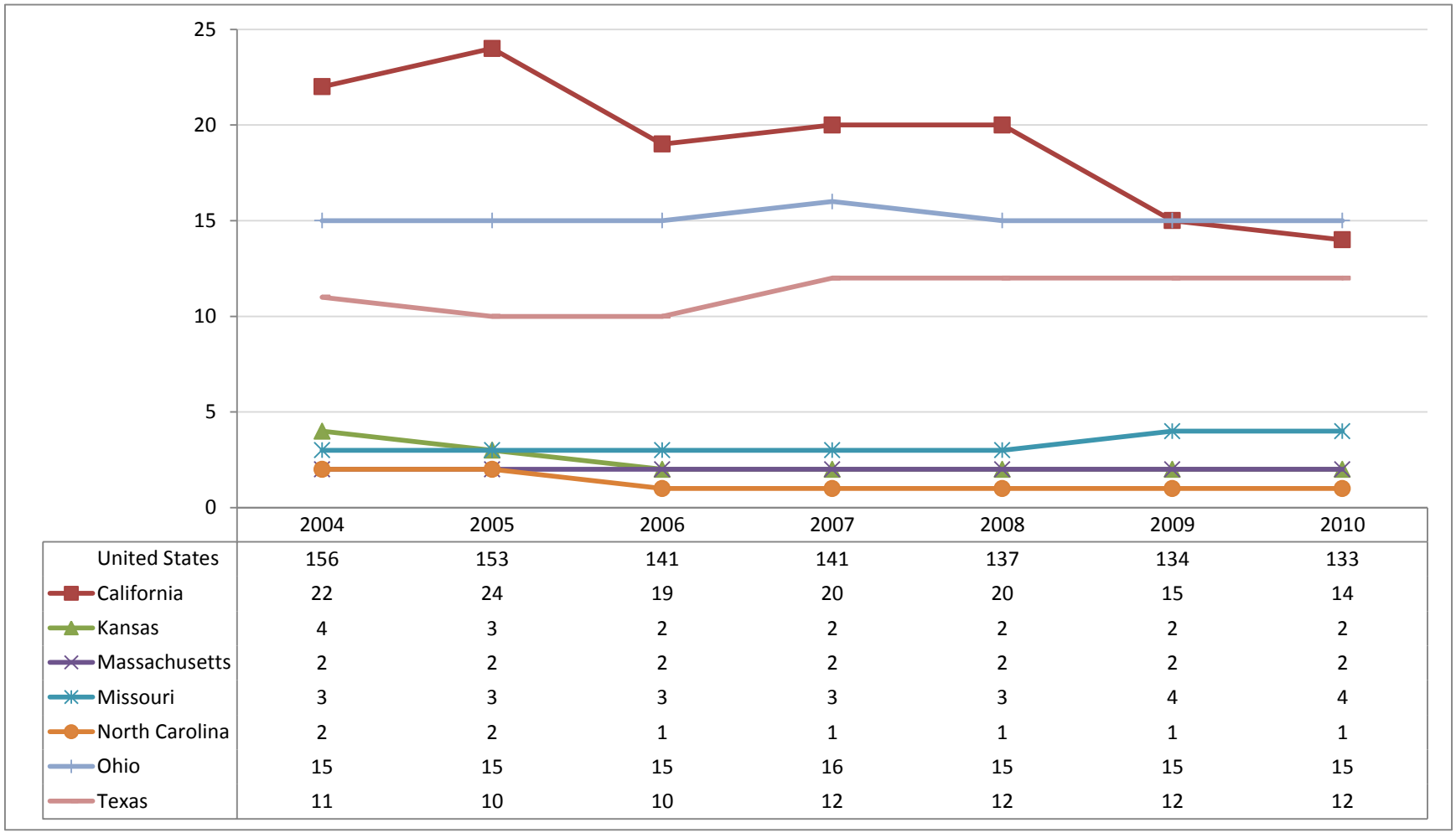
Figure 31: Employment in Industrial Process Furnace and Oven Manufacturing (Lab Furnaces and Ovens)



	2004	2005	2006	2007	2008	2009	2010
United States	12,278	12,526	12,919	13,425	13,106	10,794	10,257
California	847	894	950	986	937	715	700
Kansas	341	334	347	356	333	251	270
Massachusetts	598	537	512	491	530	458	466
Missouri	1,413	1,407	1,514	1,529	1,436	985	1,032
North Carolina	111	117	117	124	126	114	118
Ohio	1,239	1,320	1,367	1,424	1,430	1,166	1,085
Texas	426	400	412	439	403	379	432

Source: U.S. Bureau of Labor Statistics

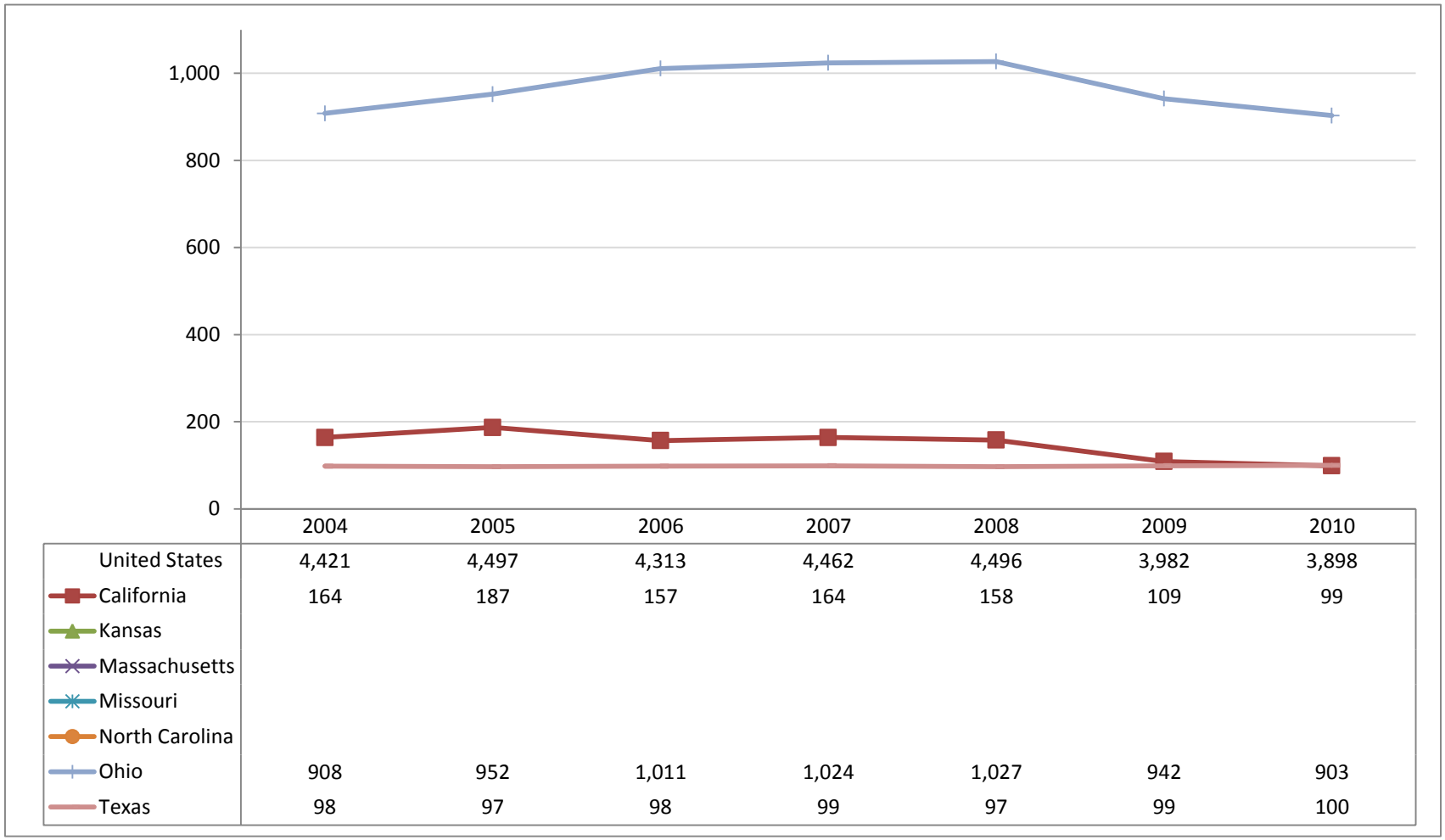
Figure 32: Establishments in Scales and Balance Manufacturing (Lab Scales and Balances)



	2004	2005	2006	2007	2008	2009	2010
United States	156	153	141	141	137	134	133
California	22	24	19	20	20	15	14
Kansas	4	3	2	2	2	2	2
Massachusetts	2	2	2	2	2	2	2
Missouri	3	3	3	3	3	4	4
North Carolina	2	2	1	1	1	1	1
Ohio	15	15	15	16	15	15	15
Texas	11	10	10	12	12	12	12

Source: U.S. Bureau of Labor Statistics

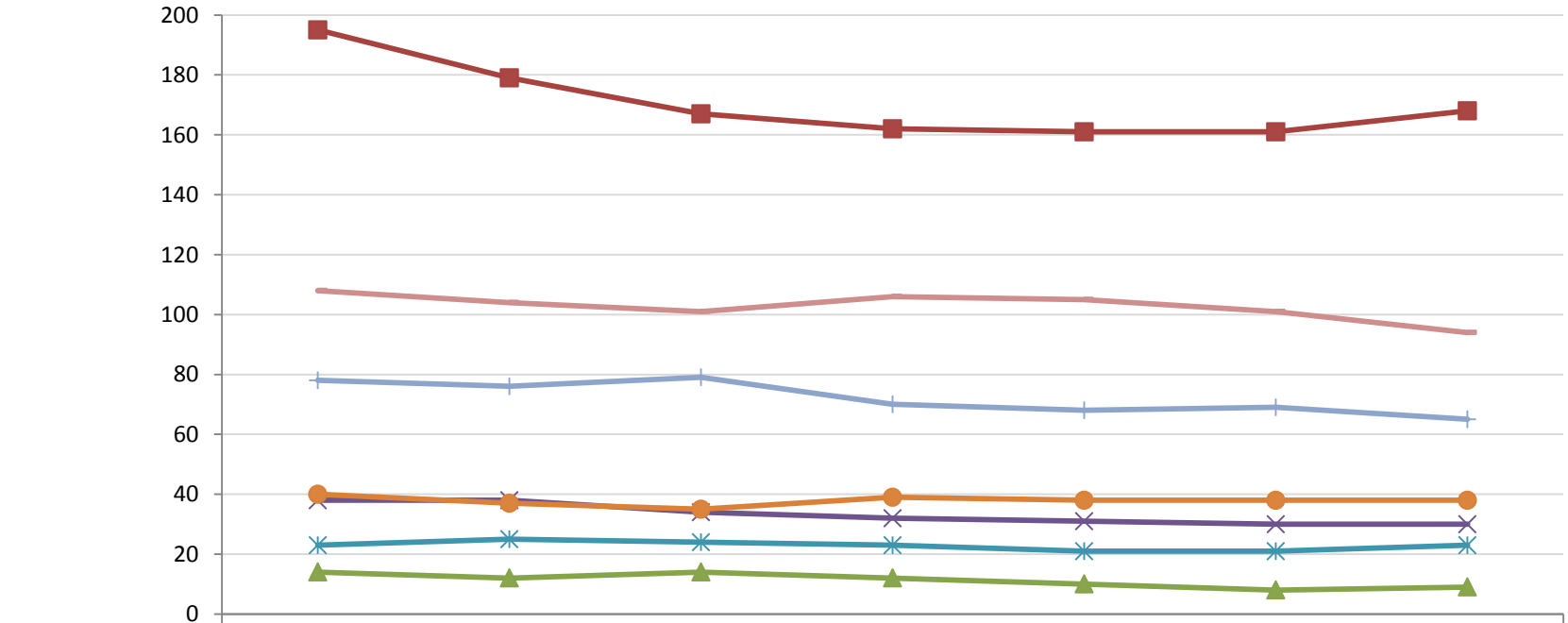
Figure 33: Employment in Scales and Balance Manufacturing (Lab Scales and Balances)



	2004	2005	2006	2007	2008	2009	2010
United States	4,421	4,497	4,313	4,462	4,496	3,982	3,898
California	164	187	157	164	158	109	99
Kansas							
Massachusetts							
Missouri							
North Carolina							
Ohio	908	952	1,011	1,024	1,027	942	903
Texas	98	97	98	99	97	99	100

*Data not available for Kansas, Massachusetts, Missouri, and North Carolina from 2004 to 2010
Source: U.S. Bureau of Labor Statistics

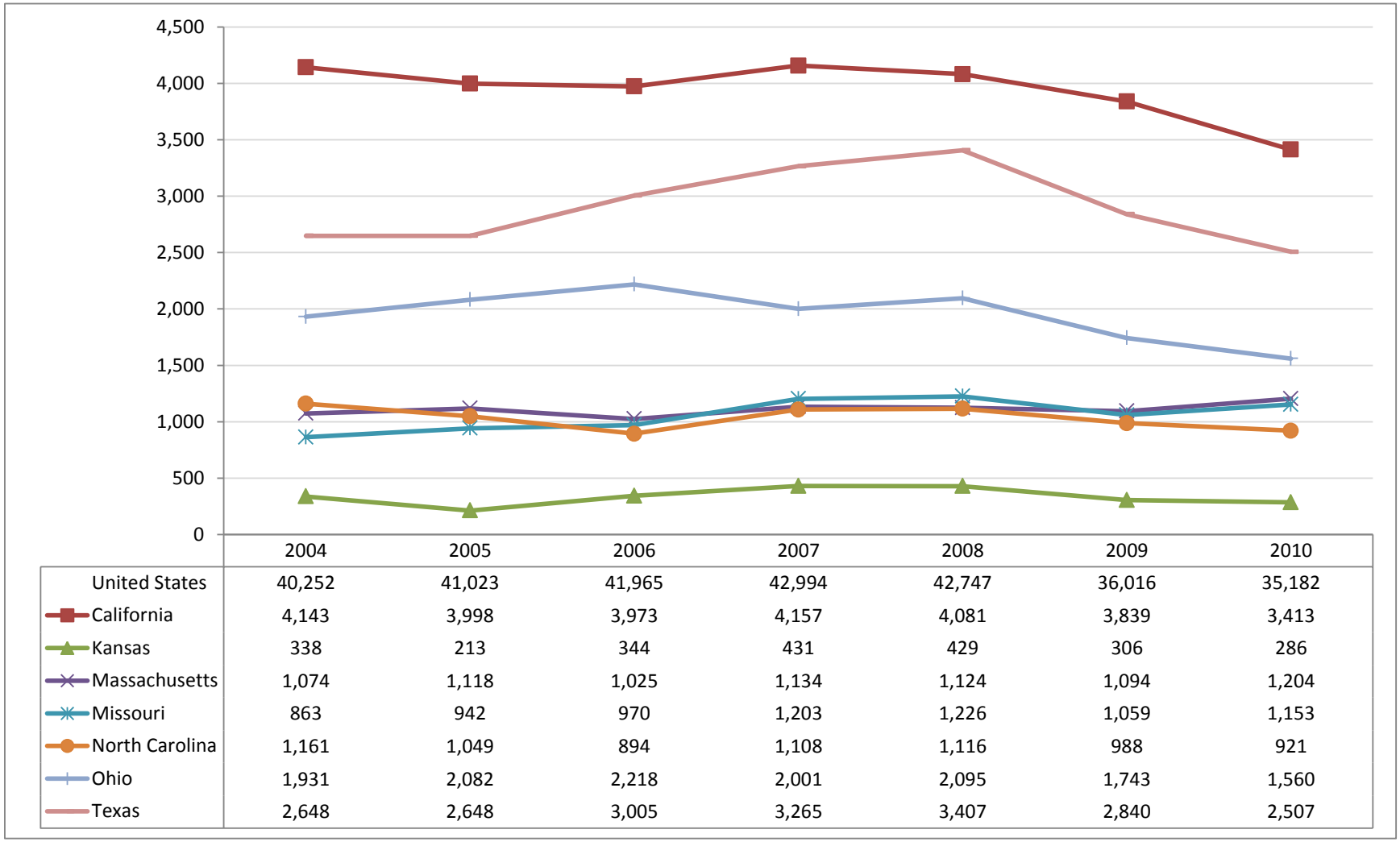
Figure 34: Establishments in All Other Miscellaneous General Purpose Machinery Manufacturing (Lab Centrifuges)



	2004	2005	2006	2007	2008	2009	2010
United States	1,559	1,487	1,465	1,435	1,414	1,367	1,345
California	195	179	167	162	161	161	168
Kansas	14	12	14	12	10	8	9
Massachusetts	38	38	34	32	31	30	30
Missouri	23	25	24	23	21	21	23
North Carolina	40	37	35	39	38	38	38
Ohio	78	76	79	70	68	69	65
Texas	108	104	101	106	105	101	94

Source: U.S. Bureau of Labor Statistics

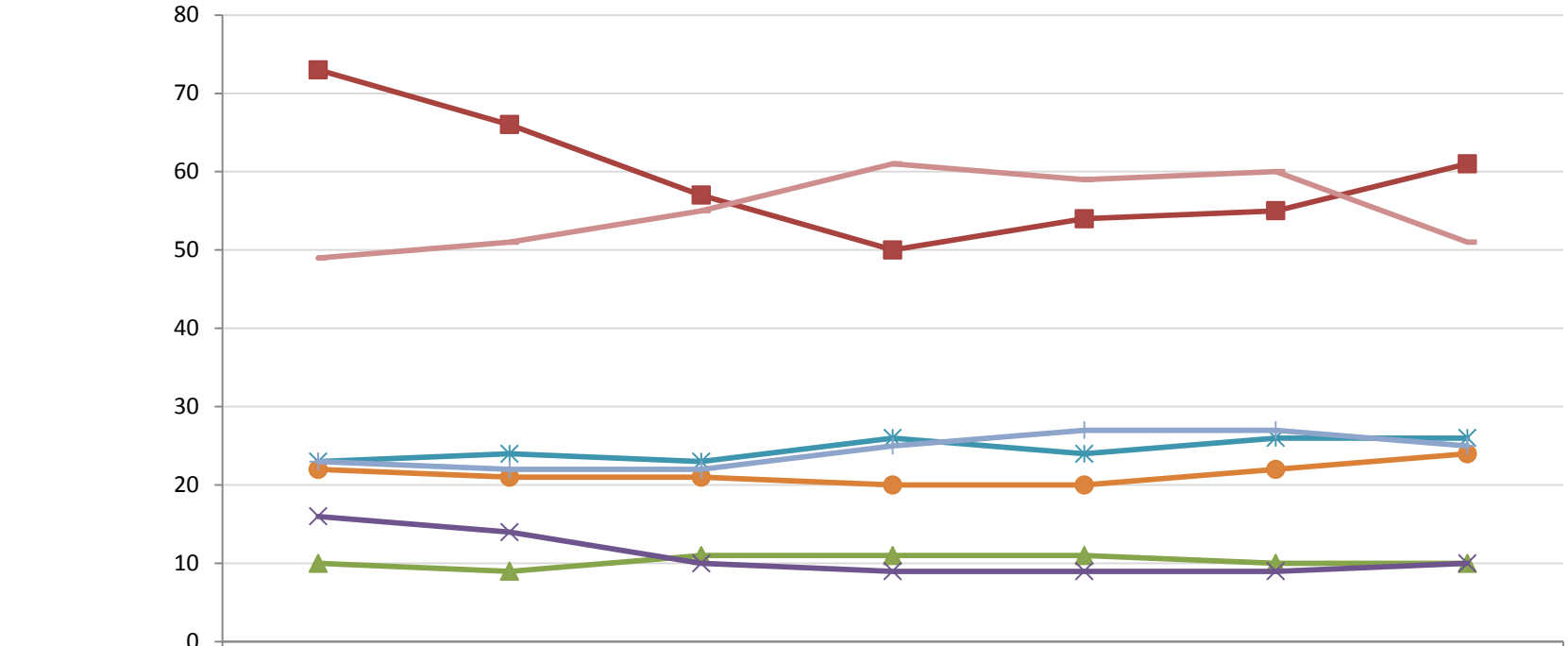
Figure 35: Employment in All Other Miscellaneous General Purpose Machinery Manufacturing (Lab Centrifuges)



	2004	2005	2006	2007	2008	2009	2010
United States	40,252	41,023	41,965	42,994	42,747	36,016	35,182
California	4,143	3,998	3,973	4,157	4,081	3,839	3,413
Kansas	338	213	344	431	429	306	286
Massachusetts	1,074	1,118	1,025	1,134	1,124	1,094	1,204
Missouri	863	942	970	1,203	1,226	1,059	1,153
North Carolina	1,161	1,049	894	1,108	1,116	988	921
Ohio	1,931	2,082	2,218	2,001	2,095	1,743	1,560
Texas	2,648	2,648	3,005	3,265	3,407	2,840	2,507

Source: U.S. Bureau of Labor Statistics

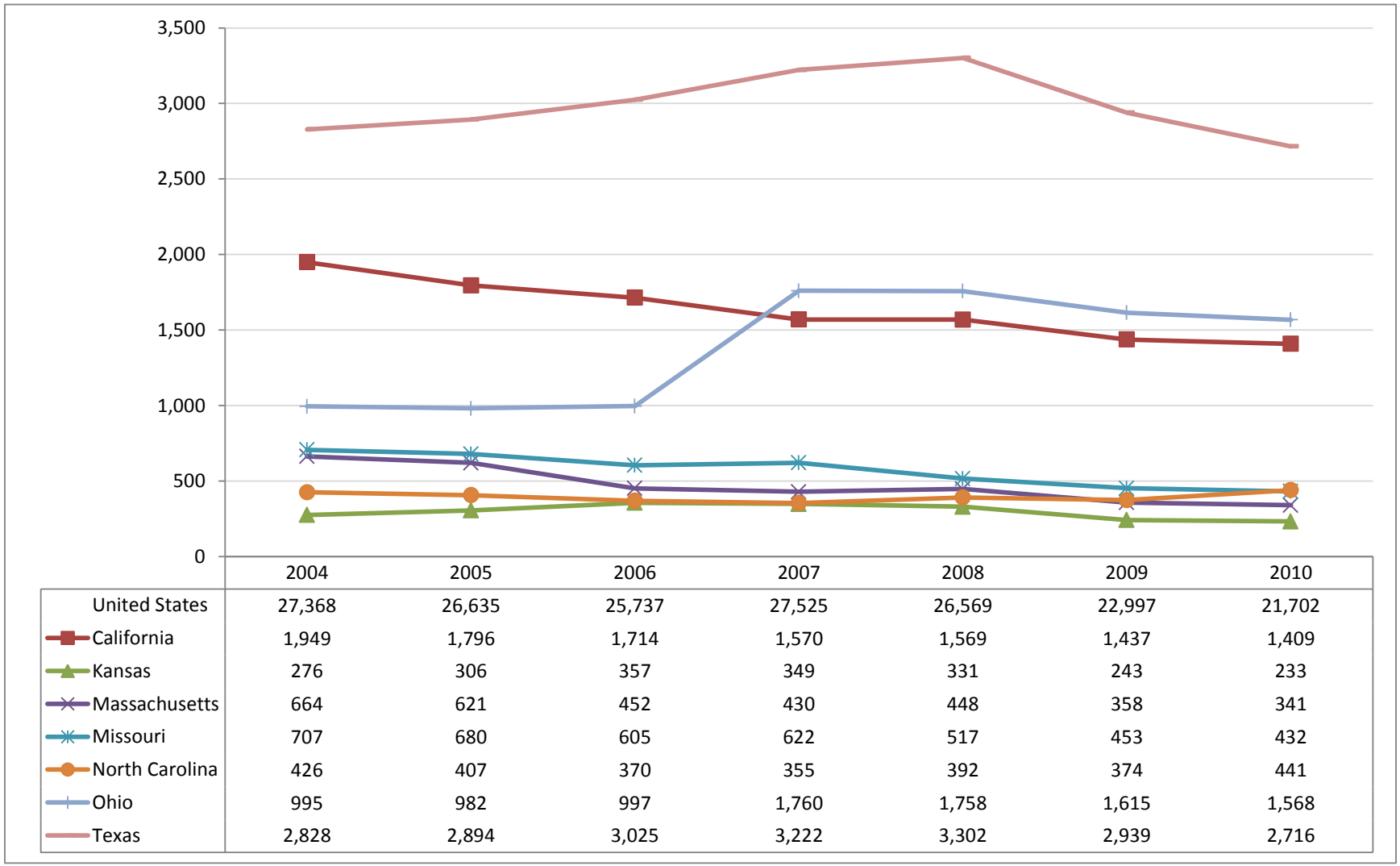
Figure 36: Establishments in Institutional Furniture Manufacturing (Lab Furniture)



	2004	2005	2006	2007	2008	2009	2010
United States	683	663	640	675	671	662	640
California	73	66	57	50	54	55	61
Kansas	10	9	11	11	11	10	10
Massachusetts	16	14	10	9	9	9	10
Missouri	23	24	23	26	24	26	26
North Carolina	22	21	21	20	20	22	24
Ohio	23	22	22	25	27	27	25
Texas	49	51	55	61	59	60	51

Source: U.S. Bureau of Labor Statistics

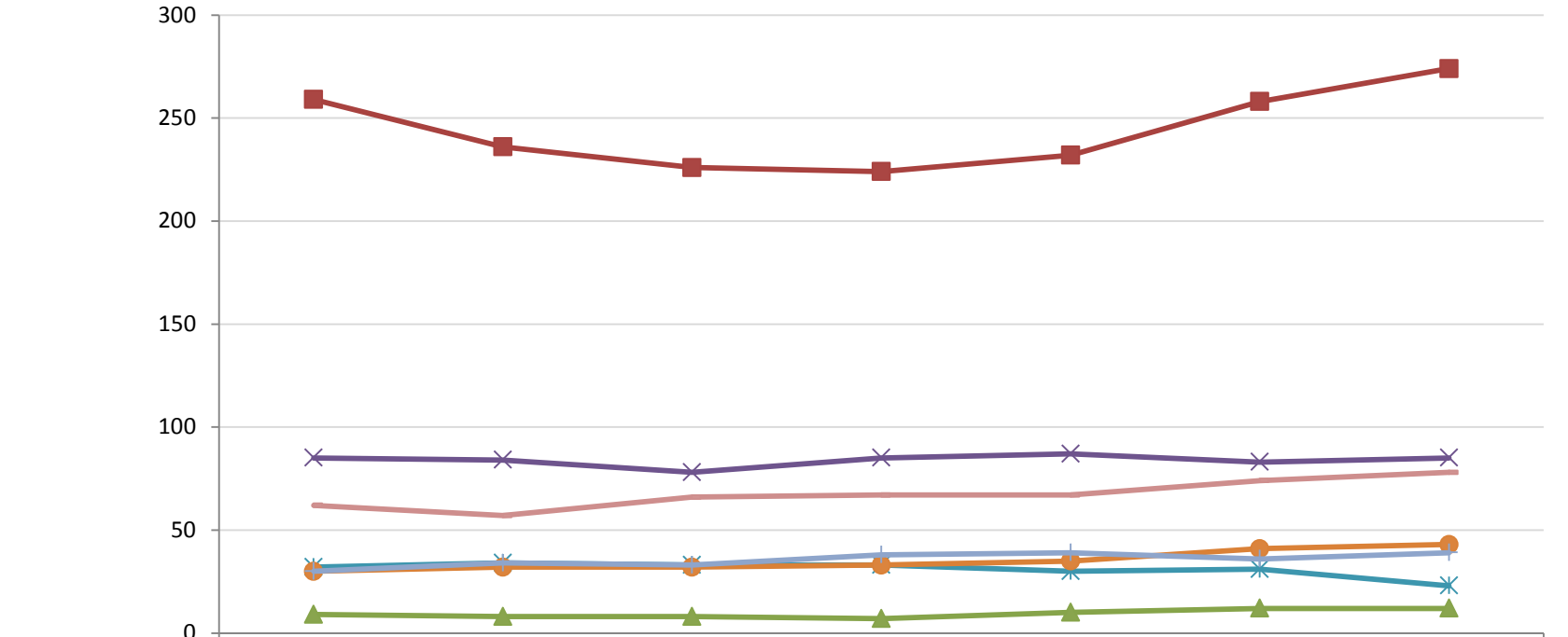
Figure 37: Employment in Institutional Furniture Manufacturing (Lab Furniture)



	2004	2005	2006	2007	2008	2009	2010
United States	27,368	26,635	25,737	27,525	26,569	22,997	21,702
California	1,949	1,796	1,714	1,570	1,569	1,437	1,409
Kansas	276	306	357	349	331	243	233
Massachusetts	664	621	452	430	448	358	341
Missouri	707	680	605	622	517	453	432
North Carolina	426	407	370	355	392	374	441
Ohio	995	982	997	1,760	1,758	1,615	1,568
Texas	2,828	2,894	3,025	3,222	3,302	2,939	2,716

Source: U.S. Bureau of Labor Statistics

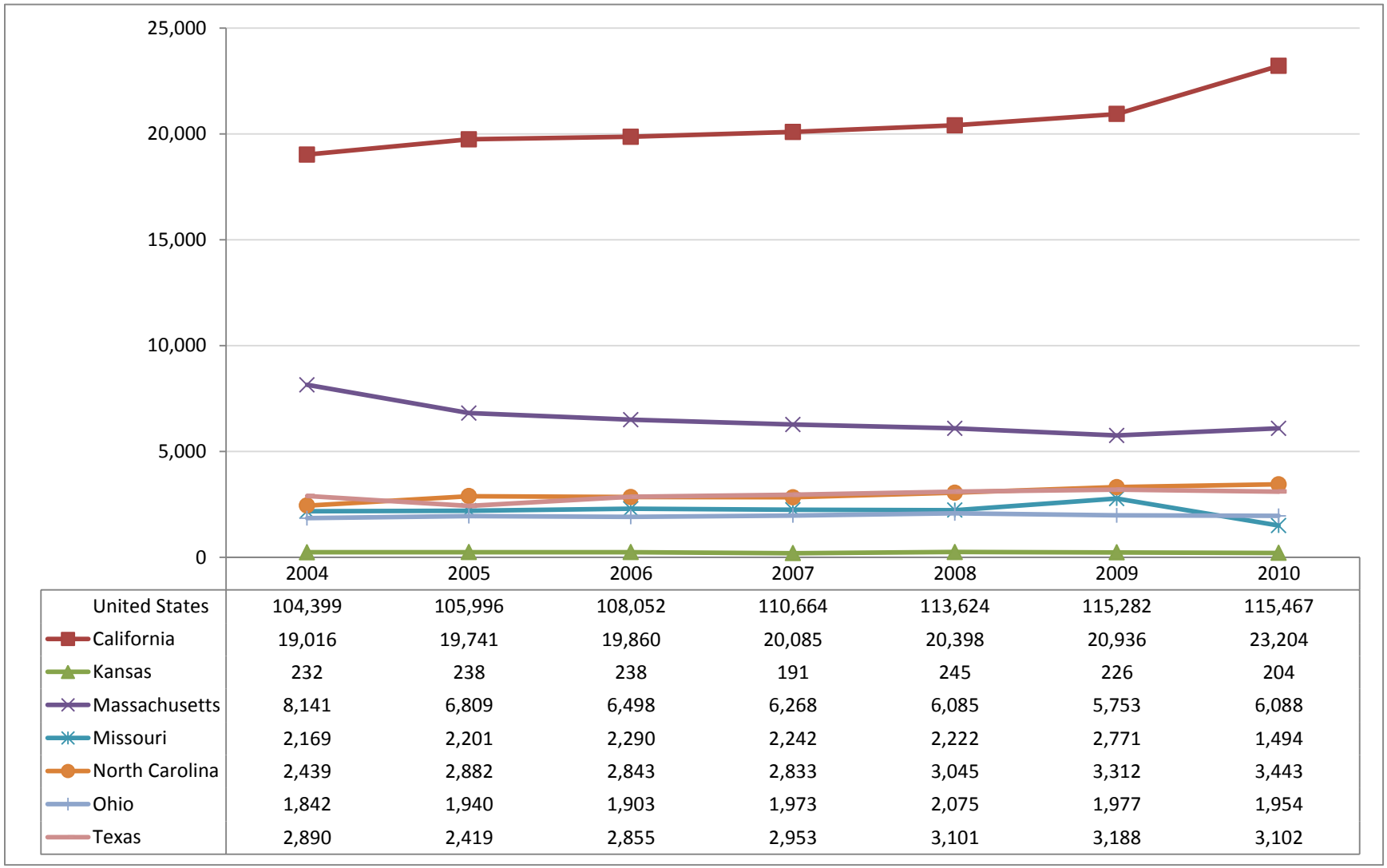
Figure 38: Establishments in Surgical and Medical Instrument Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	1,281	1,277	1,285	1,373	1,468	1,569	1,648
California	259	236	226	224	232	258	274
Kansas	9	8	8	7	10	12	12
Massachusetts	85	84	78	85	87	83	85
Missouri	32	34	33	33	30	31	23
North Carolina	30	32	32	33	35	41	43
Ohio	30	34	33	38	39	36	39
Texas	62	57	66	67	67	74	78

Source: U.S. Bureau of Labor Statistics

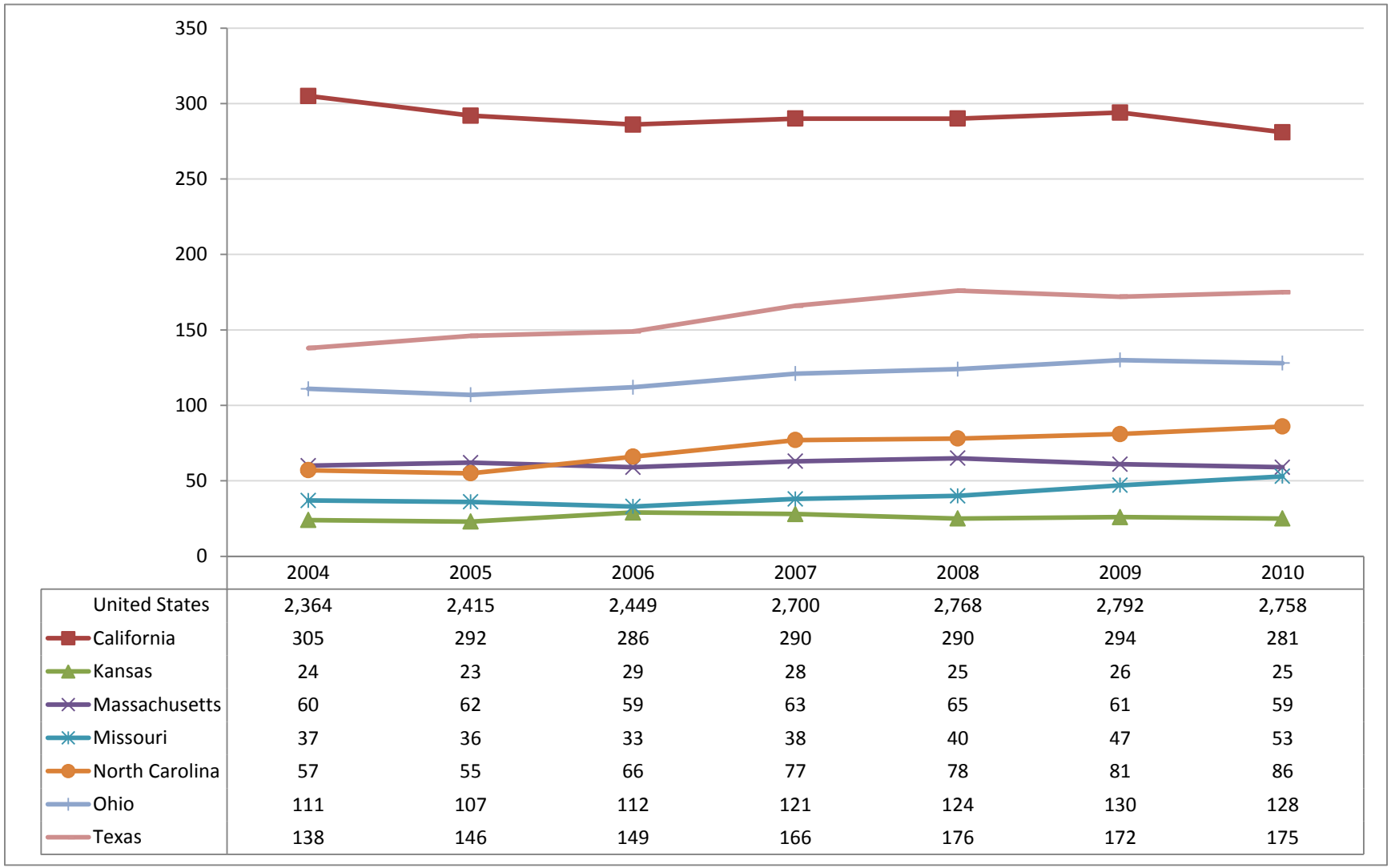
Figure 39: Employment in Surgical and Medical Instrument Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	104,399	105,996	108,052	110,664	113,624	115,282	115,467
California	19,016	19,741	19,860	20,085	20,398	20,936	23,204
Kansas	232	238	238	191	245	226	204
Massachusetts	8,141	6,809	6,498	6,268	6,085	5,753	6,088
Missouri	2,169	2,201	2,290	2,242	2,222	2,771	1,494
North Carolina	2,439	2,882	2,843	2,833	3,045	3,312	3,443
Ohio	1,842	1,940	1,903	1,973	2,075	1,977	1,954
Texas	2,890	2,419	2,855	2,953	3,101	3,188	3,102

Source: U.S. Bureau of Labor Statistics

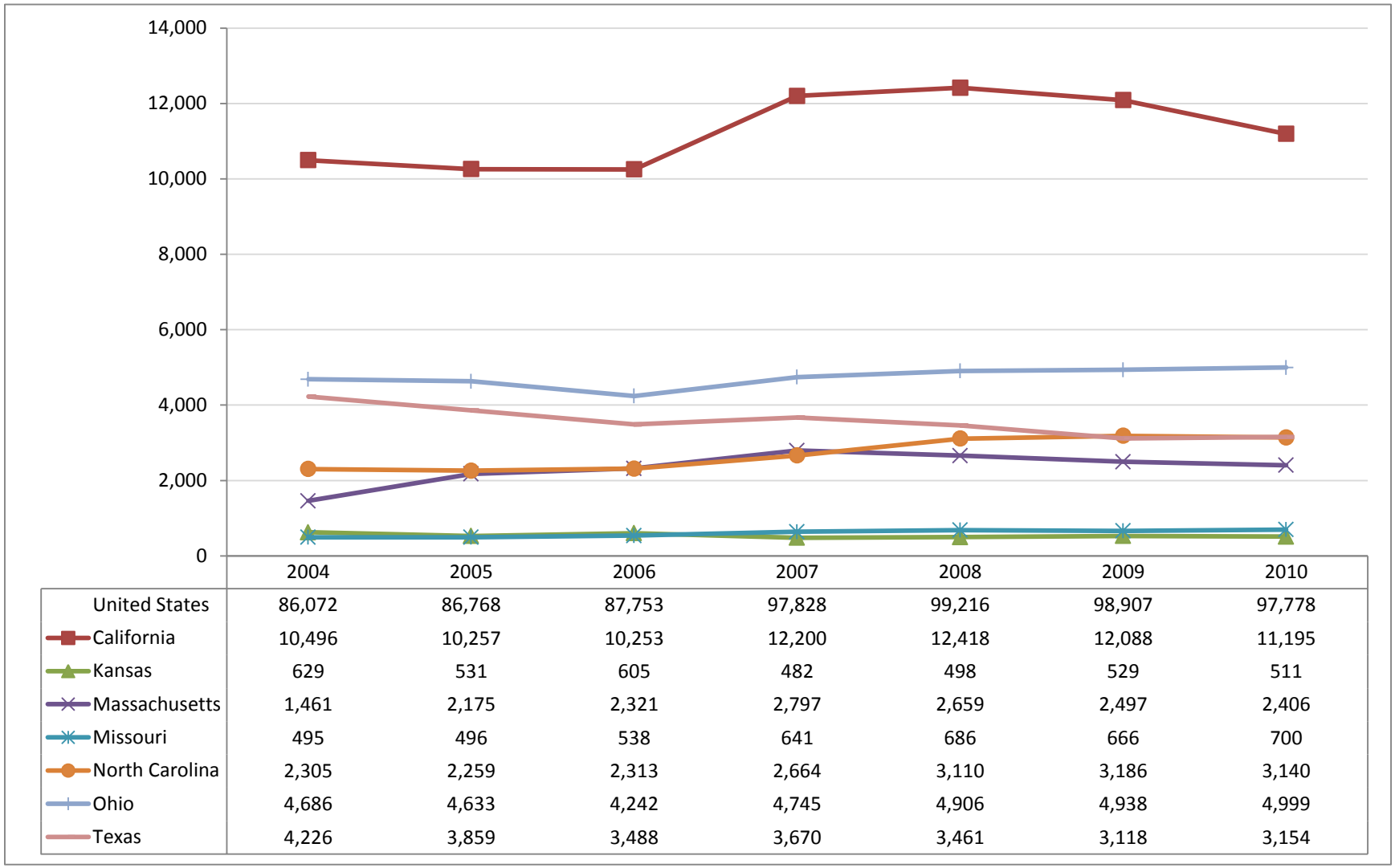
Figure 40: Establishments in Surgical Appliance and Supplies Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	2,364	2,415	2,449	2,700	2,768	2,792	2,758
California	305	292	286	290	290	294	281
Kansas	24	23	29	28	25	26	25
Massachusetts	60	62	59	63	65	61	59
Missouri	37	36	33	38	40	47	53
North Carolina	57	55	66	77	78	81	86
Ohio	111	107	112	121	124	130	128
Texas	138	146	149	166	176	172	175

Source: U.S. Bureau of Labor Statistics

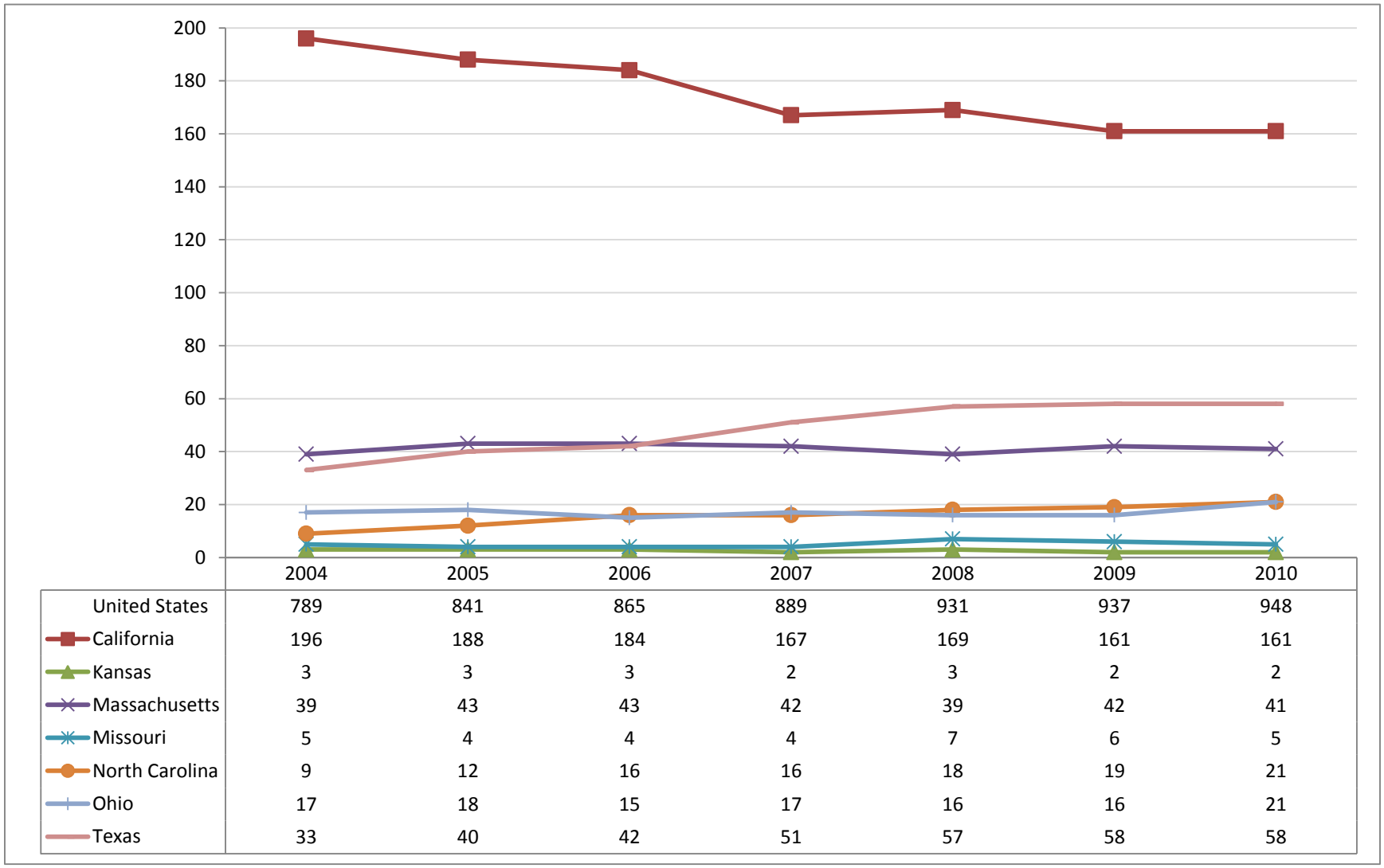
Figure 41: Employment in Surgical Appliance and Supplies Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	86,072	86,768	87,753	97,828	99,216	98,907	97,778
California	10,496	10,257	10,253	12,200	12,418	12,088	11,195
Kansas	629	531	605	482	498	529	511
Massachusetts	1,461	2,175	2,321	2,797	2,659	2,497	2,406
Missouri	495	496	538	641	686	666	700
North Carolina	2,305	2,259	2,313	2,664	3,110	3,186	3,140
Ohio	4,686	4,633	4,242	4,745	4,906	4,938	4,999
Texas	4,226	3,859	3,488	3,670	3,461	3,118	3,154

Source: U.S. Bureau of Labor Statistics

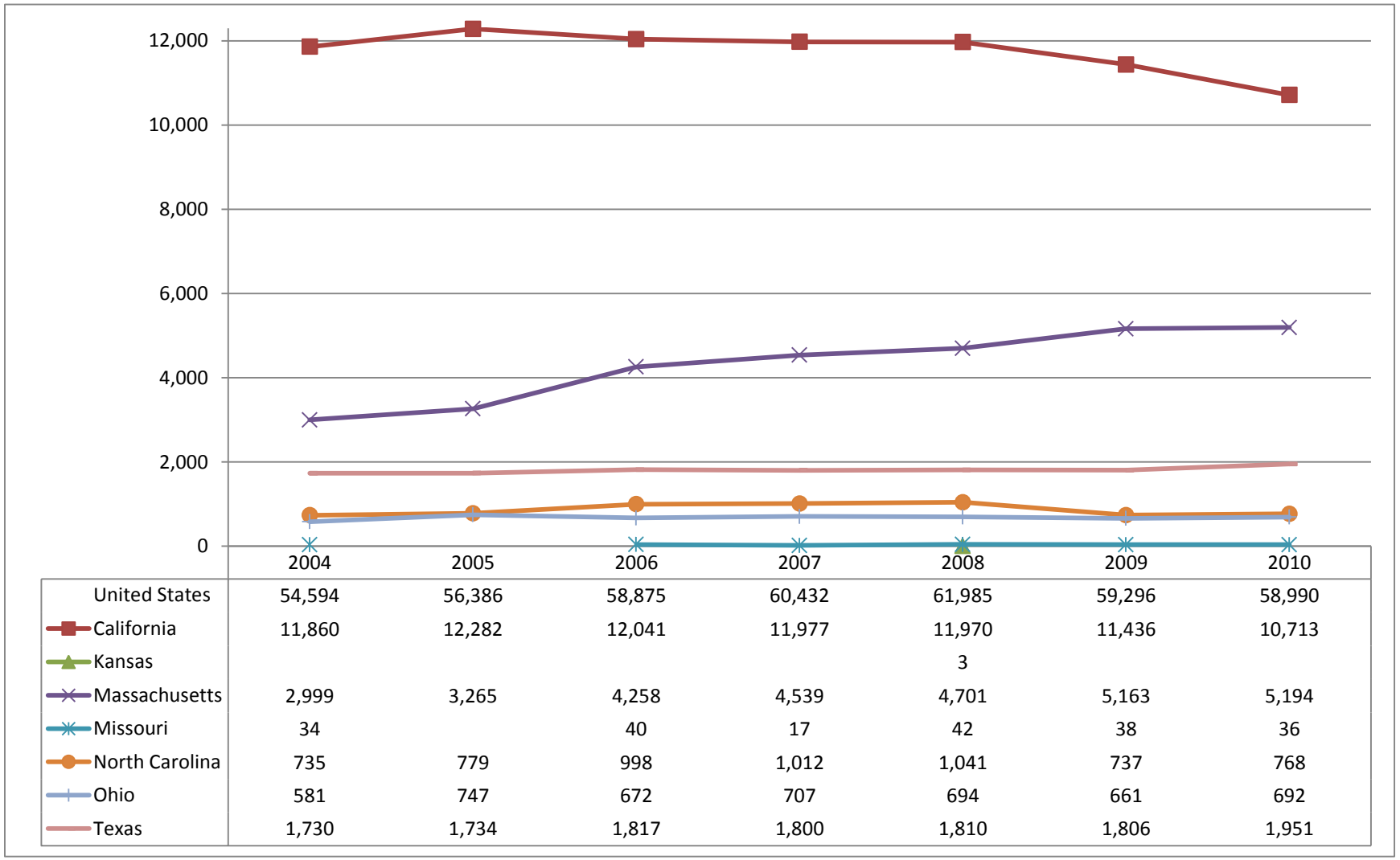
Figure 42: Establishments in Electro-medical and Electrotherapeutic Apparatus Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	789	841	865	889	931	937	948
California	196	188	184	167	169	161	161
Kansas	3	3	3	2	3	2	2
Massachusetts	39	43	43	42	39	42	41
Missouri	5	4	4	4	7	6	5
North Carolina	9	12	16	16	18	19	21
Ohio	17	18	15	17	16	16	21
Texas	33	40	42	51	57	58	58

Source: U.S. Bureau of Labor Statistics

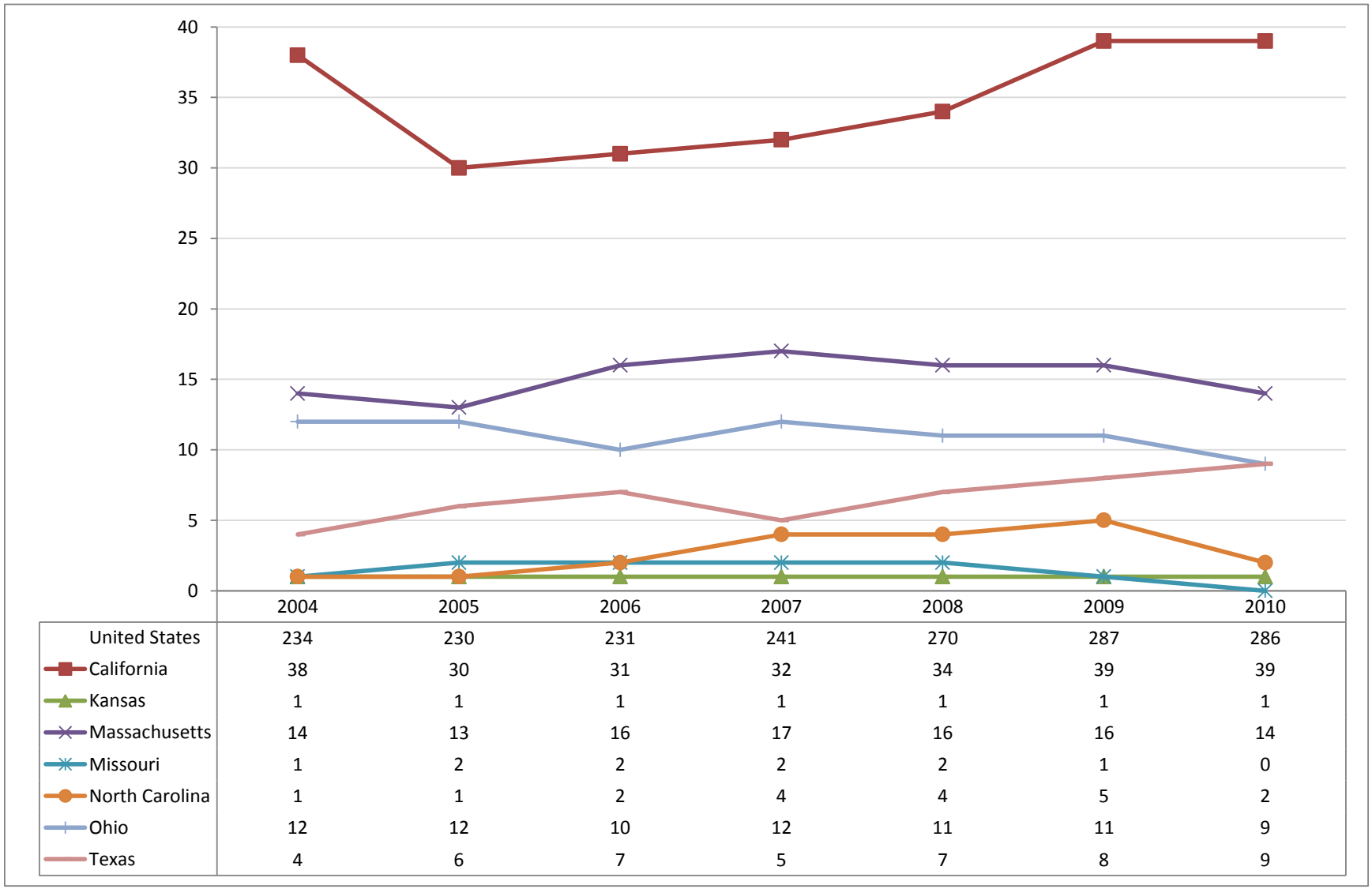
Figure 43: Employment in Electro-medical and Electrotherapeutic Apparatus Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	54,594	56,386	58,875	60,432	61,985	59,296	58,990
California	11,860	12,282	12,041	11,977	11,970	11,436	10,713
Kansas					3		
Massachusetts	2,999	3,265	4,258	4,539	4,701	5,163	5,194
Missouri	34		40	17	42	38	36
North Carolina	735	779	998	1,012	1,041	737	768
Ohio	581	747	672	707	694	661	692
Texas	1,730	1,734	1,817	1,800	1,810	1,806	1,951

*Data not available for Kansas since 2004 except 2008, and not available for Missouri in 2005
Source: U.S. Bureau of Labor Statistics

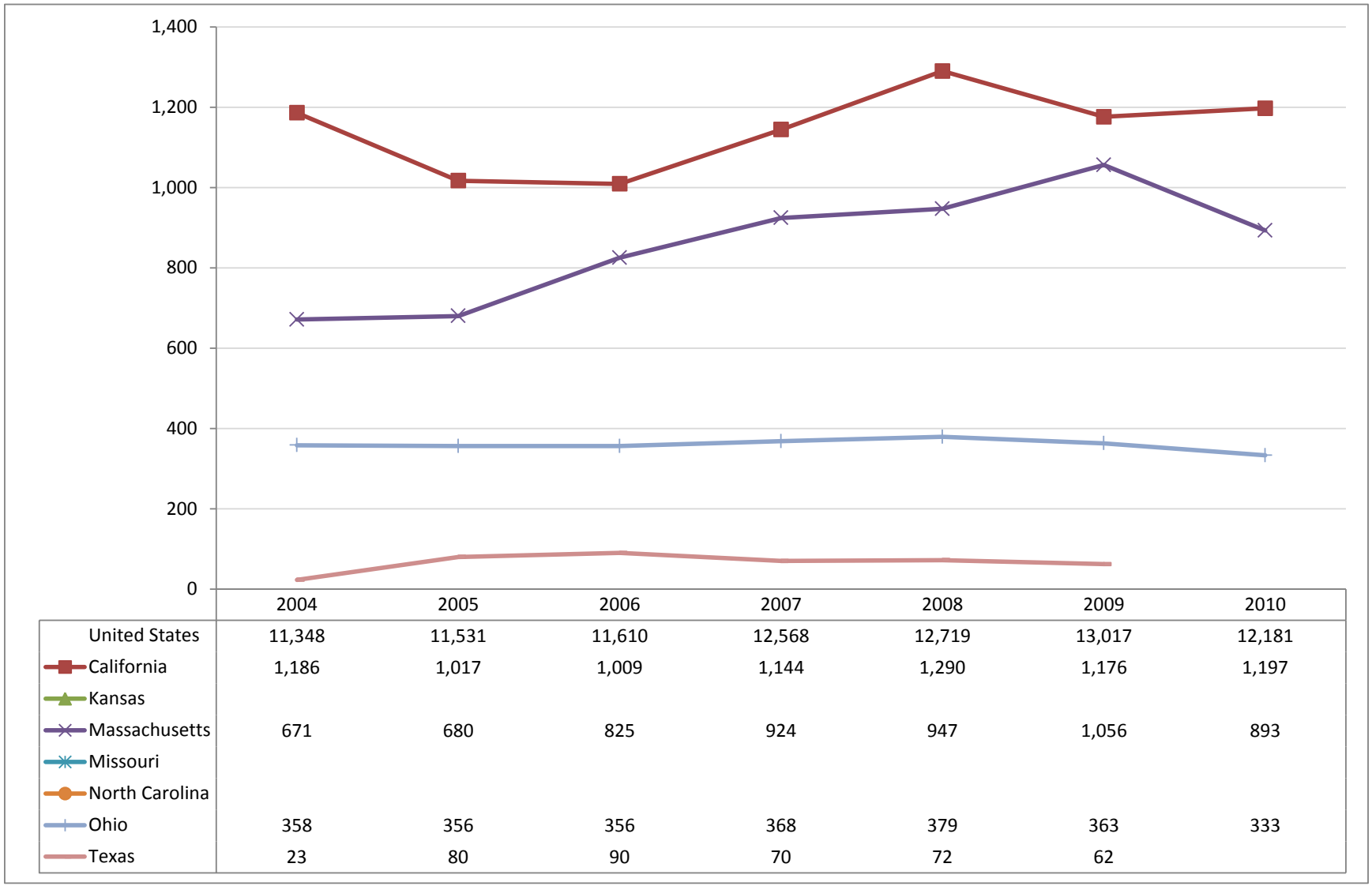
Figure 44: Establishments in Irradiation Apparatus Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	234	230	231	241	270	287	286
California	38	30	31	32	34	39	39
Kansas	1	1	1	1	1	1	1
Massachusetts	14	13	16	17	16	16	14
Missouri	1	2	2	2	2	1	0
North Carolina	1	1	2	4	4	5	2
Ohio	12	12	10	12	11	11	9
Texas	4	6	7	5	7	8	9

Source: U.S. Bureau of Labor Statistics

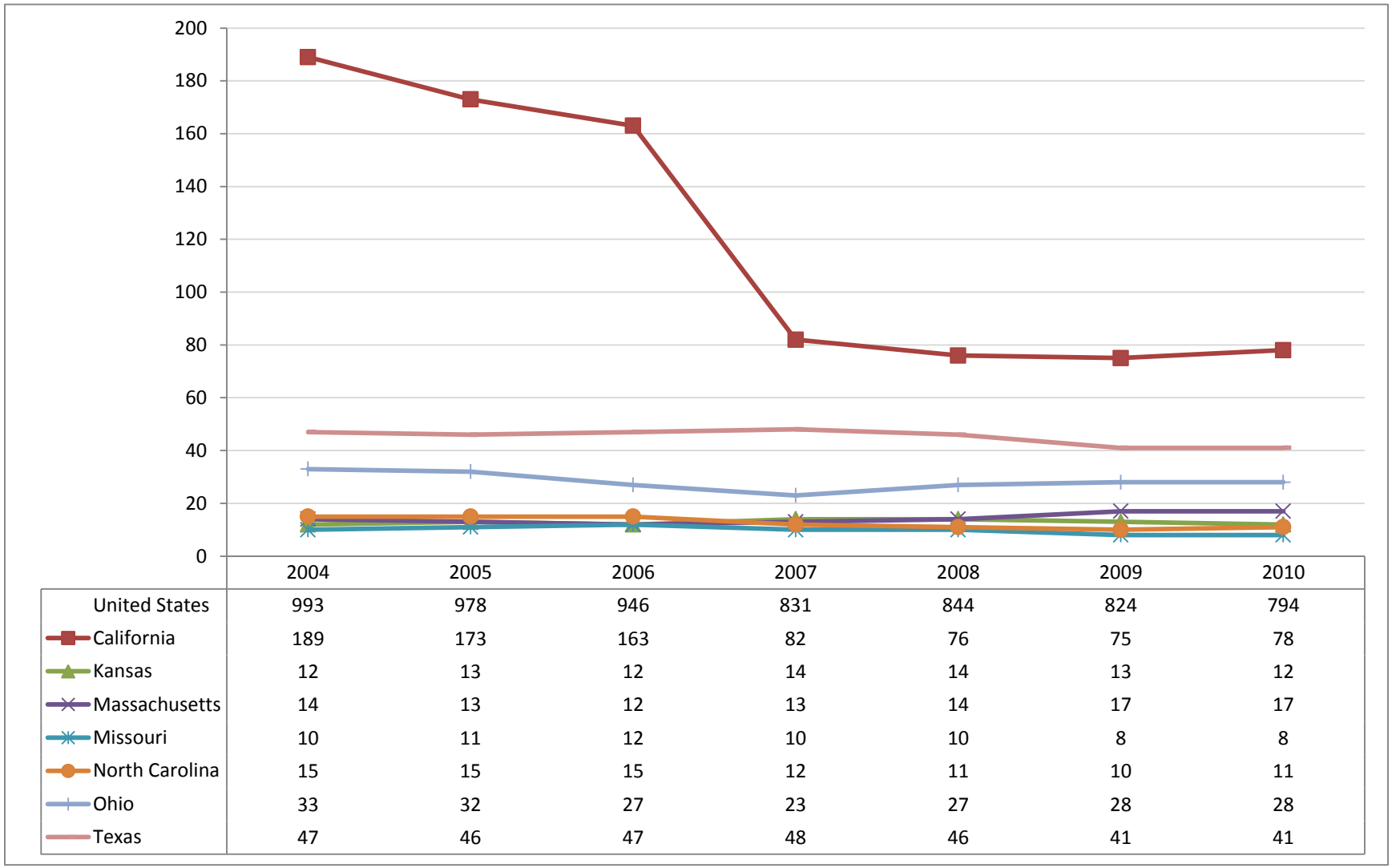
Figure 45: Employment in Irradiation Apparatus Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	11,348	11,531	11,610	12,568	12,719	13,017	12,181
California	1,186	1,017	1,009	1,144	1,290	1,176	1,197
Kansas							
Massachusetts	671	680	825	924	947	1,056	893
Missouri							
North Carolina							
Ohio	358	356	356	368	379	363	333
Texas	23	80	90	70	72	62	

*Data not available for Kansas, Missouri, and North Carolina since 2004, not available for Texas in 2010
Source: U.S. Bureau of Labor Statistics

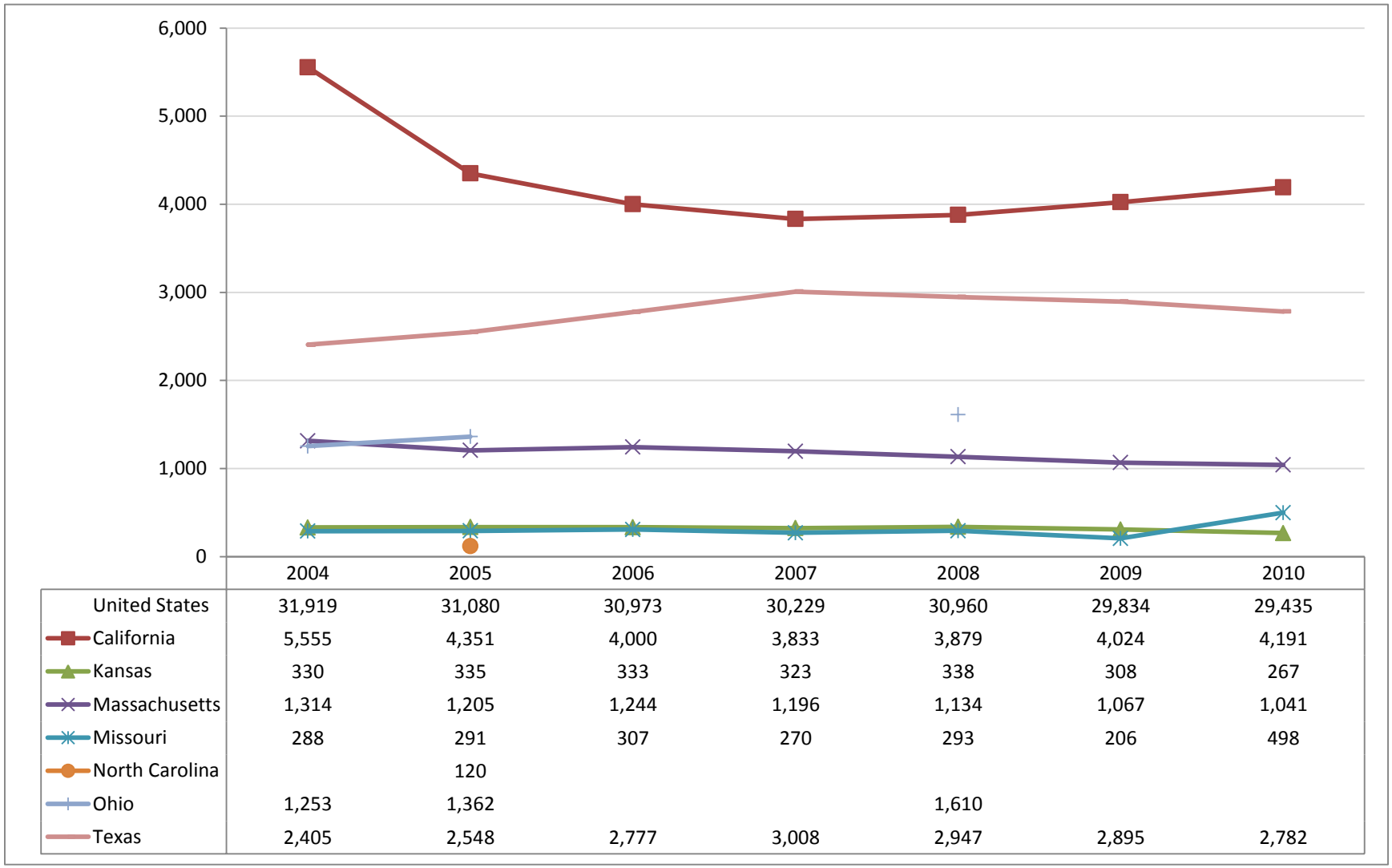
Figure 46: Establishments in Ophthalmic Goods Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	993	978	946	831	844	824	794
California	189	173	163	82	76	75	78
Kansas	12	13	12	14	14	13	12
Massachusetts	14	13	12	13	14	17	17
Missouri	10	11	12	10	10	8	8
North Carolina	15	15	15	12	11	10	11
Ohio	33	32	27	23	27	28	28
Texas	47	46	47	48	46	41	41

Source: U.S. Bureau of Labor Statistics

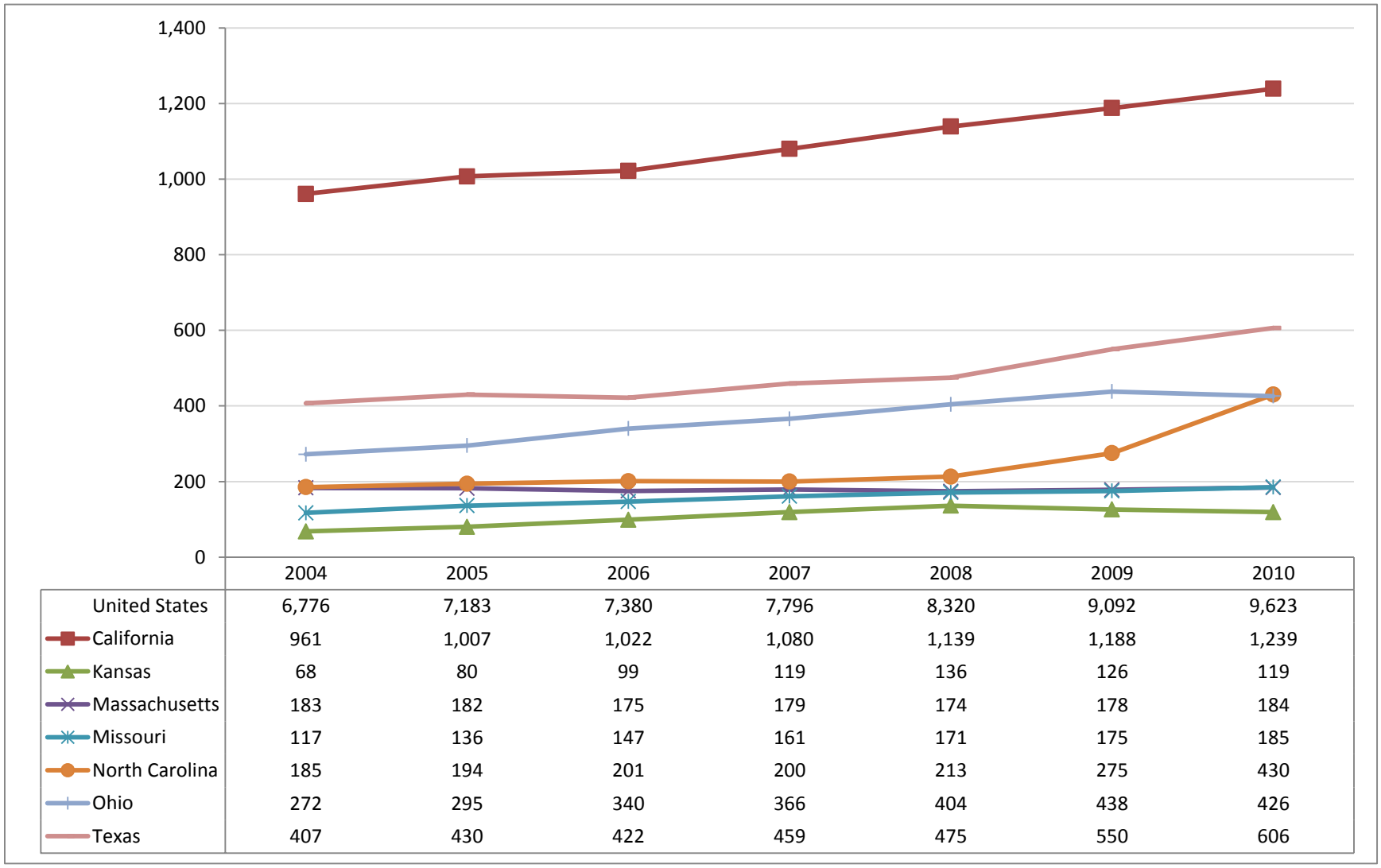
Figure 47: Employment in in Ophthalmic Goods Manufacturing



	2004	2005	2006	2007	2008	2009	2010
United States	31,919	31,080	30,973	30,229	30,960	29,834	29,435
California	5,555	4,351	4,000	3,833	3,879	4,024	4,191
Kansas	330	335	333	323	338	308	267
Massachusetts	1,314	1,205	1,244	1,196	1,134	1,067	1,041
Missouri	288	291	307	270	293	206	498
North Carolina		120					
Ohio	1,253	1,362			1,610		
Texas	2,405	2,548	2,777	3,008	2,947	2,895	2,782

*Data not available for North Carolina since 2004 except 2005, and not available for Ohio in 2006, 2007, 2009 and 2010
Source: U.S. Bureau of Labor Statistics

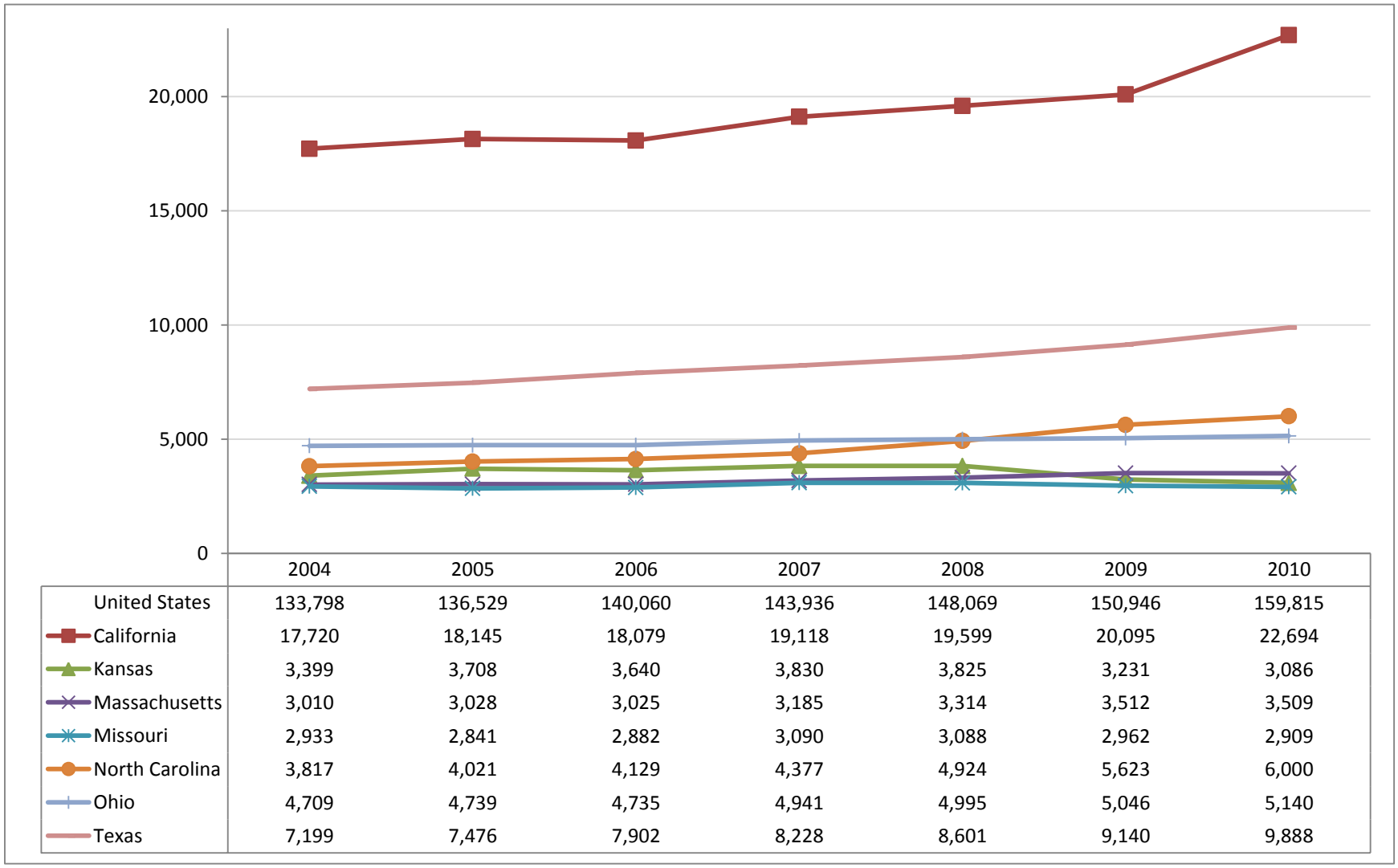
Figure 48: Establishments in Medical Laboratories



	2004	2005	2006	2007	2008	2009	2010
United States	6,776	7,183	7,380	7,796	8,320	9,092	9,623
California	961	1,007	1,022	1,080	1,139	1,188	1,239
Kansas	68	80	99	119	136	126	119
Massachusetts	183	182	175	179	174	178	184
Missouri	117	136	147	161	171	175	185
North Carolina	185	194	201	200	213	275	430
Ohio	272	295	340	366	404	438	426
Texas	407	430	422	459	475	550	606

Source: U.S. Bureau of Labor Statistics

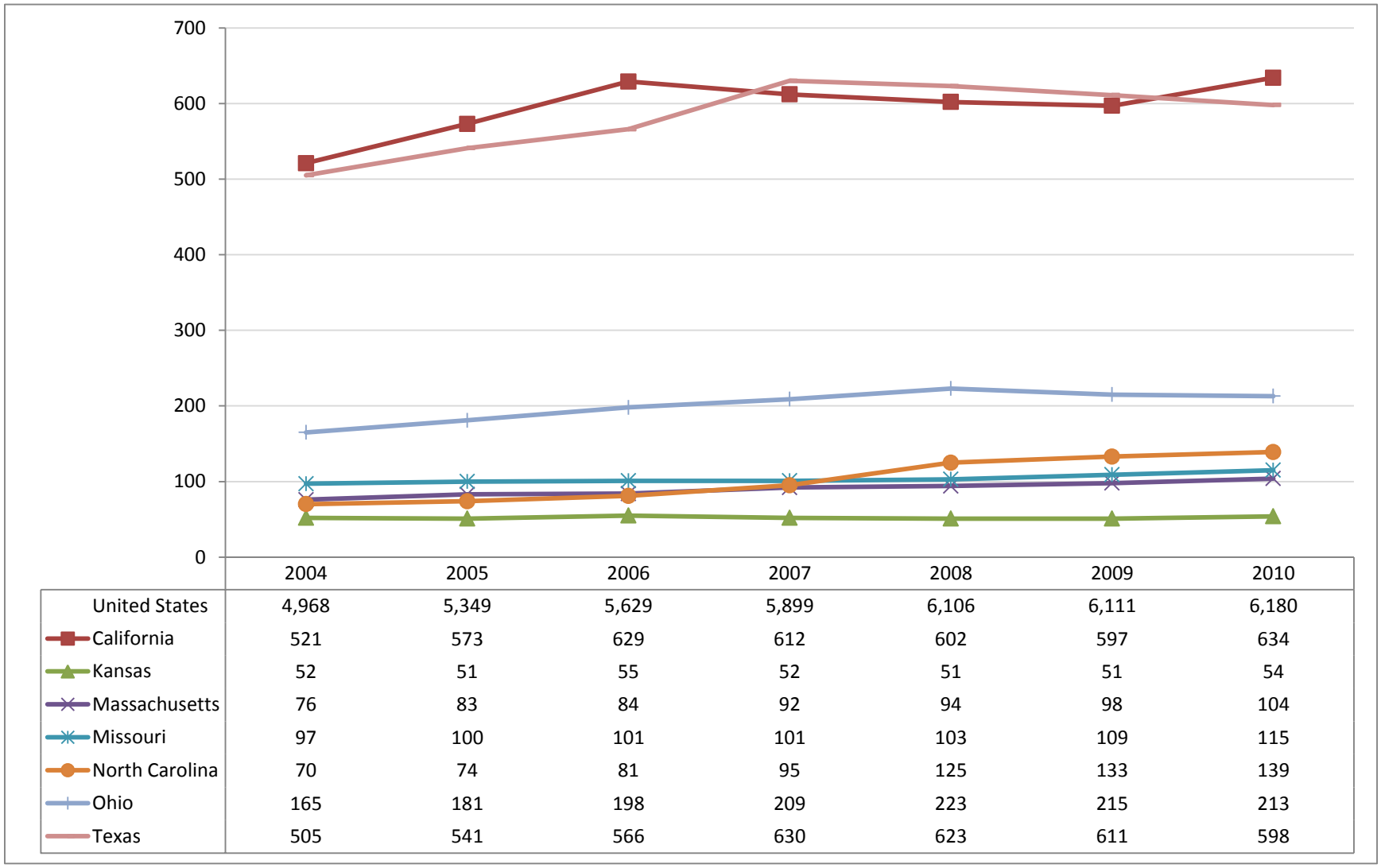
Figure 49: Employment in Medical Laboratories



	2004	2005	2006	2007	2008	2009	2010
United States	133,798	136,529	140,060	143,936	148,069	150,946	159,815
California	17,720	18,145	18,079	19,118	19,599	20,095	22,694
Kansas	3,399	3,708	3,640	3,830	3,825	3,231	3,086
Massachusetts	3,010	3,028	3,025	3,185	3,314	3,512	3,509
Missouri	2,933	2,841	2,882	3,090	3,088	2,962	2,909
North Carolina	3,817	4,021	4,129	4,377	4,924	5,623	6,000
Ohio	4,709	4,739	4,735	4,941	4,995	5,046	5,140
Texas	7,199	7,476	7,902	8,228	8,601	9,140	9,888

Source: U.S. Bureau of Labor Statistics

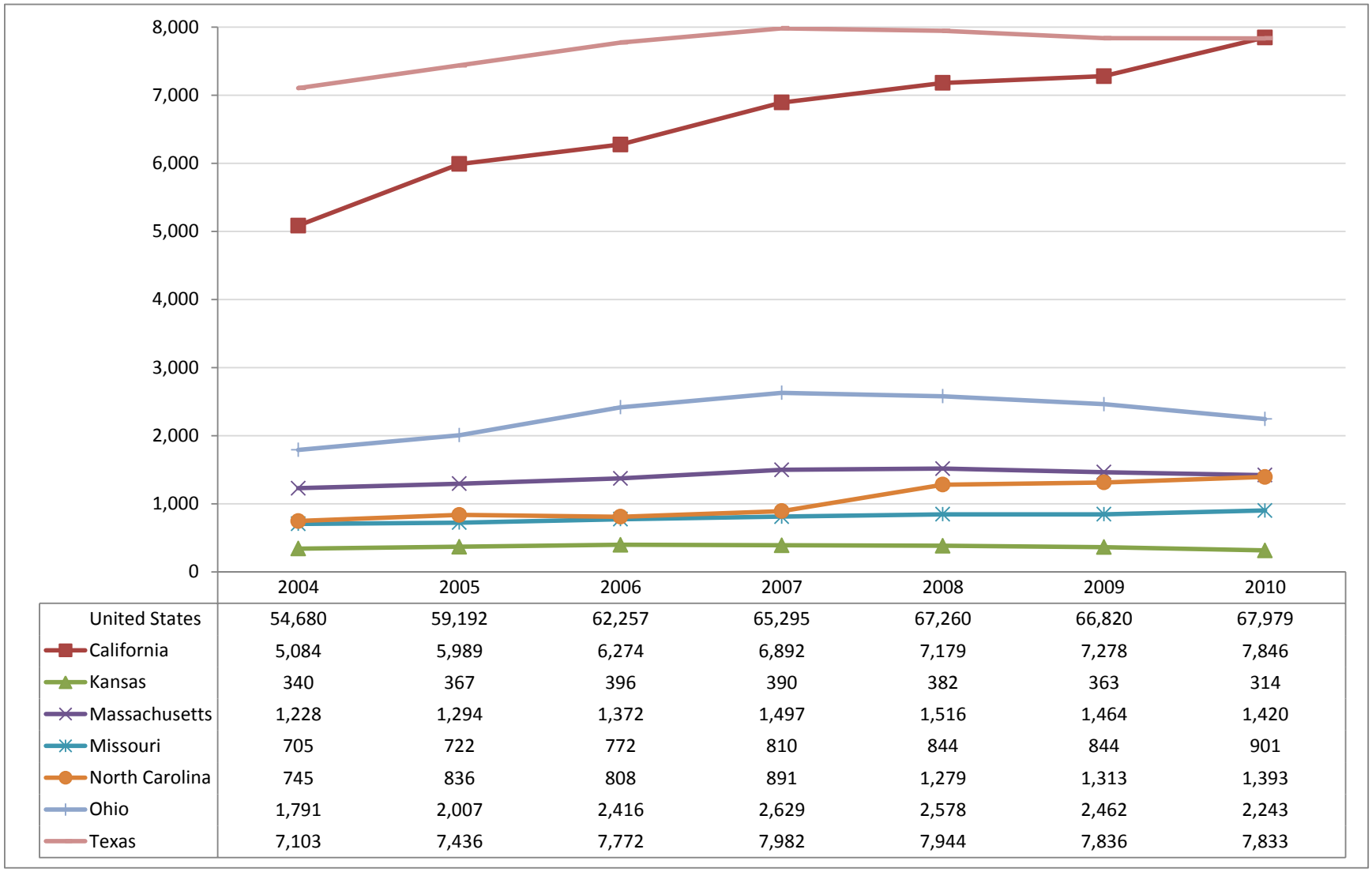
Figure 50: Establishments in Diagnostic Imaging Centers



	2004	2005	2006	2007	2008	2009	2010
United States	4,968	5,349	5,629	5,899	6,106	6,111	6,180
California	521	573	629	612	602	597	634
Kansas	52	51	55	52	51	51	54
Massachusetts	76	83	84	92	94	98	104
Missouri	97	100	101	101	103	109	115
North Carolina	70	74	81	95	125	133	139
Ohio	165	181	198	209	223	215	213
Texas	505	541	566	630	623	611	598

Source: U.S. Bureau of Labor Statistics

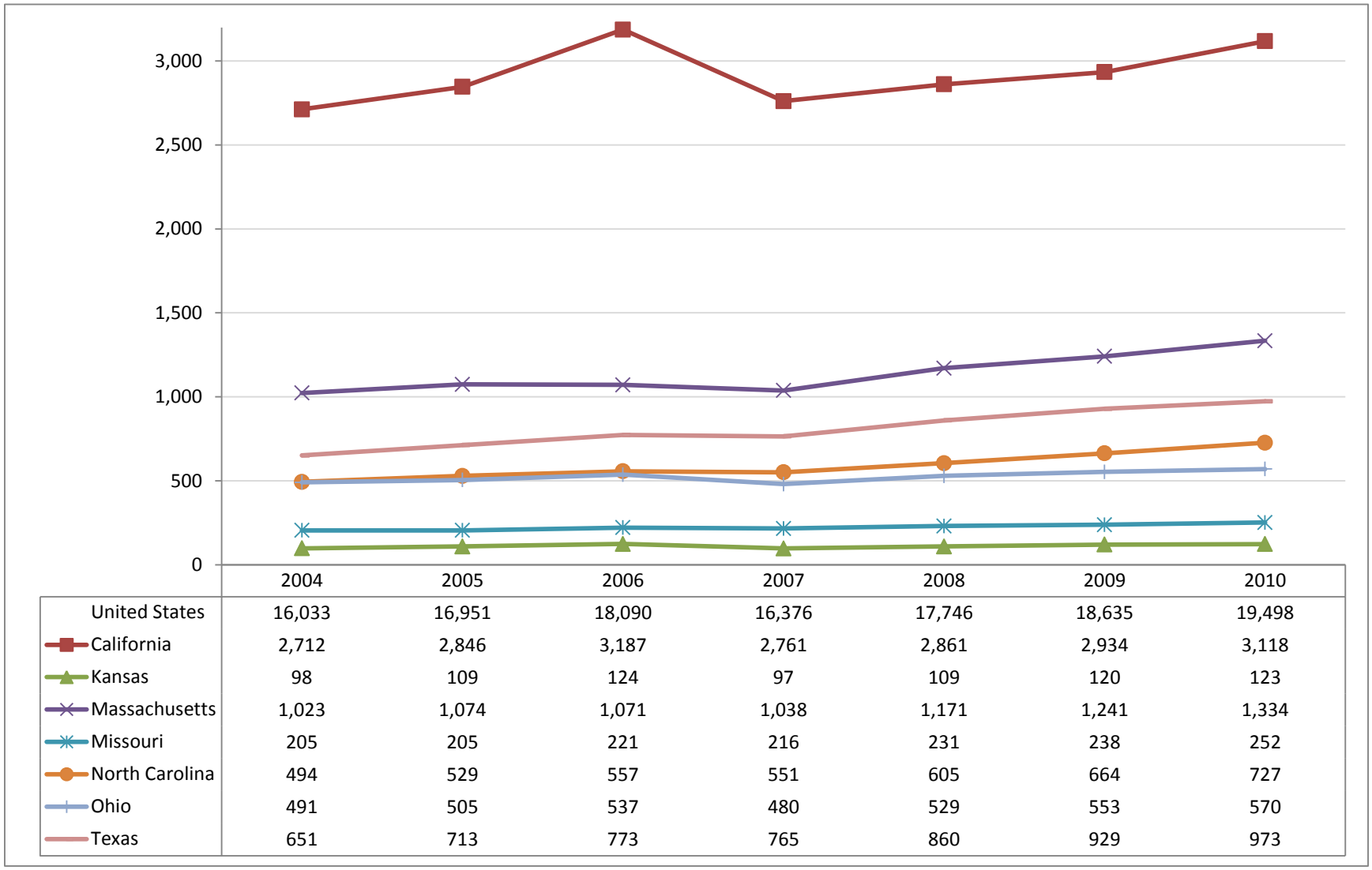
Figure 51: Employment in in Diagnostic Imaging Centers



	2004	2005	2006	2007	2008	2009	2010
United States	54,680	59,192	62,257	65,295	67,260	66,820	67,979
California	5,084	5,989	6,274	6,892	7,179	7,278	7,846
Kansas	340	367	396	390	382	363	314
Massachusetts	1,228	1,294	1,372	1,497	1,516	1,464	1,420
Missouri	705	722	772	810	844	844	901
North Carolina	745	836	808	891	1,279	1,313	1,393
Ohio	1,791	2,007	2,416	2,629	2,578	2,462	2,243
Texas	7,103	7,436	7,772	7,982	7,944	7,836	7,833

Source: U.S. Bureau of Labor Statistics

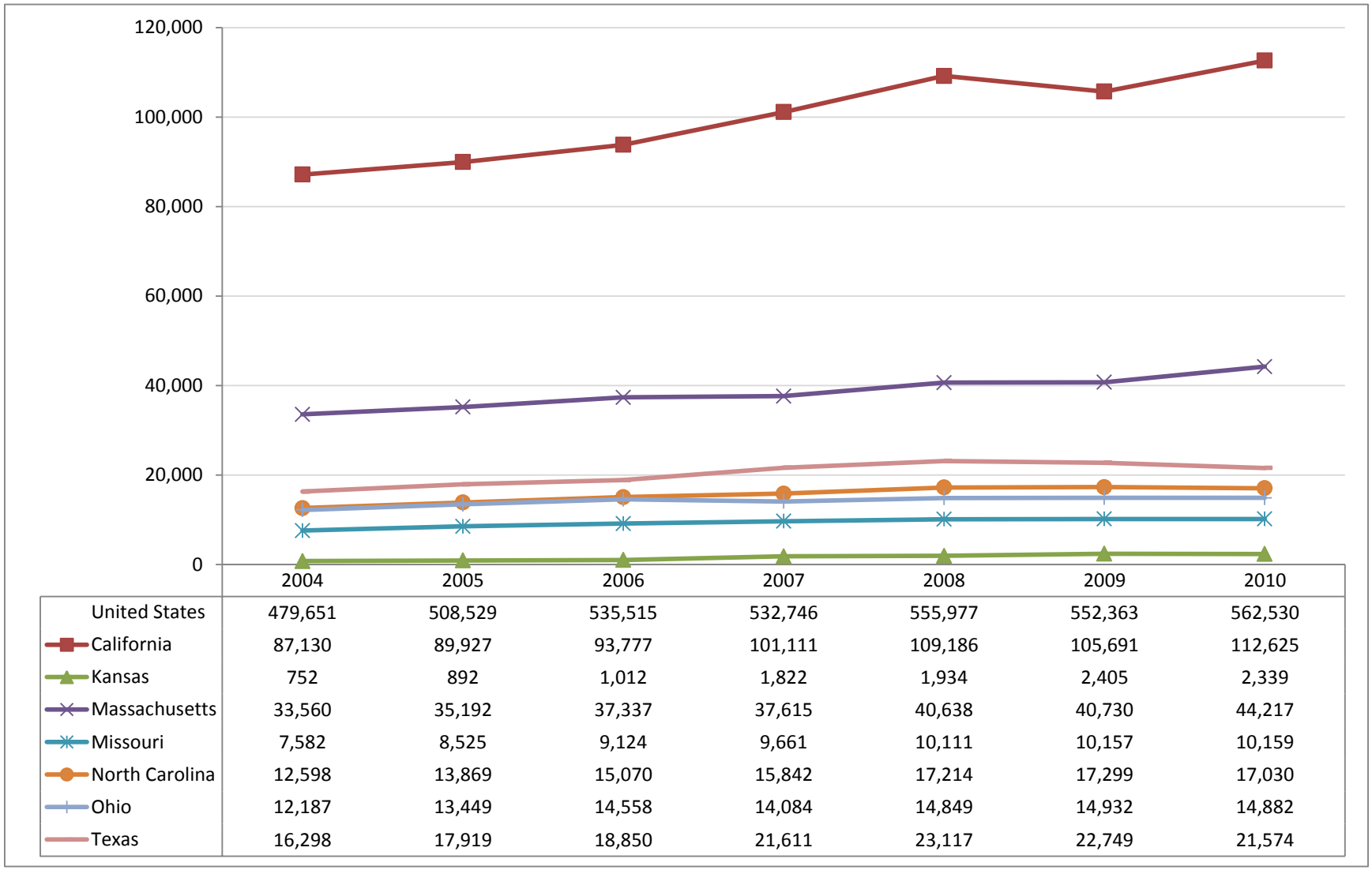
Figure 52: Establishments in Research and Development in the Physical, Engineering, and Life Sciences



	2004	2005	2006	2007	2008	2009	2010
United States	16,033	16,951	18,090	16,376	17,746	18,635	19,498
California	2,712	2,846	3,187	2,761	2,861	2,934	3,118
Kansas	98	109	124	97	109	120	123
Massachusetts	1,023	1,074	1,071	1,038	1,171	1,241	1,334
Missouri	205	205	221	216	231	238	252
North Carolina	494	529	557	551	605	664	727
Ohio	491	505	537	480	529	553	570
Texas	651	713	773	765	860	929	973

Source: U.S. Bureau of Labor Statistics

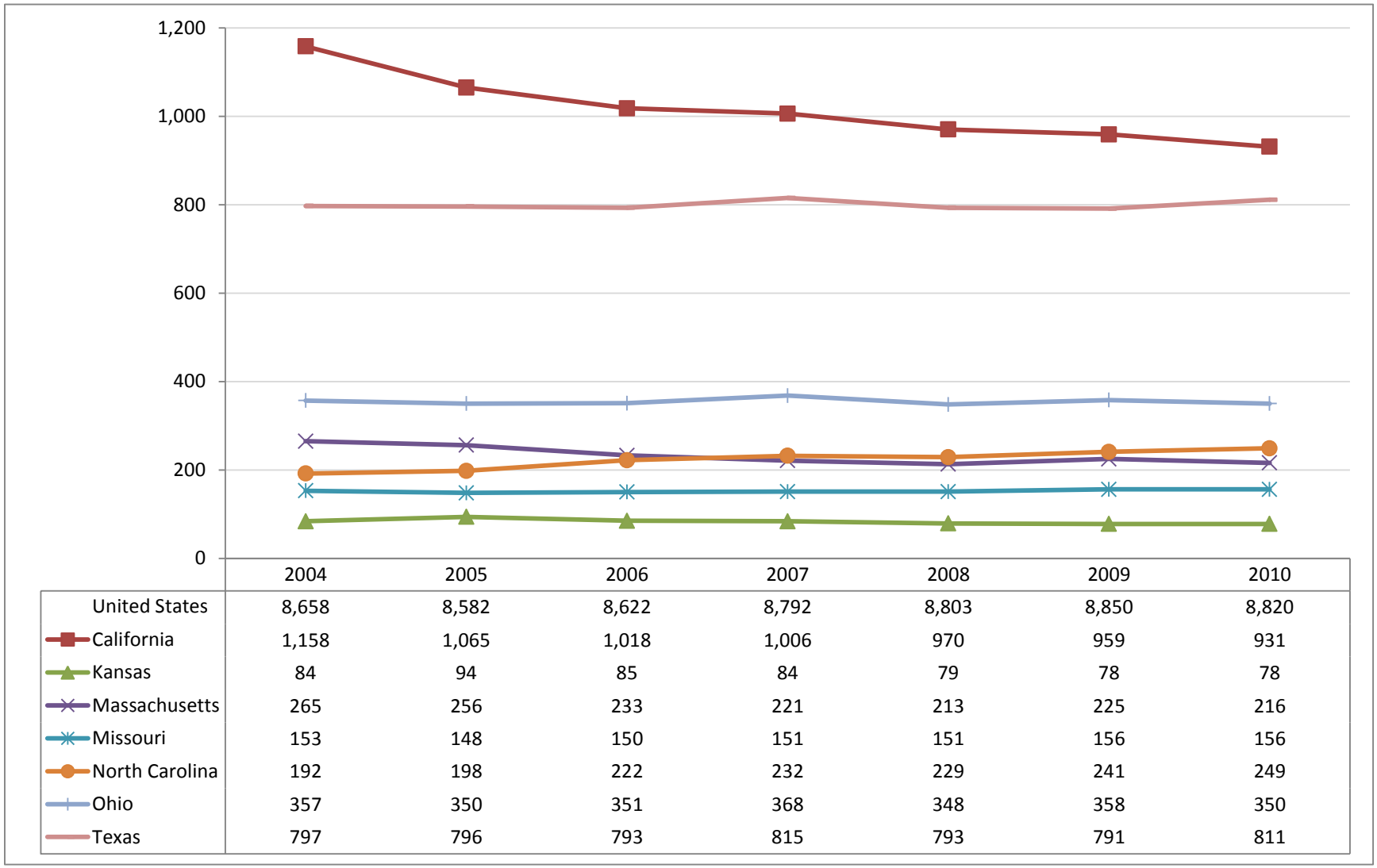
Figure 53: Employment in Research and Development in the Physical, Engineering, and Life Sciences



	2004	2005	2006	2007	2008	2009	2010
United States	479,651	508,529	535,515	532,746	555,977	552,363	562,530
California	87,130	89,927	93,777	101,111	109,186	105,691	112,625
Kansas	752	892	1,012	1,822	1,934	2,405	2,339
Massachusetts	33,560	35,192	37,337	37,615	40,638	40,730	44,217
Missouri	7,582	8,525	9,124	9,661	10,111	10,157	10,159
North Carolina	12,598	13,869	15,070	15,842	17,214	17,299	17,030
Ohio	12,187	13,449	14,558	14,084	14,849	14,932	14,882
Texas	16,298	17,919	18,850	21,611	23,117	22,749	21,574

Source: U.S. Bureau of Labor Statistics

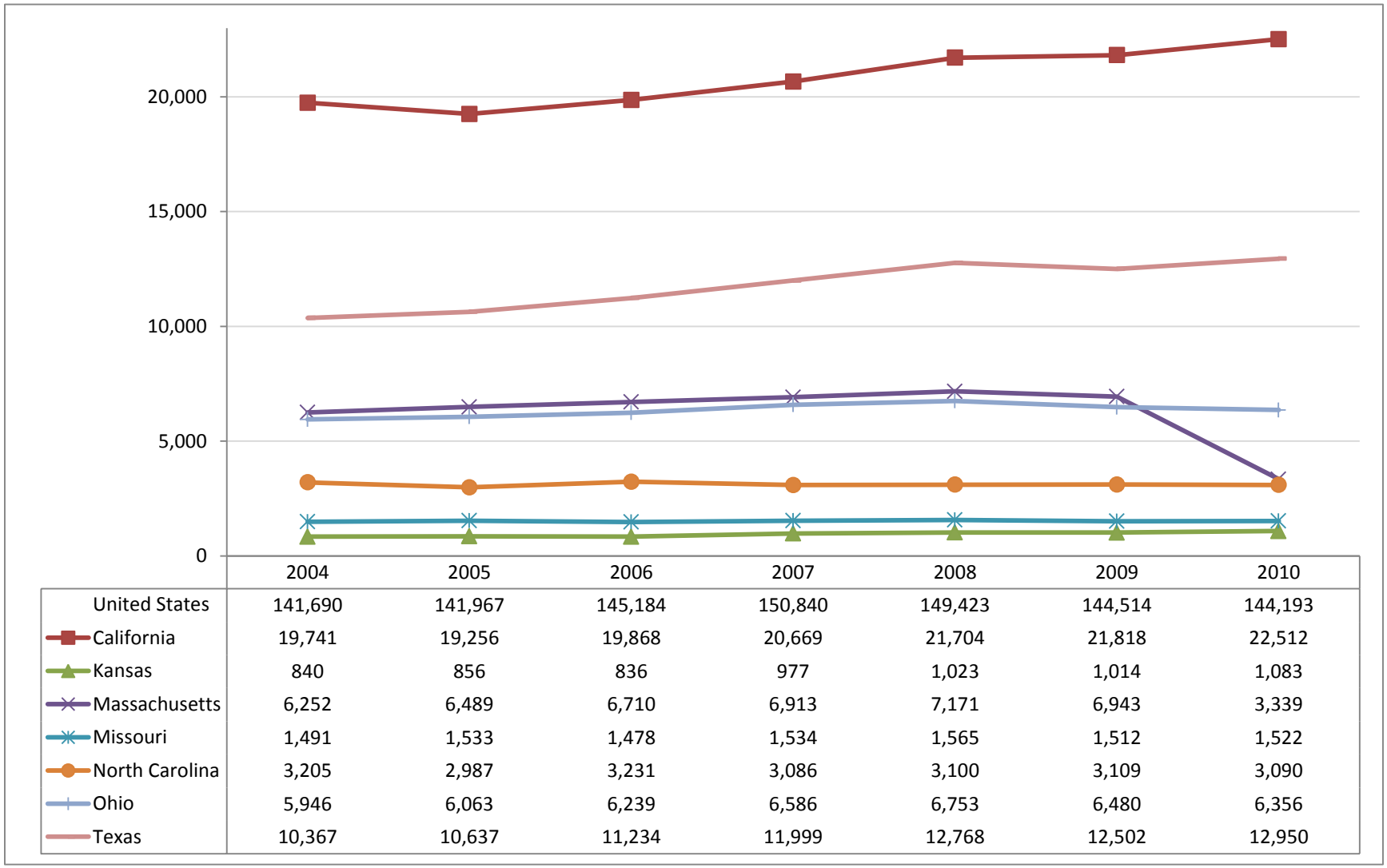
Figure 54: Establishments in Testing Laboratories



	2004	2005	2006	2007	2008	2009	2010
United States	8,658	8,582	8,622	8,792	8,803	8,850	8,820
California	1,158	1,065	1,018	1,006	970	959	931
Kansas	84	94	85	84	79	78	78
Massachusetts	265	256	233	221	213	225	216
Missouri	153	148	150	151	151	156	156
North Carolina	192	198	222	232	229	241	249
Ohio	357	350	351	368	348	358	350
Texas	797	796	793	815	793	791	811

Source: U.S. Bureau of Labor Statistics

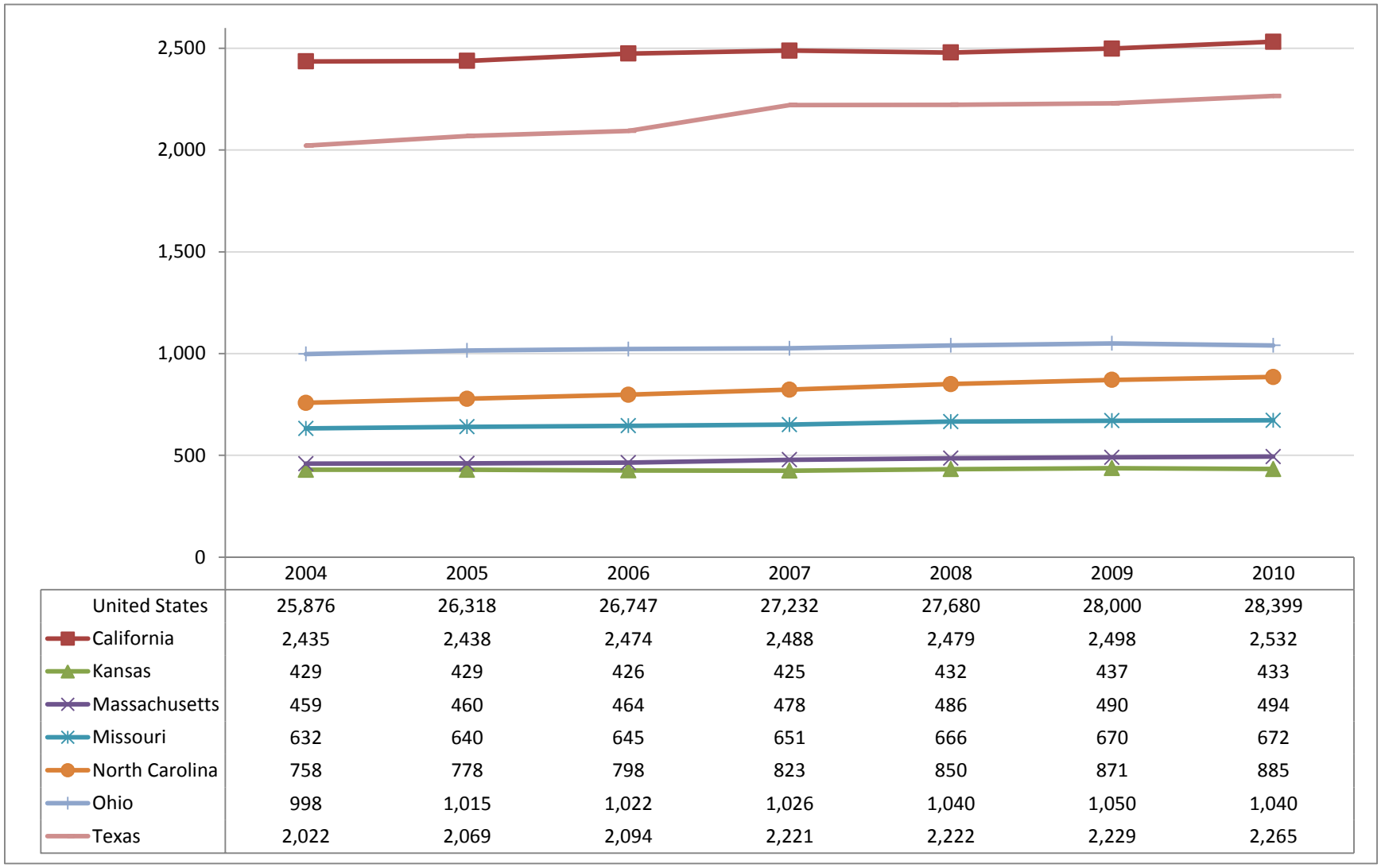
Figure 55: Employment in Testing Laboratories



	2004	2005	2006	2007	2008	2009	2010
United States	141,690	141,967	145,184	150,840	149,423	144,514	144,193
California	19,741	19,256	19,868	20,669	21,704	21,818	22,512
Kansas	840	856	836	977	1,023	1,014	1,083
Massachusetts	6,252	6,489	6,710	6,913	7,171	6,943	3,339
Missouri	1,491	1,533	1,478	1,534	1,565	1,512	1,522
North Carolina	3,205	2,987	3,231	3,086	3,100	3,109	3,090
Ohio	5,946	6,063	6,239	6,586	6,753	6,480	6,356
Texas	10,367	10,637	11,234	11,999	12,768	12,502	12,950

Source: U.S. Bureau of Labor Statistics

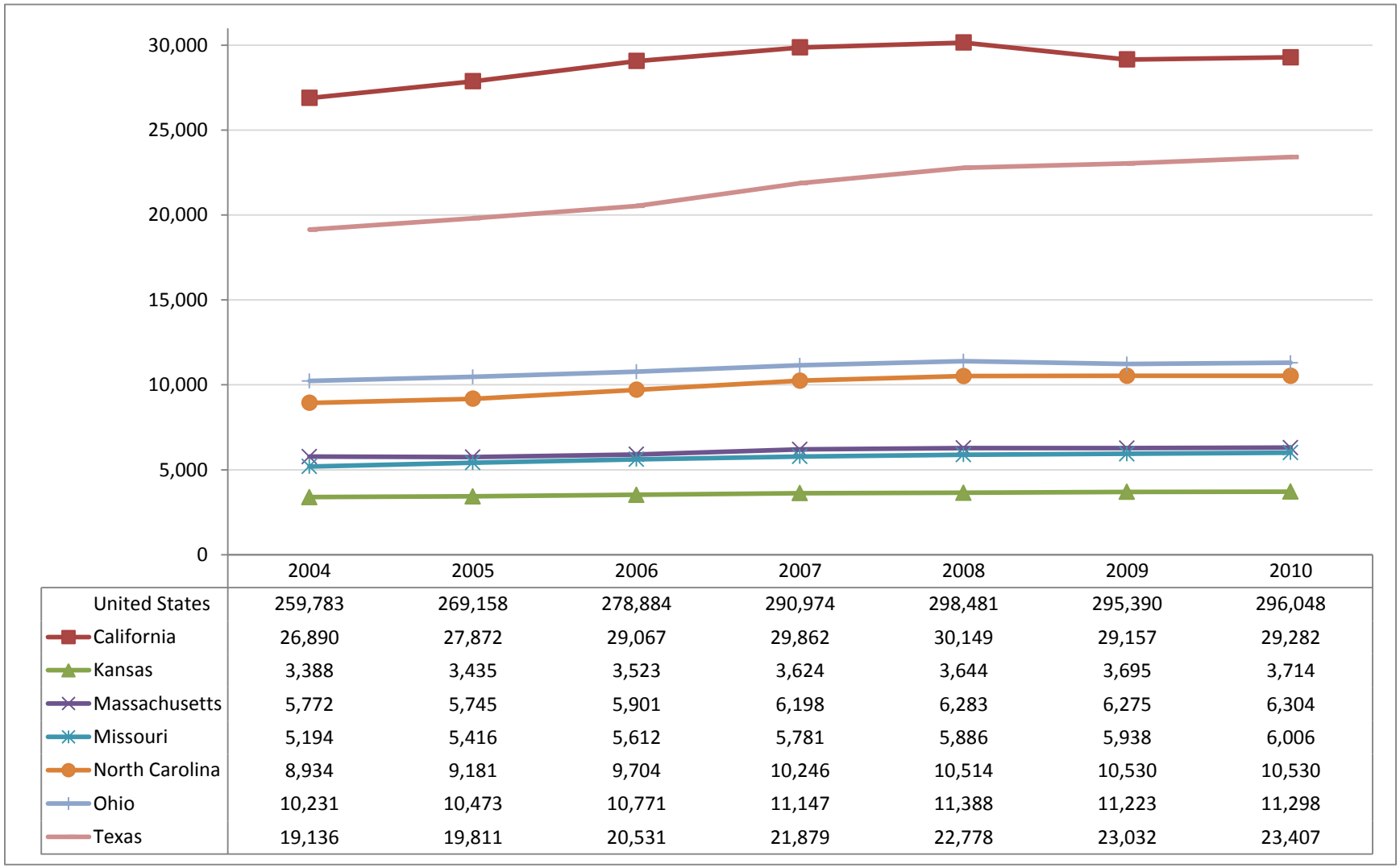
Figure 56: Establishments in Veterinary Services



	2004	2005	2006	2007	2008	2009	2010
United States	25,876	26,318	26,747	27,232	27,680	28,000	28,399
California	2,435	2,438	2,474	2,488	2,479	2,498	2,532
Kansas	429	429	426	425	432	437	433
Massachusetts	459	460	464	478	486	490	494
Missouri	632	640	645	651	666	670	672
North Carolina	758	778	798	823	850	871	885
Ohio	998	1,015	1,022	1,026	1,040	1,050	1,040
Texas	2,022	2,069	2,094	2,221	2,222	2,229	2,265

Source: U.S. Bureau of Labor Statistics

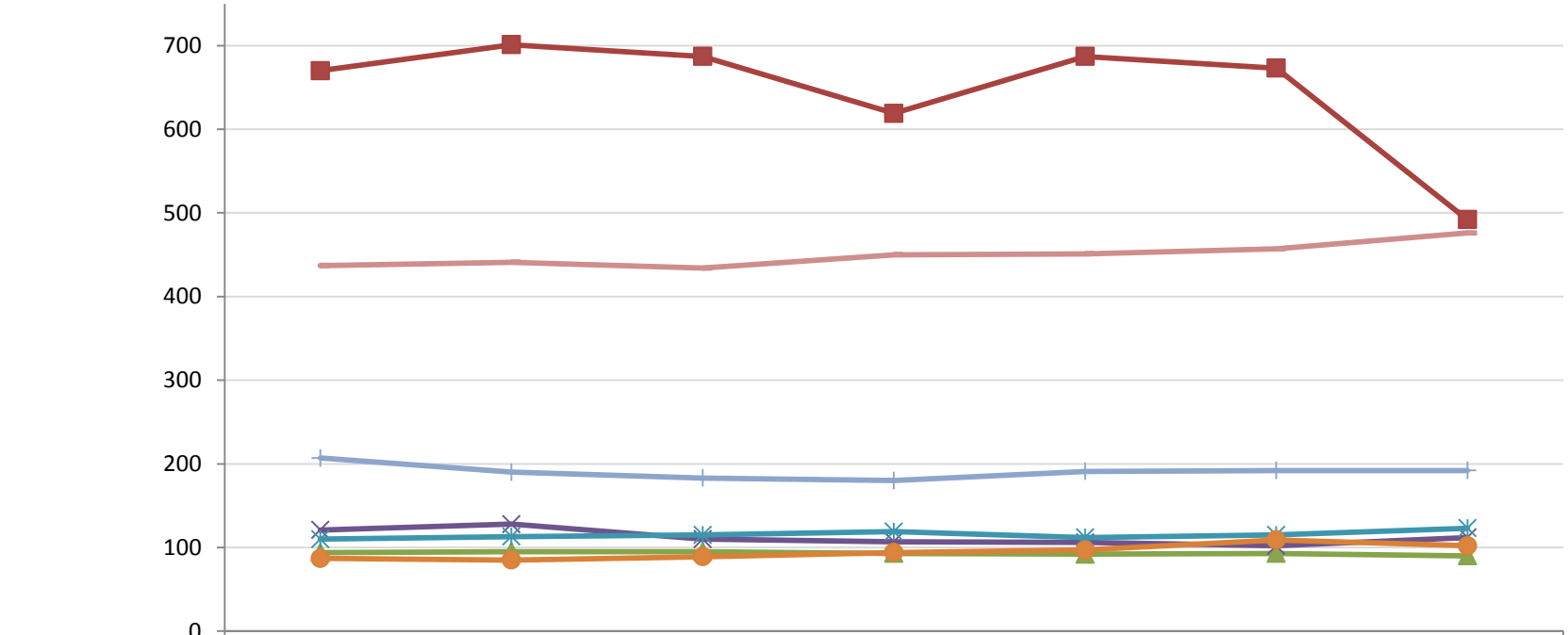
Figure 57: Employment in Veterinary Services



	2004	2005	2006	2007	2008	2009	2010
United States	259,783	269,158	278,884	290,974	298,481	295,390	296,048
California	26,890	27,872	29,067	29,862	30,149	29,157	29,282
Kansas	3,388	3,435	3,523	3,624	3,644	3,695	3,714
Massachusetts	5,772	5,745	5,901	6,198	6,283	6,275	6,304
Missouri	5,194	5,416	5,612	5,781	5,886	5,938	6,006
North Carolina	8,934	9,181	9,704	10,246	10,514	10,530	10,530
Ohio	10,231	10,473	10,771	11,147	11,388	11,223	11,298
Texas	19,136	19,811	20,531	21,879	22,778	23,032	23,407

Source: U.S. Bureau of Labor Statistics

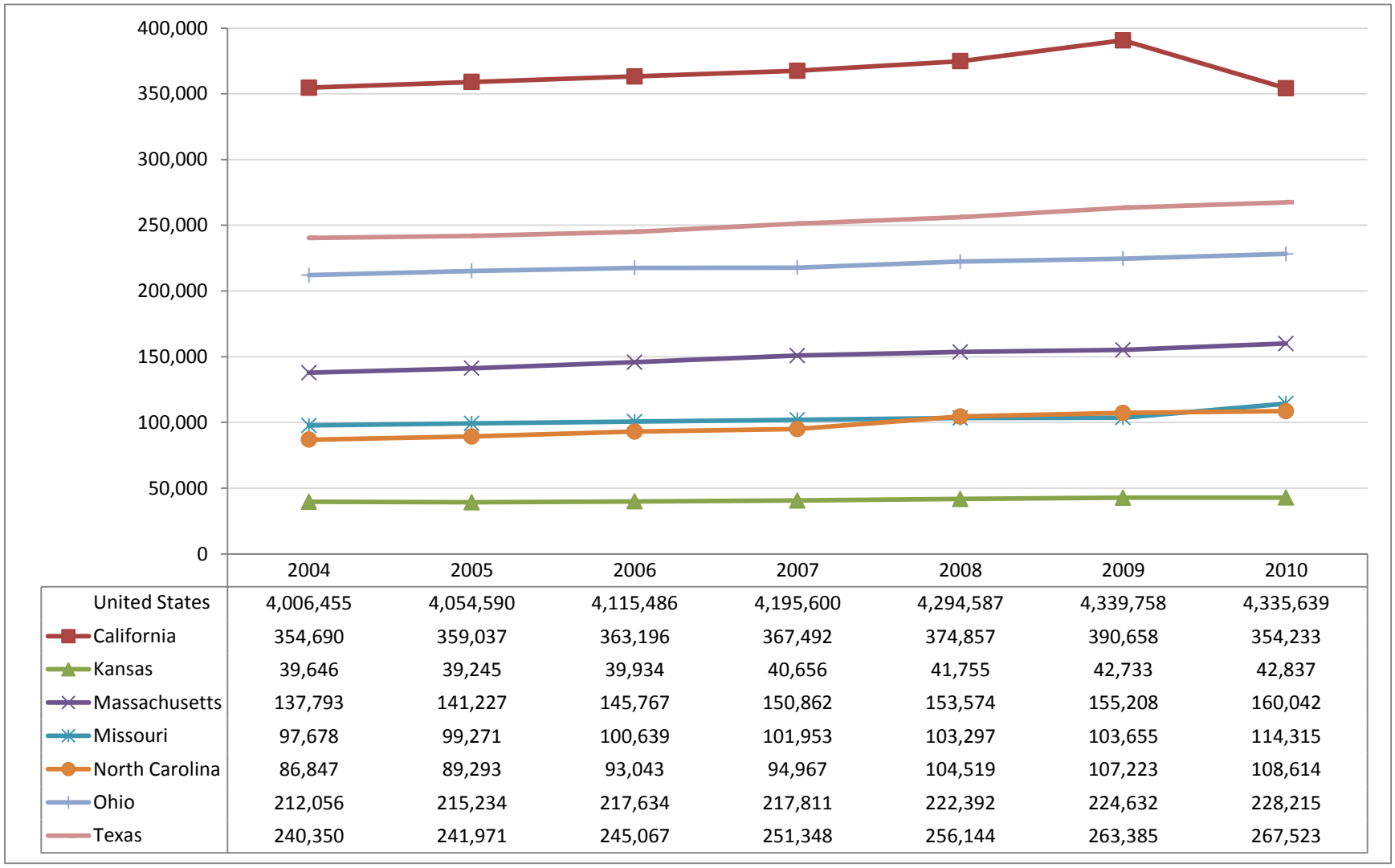
Figure 58: Establishments in General Medical and Surgical Hospitals



	2004	2005	2006	2007	2008	2009	2010
United States	5,546	5,513	5,544	5,531	5,743	5,864	5,797
California	670	701	687	619	687	673	492
Kansas	94	95	95	93	92	93	90
Massachusetts	121	128	110	107	106	102	112
Missouri	110	113	115	119	112	115	123
North Carolina	87	85	89	94	97	109	102
Ohio	207	190	183	180	191	192	192
Texas	437	441	434	450	451	457	476

Source: U.S. Bureau of Labor Statistics

Figure 59: Employment in General Medical and Surgical Hospitals



	2004	2005	2006	2007	2008	2009	2010
United States	4,006,455	4,054,590	4,115,486	4,195,600	4,294,587	4,339,758	4,335,639
California	354,690	359,037	363,196	367,492	374,857	390,658	354,233
Kansas	39,646	39,245	39,934	40,656	41,755	42,733	42,837
Massachusetts	137,793	141,227	145,767	150,862	153,574	155,208	160,042
Missouri	97,678	99,271	100,639	101,953	103,297	103,655	114,315
North Carolina	86,847	89,293	93,043	94,967	104,519	107,223	108,614
Ohio	212,056	215,234	217,634	217,811	222,392	224,632	228,215
Texas	240,350	241,971	245,067	251,348	256,144	263,385	267,523

Source: U.S. Bureau of Labor Statistics

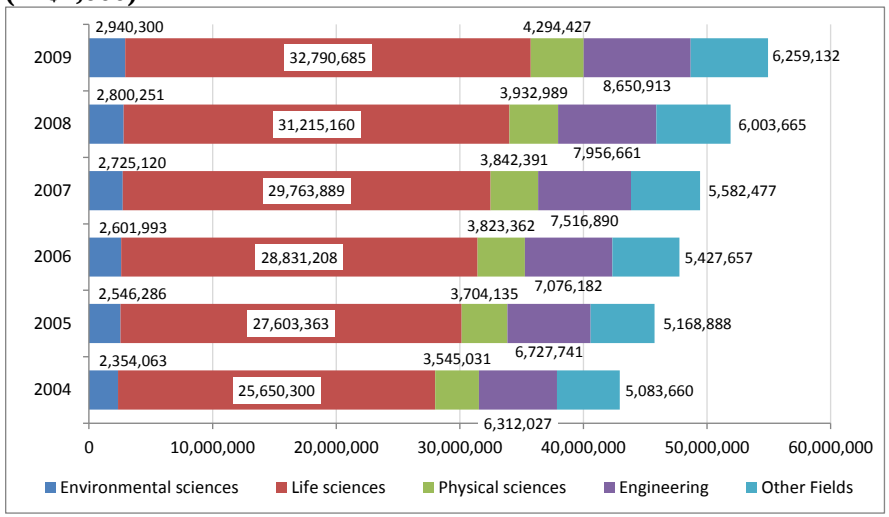
Research and Development (R&D) Capacity

Research and development accumulates knowledge, and use of the knowledge is crucial to successfully devise new applications. This section provides the measures of dollar amount of R&D spending by fields and R&D spending in bioscience. R&D spending in Kansas universities is also examined.

Universities and colleges are one of the major sources for knowledge and innovation. Their R&D spending on such academic fields as life science, physical sciences, and engineering is crucial for bioscience development. Figures 60 to 67 present the academic R&D spending in those fields for the United States and the study states from 2004 to 2009. The total academic spending had been rising from 2004 to 2009 in the nation and all the states under study. In 2009, the total academic R&D spending in the United States was $54,935 million. The total academic R&D spending in California in 2009 was $7,406 million, which was the highest among all the study states. Kansas' academic R&D spending was $441 million in 2009, the lowest among all the study states (Figure 68). Among all the study states, the field of life sciences spent the largest portion of the academic R&D funding, followed by engineering. In 2009, the academic R&D spending in life science accounted for 81.3% of the total spending in Missouri, 59.9% in Kansas, and 48.8% in Massachusetts. In the United States, the academic R&D spending in life science was 59.7% of the total spending (Figure 69).

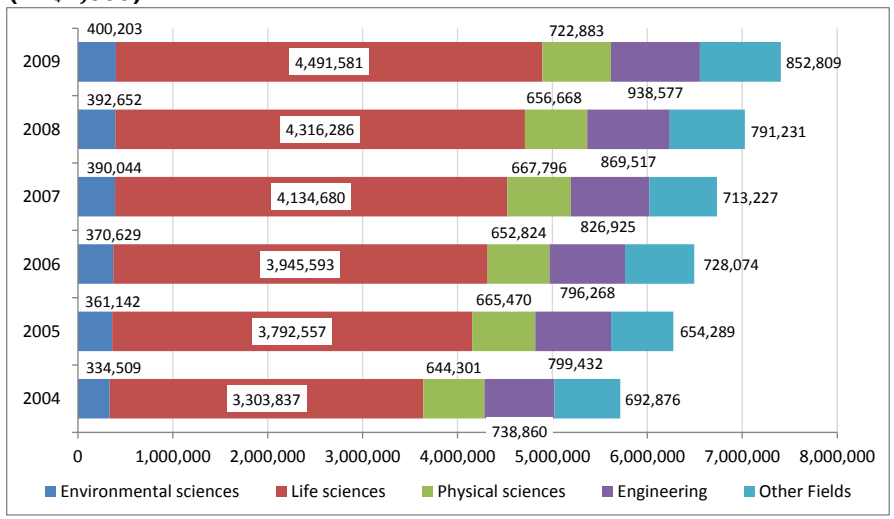
The academic R&D spending in environmental science had the smallest share of the total academic R&D spending in the nation and all the states under study. In the United States, the academic R&D spending in environmental science accounted for 5.4% of the total spending in 2009. In Massachusetts, the share of the academic R&D spending in environmental science was 8.6%, the highest among all the study states. The share in Ohio was 1.2% in 2009, the lowest among the study states. In Kansas, the share was 3.7% in 2009 (Figure 69).

Figure 60: Academic R&D Spending by Field, United States (in $1,000)



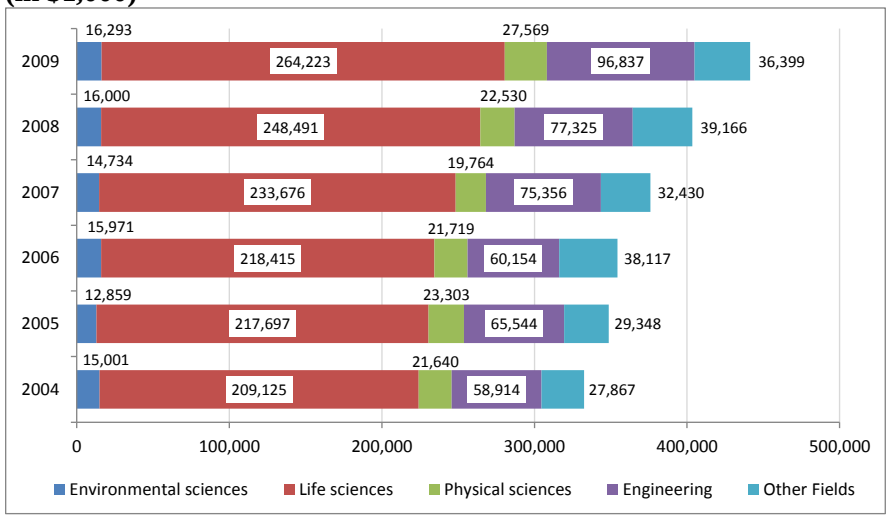
Source: National Science Foundation

Figure 61: Academic R&D Spending by Field, California (in $1,000)



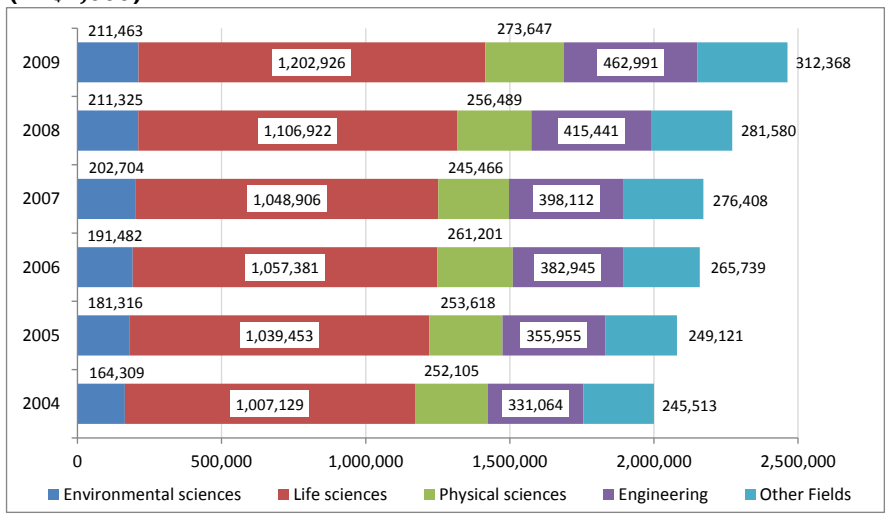
Source: National Science Foundation

Figure 62: Academic R&D Spending by Field, Kansas (in $1,000)



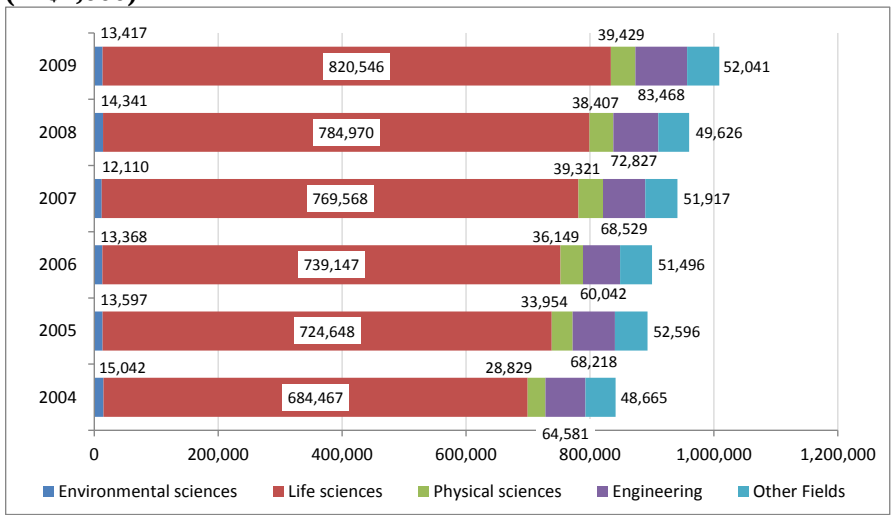
Source: National Science Foundation

Figure 63: Academic R&D Spending by Field, Massachusetts (in $1,000)



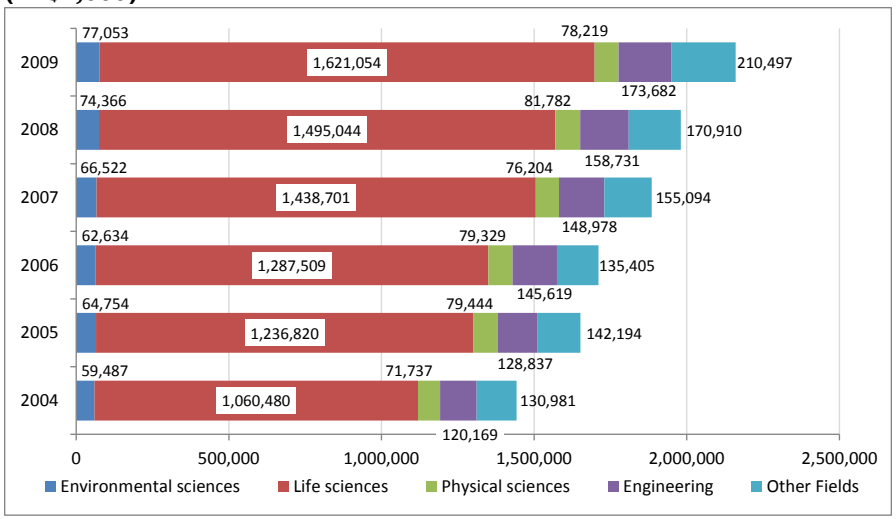
Source: National Science Foundation

Figure 64: Academic R&D Spending by Field, Missouri (in $1,000)



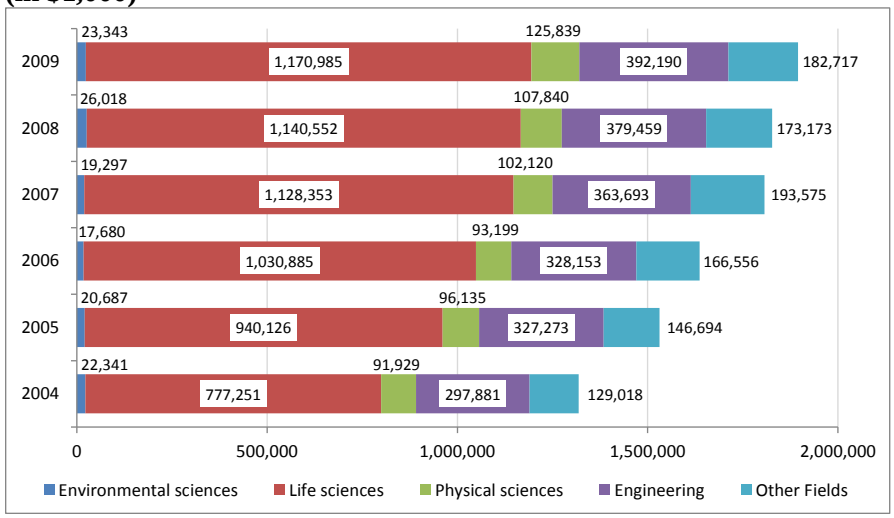
Source: National Science Foundation

Figure 65: Academic R&D Spending by Field, North Carolina (in $1,000)



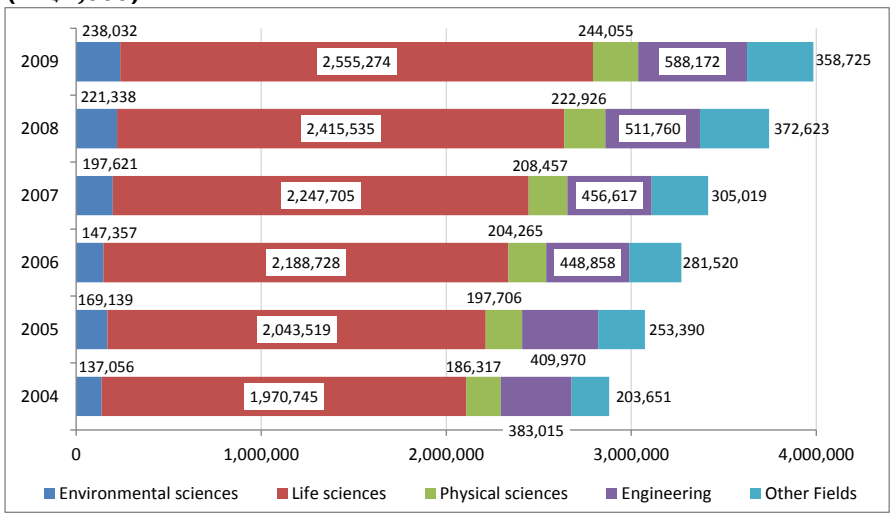
Source: National Science Foundation

Figure 66: Academic R&D Spending by Field, Ohio (in $1,000)



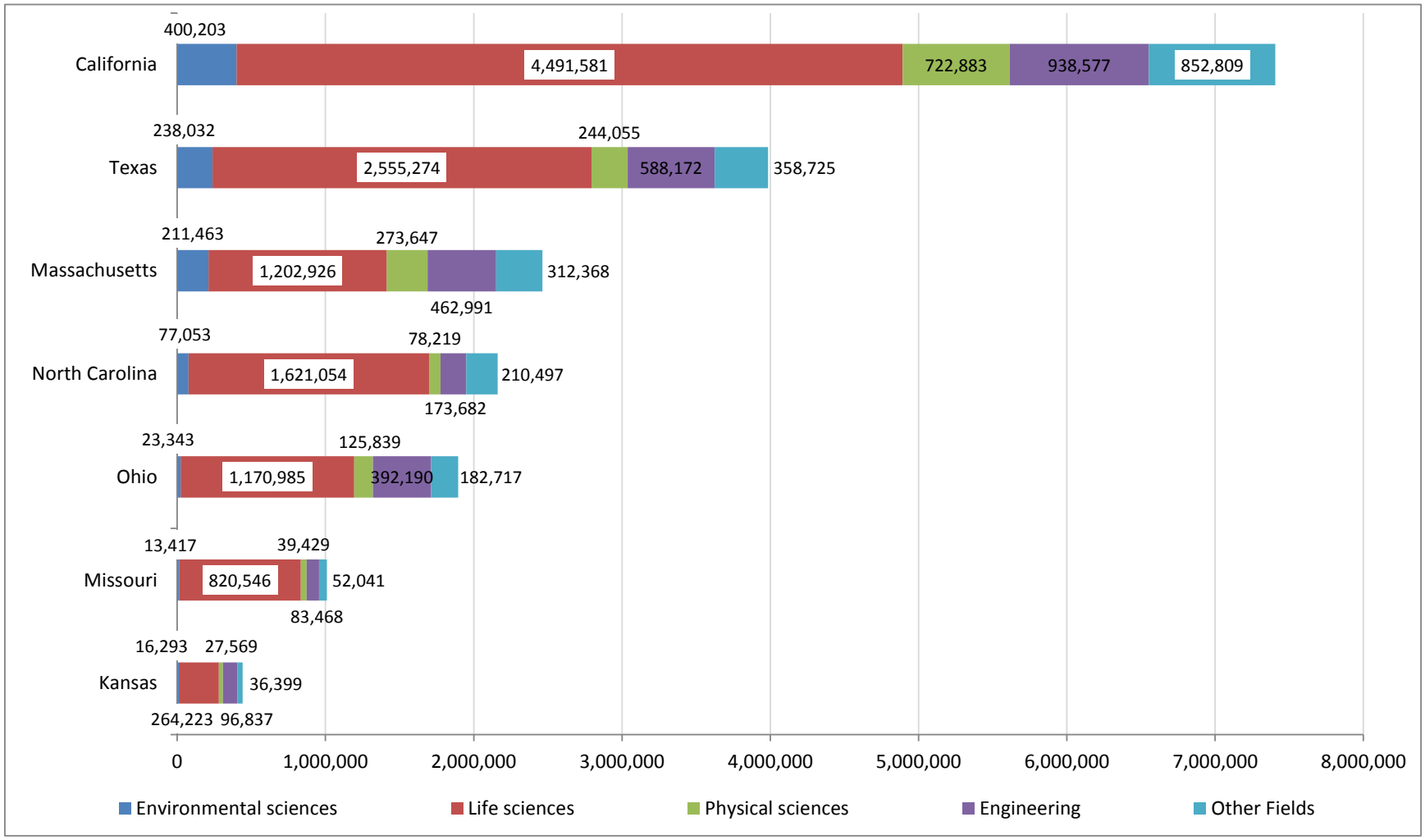
Source: National Science Foundation

Figure 67: Academic R&D Spending by Field, Texas (in $1,000)



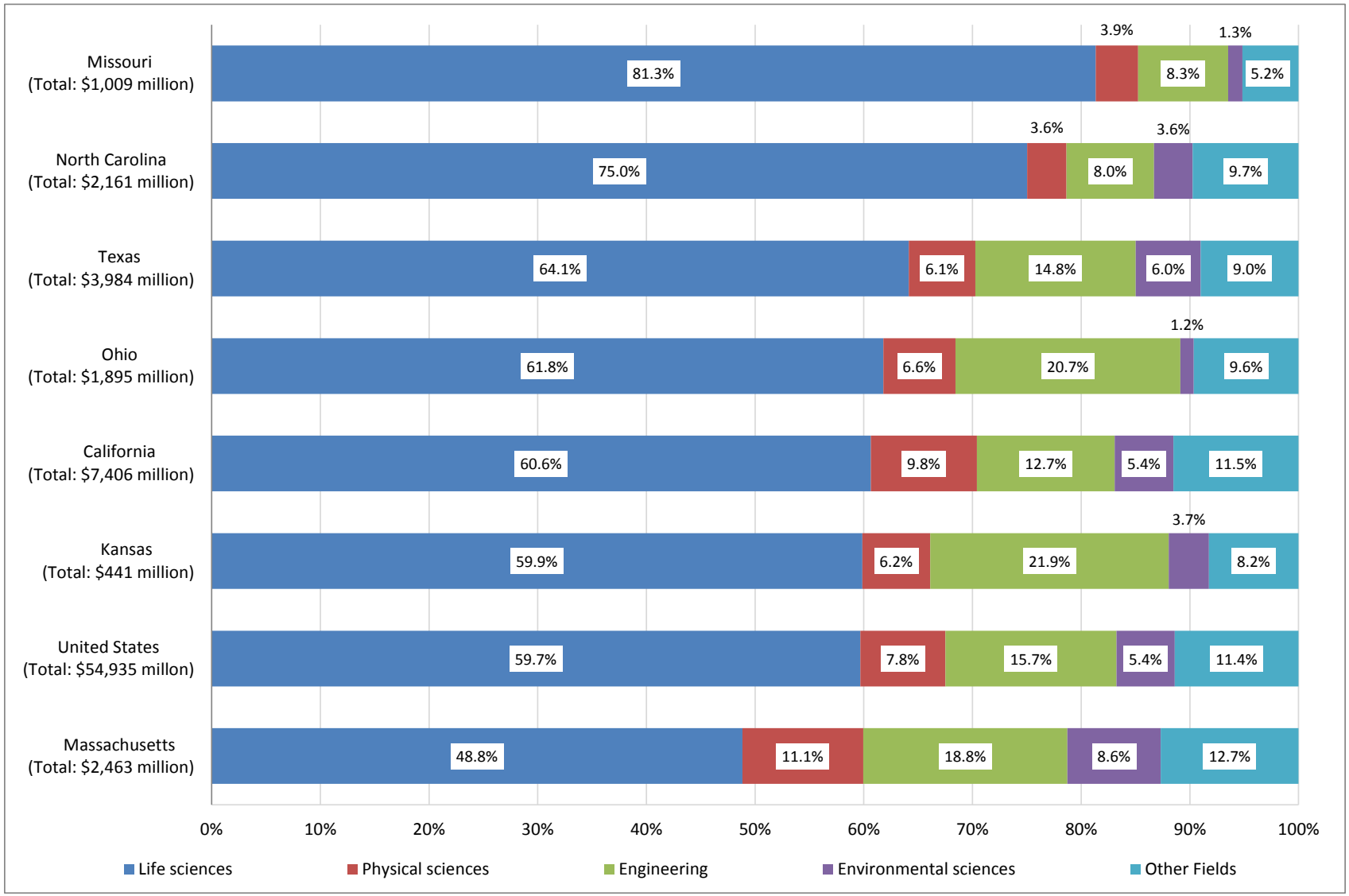
Source: National Science Foundation

Figure 68: Academic R&D Spending by Field, 2009 (in $1,000)



Source: National Science Foundation

Figure 69: Field Percentage in Academic R&D Spending, 2009



Source: National Science Foundation

The National Science Foundation (NSF) collected survey data of academic R&D spending in life science subfields and engineering subfields. This study selects the fields of agricultural sciences, biological sciences, medical sciences, and bioengineering/biomedical engineering as bioscience-related fields. Table 4 shows that the total academic R&D spending in the bioscience fields in the United States was $32,100 million in 2009, increasing by 28.7% from 2004. The academic R&D spending in bioscience increased 31.8% from 2004 to 2009 in Kansas, reaching $243 million in 2009.

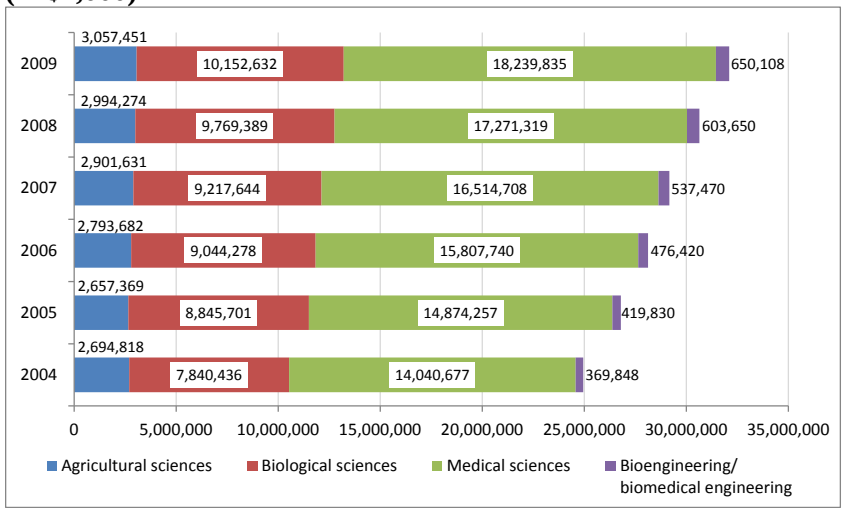
Figures 70 to 77 present academic spending in those four bioscience-related fields for the nation and each study state. The field of medical sciences had the largest share in the total bioscience academic R&D spending in all the study states except Kansas and Massachusetts. In Massachusetts, the field of medical sciences had the highest academic R&D spending among all the bioscience-related fields from 2004 to 2006, but had been exceeded by biological sciences since 2007 (Figure 73). In Kansas, the academic R&D spending in biological sciences always had the largest share in total bioscience R&D spending from 2004 to 2009 (Figure 72). In 2009, 53.5% of the total bioscience R&D spending was in the field of biological sciences in Kansas (Figure 79).

Table 4: Academic R&D Spending in Bioscience (in $1,000)

	2004	2005	2006	2007	2008	2009
United States	24,945,779	26,797,157	28,122,120	29,171,453	30,638,632	32,100,026
California	3,032,161	3,751,336	3,925,005	4,190,784	4,376,277	4,560,951
Kansas	184,555	192,387	194,655	207,144	226,859	243,306
Massachusetts	841,319	969,150	972,481	1,049,582	1,110,651	1,194,877
Missouri	634,262	678,644	692,910	752,639	776,749	801,730
North Carolina	998,784	1,175,460	1,230,265	1,419,787	1,470,010	1,565,245
Ohio	674,116	830,735	966,449	1,120,627	1,136,583	1,143,465
Texas	1,827,593	1,829,774	1,959,148	2,196,522	2,356,781	2,491,052

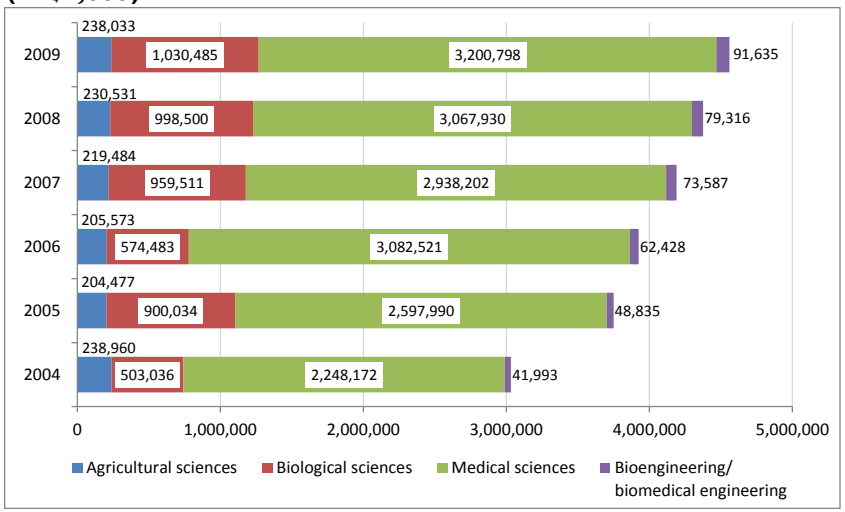
Source: National Science Foundation

Figure 70: Bioscience R&D Spending by Field, United States (in $1,000)



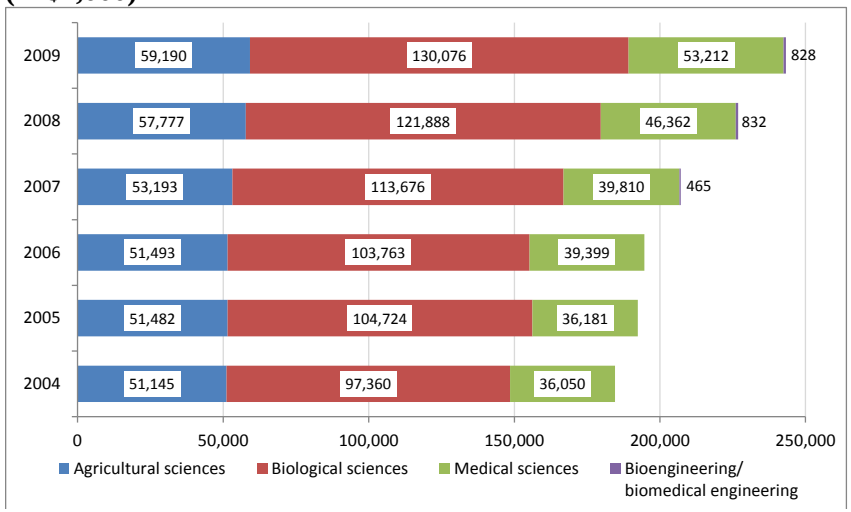
Source: National Science Foundation

Figure 71: Bioscience R&D Spending by Field, California (in $1,000)



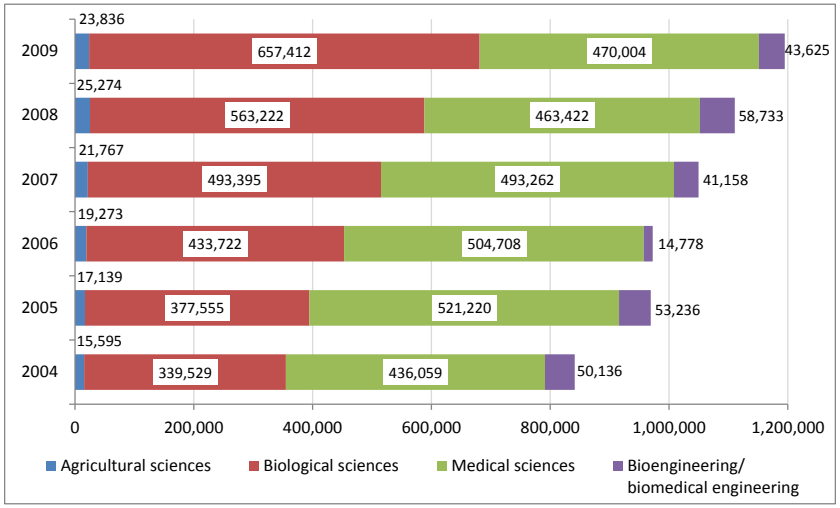
Source: National Science Foundation

Figure 72: Bioscience R&D Spending by Field, Kansas (in $1,000)



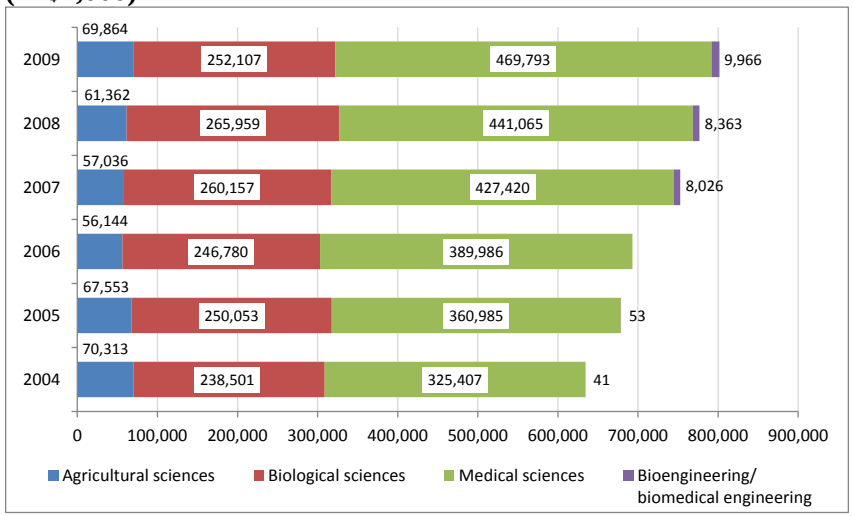
Source: National Science Foundation

Figure 73: Bioscience R&D Spending by Field, Massachusetts (in $1,000)



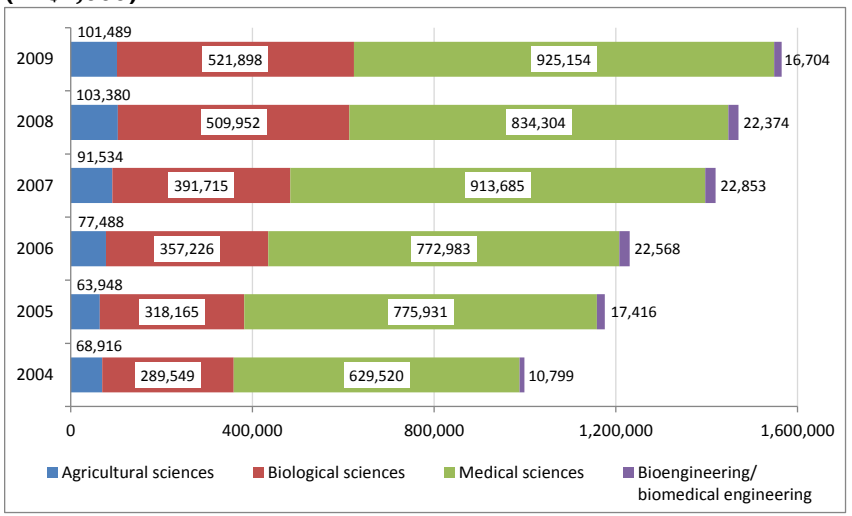
Source: National Science Foundation

Figure 74: Bioscience R&D Spending by Field, Missouri (in $1,000)



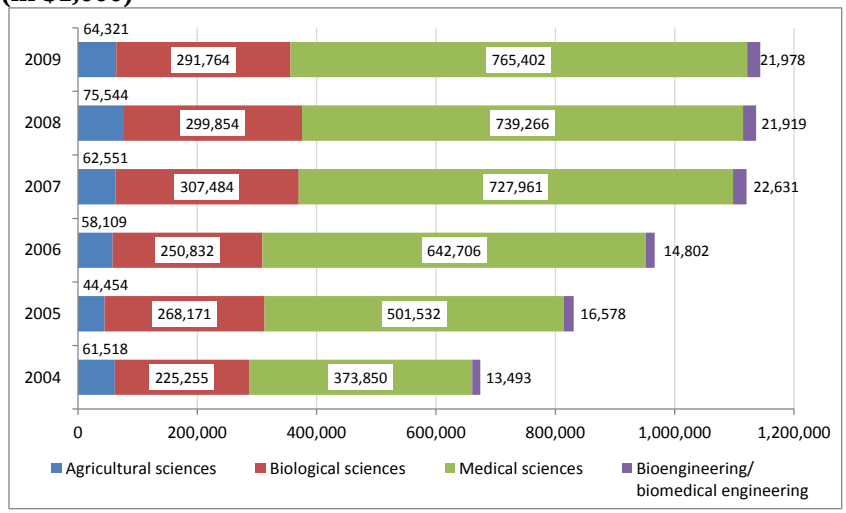
Source: National Science Foundation

Figure 75: Bioscience R&D Spending by Field, North Carolina (in $1,000)



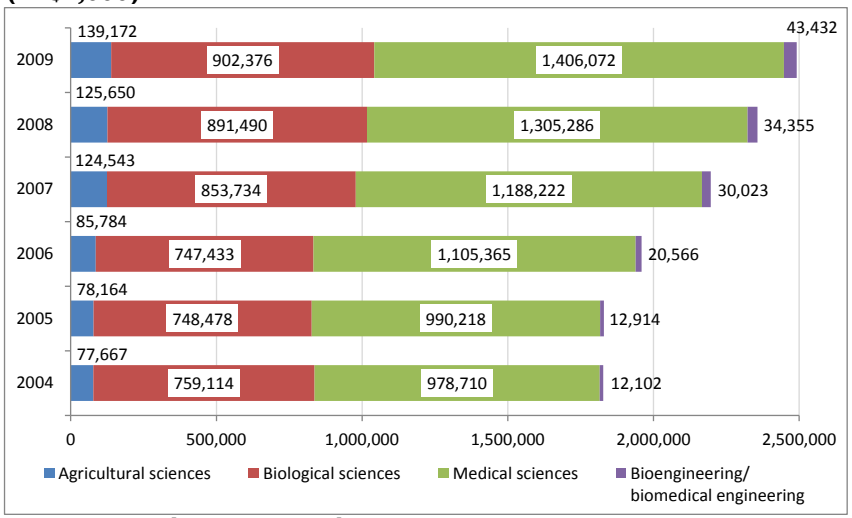
Source: National Science Foundation

Figure 76: Bioscience R&D Spending by Field, Ohio (in $1,000)



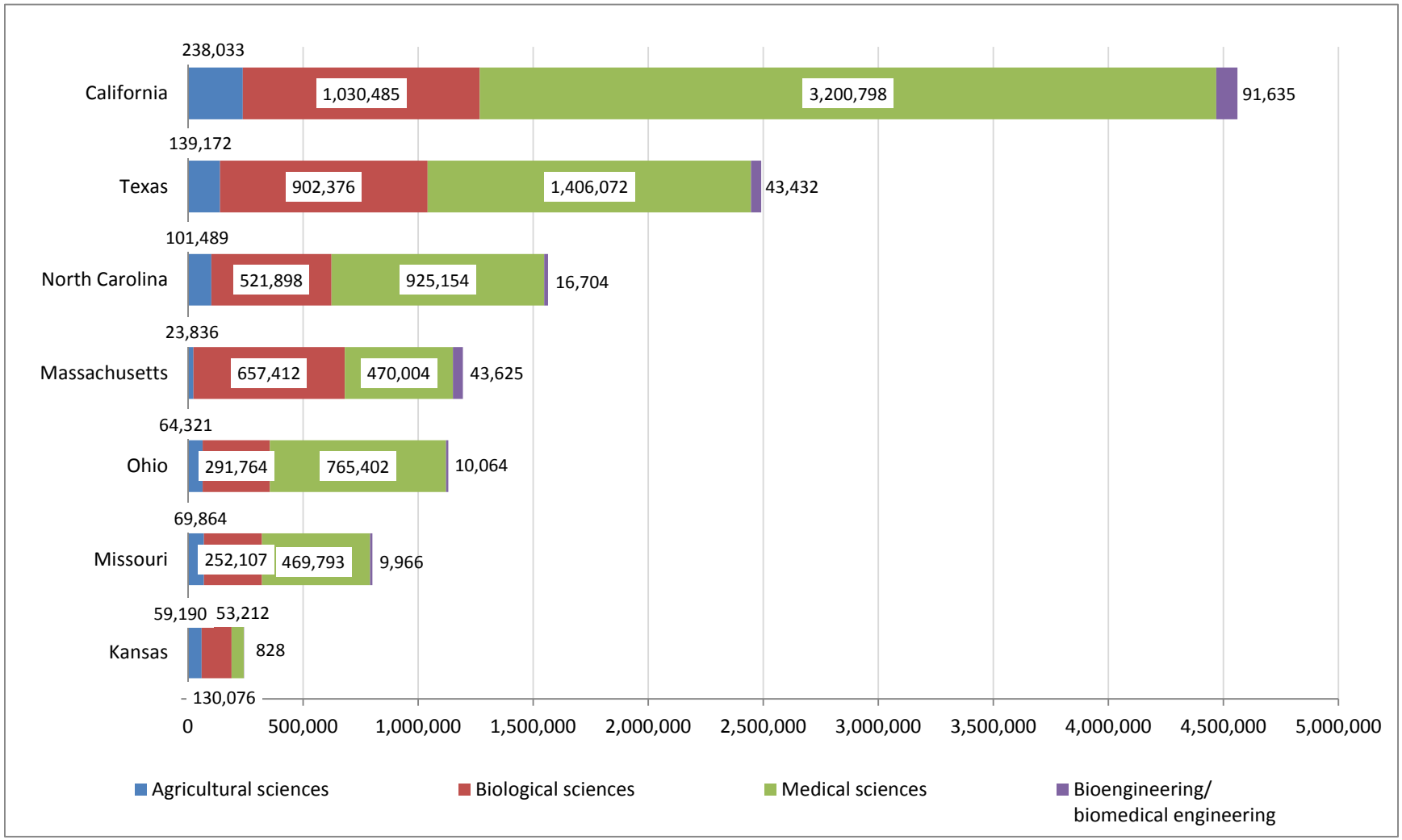
Source: National Science Foundation

Figure 77: Bioscience R&D Spending by Field, Texas (in $1,000)



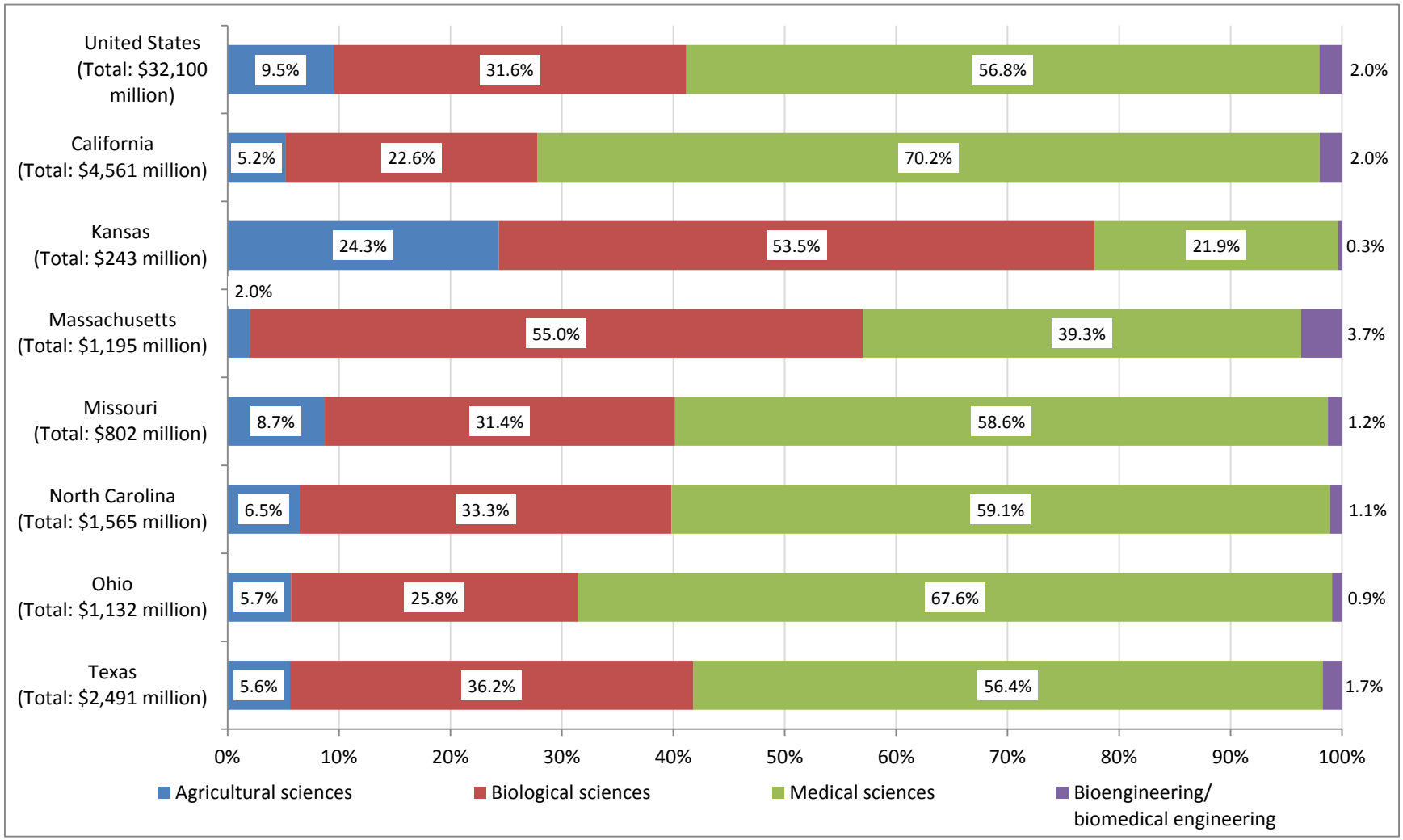
Source: National Science Foundation

Figure 78: Bioscience R&D Spending, 2009



Source: National Science Foundation

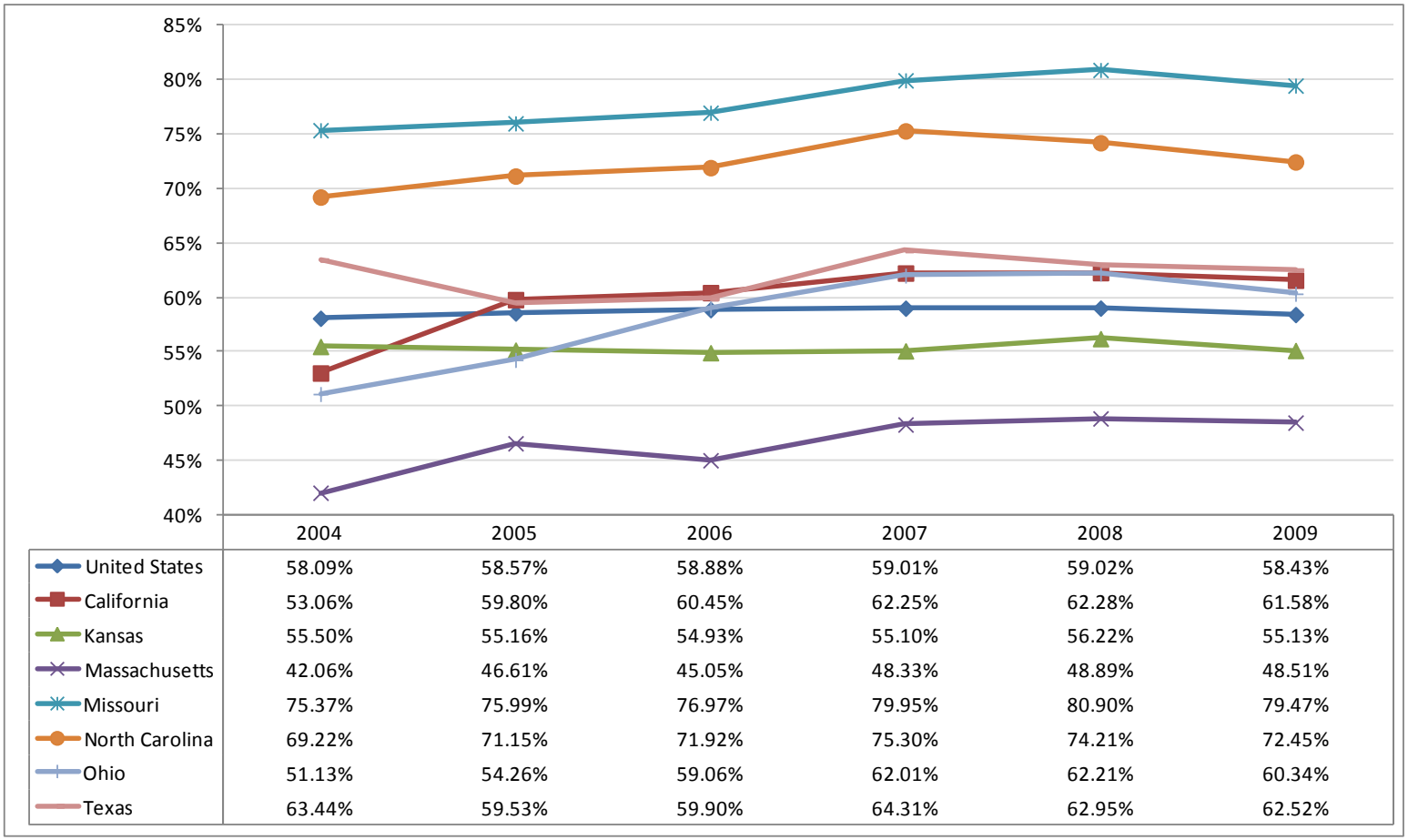
Figure 79: Field Percentage in Bioscience R&D Spending, 2009



Source: National Science Foundation

The academic R&D spending in bioscience accounts for a large proportion of the total academic R&D spending (Figure 80). In the United States, almost 60% of the academic R&D spending was in bioscience. In Kansas, the share had been around 55% from 2004 to 2009. In 2009, the academic R&D spending in bioscience was 79.47% of the total in Missouri (highest among all the study states), 55.13% in Kansas, and 48.5% in Massachusetts (lowest among all the study states).

Figure 80: Academic R&D Spending in Bioscience as a Percentage of Total Academic R&D Spending

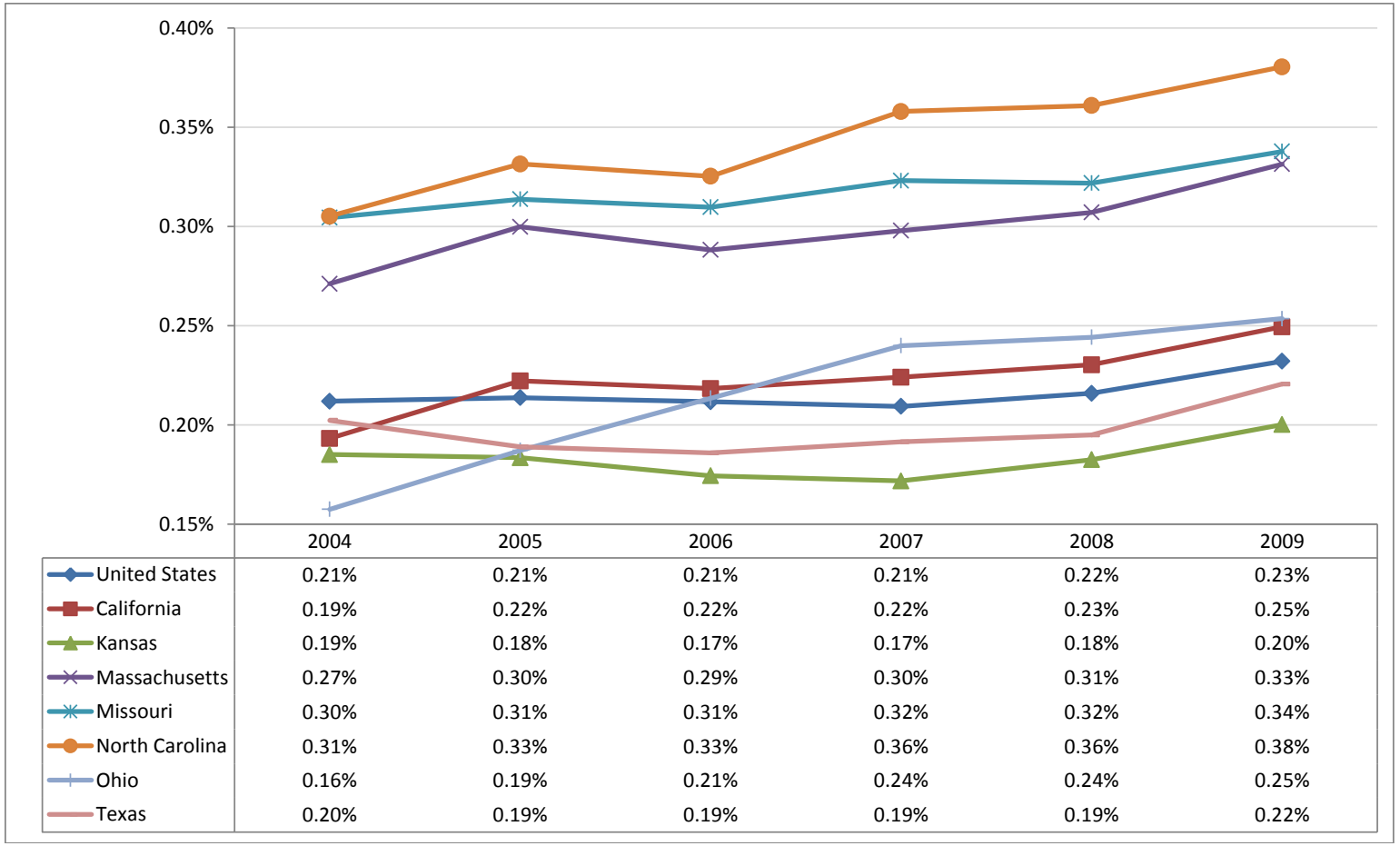


	2004	2005	2006	2007	2008	2009
United States	58.09%	58.57%	58.88%	59.01%	59.02%	58.43%
California	53.06%	59.80%	60.45%	62.25%	62.28%	61.58%
Kansas	55.50%	55.16%	54.93%	55.10%	56.22%	55.13%
Massachusetts	42.06%	46.61%	45.05%	48.33%	48.89%	48.51%
Missouri	75.37%	75.99%	76.97%	79.95%	80.90%	79.47%
North Carolina	69.22%	71.15%	71.92%	75.30%	74.21%	72.45%
Ohio	51.13%	54.26%	59.06%	62.01%	62.21%	60.34%
Texas	63.44%	59.53%	59.90%	64.31%	62.95%	62.52%

Source: National Science Foundation

The bioscience R&D spending in Kansas accounted for 0.2% of the state GDP in 2009, which was the lowest among all the study states (Figure 81). The national average was 0.23% in 2009. North Carolina ranked the highest since 2004. In 2009, the bioscience R&D spending in North Carolina was 0.38% of the state GDP.

Figure 81: Academic R&D Spending in Bioscience as a Percentage of Gross Domestic Product

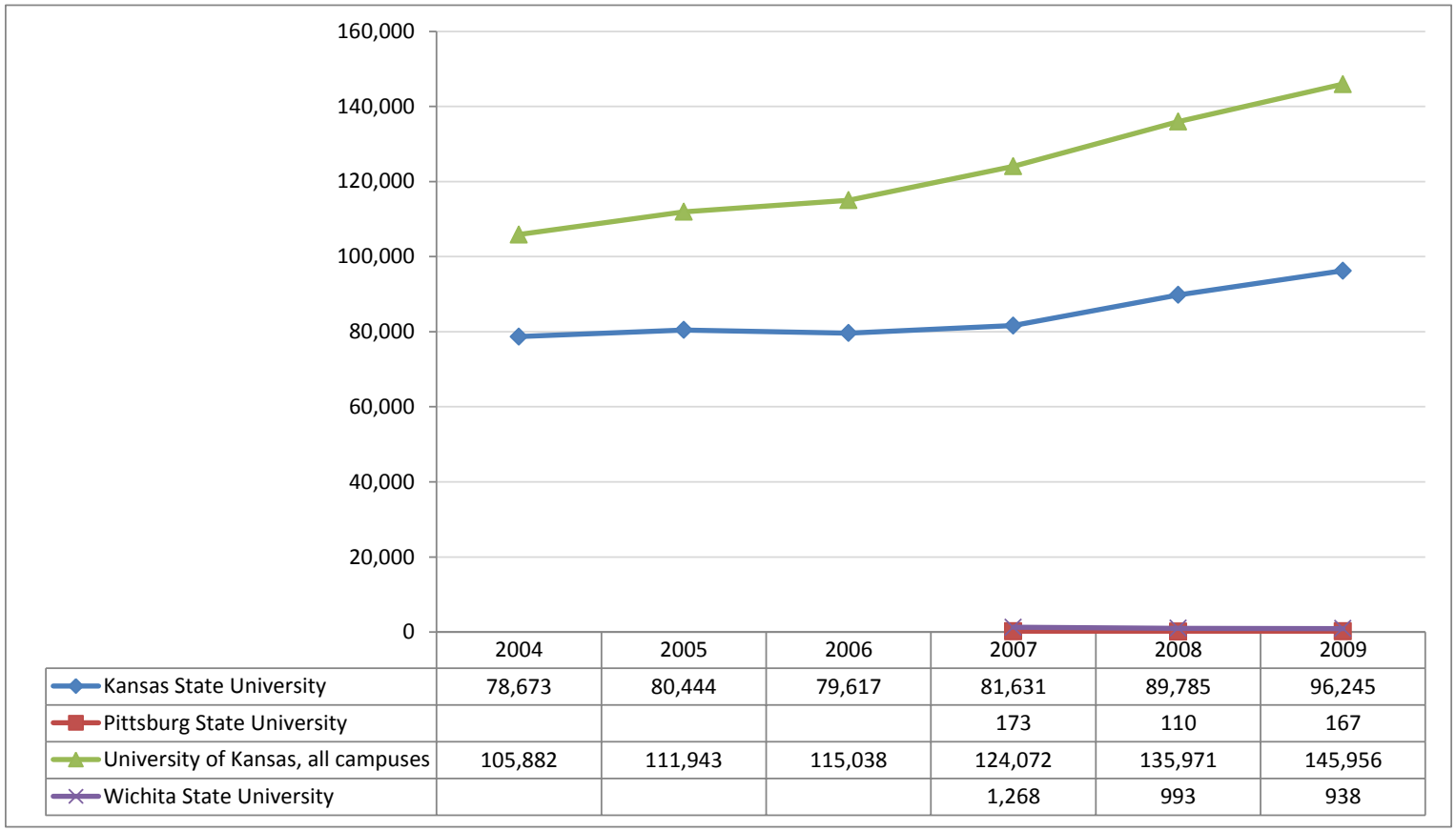


	2004	2005	2006	2007	2008	2009
United States	0.21%	0.21%	0.21%	0.21%	0.22%	0.23%
California	0.19%	0.22%	0.22%	0.22%	0.23%	0.25%
Kansas	0.19%	0.18%	0.17%	0.17%	0.18%	0.20%
Massachusetts	0.27%	0.30%	0.29%	0.30%	0.31%	0.33%
Missouri	0.30%	0.31%	0.31%	0.32%	0.32%	0.34%
North Carolina	0.31%	0.33%	0.33%	0.36%	0.36%	0.38%
Ohio	0.16%	0.19%	0.21%	0.24%	0.24%	0.25%
Texas	0.20%	0.19%	0.19%	0.19%	0.19%	0.22%

Source: National Science Foundation, U.S. Bureau of Economic Analysis

Among Kansas universities, the academic R&D spending in bioscience at the University of Kansas was the highest. Kansas State University ranked the second (Figure 82). In 2009, a total of $146 million was spent on bioscience research and development at the University of Kansas, and $96 million was spent at Kansas State University. The academic R&D spending in bioscience was much lower at Pittsburg State University and Wichita State University when compared with the University of Kansas and Kansas State University.

Figure 82: Academic R&D Spending in Bioscience at Kansas Universities (in $1,000)



	2004	2005	2006	2007	2008	2009
Kansas State University	78,673	80,444	79,617	81,631	89,785	96,245
Pittsburg State University				173	110	167
University of Kansas, all campuses	105,882	111,943	115,038	124,072	135,971	145,956
Wichita State University				1,268	993	938

*Data not available for Pittsburg State University and Wichita State University before 2007
Source: National Science Foundation

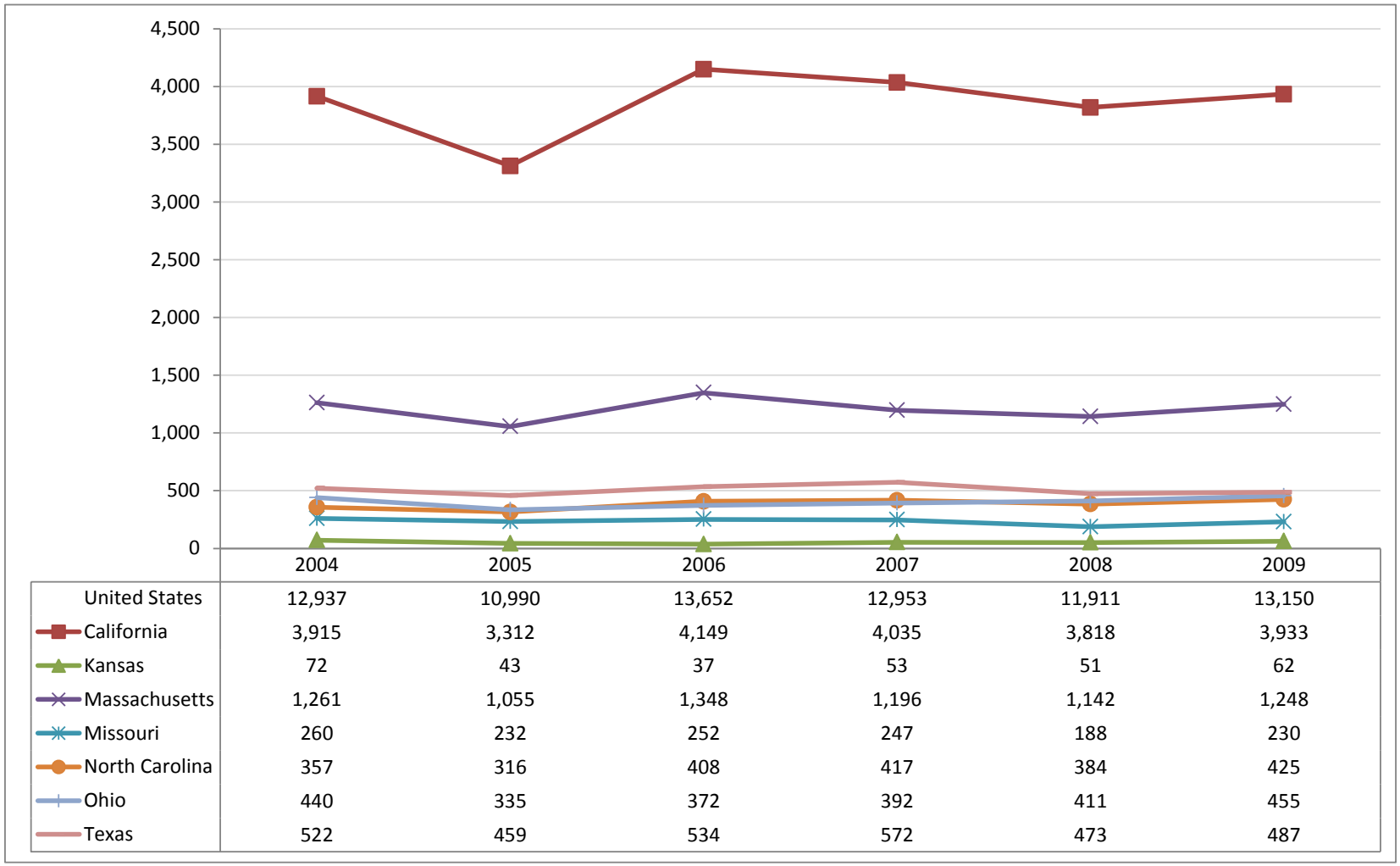
Innovation Capacity

Innovation could be either radical or incremental. The positive changes in thinking, processes, and services lead to increases in productivity and wealth in an economy. This section examines the number of bioscience-related patents issued and venture capital activities in bioscience.

The number of patents indicates the level of innovative thinking and research, which has the potential to be commercialized into products and services. In 2009, 13,150 bioscience-related patents were granted by the U.S. Patent and Trademark Office within the United States (Figure 83). Among them, 62 were from Kansas, which accounted for 14.25% of all the granted patents from Kansas in that year (Figure 84). In the United States, 15.96% of the patents issued within the U.S. were bioscience-related in 2009. The percentage was 33.77% in Massachusetts in 2009, which was the highest among the study states.

Bioscience-related venture capital is another factor that affects the innovative capacity. It provides critical funding for new bioscience startups and companies with high growth potential. Figure 85 shows that California and Massachusetts had very large bioscience-related capital investment. In 2009, the bioscience-related venture capital investment in California and Massachusetts amounted to $4,483 million, which accounted for 57.7% of the total bioscience-related venture capital investment in the United States. In Kansas, $6 million venture capital was invested in bioscience in 2009. From 2004 to 2009, a total of $120 million bioscience-related venture capital was invested in Kansas (Figure 85).

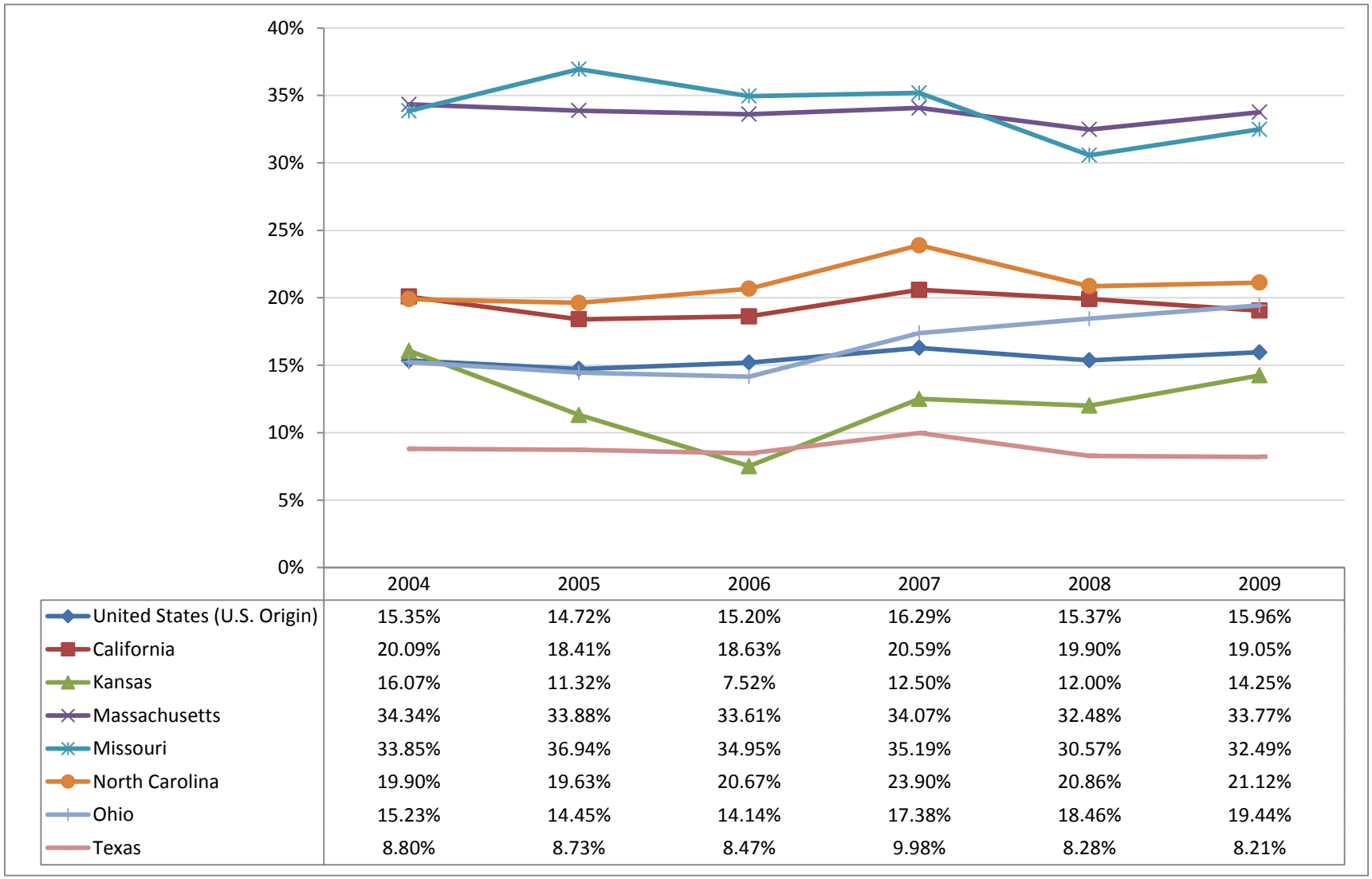
Figure 83: Bioscience-related Patents Awarded



	2004	2005	2006	2007	2008	2009
United States	12,937	10,990	13,652	12,953	11,911	13,150
California	3,915	3,312	4,149	4,035	3,818	3,933
Kansas	72	43	37	53	51	62
Massachusetts	1,261	1,055	1,348	1,196	1,142	1,248
Missouri	260	232	252	247	188	230
North Carolina	357	316	408	417	384	425
Ohio	440	335	372	392	411	455
Texas	522	459	534	572	473	487

Source: Battelle Memorial Institute

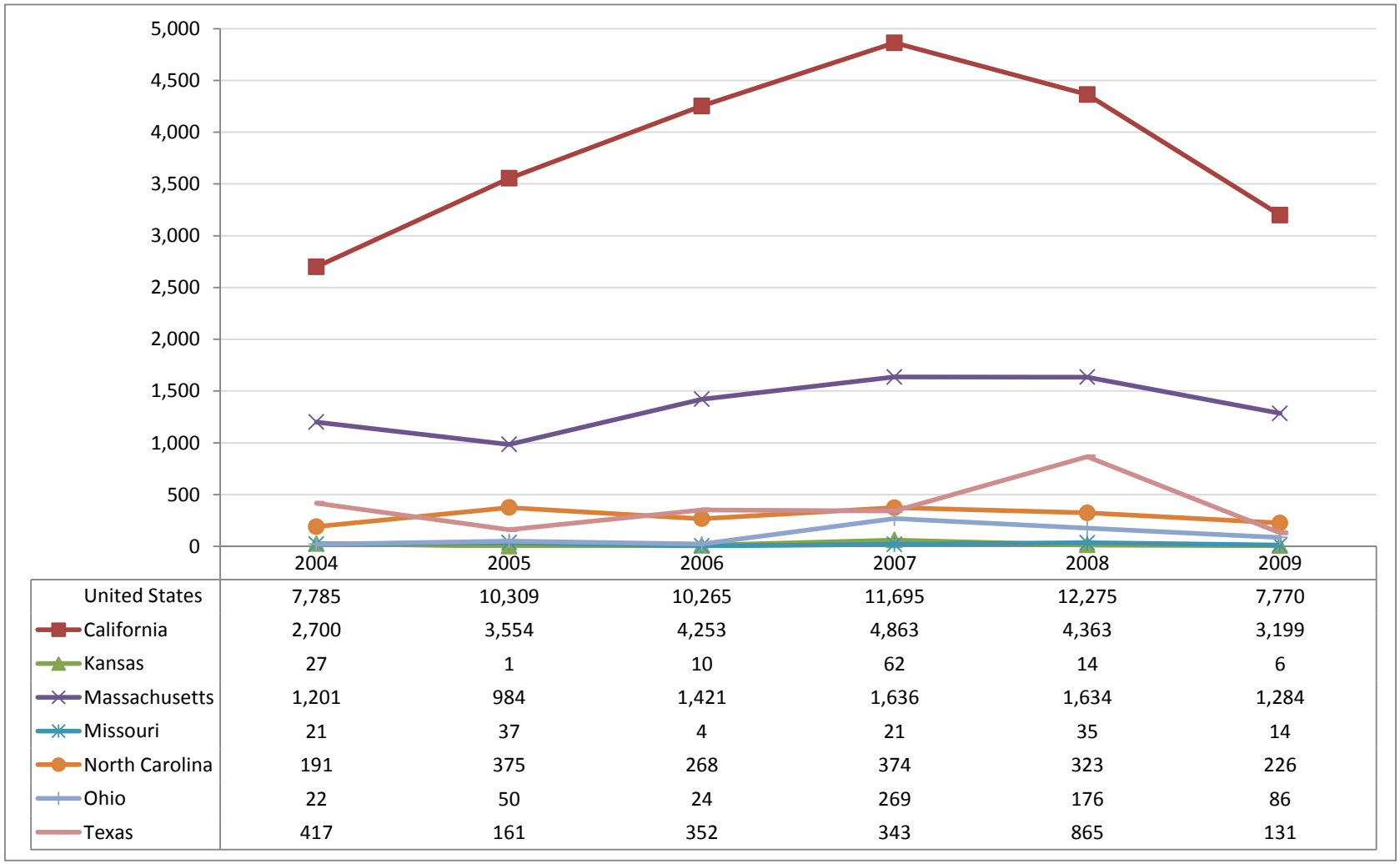
Figure 84: Bioscience-related Patents as a Percentage of Total Patents Awarded



	2004	2005	2006	2007	2008	2009
United States (U.S. Origin)	15.35%	14.72%	15.20%	16.29%	15.37%	15.96%
California	20.09%	18.41%	18.63%	20.59%	19.90%	19.05%
Kansas	16.07%	11.32%	7.52%	12.50%	12.00%	14.25%
Massachusetts	34.34%	33.88%	33.61%	34.07%	32.48%	33.77%
Missouri	33.85%	36.94%	34.95%	35.19%	30.57%	32.49%
North Carolina	19.90%	19.63%	20.67%	23.90%	20.86%	21.12%
Ohio	15.23%	14.45%	14.14%	17.38%	18.46%	19.44%
Texas	8.80%	8.73%	8.47%	9.98%	8.28%	8.21%

Source: Battelle Memorial Institute, U.S. Patent and Trademark Office

Figure 85: Bioscience-related Venture Capital Investment (in million $)



	2004	2005	2006	2007	2008	2009
United States	7,785	10,309	10,265	11,695	12,275	7,770
California	2,700	3,554	4,253	4,863	4,363	3,199
Kansas	27	1	10	62	14	6
Massachusetts	1,201	984	1,421	1,636	1,634	1,284
Missouri	21	37	4	21	35	14
North Carolina	191	375	268	374	323	226
Ohio	22	50	24	269	176	86
Texas	417	161	352	343	865	131

Source: Battelle Memorial Institute

Workforce Capacity

A highly skilled and educated workforce in the bioscience industry is very important to grow and sustain the bioscience industry. This section examines the share of science and engineering doctorate holders in the workforce and the share of life and physical scientists in the workforce. Doctorate holders are most likely to assume a higher proportion of research responsibilities than people with lower-level degrees. Share of science and engineering doctorate holders in the workforce indicates the research capacity of a state's workforce in science and engineering. The share of life and physical scientists in workforce measures the research capacity of a state's workforce in life and physical sciences, which are related to the development of the bioscience industry.

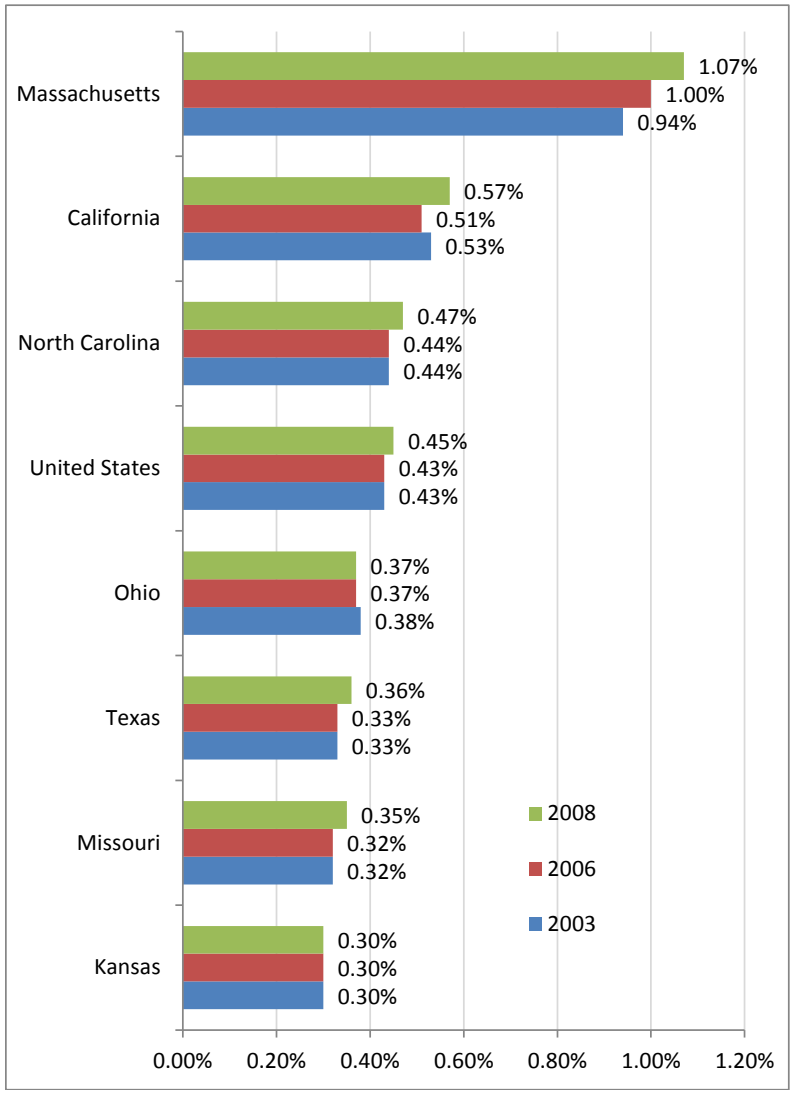
Among all the study states, Kansas has the smallest employed workforce. In year 2011, the overall size of the employed workforce was 1,404,339 in Kansas. In Kansas, 0.3% of its employed workforce was comprised of science and engineering doctorate holders in 2003, 2006 and 2008. Massachusetts had the highest level of science and engineering doctorate holders in workforce. In 2008, 1.07% of Massachusetts' workforce had science and engineering doctorate degrees (Figure 86). Massachusetts also had the highest percentage of life and physical scientists in its workforce. In 2010, 0.86% of Massachusetts' workforce was life and physical scientists. In Kansas, the percentage was 0.41% in 2010, rising from 0.34% in 2004 (Figure 87).

Table 5: Employed Workforce

	2004	2005	2006	2007	2008	2009	2010	2011
United States	129,278,176	131,571,623	133,833,834	135,366,106	134,805,659	128,607,842	127,820,442	129,408,962
California	16,354,779	16,592,204	16,821,266	16,960,730	16,890,021	16,144,481	16,051,513	16,226,558
Kansas	1,381,343	1,390,292	1,403,938	1,411,384	1,415,467	1,399,356	1,397,208	1,404,339
Massachusetts	3,203,810	3,219,717	3,255,504	3,276,532	3,277,179	3,184,631	3,180,680	3,202,251
Missouri	2,815,878	2,849,708	2,889,461	2,894,771	2,871,930	2,784,226	2,767,306	2,785,797
North Carolina	4,031,081	4,123,857	4,261,325	4,283,826	4,281,719	4,085,701	4,111,884	4,164,814
Ohio	5,502,533	5,537,419	5,602,764	5,611,042	5,557,149	5,327,706	5,278,510	5,305,348
Texas	10,385,318	10,551,547	10,757,510	10,914,098	11,079,931	11,071,106	11,264,748	11,464,525

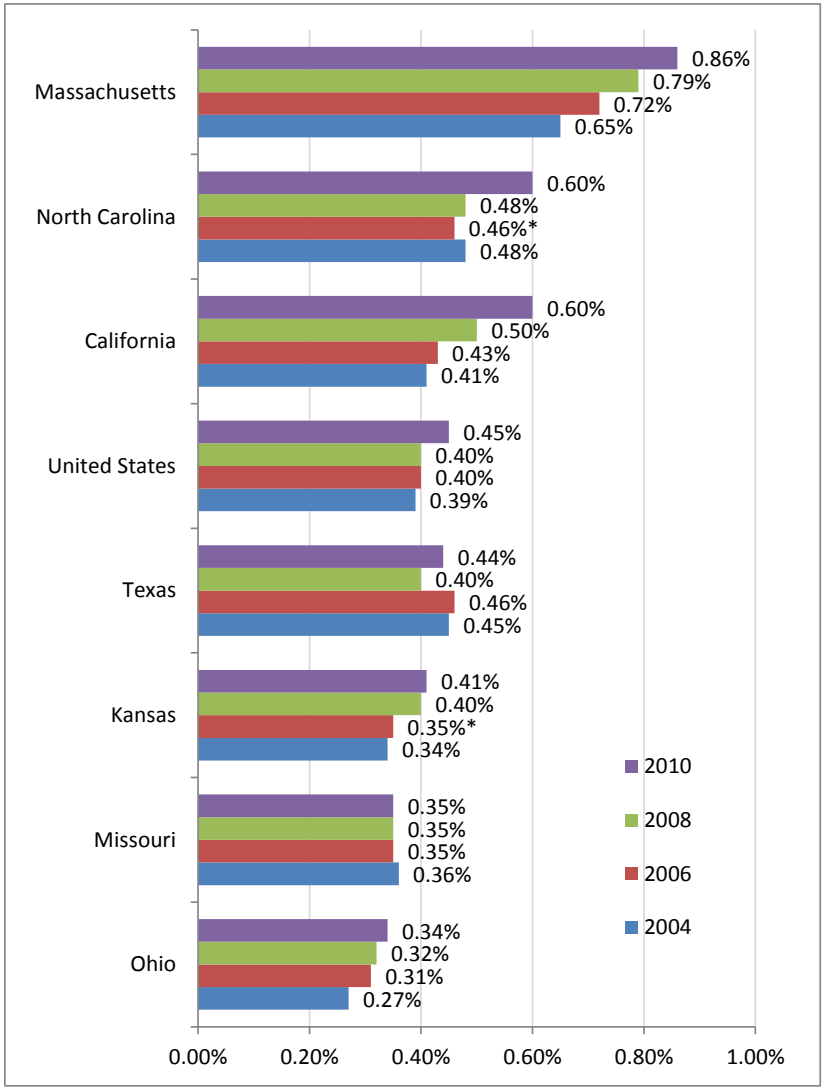
Source: U.S. Bureau of Labor Statistics

Figure 86: Employed Science and Engineering Doctorate Holders as a Percentage of Employed Workforce



Source: National Science Foundation

Figure 87: Employed Life and Physical Scientists as a Percentage of Employed Workforce



Source: National Science Foundation