

Industry Employment Report

Antonio Jurlina

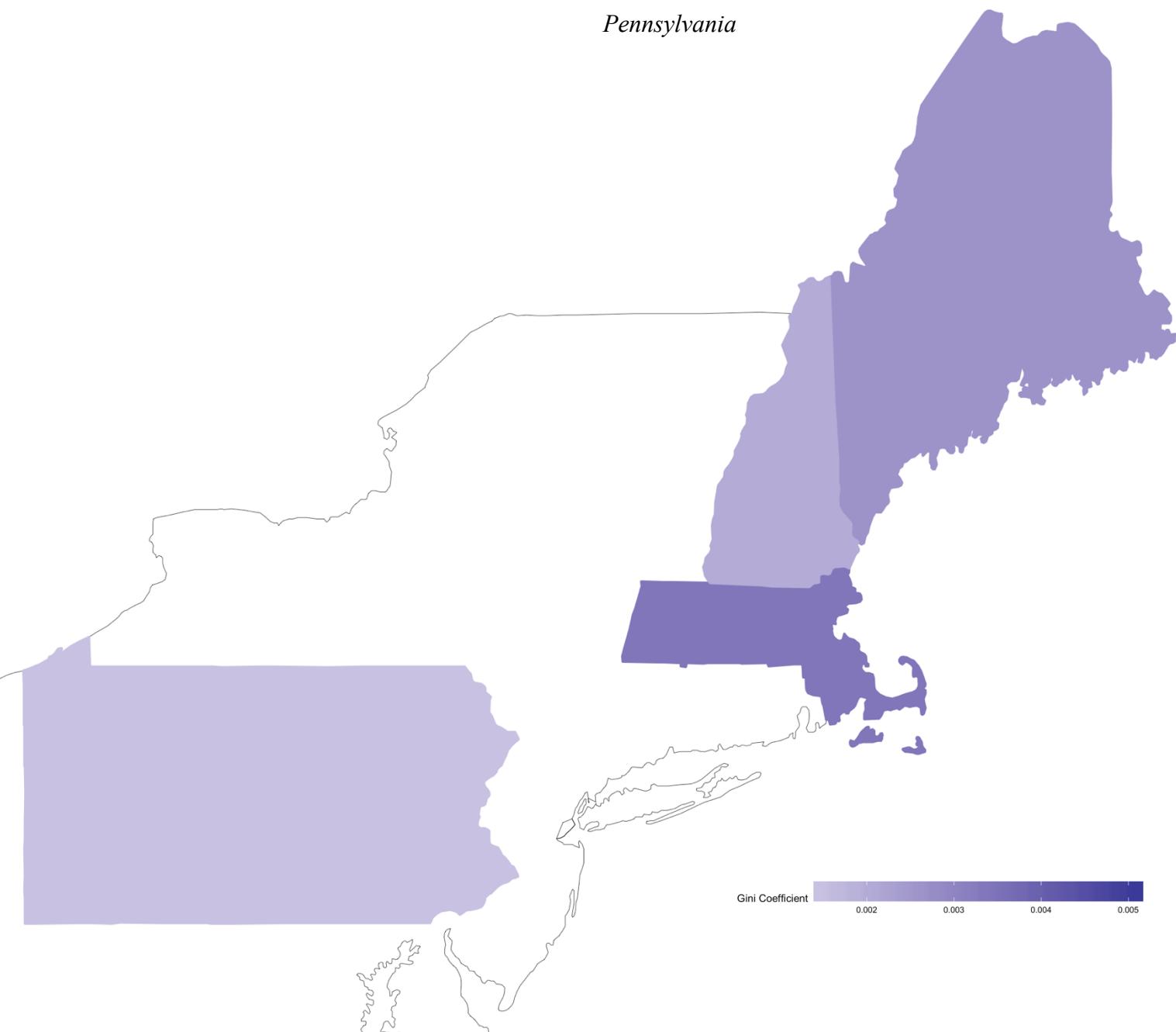
2009 – 2017

Maine

Massachusetts

New Hampshire

Pennsylvania



ECO 527

Regional Economics: Modeling

Prof. Andrew Crawley

The purpose of this report is to analyze changes in industry employment levels across four states: Maine, New Hampshire, Massachusetts, and Pennsylvania. Specifically, the period under consideration is between (and including) years 2009 and 2017. The report will begin by describing the types of analyses used and the scale of focus. Then, it is going to cover some overall trends across the regions, before finally delving into specific industry trends in each region.

Six different statistics were calculated to illustrate employment trends under consideration. *Location quotient* (LQ) serves as indicator of how concentrated an industry in the region is, compared to the nation. In unison with percent of regional employment covered by a specific industry, LQ will indicate how vital said industry might be to the regional economy. *Growth Rate* (GR) serves as an indicator of industry-specific employment change over time. *Birch Index* (BI) is another growth measure focusing not only on relative, but absolute growth as well. *National Share* (NS) shows how much of total change in employment for an industry can be attributed to the growth of the U.S. economy. *Industrial Mix* (IM) shows how much of the same change can be attributed to economic performance of the relevant industry and *Local Share* (LS) shows how much of it can be attributed to regional influences. Finally, this report will observe industrial employment trends at the 3-digit NAICS level in order to more accurately pinpoint the sources of major changes.

At state level, all states except Pennsylvania show small drops in Gini coefficients and LQs (see Table 4). In Maine, Massachusetts and New Hampshire, there is 28%, 402% and 141% growth in employment, respectively. Alternatively, Pennsylvania shows a decrease of 0.4% in employment. Furthermore, these trends can be mostly attributed to a positive growth in the U.S. economy (see Figure 15). Maine, New Hampshire and Pennsylvania exhibit negative regional influence on employment levels, with the LS influence in Pennsylvania overcoming the positive

effects of NS and IM and ultimately being the reason behind overall decline. Upon removing some outliers (industry shifts greater than 25,000 employees), the shift share analysis across states remains largely the same, with the major difference being that now Pennsylvania is the only state with a negative LS influence. Without outliers, each state has experienced most growth due to growth of U.S. economy as a whole (see Figure 16).

Industries employing over 60% of workforce in each state are largely the same: Health care and Social assistance, Retail trade, Accommodation and Food services and Food services and Drinking places. Maine, New Hampshire and Pennsylvania also share the Manufacturing industry as another high employing one, while in Massachusetts Professional and Technical services industry takes that place (see Table 1). All of these industries have LQs around 1, suggesting concentration levels equal to those of the nation as a whole. Moreover, between 2009 and 2017, there weren't any significant changes in these values. Table 1 also shows that NS effects have only been positive within industries, with negative ones coming from some mix of IM and LS. Together, these values indicate that these industries are important to their respective regions mostly because they employ such a large share of the workforce. However, they are not a source of regional growth, only insofar the whole economy is.

Maine's five most concentrated industries range from 20 to 3 times more concentrated in the region than the nation. Together, they employ around 2% of the workforce and are likely exporters, but not that vital to the region (see Table 2). Focusing on outliers (LQ changes greater than 80%), Maine has had four industries experiencing significant growth and one facing major decline (see Tables 3, 5 and Figures 4, 17). Growing industries now account for over 14% of the workforce and have centralized more. The declining industry (Waste management) has been

reduced from 6% to almost 0.2% of the workforce. Each of these shifts can largely be attributed to regional effects.

In **Massachusetts**, five most concentrated industries range from 7 to 2 times more concentrated in the region than the nation. Together, they employ around 8% of the workforce and are likely exporters, but not that vital to the region (see Table 2). Focusing on outliers, Massachusetts has had 11 industries experiencing significant growth and three facing major decline (see Tables 3, 5 and Figures 6, 18). Growing industries now account for almost 11% of the workforce and have centralized more. Declining industries (Textile mills, Petroleum and Coal manufacturing, Beverage and Tobacco manufacturing) have decreased by almost 90% and are less centralized in the region compared to the nation. Beverage and Tobacco manufacturing went from 16 to 0.8 times more concentrated. Each of these shifts can largely be attributed to regional effects.

New Hampshire's five most concentrated industries range from 4 to 2 LQ. Together, they employ around 7% of the workforce, but are not that vital to the region (see Table 2). Focusing on outliers, New Hampshire has had 4 industries experiencing significant growth and two facing major decline (see Tables 3, 5 and Figures 8, 19). Growing industries now account for 4% of the workforce and have centralized more. Both declining industries have gone to almost nonexistent in the region, with the Funds, trusts and other financial vehicles industry experiencing a drastic shift from 453 to 0.3 times more concentrated in the region than the nation. While other changes are due to local influences, this one is a significant mix of local and industry influences.

Pennsylvania's five most concentrated industries range from 2.2 to 1.6 LQ. Together, they employ 4.5% of the workforce, but are not that vital to the region (see Table 2). There is only one industry with significant growth, and it is the Electronic markets, agents and brokers industry, accounting for 0.9% of the workforce (see Tables 3, 5 and Figures 10, 20). Local effects, combined

with NS, give enough of a positive growth effect, to undo the poor performance of the industry in general.

Word count: 998

Notes on tables and figures:

- *% Employment* is industry employment as percentage of total state employment
- *LQ* is Location Quotient (industry's share of regional employment divided by its share of national employment)
- *Growth Rate* is simply the percent change in industry employment between 2009 and 2017
- *Birch Index* is industry difference in employment between 2017 and 2009 multiplied by their ratio
- *National share* shows how much of total change in employment for an industry can be attributed to the growth of the U.S. economy
- *Industrial mix* shows how much of the same change can be attributed to economic performance of the relevant industry
- *Local share* shows how much of it can be attributed to regional influences
- *Each industry* was analyzed at 3-digit NAICS level
- *Arrows* indicate the direction of change from 2009, however the values don't reflect the amount of change, just final value
- *Red* indicates a value that has decreased from 2009 (if arrow is present) or a negative value
- *Green* indicates a value that has increased from 2009 (if arrow is present) or a positive value

Table 1 – Top 5 industries in each state, based on 2017 % Employment

State	Industry	2009 LQ	2017 LQ	2009 % Employment	2017 % Employment	Growth rate	Birch Index	National share	Industrial mix	Local share
Maine	Health care and social assistance	1.4	↓ 1.3	21.1	↓ 20.8	3.3	3503.5	6048.2	3613.8	-6271.0
Maine	Retail trade	1.2	↑ 1.3	16.2	↓ 15.4	-0.7	-513.6	4654.1	-5257.4	86.3
Maine	Accommodation and food services	0.9	↑ 0.9	10.3	↑ 10.5	7.2	3833.4	2940.7	384.3	251.0
Maine	Manufacturing	1.0	↑ 1	10.3	↑ 10.3	4.1	2153.6	2958.2	-1071.6	181.4
Maine	Food services and drinking places	0.9	↑ 0.9	8.6	↓ 8.3	1.6	644.9	2866.1	897.1	-3128.3
Massachusetts	Health care and social assistance	1.3	↑ 1.3	20.0	↑ 20.1	7.5	47723.6	34996.4	20910.3	-11515.7
Massachusetts	Retail trade	0.9	↑ 0.9	11.7	↓ 10.9	-0.6	-2181.1	20463.9	-23116.5	457.6
Massachusetts	Professional and technical services	1.4	↑ 1.4	10.0	↑ 10.8	16.2	55099.1	20671.5	10237.7	16522.8
Massachusetts	Accommodation and food services	0.9	↑ 0.9	9.7	↑ 9.7	6.8	20796.6	16956.0	2216.1	300.8
Massachusetts	Food services and drinking places	0.9	↑ 0.9	8.7	↓ 8.5	6.3	17028.6	17845.1	5585.7	-7414.8
New Hampshire	Health care and social assistance	1.0	↑ 1	16.2	↑ 16.4	6.9	6420.3	5181.8	3096.1	-2269.9
New Hampshire	Retail trade	1.3	↑ 1.3	17.2	↓ 16.3	-0.2	-211.5	5496.4	-6208.8	500.4
New Hampshire	Manufacturing	1.2	↑ 1.2	12.4	↑ 12.5	6.8	4822.5	3953.1	-1432.0	1995.9
New Hampshire	Accommodation and food services	0.9	↑ 0.9	10.0	↑ 10.2	7.7	4449.8	3179.5	415.6	537.0
New Hampshire	Food services and drinking places	0.9	↑ 0.9	8.5	↑ 8.7	8.2	4076.3	3244.4	1015.5	-492.0
Pennsylvania	Health care and social assistance	1.2	↑ 1.2	19.0	↑ 20	10.1	105427.7	56055.3	33493.1	6199.7
Pennsylvania	Retail trade	1.0	↓ 0.9	12.5	↓ 11.5	-3.2	-19473.4	36896.2	-41678.8	-15340.5
Pennsylvania	Manufacturing	1.1	↑ 1.1	11.4	↓ 11	1.4	8023.3	33595.4	-12170.2	-13512.3
Pennsylvania	Accommodation and food services	0.8	↑ 0.8	9.0	↑ 9.2	6.3	30161.8	26636.4	3481.4	-1744.8
Pennsylvania	Food services and drinking places	0.9	↓ 0.8	8.1	↓ 8	-1.6	-6823.3	30063.4	9410.1	-46409.5

Table 2 – Top 5 industries in each state, based on 2017 LQ

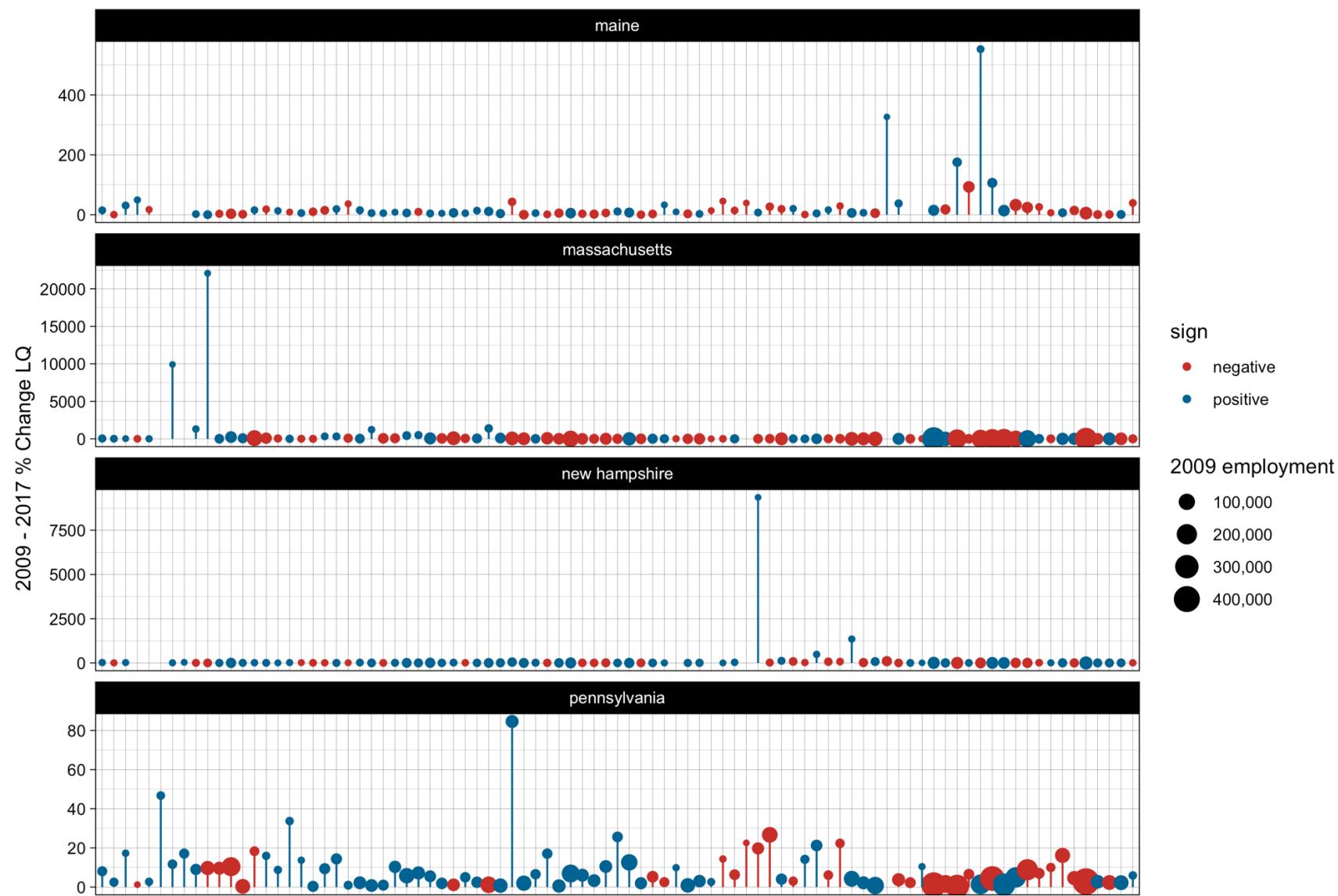
State	Industry	2009 LQ	2017 LQ	2009 % Employment	2017 % Employment	Growth rate	Birch Index	National share	Industrial mix	Local share
Maine	Fishing, hunting and trapping	13.4	↑ 20.1	0.1	↑ 0.1	56.1	365.3	29.4	-2.9	207.5
Maine	Leather and allied product manufacturing	15.8	↑ 16.7	0.4	↑ 0.4	-1.4	-25.6	130.3	-220.9	64.6
Maine	Forestry and logging	8.3	↑ 10.8	0.4	↑ 0.4	18.0	393.1	130.0	-280.5	483.5
Maine	Unclassified	0.3	↑ 4.4	0.1	↑ 0.5	882.4	24618.8	16.8	-102.1	2591.3
Maine	Paper manufacturing	3.6	↓ 3.1	1.2	↓ 0.9	-17.7	-795.4	383.9	-469.0	-881.9
Massachusetts	Fishing, hunting and trapping	7.4	↓ 7.1	0.0	↑ 0	4.3	63.6	99.3	-9.6	-28.7
Massachusetts	Leather and allied product manufacturing	2.8	↓ 2.6	0.1	↑ 0.1	-12.6	-227.1	144.9	-245.7	-159.2
Massachusetts	Publishing industries, except internet	2.3	↑ 2.3	1.4	↑ 1.4	3.3	1416.0	2943.4	-1332.4	-240.0
Massachusetts	Computer and electronic product manufacturing	1.2	↑ 2	1.1	↑ 1.7	63.9	33903.4	2282.3	-1662.6	20070.3
Massachusetts	Educational services	2.1	↓ 2	4.9	↓ 4.8	7.1	10835.2	10071.3	2266.3	-2218.6
Massachusetts	Transit and ground passenger transportation	2.0	↑ 2	0.8	↑ 0.8	5.4	1360.7	1684.5	-593.9	200.4
New Hampshire	Textile mills	3.6	↑ 3.8	0.4	↓ 0.3	-3.3	-61.9	136.1	-270.1	70.0
New Hampshire	Computer and electronic product manufacturing	3.0	↑ 3.4	2.7	↑ 2.9	11.4	1868.3	1035.8	-754.5	1395.8
New Hampshire	Electronic markets and agents and brokers	2.2	↑ 3.3	1.7	↓ 1.4	-14.8	-1177.8	656.6	-4532.1	2492.5
New Hampshire	Electrical equipment and appliance mfg.	2.3	↑ 2.3	0.7	↑ 0.7	6.1	257.8	280.5	-40.7	3.1
New Hampshire	Nonstore retailers	2.2	↑ 2.2	0.9	↑ 1	14.4	824.0	351.2	344.2	24.6
Pennsylvania	Primary metal manufacturing	2.0	↑ 2.2	0.7	↑ 0.7	0.0	-7.0	2547.0	-3317.0	763.0
Pennsylvania	Electronic markets and agents and brokers	1.1	↑ 2	0.8	↑ 0.9	-0.1	-54.9	3136.4	-21647.3	18455.9
Pennsylvania	Transit and ground passenger transportation	1.8	↑ 1.8	0.7	↑ 0.7	-0.2	-85.8	2670.9	-941.6	-1815.3
Pennsylvania	Warehousing and storage	2.5	↓ 1.8	1.7	↑ 1.7	-0.1	-50.0	6241.7	35580.0	-41871.7
Pennsylvania	Electrical equipment and appliance mfg.	1.6	↑ 1.6	0.5	↑ 0.5	0.0	9.0	1916.7	-277.8	-1629.9

Table 3 – Top growing industries in each state, based on changes in LQ over 80% since 2009

State	Industry	2009 LQ	2017 LQ	2009 % Employment	2017 % Employment	Growth rate	Birch Index	National share	Industrial mix	Local share
Maine	Administrative and support services	0.27069	↑ 0.74575	1.9	↑ 5.2	186.7	48231.8	634.9	-99.3	16288.4
Maine	Ambulatory health care services	0.47060	↑ 0.97125	2.7	↑ 5.9	128.1	37616.3	906.6	706.9	14875.5
Maine	Educational services	0.17135	↑ 1.11883	0.4	↑ 2.7	596.7	80104.1	135.8	30.5	11331.7
Maine	Funds, trusts, and other financial vehicles	0.14745	↑ 0.62921	0.0	↑ 0	925.0	379.2	0.3	5.5	31.2
Maine	Unclassified	0.31085	↑ 4.41169	0.1	↑ 0.5	882.4	24618.8	16.8	-102.1	2591.3
Maine	Waste management and remediation services	17.29727	↓ 1.2053	5.7	↓ 0.4	-92.2	-1958.8	1914.0	1965.1	-28923.1
Massachusetts	Beverage and tobacco product manufacturing	16.96338	↓ 0.80093	3.1	↓ 0.2	-93.9	-5244.8	6442.4	19410.4	-111716.8
Massachusetts	Construction of buildings	0.00369	↑ 0.81924	0.0	↑ 1.1	26147.7	8784828.1	9.0	13.2	33446.8
Massachusetts	Fabricated metal product manufacturing	0.15881	↑ 0.84488	0.2	↑ 1	446.7	141101.7	407.1	-298.5	25703.4
Massachusetts	Machinery manufacturing	0.10295	↑ 0.61167	0.1	↑ 0.5	501.9	87085.0	203.1	-190.4	14456.3
Massachusetts	Merchant wholesalers, durable goods	0.05490	↑ 0.81847	0.1	↑ 2.1	1538.2	1007743.6	281.7	76.3	61156.0
Massachusetts	Merchant wholesalers, nondurable goods	0.38916	↑ 0.80184	0.7	↑ 1.4	121.4	52812.9	1383.7	-96.4	22563.7
Massachusetts	Mining, except oil and gas	0.00180	↑ 0.18048	0.0	↑ 0	9522.2	82462.4	0.6	-1.1	857.4
Massachusetts	Paper manufacturing	0.18858	↑ 0.81025	0.1	↑ 0.2	326.6	24268.1	122.7	-149.9	5716.2
Massachusetts	Petroleum and coal products manufacturing	2.98543	↓ 0.37256	0.3	↓ 0	-86.9	-918.0	566.3	-207.4	-7340.9
Massachusetts	Plastics and rubber products manufacturing	0.05202	↑ 0.69032	0.0	↑ 0.4	1331.8	169137.7	62.5	-0.6	11751.1
Massachusetts	Printing and related support activities	0.22344	↑ 0.92764	0.1	↑ 0.3	296.1	29300.8	176.0	-310.9	7531.9
Massachusetts	Specialty trade contractors	0.28541	↑ 0.95822	1.0	↑ 3.5	296.3	332065.7	1991.6	2829.4	78960.0
Massachusetts	Textile mills	8.34585	↓ 0.91051	0.8	↓ 0.1	-89.8	-2235.9	1713.7	-3400.9	-20147.8
Massachusetts	Utilities	0.06043	↑ 0.85071	0.0	↑ 0.4	1307.2	152866.3	58.5	-66.0	10870.4
New Hampshire	Couriers and messengers	0.00922	↑ 0.87177	0.0	↑ 0.5	12158.3	357698.2	1.7	5.9	2910.4
New Hampshire	Credit intermediation and related activities	0.04607	↑ 0.66832	0.1	↑ 1.4	1375.4	109785.7	38.1	-21.1	7423.9
New Hampshire	Funds, trusts, and other financial vehicles	453.23416	↓ 0.29466	2.6	↓ 0	-99.8	-22.0	988.6	19296.1	-34295.7
New Hampshire	Motion picture and sound recording industries	2.67275	↓ 0.45695	0.9	↓ 0.2	-82.4	-708.0	344.3	-136.0	-4236.3
New Hampshire	Publishing industries, except internet	0.68629	↑ 1.50583	0.4	↑ 0.9	124.7	6374.8	160.3	-72.5	2749.3
New Hampshire	Telecommunications	0.19622	↑ 1.14954	0.1	↑ 0.7	413.9	15483.0	51.3	-131.7	3093.4
Pennsylvania	Electronic markets and agents and brokers	1.09677	↑ 2.0245	0.8	↑ 0.9	-0.1	-54.9	3136.4	-21647.3	18455.9

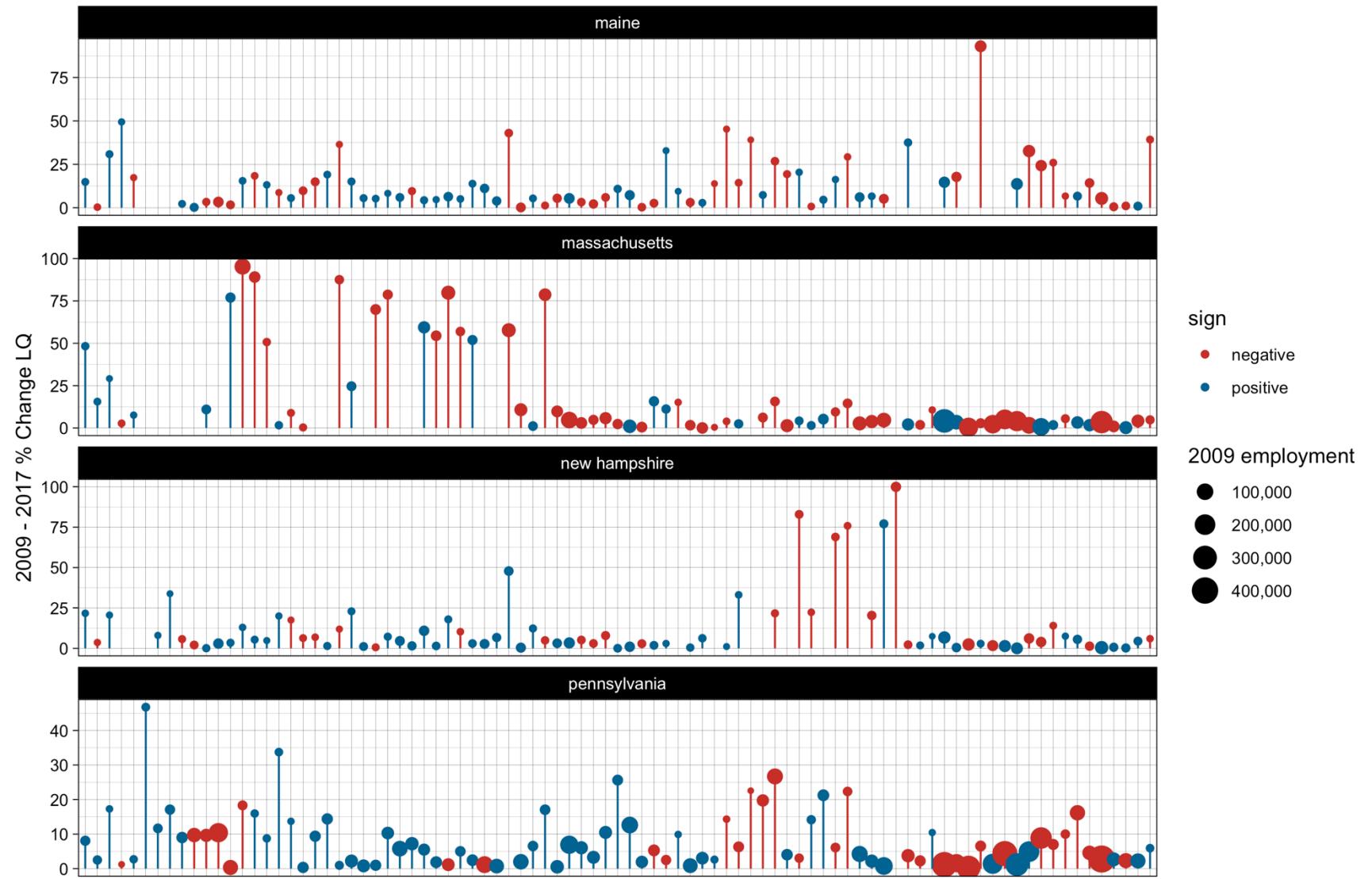
Industry Employment Location Quotient

Figure 1



Industry Employment Location Quotient
changes under 100%

Figure 2



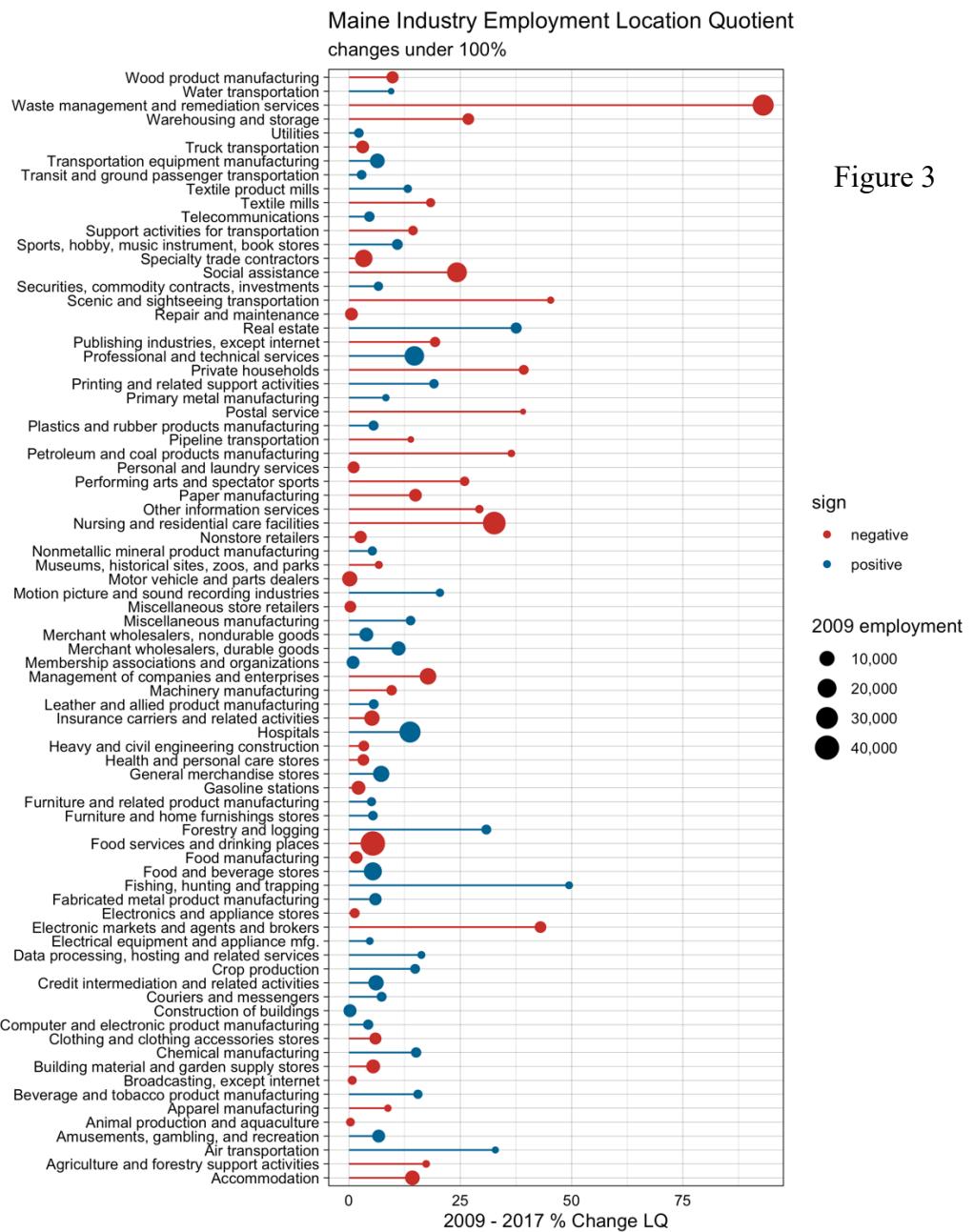


Figure 3

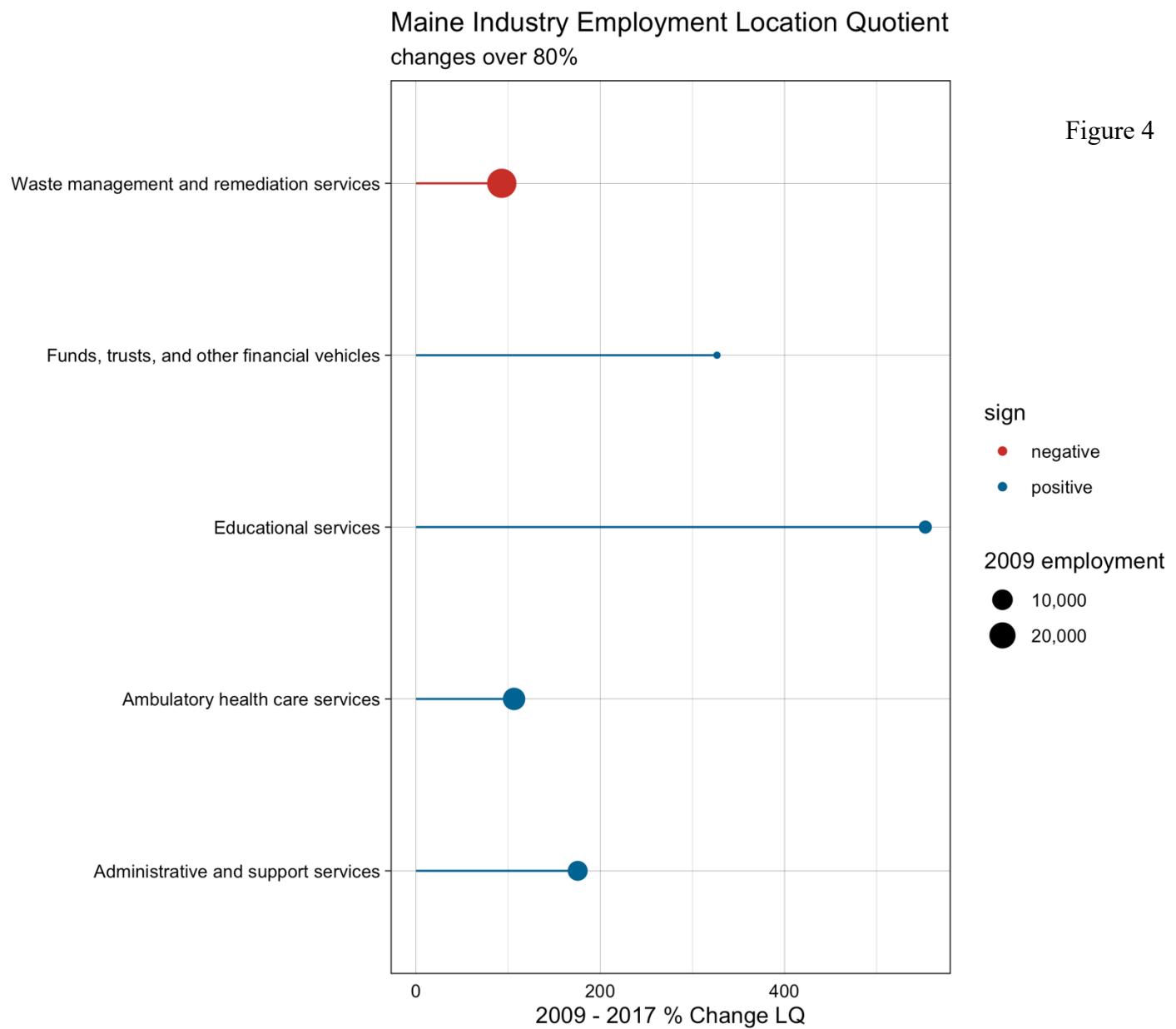


Figure 4

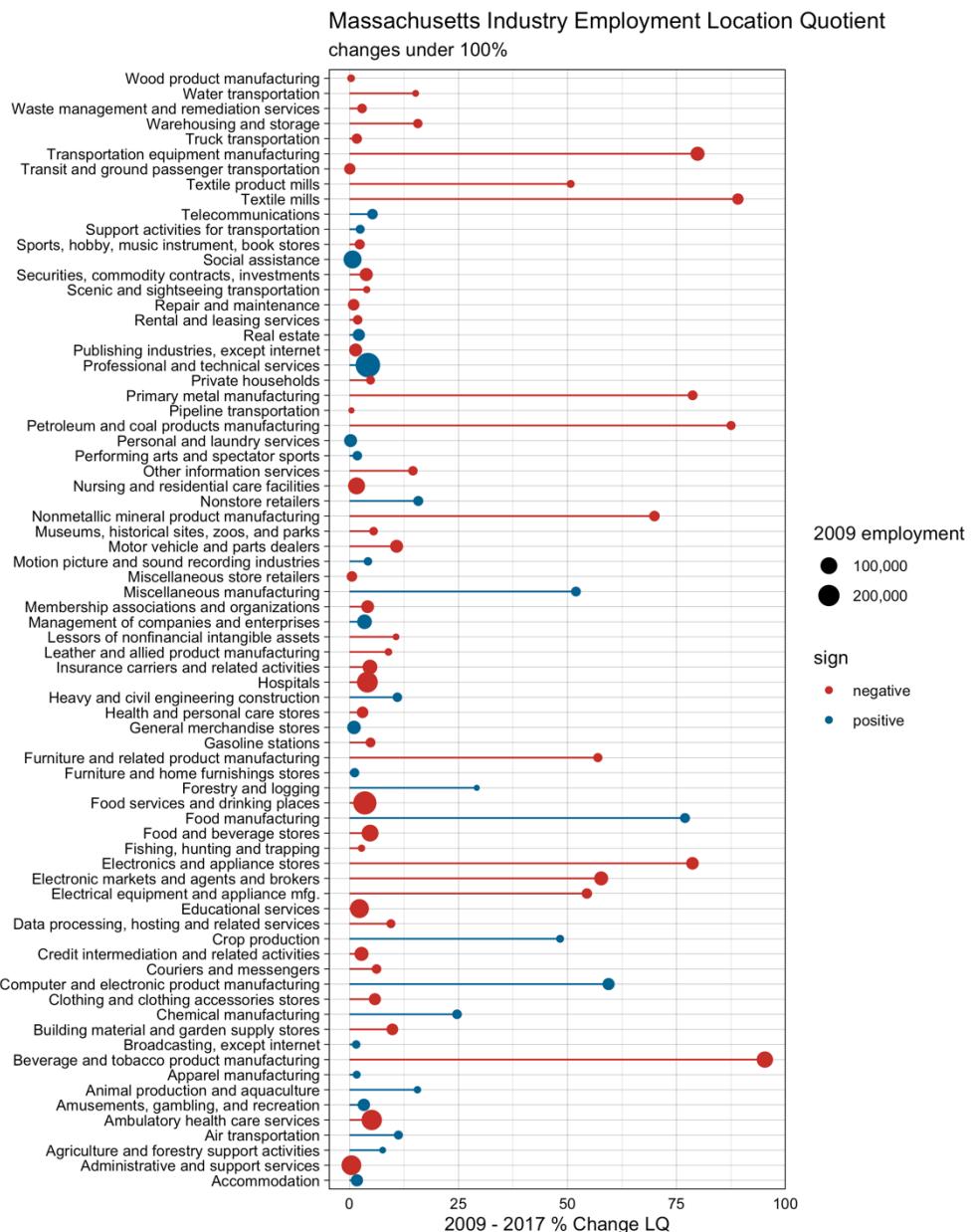


Figure 5



Figure 6

sign

- negative
- positive

2009 employment

- 25,000
- 50,000
- 75,000

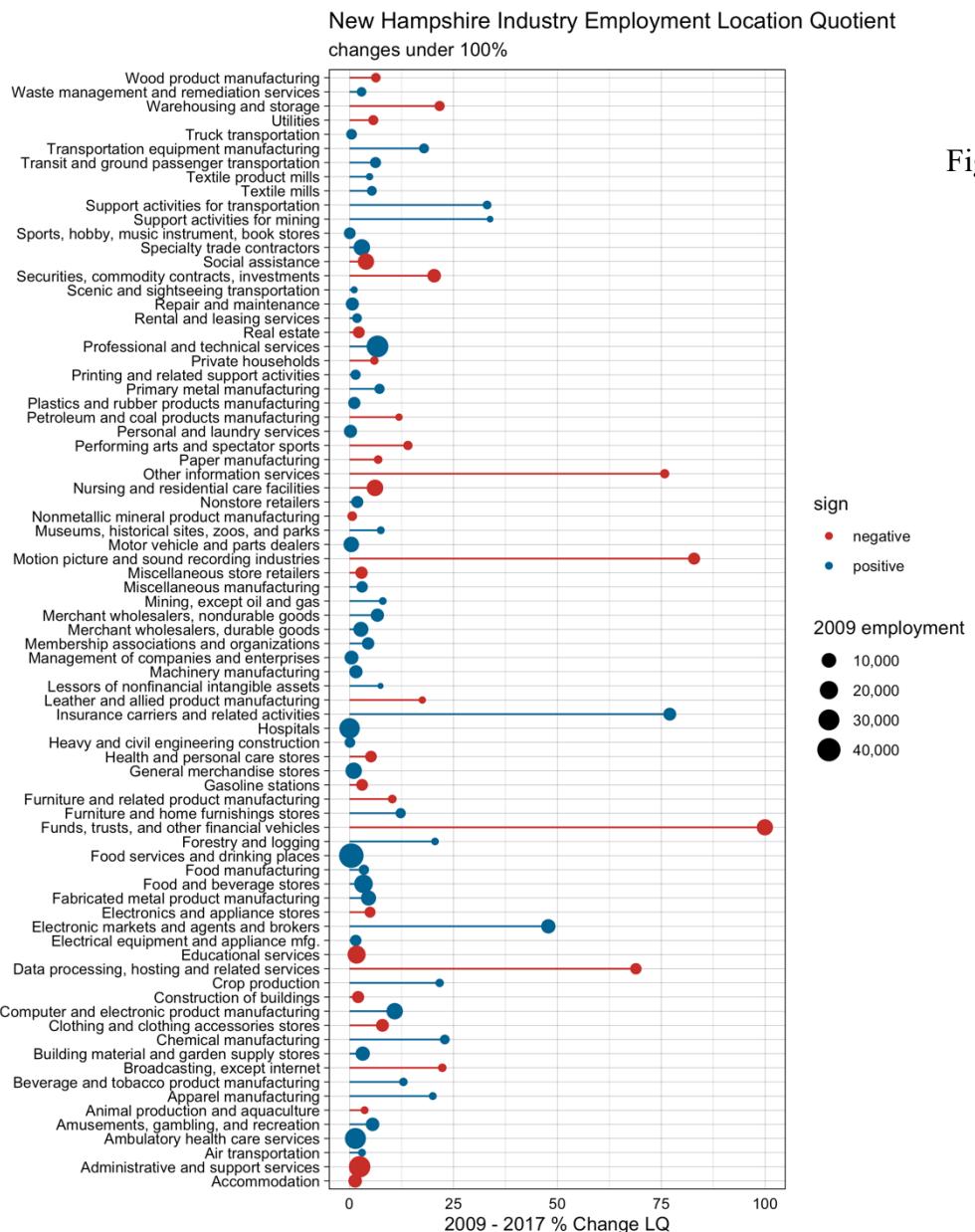


Figure 7



Figure 8

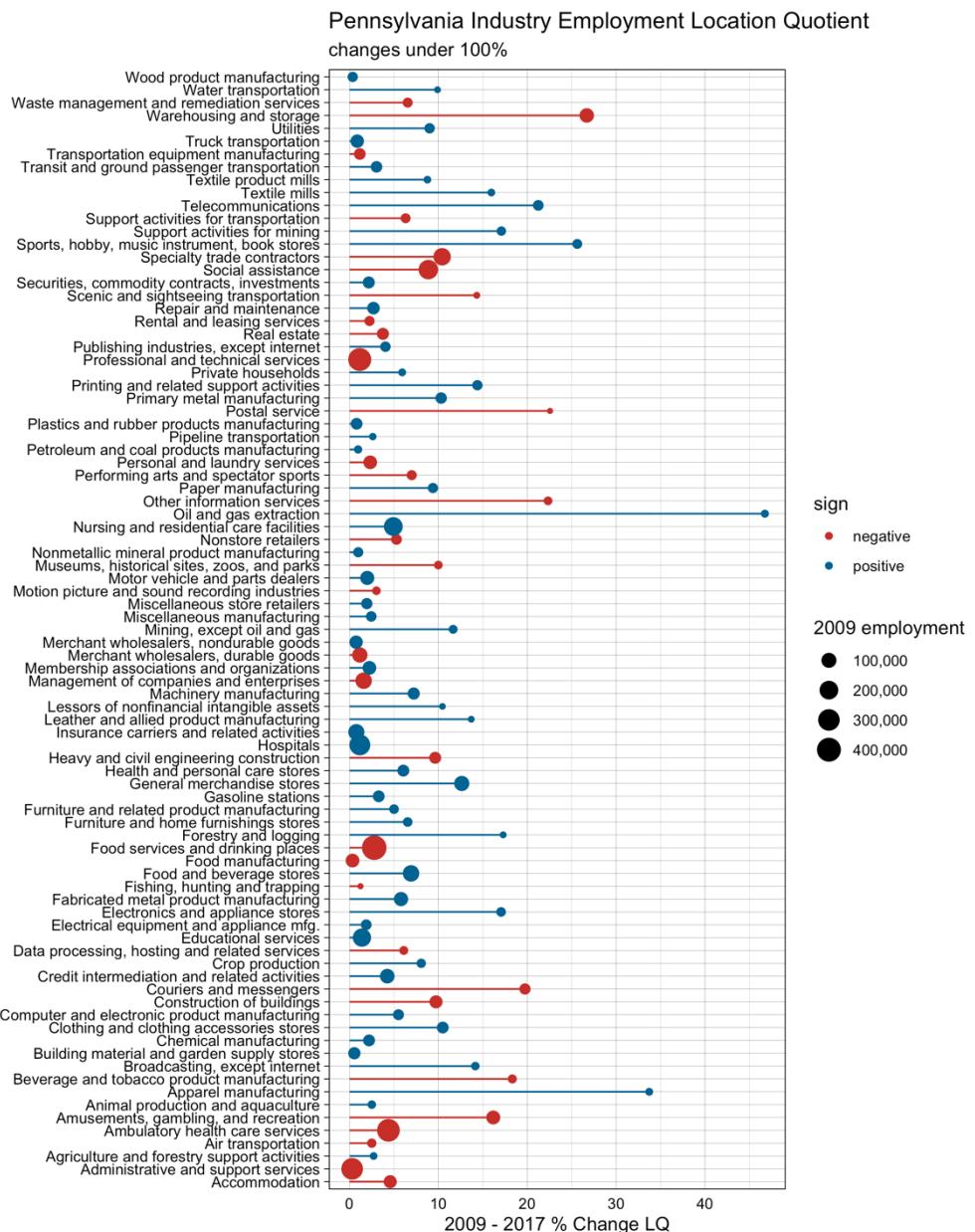


Figure 9

Pennsylvania Industry Employment Location Quotient
changes over 80%

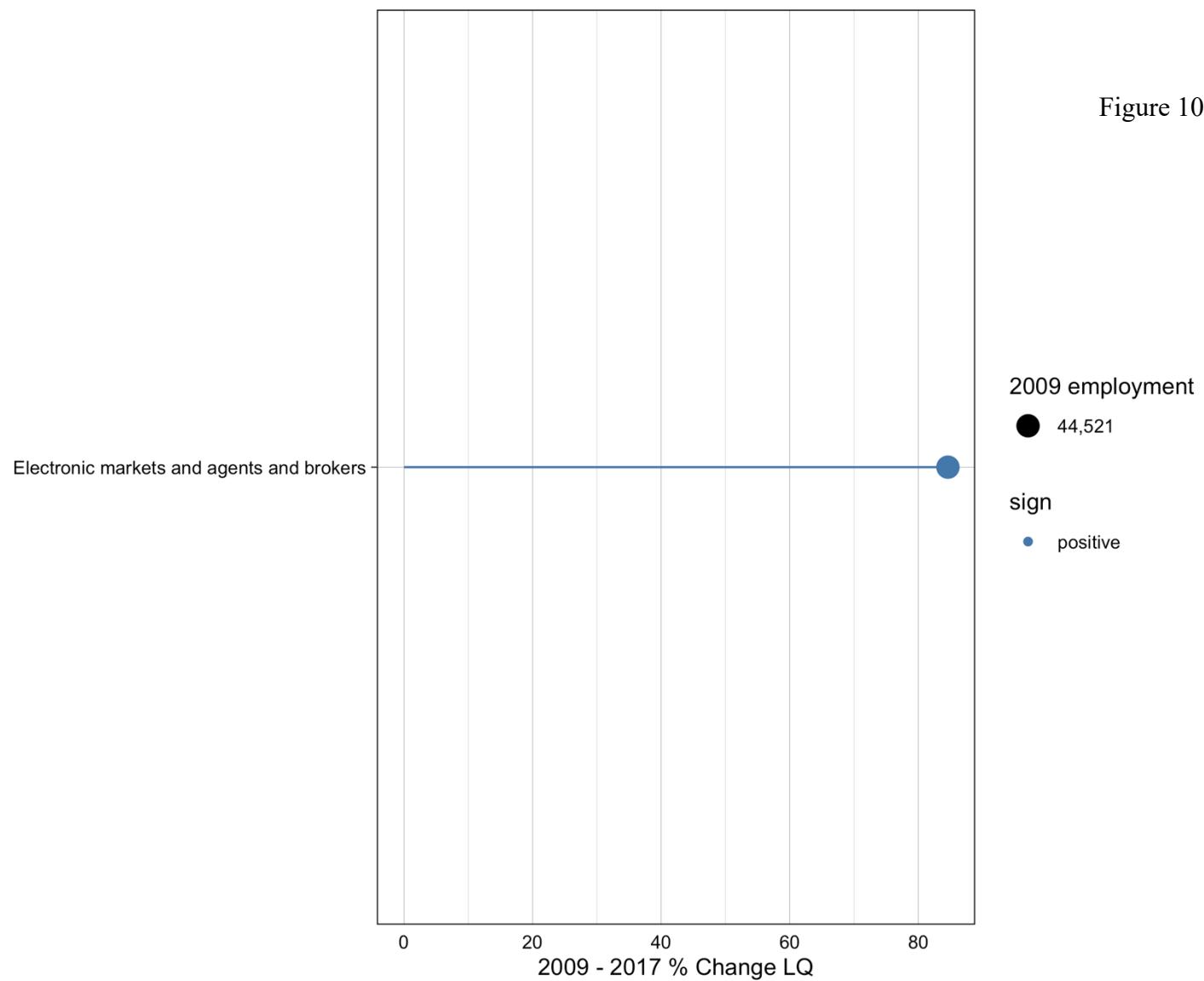
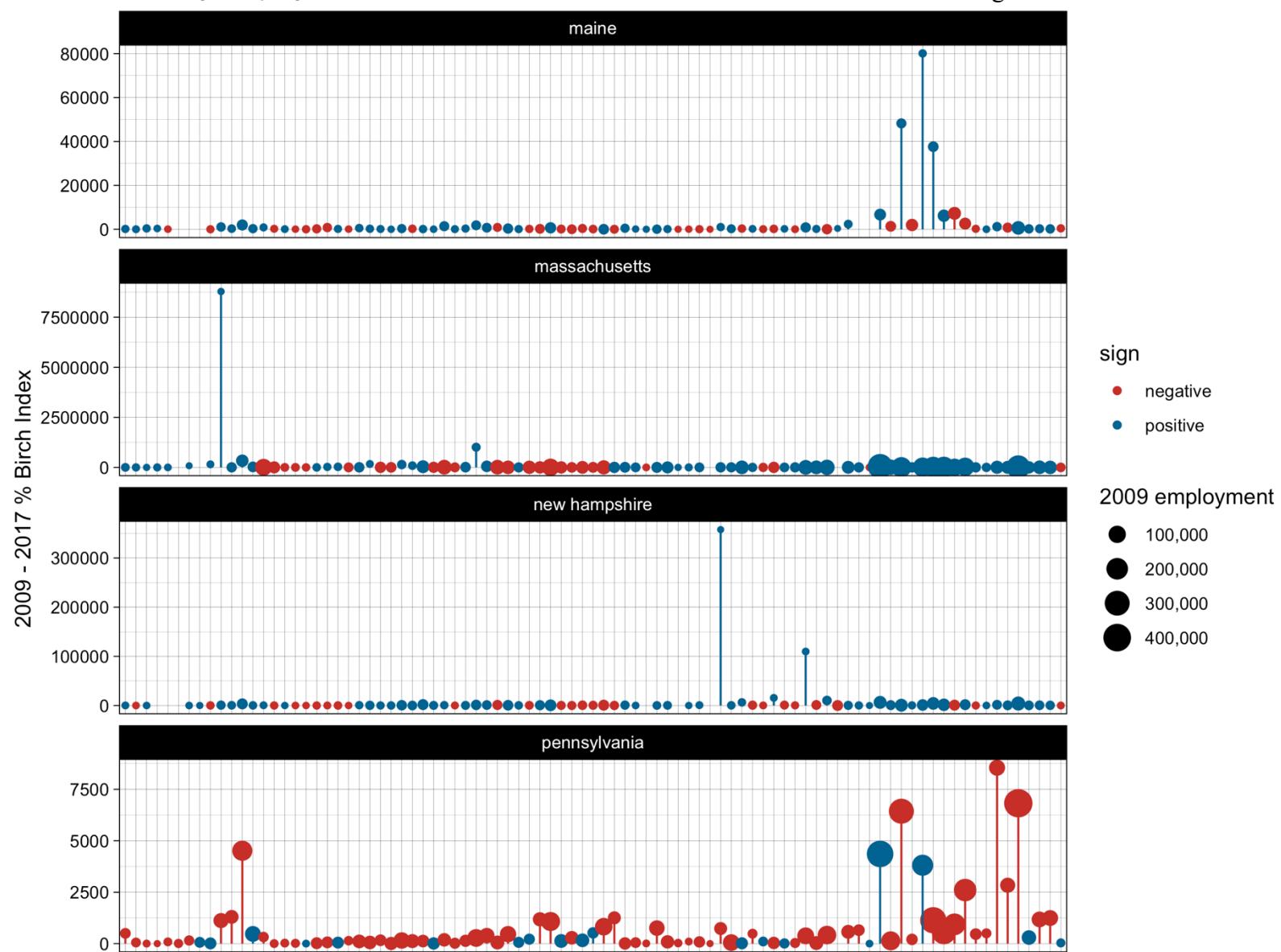


Figure 10

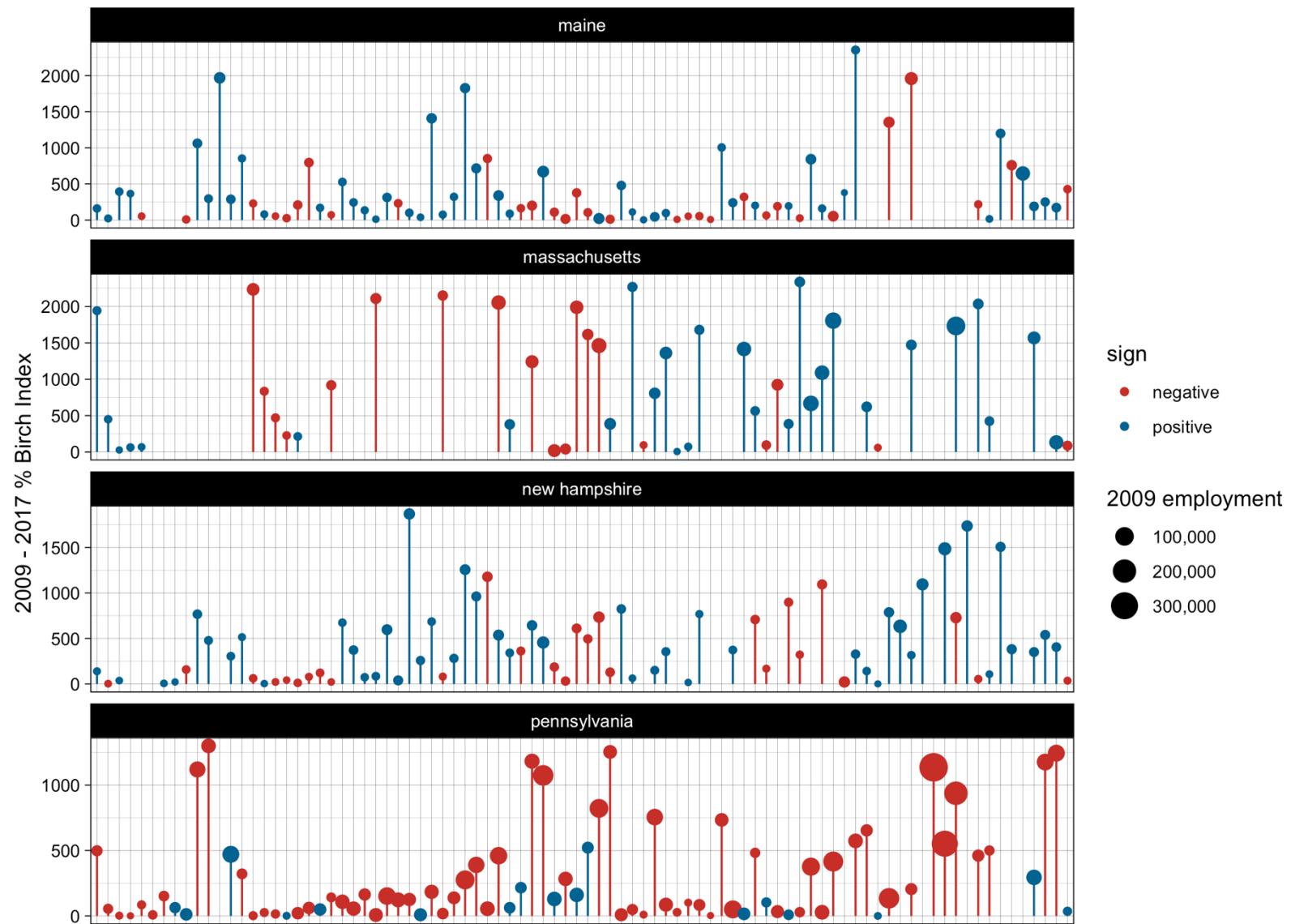
Industry Employment Birch Index

Figure 11



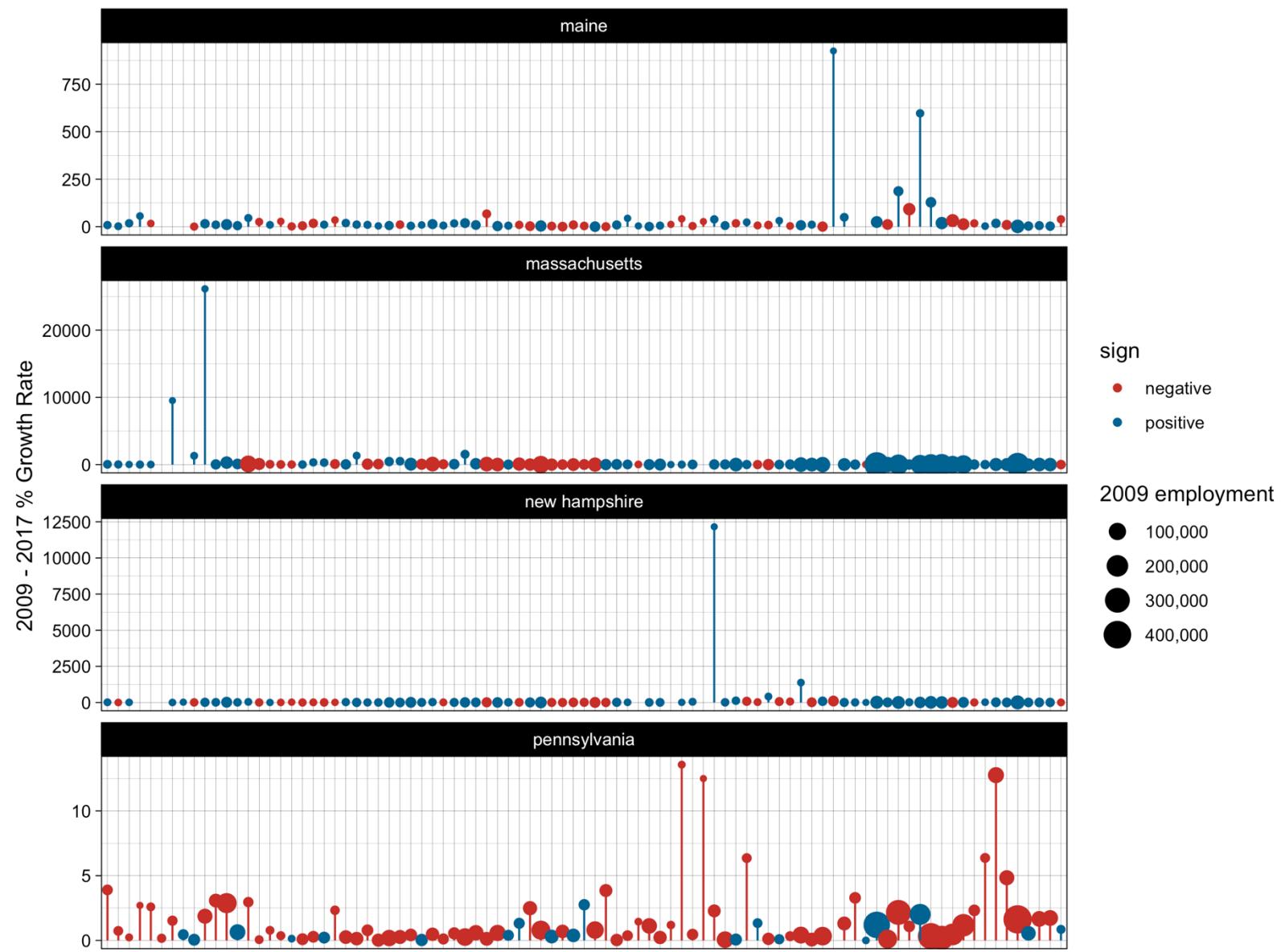
Industry Employment Birch Index
values under 2500

Figure 12



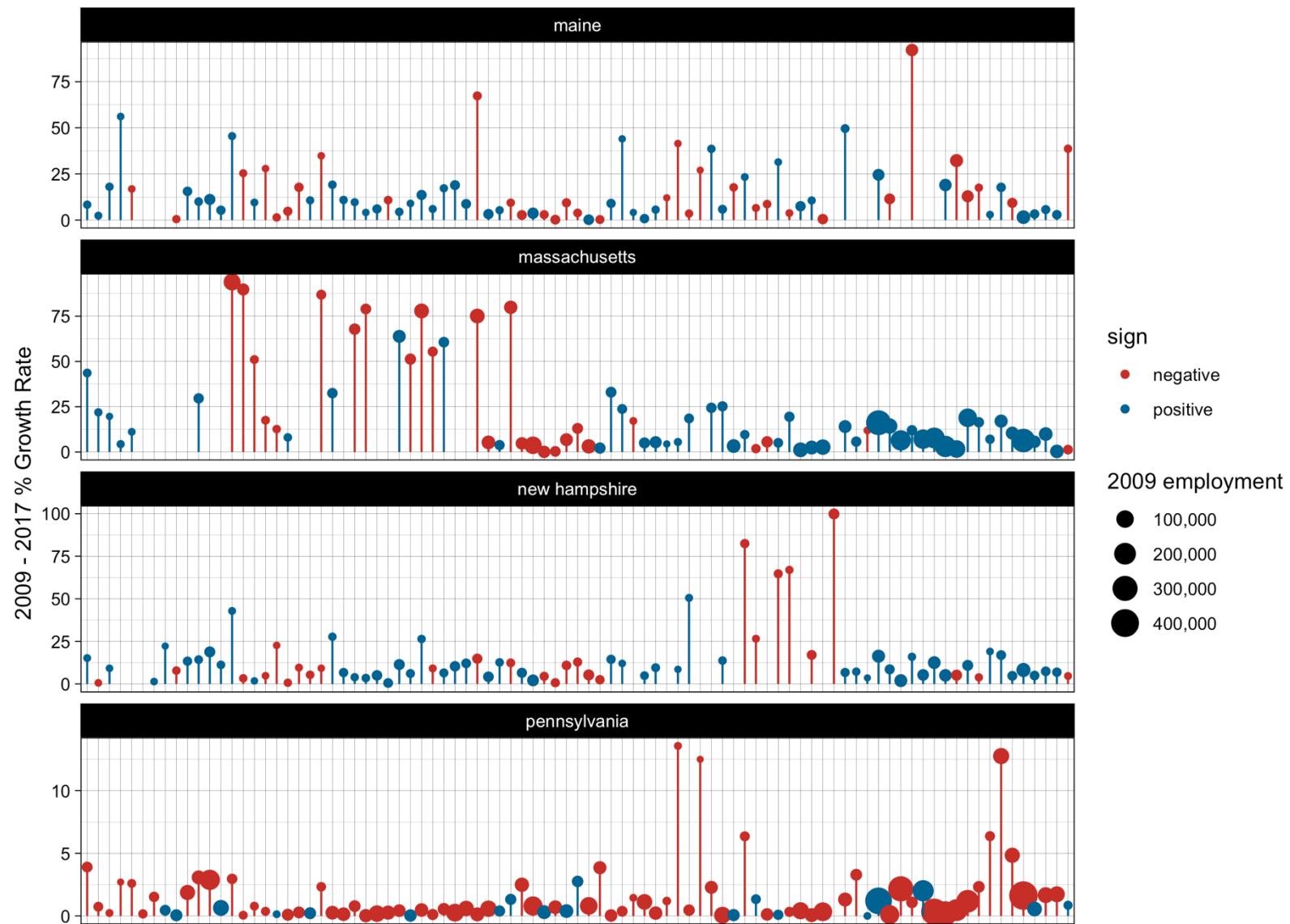
Industry Employment Growth Rate

Figure 13



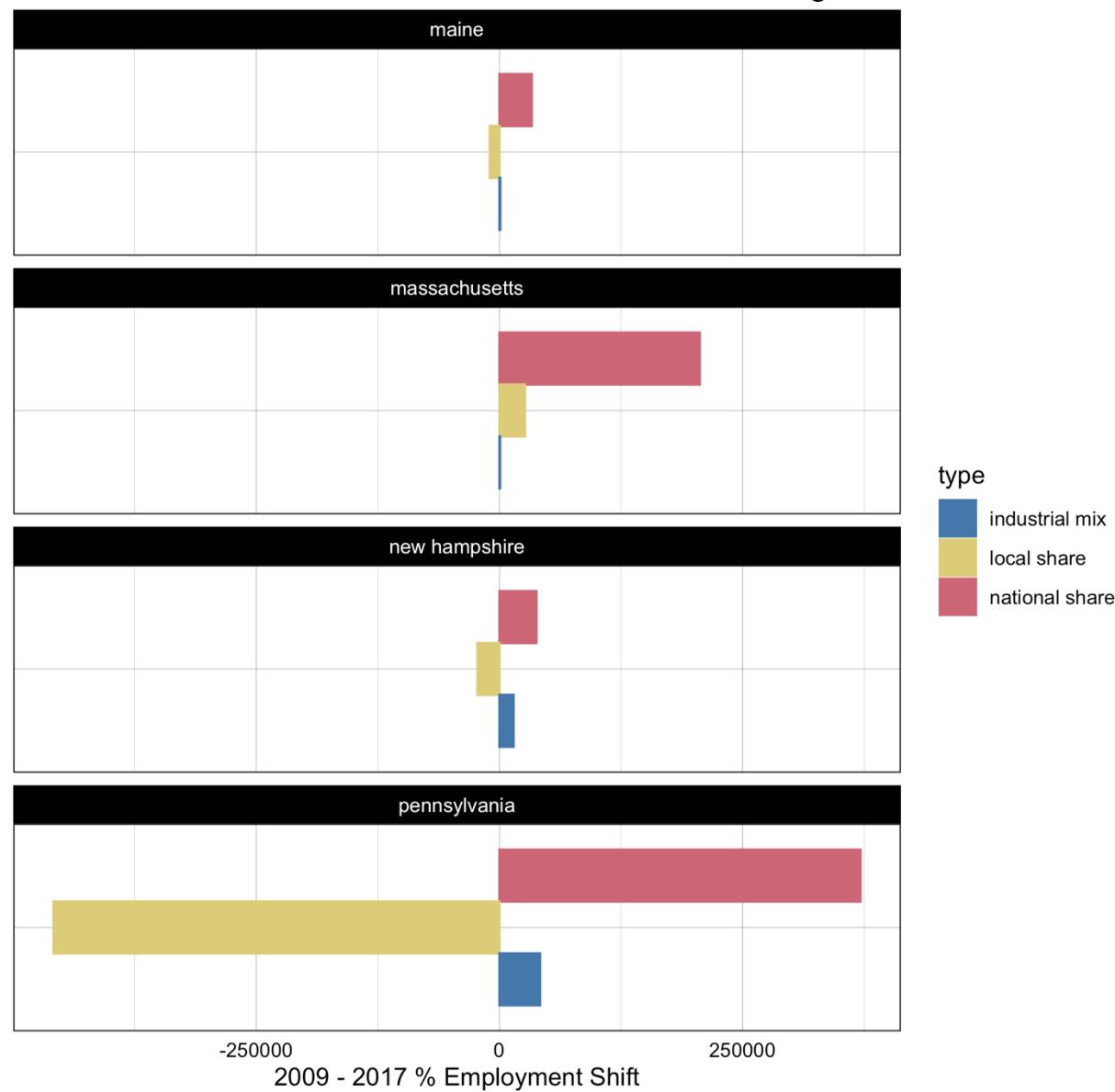
Industry Employment Growth Rate
changes under 100%

Figure 14



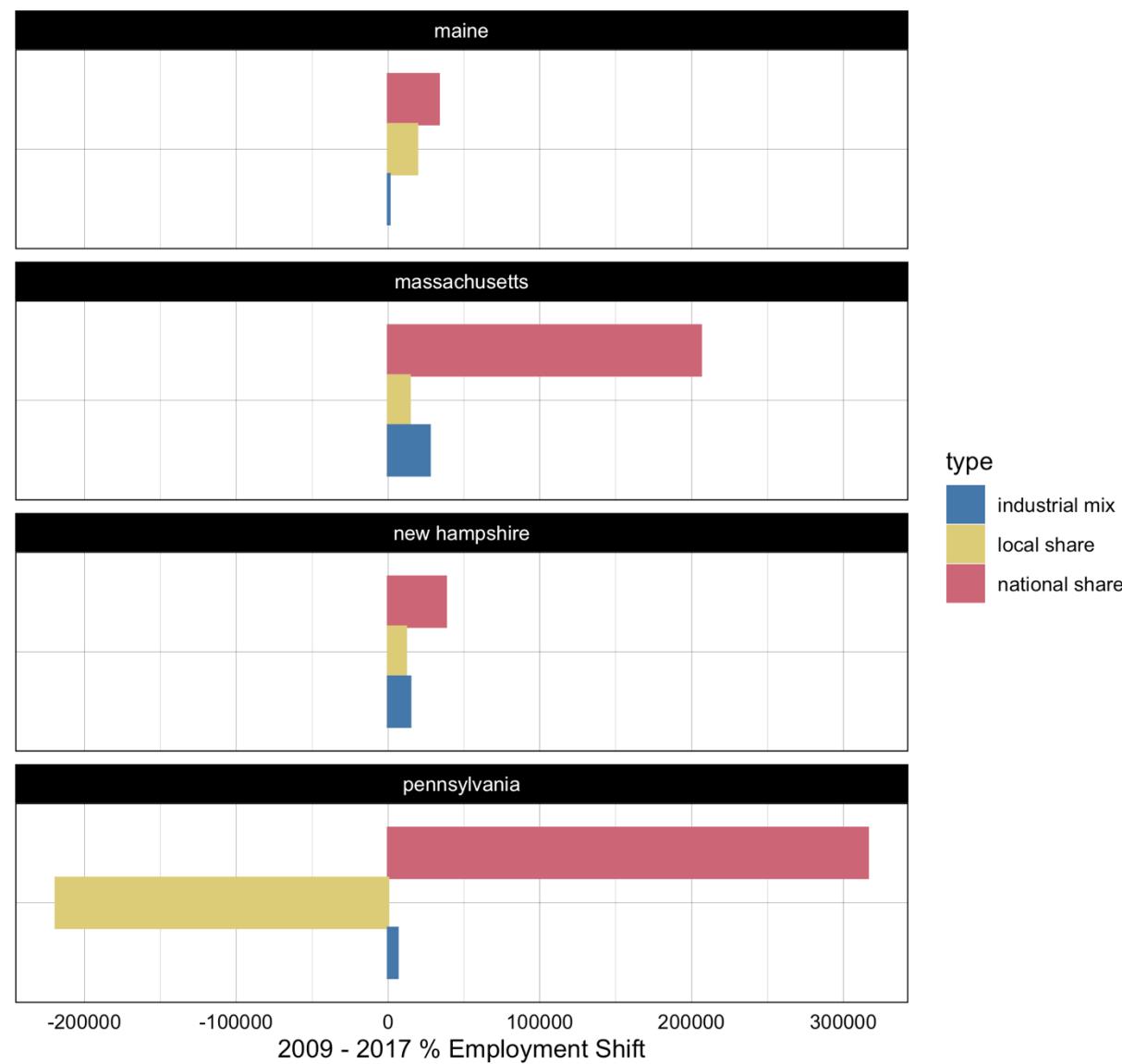
Industry Employment Shift Share Analysis

Figure 15



Industry Employment Shift Share Analysis
shifts under 25,000

Figure 16



Maine Industry Employment Shift Share Analysis changes over 80%

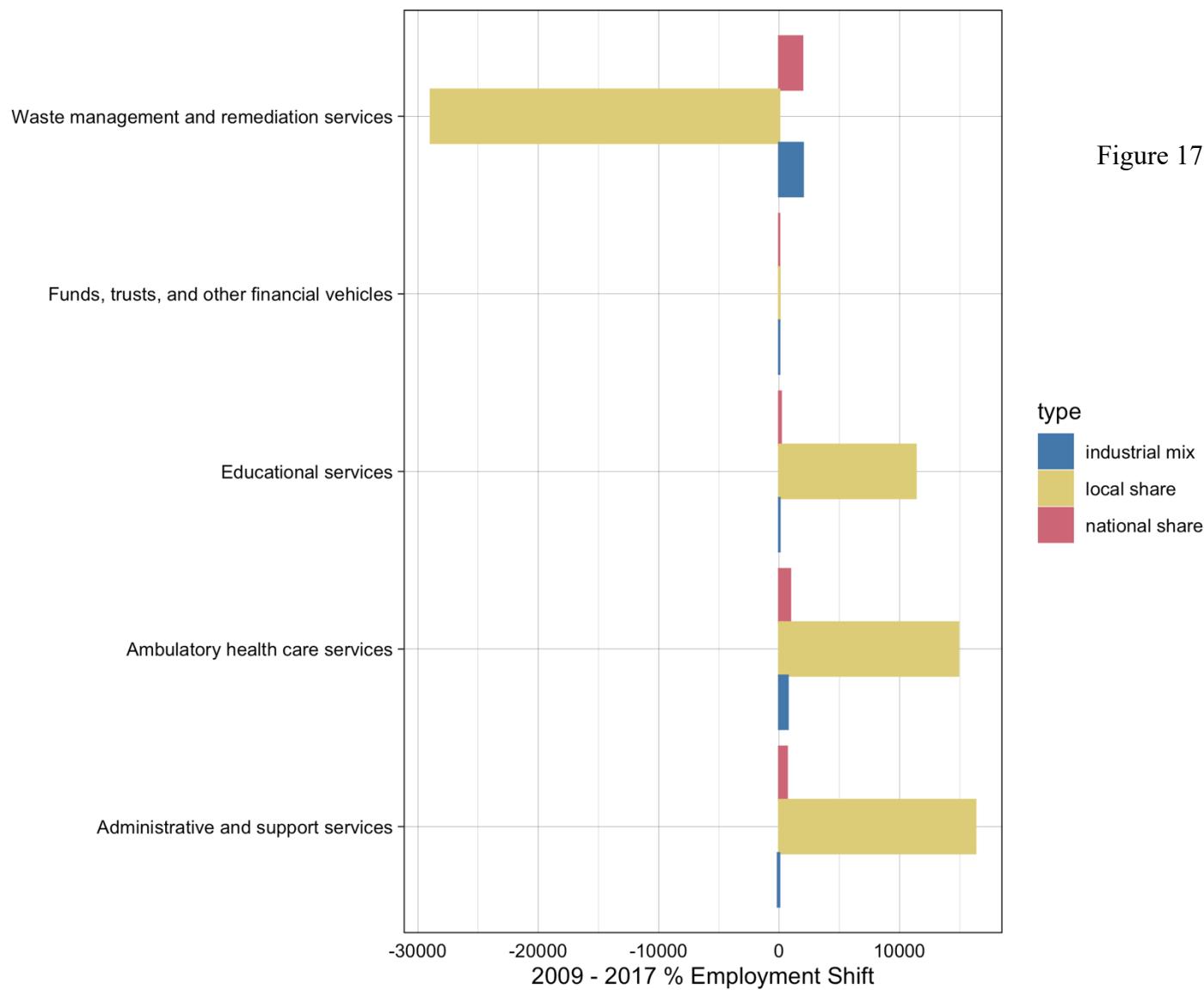


Figure 17

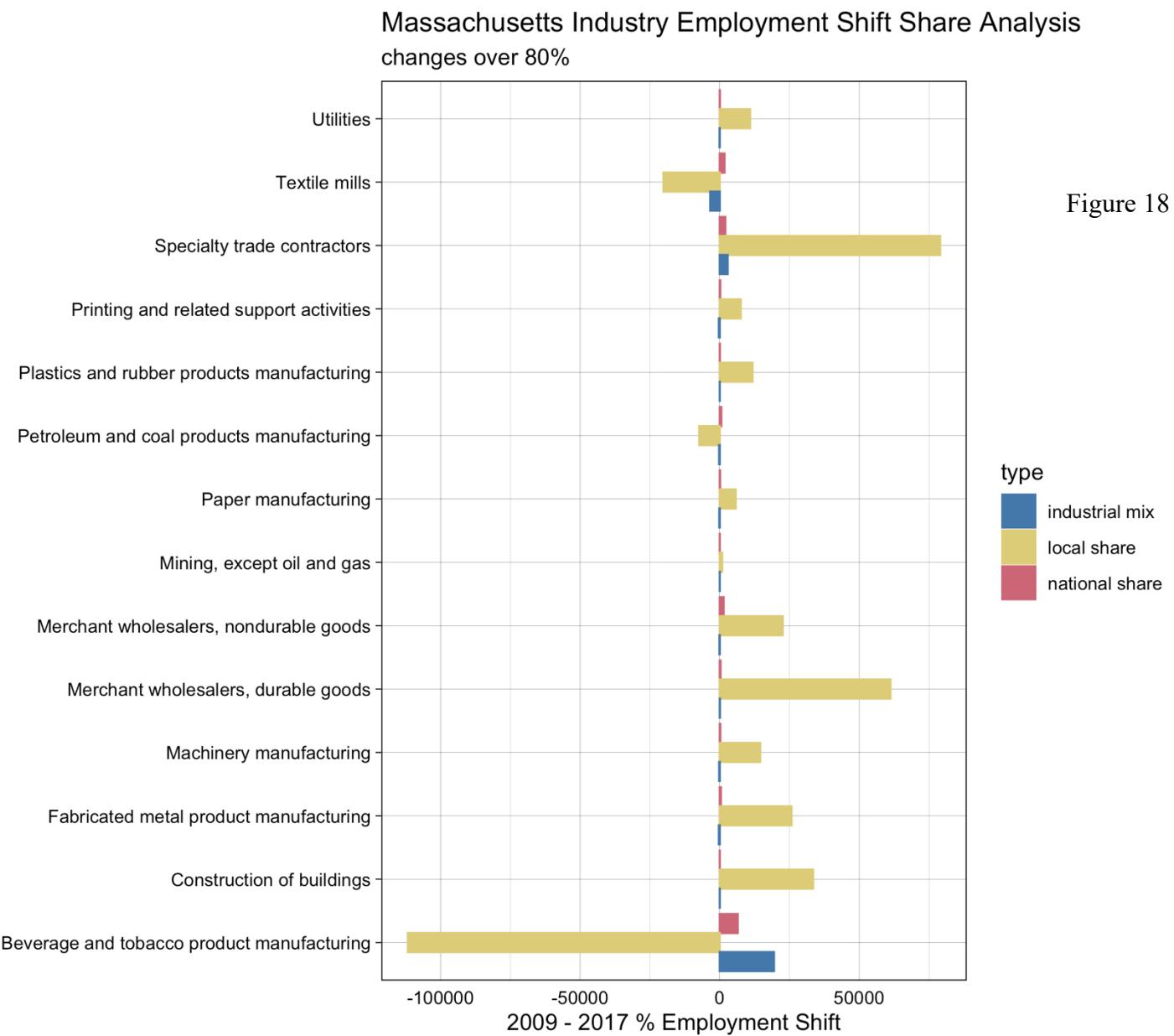


Figure 18

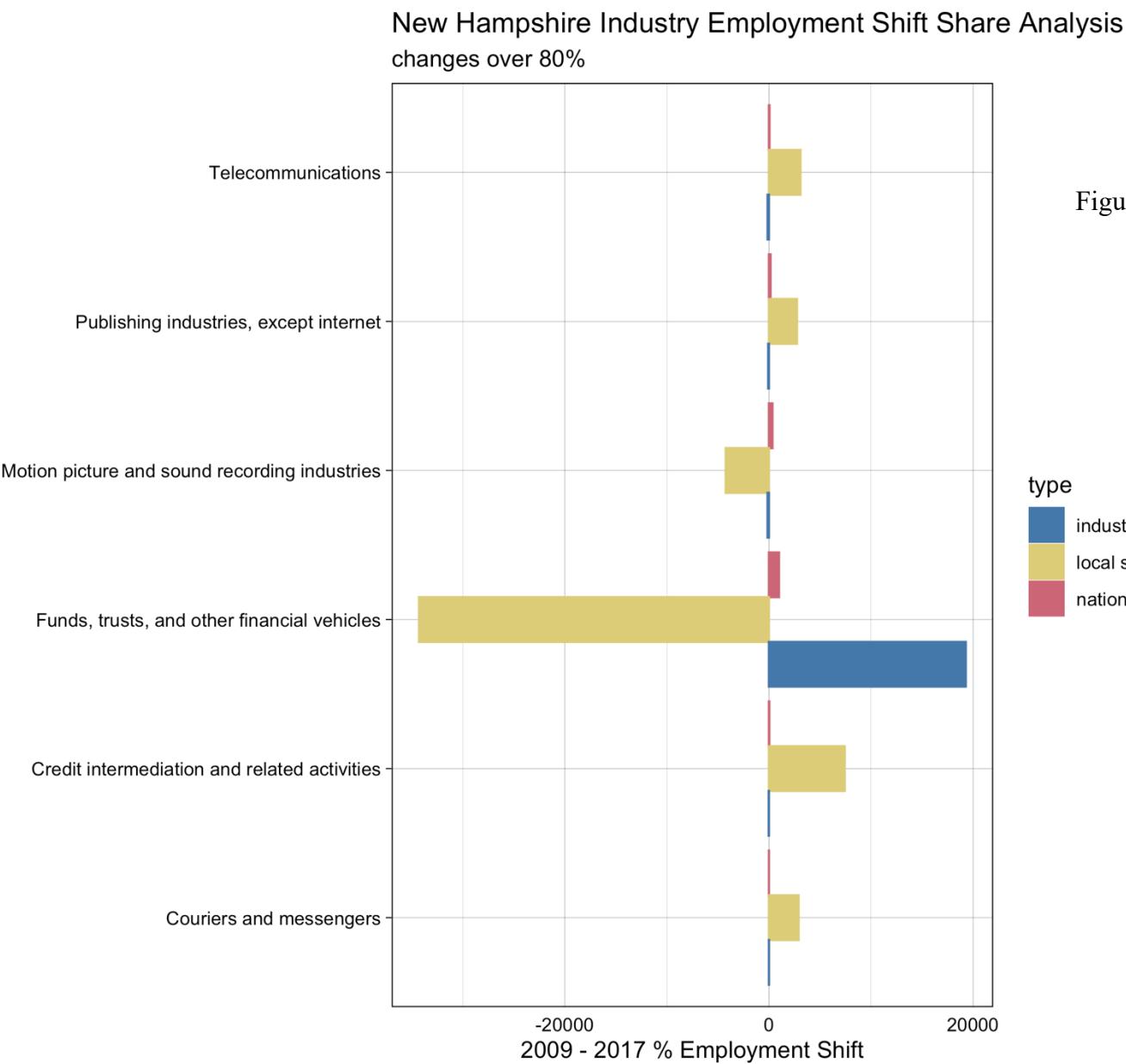


Figure 19

Pennsylvania Industry Employment Shift Share Analysis
changes over 80%

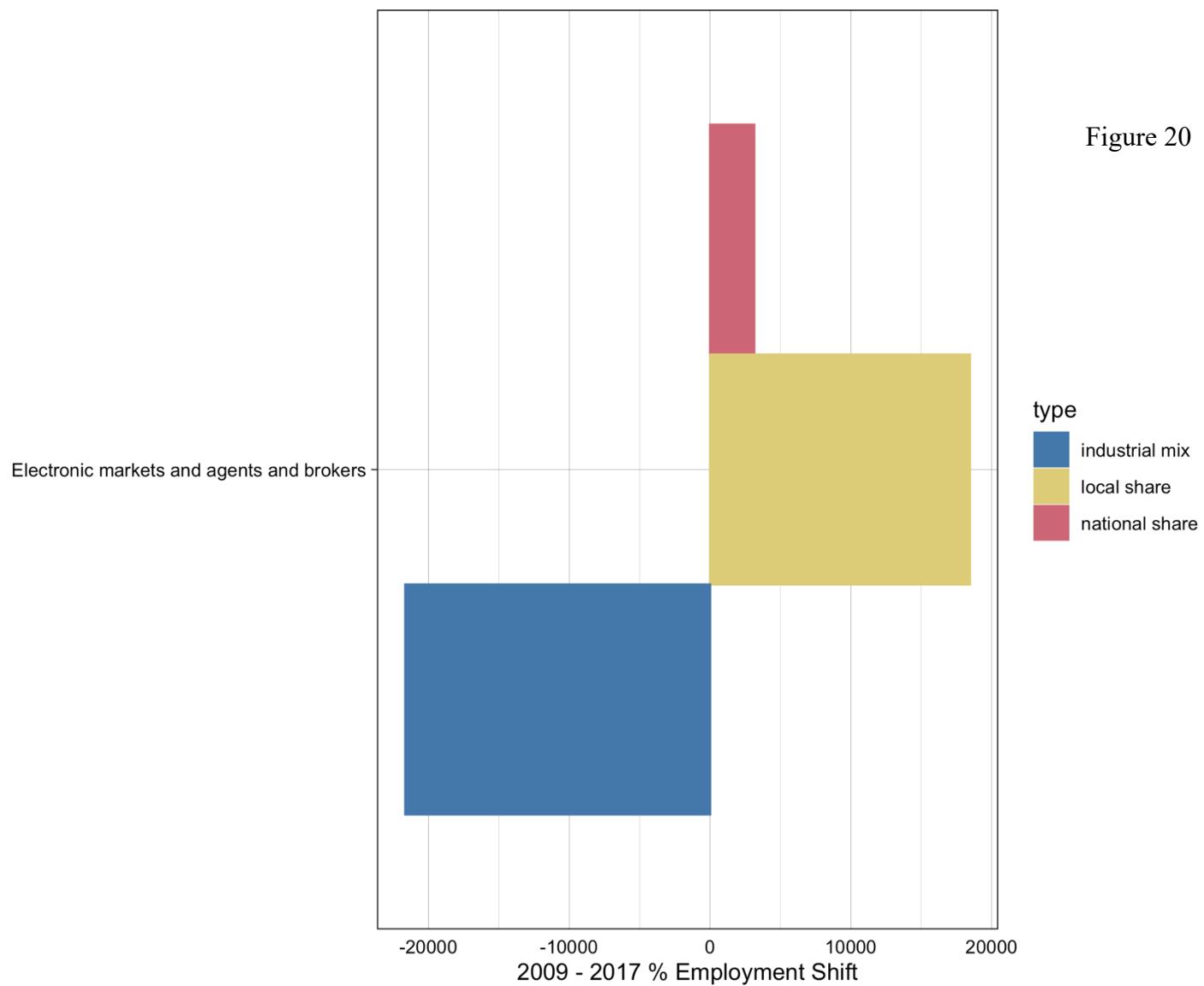


Figure 20

Table 4a – Average changes in State Gini Coefficient

State	2009	2017
maine	0.01100	↓ 0.00265
massachusetts	0.00582	↓ 0.00339
new hampshire	0.00321	↓ 0.00202
pennsylvania	0.00146	↑ 0.00148

Table 4b – Average changes in State LQ

State	2009	2017
maine	1.46294	↓ 1.42369
massachusetts	1.23910	↓ 0.96764
new hampshire	5.45846	↓ 1.02138
pennsylvania	0.94808	↑ 0.96202

Table 4 – Average changes in Gini and LQ, growth rate, Birch Index and state employment change

Table 4c – State growth rate and Birch Index

State	Growth rate	Birch Index
maine	27.93472	2199.825
massachusetts	402.41999	108819.904
new hampshire	140.54780	5553.782
pennsylvania	-0.39659	2156.379

Table 4d – State employment change

State	2009	2017
maine	472744	↑ 497048
massachusetts	2923927	↑ 3156746
new hampshire	539562	↑ 569528
pennsylvania	5270820	↓ 5225474

Table 5 – Shift share analysis without summing any shifts over 25,000 (left) and with all shifts included (right)

State	Shift type	Shift share
maine	industrial mix	860.1
maine	local share	-9859.5
maine	national share	33303.4
massachusetts	industrial mix	636.6
massachusetts	local share	26200.6
massachusetts	national share	205981.8
new hampshire	industrial mix	14542.7
new hampshire	local share	-22587.2
new hampshire	national share	38010.5
pennsylvania	industrial mix	41762.5
pennsylvania	local share	-458421.8
pennsylvania	national share	371313.3

State	Shift type	Shift share
maine	industrial mix	860.1
maine	local share	19063.5
maine	national share	33303.4
massachusetts	industrial mix	27293.0
massachusetts	local share	14164.2
massachusetts	national share	205981.8
new hampshire	industrial mix	14542.7
new hampshire	local share	11708.5
new hampshire	national share	38010.5
pennsylvania	industrial mix	6182.5
pennsylvania	local share	-218894.3
pennsylvania	national share	315975.6