



**Job Retention vs. Loss in Connecticut, 1990 to 2010,  
Studied as a Shift or Share of the National Labor Market**

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## Introduction

Throughout the 90's, Connecticut experienced marginal employment growth, seeing expansion from 1,644,200 jobs in January of 1990 to just 1,692,800 in January of 2001. But the last decade has been even less favorable to the state. By June 2011, there were 69,400 fewer people employed in Connecticut than there were at the start of the new millennia. This study looks at the nature of the dynamics within this stagnant employment experience, using a shift-share analysis to illuminate the shifting shares among industrial sectors.

Shift-share analysis allows CCEA to identify the sources of local job loss by industry and then further study – at significant granularity – the components that make up this loss. The simple model assumes three components that makeup regional job change: a shift in national growth trends, changing industrial patterns within a locality, and differences in relative competitiveness of sectors. Despite the simplicity, working knowledge of these effects has significance, especially when individual industries within a state are dissected and study periods are chosen carefully.

CCEA focuses on two extended periods for the traditional analysis, 1990-2011 and 2001-2011. The longer time frame captures the full study period and allow for better understanding of the employment contraction that occurred. But that long-term analysis does little to indicate trends. Given significant industrial changes that occurred during the 90's, CCEA then focused on the most recent time frame, January 2001 through June 2011, to tease out clear trends.

This analysis has three main sections: first, a description of the model; second, identification and analysis of the shift-share effects; third, a summary of the insights and policy implications.

## Description of the Traditional Shift-share Model

The traditional shift-share model delineates a region's employment growth into three separate effects:

- 1) The effect from changes in overall national growth (N).
- 2) The industrial mix effect (IM), i.e. growth due to the difference between the industrial composition of the specified region and the United States as a whole.
- 3) The regional shift (RS), i.e. changes in employment due to regional competitive advantages/disadvantages.

CCEA is concerned only with changes in Connecticut employment. As such, the algebraic representation of this delineation for the i-th industry is captured in the following equation:

$$\Delta E = \sum_{i=1}^n (N_i + IM_i + RS_i)$$

Where:

E is actual growth in Connecticut;

$N_i$  is the growth of the i-th industry in Connecticut associated with overall nationwide growth;

$IM_i$  is the growth of the i-th industry associated with Connecticut's specific industry mix;

$RS_i$  is the growth of the i-th industry due to the regional shift; and

n is the number of industries in Connecticut.

## National Growth

The national growth component of a traditional shift-share formula represents employment growth in a region had it grown at the rate of total national employment. For this study it reflects the growth in Connecticut employment from the base year of analysis to the end year, considering only national labor market expansion. The calculation is simply Connecticut's base year employment in each industry multiplied by the national employment growth rate, or total growth among all industries, over the course of the study period. Expressed mathematically as:

$$N_i = (E_i^{t-1} \cdot NE^t / NE^{t-1}) - E_i^{t-1}$$

Where:

$E_i^{t-1}$  is regional employment in industry "i" in the base year;

$NE^{t-1}$  is total national employment in the base year and

$NE^t$  is total national employment in the end year.

## Industrial Mix

Employment shocks tend to have a significantly different effect on each individual industry. For example, the bursting of a housing bubble may hamper employment growth in the Construction and Real Estate industries to a much larger extent than it would others. The industrial mix component of a shift-share analysis measures the favorability of a particular region's make-up of industries. Specifically, it is the ratio of a specific industry's employment compared to the national ratio. From an employment perspective, this permits clearer understanding of diversification of industries within the region of study. The equation below captures the industrial mix component:

$$IM_i = E_i \cdot (NE_i^t / NE_i^{t-1} - NE^t / NE^{t-1})$$

Where:

$IM_i$  is the industrial mix component for industry "i";

$NE_i^{t-1}$  is total national employment for industry "i" in the base year; and

$NE_i^t$  is total national employment for industry "i" during the final year.

Note:  $NE_i^t / NE_i^{t-1} - NE^t / NE^{t-1}$  simply represents the difference between the growth rate in a specific

industry and the growth rate for all industries nationally.

## Regional Shift

The regional shift component of shift-share analysis is typically thought the most informative result, especially from a policy perspective. This element compares the growth rate of a local sector with the growth rate for that same sector at the national level. It indicates which industries or sectors exhibit regional competitive advantages. The mathematical representation is:

$$RS_i = E_i \cdot (R_i^t / R_i^{t-1} - NE_i^t / NE_i^{t-1})$$

Where:

$C_i$  is the competitive component for industry "i";

$R_i^{t-1}$  is the total employment for industry “i” in the specified region during the base period; and  $R_i^t$  is the total employment for industry “i” in the specified region during the final period.

Note:  $\frac{R_i^t}{R_i^{t-1}} - \frac{NE_i^t}{NE_i^{t-1}}$  simply represents the difference in local and national growth rate for a specific industry.

### *Dynamic Shift-share Analysis*

For purposes of this report, CCEA employs a dynamic shift-share analysis, which extends the traditional model. The motivation for typical shift-share analysis is to offer some assessment of policy effectiveness. Dynamic shift-share models are well suited for this task. They are “dynamic” in the sense that they analyze the differential between specific periods of interest. Consider a simple example: In the event of a recession, local governments tend to enact targeted policies that they believe will stimulate job growth and economic development, driven by the hope of increasing economic competitiveness in specific areas. To test whether or not such policies had an effect, it is necessary to look closely at the data for the industry or sector in question. Dynamic shift-share analysis accomplishes this task by looking at the differential between competitive responses over different recessions.

#### *Limitations*

A shift-share analysis reveals areas of local competitive advantage, but fails to account for the forces driving such advantages. Despite such limitations, a shift-share analysis is an efficient method to separate national and industrial elements from regional growth, which allows for the identification of industries that exhibit significant growth opportunities. In so doing, the analysis invites both a thoughtful assessment of the forces that drove the job dynamics and to develop policies that will exploit and strengthen the development process.

## **Results**

### ***Traditional Shift-share***

For the period January 1990 to June 2011, employment in the U.S. grew 20.1%. During the same period Connecticut’s job market contracted 1.3% or 20,800 jobs. Breaking down this job loss by industry, in some cases by sector, and analyzing the shift-share effects provides a clearer picture of the state’s standing. Below the study summarizes the shifts over this full period. The focus changes to the last decade, January 2001 to June 2011. Given paradigm shifts occurring throughout the 90’s, CCEA believes this smaller study period provides a more relevant outlook on current industry employment trends.

#### *January 1990 – June 2011*

Connecticut’s industries’ “share” of national employment was unilaterally positive over the entire study period, adding 329,830 jobs. This result is not surprising as national population growth along with an expanding economy and employment base allowed national employment to increase

rapidly. So why did Connecticut see a net loss over the 21 years? Further exploration of the shift-share components may provide a reasonable explanation.

**Table 1: Sources of CT Job Changes (000's)  
January 1990 through June 2011**

| Sector                            | NS            | IM           | RS             | Total Job gain/loss |
|-----------------------------------|---------------|--------------|----------------|---------------------|
| Mining & Logging                  | 0.18          | -0.15        | -0.33          | -0.30               |
| Construction                      | 13.62         | -12.37       | -19.15         | -17.90              |
| Manufacturing                     | 61.63         | -166.48      | -35.75         | -140.60             |
| Trade, Transportation & Utilities | 65.44         | -34.01       | -65.83         | -34.40              |
| Information                       | 8.69          | -8.49        | -11.79         | -11.60              |
| Financial Activities              | 31.05         | -7.06        | -45.19         | -21.20              |
| Professional & Business Services  | 34.26         | 66.79        | -78.96         | 22.10               |
| Education & Health Services       | 38.92         | 127.34       | -45.75         | 120.50              |
| Leisure & Hospitality             | 22.11         | 24.30        | -21.90         | 24.50               |
| Other Services                    | 11.76         | 5.32         | -14.78         | 2.30                |
| Government                        | 42.19         | 2.99         | -9.37          | 35.80               |
| <b>State of Connecticut Total</b> | <b>329.83</b> | <b>-1.82</b> | <b>-348.81</b> | <b>-20.80</b>       |

Over the 21 year study period, Connecticut's industrial mix did little to help job creation, resulting in 1,820 job losses. The state was burdened by a higher, relative to the nation, concentration of manufacturing jobs – a sector that significantly contracted nationally, seeing a 34.7% decline. Although a large concentration of education and health services jobs – a sector that rapidly expanded nationally, seeing an 84.3% increase – made up for some of the difference, it was not enough to push Connecticut's industrial mix component positive.

Competitively, Connecticut's results are abysmal – represented by the unilaterally negative numbers down the regional shift (RS) column of Table 1. All of the state's industries suffered from poor performance resulting in 348,810 job losses. Performance in financial activities, information, and trade, transportation and utilities (TTU) was exceptionally severe. Financial activities employment fell 13.7% in Connecticut while it grew 15.5% nationally. Employment in the local information industry shrank by 26.8% compared with national flat growth, and TTU dropped 10.5% as opposed to 9.6% growth nationally. For the study period, relatively low competitiveness proved responsible for Connecticut's contracting employment.

According to CCEA's analysis, the only shift-share component which resulted in positive job growth for Connecticut was national share. The state's idiosyncratic concentration of industries and relative competitiveness weighed extremely heavily on job growth, wholly contributing to the loss over the 21 year period.

January 2001 – June 2011

Connecticut employment declined by 4.1% - 69,400 jobs - over the 11 year period starting January 2001 and ending June 2011. This compares with a national growth rate for the same period of 0.2%. Had Connecticut grown at the same rate as the nation it's "share" of jobs would have been 3,440. However, the state's specific industrial mix and low performing industries resulted in the job losses mentioned above.

In this more focused study period, as opposed to above, the U.S. economy had many industries that were contracting and many that were expanding. The third column of table 2 shows Connecticut's concentration of each of these industries accounts for 18% of the 69,400 jobs lost. Manufacturing was the industry hit hardest on a national level – total employment fell 31.5% over the 11 year period. In the base year Connecticut was heavily invested, in terms of jobs, in manufacturing with 13.8% of the total workforce. This unfortunate combination resulted in heavy losses within the industry. Connecticut also had a very large portion of total employment, 18.6%, situated in TTU. While the industry only saw a 5% decline nationally, heavy losses resulted from the state's significant concentration.

**Table 2: Sources of CT Job Changes (000's)  
January 2001 through June 2011**

| <b>Sector</b>                     | <b>NS</b>   | <b>IM</b>     | <b>RS</b>     | <b>Total Job gain/loss</b> |
|-----------------------------------|-------------|---------------|---------------|----------------------------|
| Mining & Logging                  | 0.00        | 0.21          | -0.31         | -0.1                       |
| Construction                      | 0.13        | -12.53        | -2.60         | -15.0                      |
| Manufacturing                     | 0.48        | -74.24        | 6.16          | -67.6                      |
| Trade, Transportation & Utilities | 0.64        | -16.70        | -6.84         | -22.9                      |
| Information                       | 0.09        | -13.00        | -2.00         | -14.9                      |
| Financial Activities              | 0.29        | -2.98         | -6.51         | -9.2                       |
| Professional & Business Services  | 0.44        | 3.72          | -25.36        | -21.2                      |
| Education & Health Services       | 0.51        | 74.12         | -10.13        | 64.5                       |
| Leisure & Hospitality             | 0.24        | 12.00         | 2.76          | 15.0                       |
| Other Services                    | 0.13        | 2.80          | -3.62         | -0.7                       |
| Government                        | 0.50        | 13.70         | -11.49        | 2.7                        |
| <b>State of Connecticut Total</b> | <b>3.44</b> | <b>-12.89</b> | <b>-59.95</b> | <b>-69.4</b>               |

Most of the above industrial mix losses were offset by education and health services gains. The industry saw 29.9% growth at the national level. In January 2001, Connecticut had 14.8% of its total workforce concentrated in education and health services. With this fairly large share the state was able to benefit strongly from large national growth, as noted by the positive 74,120 jobs for EHS in the third column.

The regional shift, or competitive component, was responsible for the rest of the job loss over the study period. The fourth column of Table 2 shows a total of 59,950 jobs were lost due to the poor performance of Connecticut industries. Professional and business services took the hardest hit losing 25,360 jobs due to a competitive disadvantage. As seen from the table above, very few industries

experienced competitive job gains and those that did saw relatively small growth. It is no surprise then that the overall effect was so pronounced.

It is noteworthy, however, to discuss the one ray of sunshine in the competitive component: manufacturing. Despite heavy losses sustained nationwide, Connecticut remained competitive in manufacturing. The job losses the industry sustained over the study period were strictly from the national industry contracting. Applying shift-share analysis to specifically the manufacturing industry (for sectors where the data were available) will allow dissection of Connecticut’s competitiveness by sector.

**Table 3: Sources of CT Job Changes in Manufacturing (000’s)  
January 2001 through June 2011**

|                                | NS   | IM     | RS    | Total Job gain/loss |
|--------------------------------|------|--------|-------|---------------------|
| <b>Manufacturing</b>           | 0.48 | -74.24 | 6.16  | -67.60              |
| Chemicals                      | 0.04 | -4.13  | -3.32 | -7.40               |
| Fabricated Metals              | 0.08 | -9.12  | -2.56 | -11.60              |
| Machinery                      | 0.05 | -6.54  | -1.91 | -8.40               |
| Computer & Electronic Products | 0.05 | -9.05  | 0.11  | -8.90               |
| Transportation Equipment       | 0.10 | -14.91 | 11.31 | -3.50               |
| Aerospace Products & Parts     | 0.07 | -1.56  | 0.39  | -1.10               |
| Miscellaneous Manufacturing    | 0.03 | -2.72  | -0.71 | -3.40               |

*Note: columns do not sum as job numbers were not available for every sector in manufacturing over the study period.*

Table 3 shows a shift-share sector breakdown of the manufacturing industry in Connecticut. All available sectors were contracting nationally, and Connecticut was heavily impacted by this decline. As such, the industrial mix (more appropriately “sectoral mix”) component is negative for all sectors, reflecting a delineation of job losses associated with a shrinking industry. The positive regional shift effect in all of manufacturing is being carried by the transportation equipment sector which saw a 7.4% decline locally despite a nearly 32% decline nationally. Much of this difference is associated with a relative competitive advantage in the sector. This result can be extrapolated to both the computer and electronic products; and aerospace products and parts sectors, though to a significantly lesser degree.

**Dynamic Shift-share**

The Connecticut economy was more severely impacted than the national economy during the recession of July 1990-May 1991. While the US only lost approximately 1.4% of total jobs, the state of Connecticut lost approximately 3.6% of total jobs. However, the two subsequent recessions have produced the opposite results. The recession of 2001, resulting from the ‘Dot Com Bubble,’ had a significantly weaker impact on the state’s economy compared to the national economy. The most recent recession, which lasted from December 2007 to June 2009, saw the Connecticut economy slightly outperform the national economy in terms of job retention.

The following three subsections highlight the specific impacts of the past three recessions on the Connecticut economy.

### *July 1990-May 1991*

During the recession of July 1990-May 1991, 1.4% of jobs were lost in the US. The Connecticut economy, which was impacted to a much greater degree, lost nearly 3.6% of total employment. At the national level, no sectors experienced a growth in employment. However, within Connecticut the education and health services industry did experience job growth.

Declining national industries included mining and logging; construction; manufacturing; trade, transportation and utilities; professional and business services; and education and health services.

Competitive advantages - in the form of a positive regional shift - for the Connecticut economy were found within the professional and business services; education and health services; and government industries. Of these, only the education and health services sector was growing at the national level.

Manufacturing lost the second most jobs of any industry - approximately 15,400 – during this recession. As would be expected, all manufacturing subsectors also saw a decline in employment. Despite this decline in employment, three manufacturing subsectors - chemicals, fabricated metals, and machinery – within the state performed better than their national industry counterparts.

### *March 2001-November 2001*

Effects of the March 2001-November 2001 recession were considerably greater at the national level than at the state level. During this recession, 1.2% of jobs were lost in the US versus only 0.3% of jobs in Connecticut. At both the national and state levels, only the Financial Activities, Education and Health Services, Other Services and Government sectors experienced a growth in employment.

Declining industries included: Manufacturing, Trade, Transportation and Utilities, Information, and Professional and Business Services.

The fact that Connecticut outperformed the national economy in terms of job retention is an indication of certain competitive advantages within the state's economy. These competitive advantages were spread across a number of sectors. Such industries include Construction, Manufacturing, Trade, Transportation and Utilities, Professional and Business Services, Leisure and Hospitality, and Government.

Despite a positive regional shift within Connecticut, the Manufacturing sector lost the most jobs of any sector – approximately 12,700 jobs – during this recession. All manufacturing subsectors saw a decline in total employment, except for Aerospace Products and Parts. The competitive advantage for Connecticut's manufacturing industry is driven by the positive regional shifts within the state's Machinery, Transportation Equipment, Aerospace Products and Parts, and Miscellaneous Manufacturing sectors.



*December 2007-June 2009*

During the recession of December 2007-June 2009, 5.4% of jobs were lost in the US. The Connecticut economy slightly outperformed the national economy, losing 5.2% of jobs. At the national level, only the Education and Health Services and Government sectors experienced growth in employment. At the state level, only the Education and Health Services sector experienced a growth in employment.

Declining industries included: construction; manufacturing; trade transportation and utilities; information; financial activities; and business and professional services.

The positive performance of the state's economy compared with the national is attributable to positive competitive shifts in many industries. Such industries include mining and logging; manufacturing; trade, transportation and utilities; financial activities; education and health services; and leisure and hospitality.

The manufacturing industry continued to exhibit a positive competitive shift during this recession. However, the third largest number of jobs of any sector – approximately 17,900 – was lost here. All manufacturing subsectors also experienced a decline in employment. The positive competitive shift within the state's manufacturing industry is attributable to positive regional shifts in a majority of the manufacturing subsectors. Such increasingly competitive subsectors include fabricated metals; machinery; computer and electronics products; transportation equipment; aerospace products and parts; and miscellaneous manufacturing.

The improvement in the state's competitiveness over the past two recessions is comparable to the overall trend found in our traditional shift-share analysis. Specifically, the Connecticut manufacturing industry, which experienced especially poor performance compared to the US during the July 1990-May 1991 recession, has experienced a steady increase in competitiveness – as measured by regional shift. Results indicate that during the most recent recession, manufacturing within the state drastically outperformed the manufacturing industry at the national level.

## **Summary**

The primary concern for Connecticut's industries is not necessarily on whether jobs were lost, but on whether there are local competitive advantages. The secondary concern is about nature of the industries on a national level, i.e. whether specific industries are expanding or contracting. While these effects are interesting on their own, they provide more information when considered together. Is the state competitive in a growing industry? Is it competitive in a shrinking industry? Perhaps Connecticut does not have a competitive advantage in either. Each of these combinations has implications, and while shift-share analysis is not a behavioral model, it at least points to where industries in Connecticut lie.

| <b>Table 4: Division of Industries by Regional Shift and Industry Mix Effects<br/>January 1990 – June 2011</b>                 |   |
|--|---|
| <b>Positive RS, Positive IM</b>  | <b>Positive RS, Negative IM</b>   |
| None   | None  |
| <b>Negative RS, Positive IM</b>  | <b>Negative RS, Negative IM</b>   |
| Business and Professional Services<br>Education and Health Services<br>Leisure and Hospitality<br>Other Services<br>Government | Mining and Logging<br>Construction<br>Trade, Transportation and Utilities<br>Information<br>Financial Activities<br>Manufacturing |

Table 4 is a visual representation of Connecticut’s industries over the extended study period from January 1990 through June 2011. It is obvious that during this time there was no local competitive advantage in any industry – the regional shift component was uniformly negative. In addition, as the right half of the table reveals, the majority of industries in Connecticut contracted nationally. The lower right quadrant contains the local industries that not only shrank on a national level but also lacked a competitive advantage; the lower left quadrant contains those that experienced poor local performance but experienced positive national growth.

The lower left quadrant of Table 5 consists of the local industries with relatively poor local performance but employment growth on the national level. Of the five listed, two are of note: professional and business services; and education and health services. These are industries where targeted government policy could improve competitiveness and increase the likelihood Connecticut is able to take advantage of positive industry employment trends.

Again, the lower right quadrant lists the industries that contracted nationally *and* performed weakly in Connecticut over the study period. TTU is second largest local industry in terms of employment, decreasing from 18.5% of the total workforce to 18%. While nothing can be done about national growth, it is important to understand that, competitively, Connecticut is underperforming here.

| <b>Table 5: Division of Industries by Regional Shift and Industry Mix Effects<br/>January 2001 – June 2011</b>            |  |
|---|--|
| <b>Positive RS, Positive IM</b>   | <b>Positive RS, Negative IM</b>  |
| Leisure and Hospitality   | Manufacturing  |
| <b>Negative RS, Positive IM</b>   | <b>Negative RS, Negative IM</b>  |
| Mining and Logging<br>Professional and Business Services<br>Education and Health Services<br>Other Services<br>Government | Construction<br>Trade, Transportation and Utilities<br>Information<br>Financial Activities |

From January 2001 to June 2011 Connecticut had two industries that performed competitively. Manufacturing, despite significant nationwide contraction, experienced a competitive advantage in Connecticut over the study period. As stated earlier, the positive regional shift is largely thanks to transportation equipment manufacturing, although the computer and electronics products sector; and the aerospace products and parts sector were marginally positive. Over the ten year study period, only one Connecticut industry saw positive national growth *and* a local competitive advantage: leisure and hospitality. Locally, the industry saw 12.5% growth over the study period while, nationally, the industry grew by 10.2%.

### **Conclusion**

It is obvious from the results above that Connecticut’s industrial performance from 1990 through 2011 was exceptionally poor. No single state industry experienced a competitive advantage. CCEA’s analysis concludes that this lack of competitiveness was almost solely responsible for the 20,800 local job losses over the period, despite 20% national employment growth. While this is valuable information, it lends little to policy analysis or to reveal current trends

Analysis of the shorter, more recent time frame, 2001 to 2011, revealed two key pieces of information. First, Connecticut’s manufacturing and leisure and hospitality sectors outperformed the national pattern. This result indicates a comparative advantage in both industries, manufacturing having a relatively greater effect. The industry’s competitive advantage is especially important because the job losses sustained in manufacturing were a large portion of the total losses seen by the state. The

combined effect, according to CCEA's analysis, is that the manufacturing jobs lost in Connecticut were a direct result of the industry's national contraction, an element that is out of the state's policymakers' hands. At the same time, the study establishes the importance of sustaining support for manufacturing where the state can continue to capture an increasing share of a sector contracting at the national level. This will not restore strong job growth, but it will sustain high-paying jobs in a sector with particularly strong multiplier effects.

Second, there is one clear area of focus. Connecticut is lagging behind the nation, competitively, in two expanding key sectors: professional and business services and education and health services. There are many potential implications to draw from this; firm relocation, lagging worker productivity, etc. Targeted policy initiatives focusing on improving performance in these industries is critical for Connecticut to take advantage of strong national growth. CCEA's results indicate that, given available resources, improved competitiveness in professional and business services and in education and health services over the last decade would have covered nearly 50% of the total job losses in the state.