The Impact of Automation on Occupations

Technology tends to have a disruptive impact on the labor market, increasing the demand for some skills while simultaneously decreasing demand for others. Recent research by Carl Frey and Michael Osborne[1] examines the susceptibility of jobs to a particular type of technology, computerization. The authors look at 702 detailed occupations (by SOC-code) and create a methodology to assess the future impact of computerization. They first observe that computers have already displaced a significant number of workers in occupations involving routine, well defined and repeatable tasks such as manufacturing. These jobs have, in many cases, been replaced by lower-paying service jobs that are less susceptible to computerization. *In contrast to these jobs, Frey and Osborne identify substantial employment growth in occupations requiring cognitive tasks. The tasks primarily associated with being non-susceptible to computerization include tasks related to social intelligence, creativity, perception and manipulation.* The primary research focus, however, is in predicting areas of loss.

The Economic & Labor Market Information Division (ELMI) of the Vermont Department of Labor is a primary source of labor market information in Vermont.

We provide detailed information about current employment patterns, labor market trends and workforce utilization for the state of Vermont and various sub-state geographies

ELMI administers labor market data programs in collaboration with our federal partners at the Bureau of Labor Statistics and the Employment & Training administration.

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Frey and Osborne attempt to "determine which problems engineers need to solve for specific occupations to be automated". The authors then identify how difficult those problems are likely to be. Finally, they compare the characteristics of those problems to occupational characteristics identified in the O*NET database, a primary source for occupational information created by the US Department of Labor. By doing so, they are able to estimate the impact of technological changes on individual occupations and the composition of the labor market as a whole. These technological impacts don't necessarily indicate that the occupation is disappearing altogether – in many cases the technology allows information-based tasks to be moved to lower-wage nations instead. The results of this research indicate that forty seven percent of all employment in the United States is at risk of becoming automated over "the next decade or two." Building on the work of Frey and Osborne, we use their framework to analyze the impact of automation on the Vermont labor force. The results of this analysis are summarized below.

It is important to note that only occupations that exist in the Frey and Osborne data set *and* exist in reportable numbers in Vermont are included in this analysis. In total, this includes 394 occupations representing 289,971 jobs in the state, approximately 82% of employed persons (2010 data).

> **The Case of the Buggy Whip**
> *One oft-cited example of the disruptive impact of technology is the introduction of the automobile, which all but abolished employment in the production of buggy whips. Former buggy whip makers had to learn new skills and find new work, perhaps in the emerging automobile industry.*

[1]Frey, C.B. & Osborne, M.A. (2013). The Future of Employment: How Susceptible are Jobs to Computerisation?

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Using Frey and Osborne's methodology, the occupations with the greatest probability of losing employment due to automation are Insurance Underwriters, Tax Preparers, Library Technicians, Telemarketers, New Accounts Clerks, Cargo & Freight Agents and Data Entry Keyers. The occupations least likely to lose employment due to automation include Recreational Therapists, First Line Supervisors of Mechanics, Mental Health & Substance Abuse Social Workers, Occupational Therapists, Healthcare Social Workers and Dietitians & Nutritionists. All of these have less than .4% probability of being lost to automation.

Location Quotient Analysis

Table 1 lists these occupations and their respective location quotient, a measure of how concentrated these jobs are in Vermont relative to the nation as a whole. A location quotient above 1 means that this occupation is a larger share of the workforce in Vermont than nationwide, while a number less than one means the occupation is a smaller share. The only occupation on the most-impacted list that will have a greater impact in Vermont than the rest of the nation is library technicians. Vermont has an 18% greater concentration of these jobs than the nation and therefore the impact will be more pronounced here. Among the jobs least likely to be impacted, only Mental Health & Substance Abuse Social Workers are significantly different than the national concentration. That occupation is more than three times more heavily concentrated in Vermont.

Table 1: Location Quotient of Most and Least Impacted Occupations

Most impacted by automation		Least impacted by automation	
Title	**Location Quotient**	**Title**	**Location Quotient**
Insurance Underwriters	0.79	Dietitians and Nutritionists	1.04
Tax Preparers	0.46	Healthcare Social Workers	0.96
Library Technicians	1.18	Occupational Therapists	0.9
Telemarketers	0.24	Mental Health and Substance Abuse Social Workers	3.34
New Accounts Clerks	0.51	First-Line Supervisors of Mechanics, Installers	1.05
Cargo and Freight Agents	0.32	Recreational Therapists	0.97
Data Entry Keyers	0.74		

Occupational Groups

Across all occupations 59% of all jobs in Vermont are susceptible to loss due to automation. The susceptibility varies significantly across occupational groups. According to Frey and Osborne, the probability of Community & Social Science occupations being automated is less than 5%. On the other end of the spectrum, legal occupations face an 89% probability. Vermont's largest occupational category, Office & Administrative Support (44,276 jobs in 2010), is estimated to have an 82% probability of decline due to automation. Food Service and Preparation, employing an estimated 24,296 people, faces an 86% probability of losses.

Occupations least likely to face losses due to automation include the aforementioned Community & Social Service, where 2010 employment was 7,008; Management, where employment was 9,172; and Life, Physical & Social Sciences, with employment of 2,811. Table 2 lists the occupational groups, 2010 employment and percent of potential job losses.
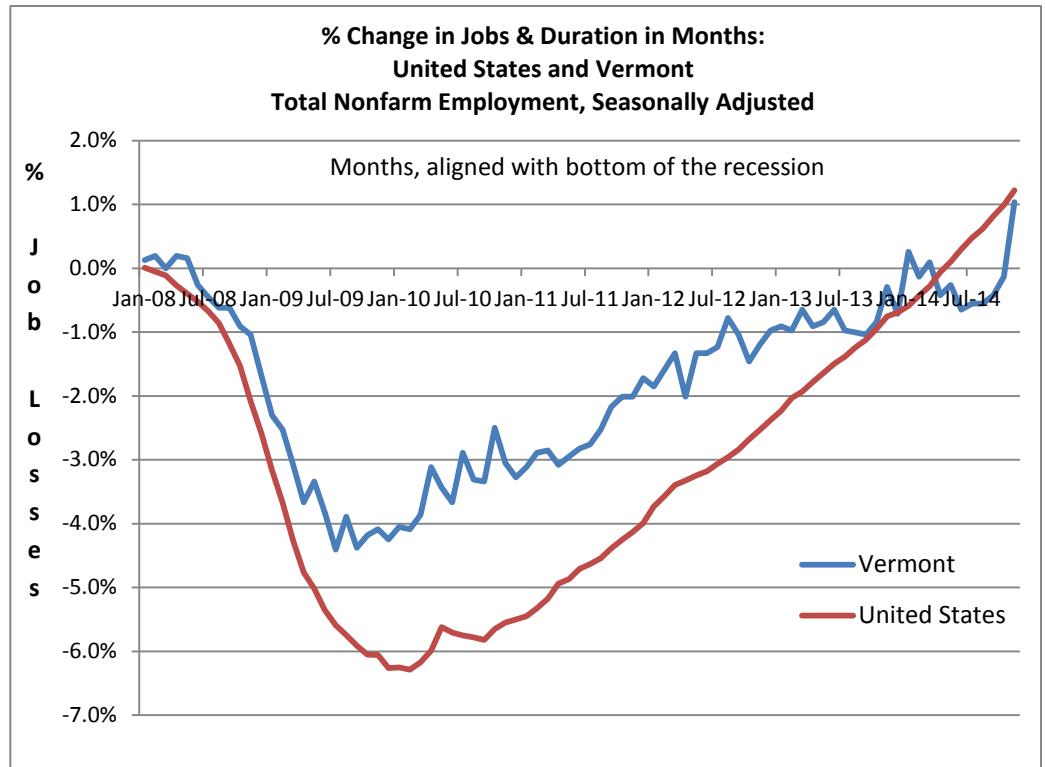
Table 2: Potential Job Losses by Occupational Group

Occupational Group Title	2010 Employment	Potential job losses	Percent of jobs in group
Management	9,172	825	9.0%
Business & Financial Operations	11,330	6,279	55.4%
Computer & Mathematical	5,854	1,552	26.5%
Architecture & Engineering	3,978	606	15.2%
Life, Physical & Social Sciences	2,811	412	14.7%
Community & Social Service	7,008	336	4.8%
Legal	685	609	88.9%

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Current Employment Statistics

The Current Employment Statistics (CES) program provides detailed industry data on employment, hours and earnings of workers on nonfarm payrolls. It is designed to take a monthly 'pulse' of the economy based on historical data and a survey of approximately 144,000 business and government agencies nationwide. The sample includes approximately 2,000 firms in Vermont each month.

CES output is a modeled survey sample. As with any sample, it is subject to statistical error. Another program, the Quarterly

% Change in Jobs & Duration in Months:
United States and Vermont
Total Nonfarm Employment, Seasonally Adjusted

Census of Employment and Wages (QCEW), provides a more comprehensive count but publication is delayed by up to six months. QCEW provides the historical data for the CES program.

As of November, 2014 the Vermont economy has recovered all jobs lost during the most recent recession. Over the past twelve months the economy added 4,100 jobs, an increase of 1.3%. Total seasonally adjusted nonfarm payroll employment stood at 311,700 as of November. The fastest area of growth was in Arts, Entertainment & Recreation, which increased by 15.0% between November of 2013 and November of 2014.

The Quarterly Census of Employment and Wages

QCEW is a quarterly census of all firms covered by unemployment insurance in the state of Vermont. Data collected includes monthly employment level and wages at each worksite. Because it is a census, QCEW serves as a benchmark for other LMI programs. Data is published on a quarterly basis with a processing delay of approximately six months. Between June of 2013 and June, 2014 total employment increased by 2,972 (about 1%), with private, service-providing industries accounting for the largest increase. On a percent basis the largest area of growth was

Agriculture, Forestry, Fishing & Hunting (6.2% growth, 187 jobs) followed by Management of Companies (6.0%, 119 jobs) and Educational Services (5.8%, 533 jobs). The greatest increase in number of jobs was in Education & Health (+1032); Leisure & Hospitality (+804) and Construction (+796). The largest losses were in Durable Goods (-989) and Professional & Technical Services (-173)

Change in QCEW Employment, June 2013 - June 2014

Industry Group	2013	2014	Change	Percent change
Total employment	304,036	307,008	2,972	0.98%
Private ownership	251,554	253,965	2,411	0.96%
Goods Producing	*50,888*	*51,152*	*264*	*0.52%*
Service Providing	*200,666*	*202,813*	*2,147*	*1.07%*
Government	52,782	53,043	261	0.49%

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Local Area Unemployment Statistics

The Local Area Unemployment Statistics (LAUS) program produces monthly and annual employment, unemployment, and labor force data for Census regions, states, counties, metropolitan areas, and towns by place of residence.

Unemployment Rate, Seasonally Adjusted
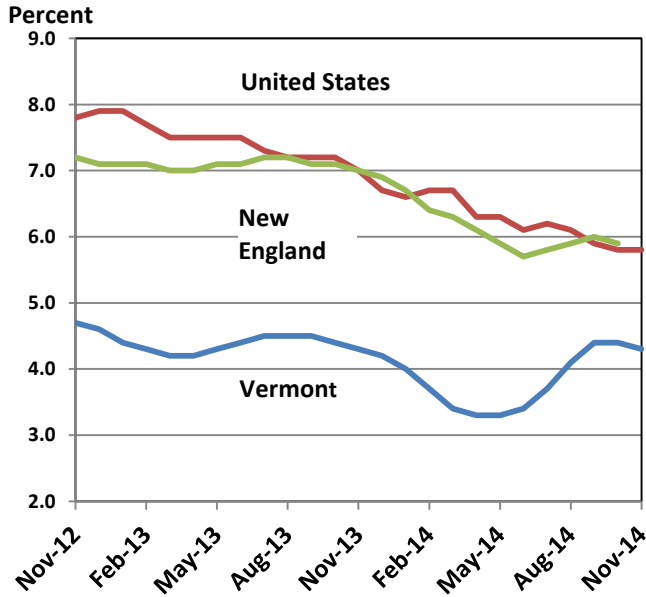
The state's seasonally adjusted unemployment rate has been falling unevenly since its 7.2% peak in the spring of 2009. As of November, 2014 it stands at 4.3%, a decline of one tenth of one percent over the month. Vermont's rate follows a trend similar to the US rate, but is typically lower. The comparable US rate was 5.8% in November.

Vermont's unemployment rate was the 10th lowest in the nation as of November, and the second lowest in New England behind New Hampshire, where the rate was 4.1%. Rhode Island had the highest rate in New England at 7.1%. Nationwide, Mississippi had the highest rate among state (7.3%), though The District of Columbia was higher still at 7.4%. November data also shows that the Vermont Labor Force grew has grown by approximately 1,650 people since August.

Labor Force Data during The Great Recession

The Great Recession officially started in December, 2007. Subsequently, the unemployment rate increased in every county in the state. It reached over 10% in Essex, Grand Isle and Orleans County. By 2010 it had begun to decline in most areas. As of November of 2014, the unemployment rate is now below 2007 levels in nine counties: Addison, Caledonia, Essex, Franklin, Grand Isle, Lamoille, Orange, Orleans and Washington. One striking feature of the recent recession was a decline in the labor force nationwide. In Vermont, the labor force remains below its December 2007 levels in Windham (118 fewer in the labor force), Addison (-554), Bennington (-1,119), Caledonia (-889), Essex (-328), Grand Isle (-402), Orange (-939) and Rutland (-1696). The largest increase is in Chittenden, where the labor force has increased by 3,602. The labor force has also grown in Franklin, Lamoille, Orleans and Washington.

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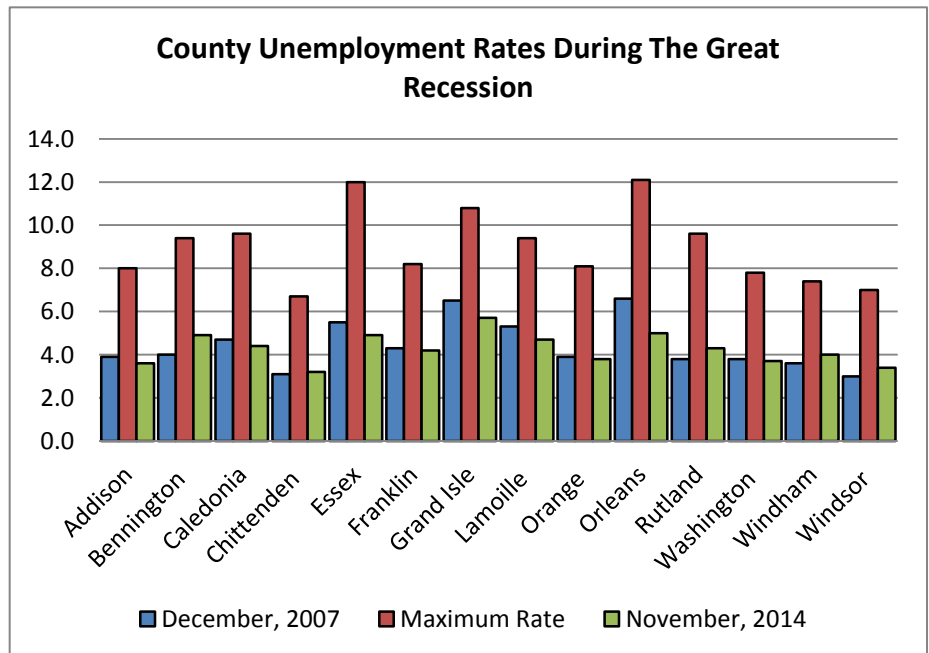
Career Planning and Employment Data Resources

The Department of Labor has a wide range of employment resources available to Vermonters seeking to find work, change careers or just explore opportunities. Our staff work to connect Vermont businesses with qualified employees and offer innovative programs to help train motivated individuals. The Economic & Labor Market Information Division also houses data related to occupations, industries, wages, income and labor force utilization for the state and various sub-state geographies.

Career Exploration Resources

American Job Centers: The Vermont Department of Labor has 13 Career Resource Centers throughout the state. These centers can assist with job searches and provide access to online resources.
www.labor.vermont.gov/workforce-development

Start Where You Are explores the variety of occupations available to Vermonters and offers guidance on where to receive the requisite education and training.
www.startwhereyouarevt.org

My Skills My Future is a place to manage your career and create a pathway to success. Tools are available to help students, businesses and career professionals.
www.careeronestop.org

My Next Move helps young people and those changing careers make informed decisions about career choices, including a unique exploration tool that allows the user to search by interests and training. www.mynextmove.org

Vermont Job Link is a free, self-service job matching system for jobseekers and employers. Job seekers can post a resume and apply for positions directly from the site. Job Link is hosted by the VT Department of Labor.
www.vermontjoblink.com

Resources for Employers

Vermont Small Business Development Center is a source for no-cost business advising and low-cost training for Vermont entrepreneurs. www.vtsbdc.org

Think Vermont is a source for information about starting, expanding and relocating a business in VT.
www.accd.vermont.gov/business

Economic & Labor Market Data

From our homepage at www.vtlmi.info, Vermonters can access a wide range of labor market data. This includes all of the background data for sections of this newsletter as well as occupational and industrial projections, wage ranges and quintiles by occupation, fringe benefits comparisons, per capita incomes, an employer database, quarterly workforce indicators and assorted related data. Other sources for labor market data include:

The United States Bureau of Labor Statistics www.bls.gov.

The Employment and Training Administration
www.doleta.gov

Vermont Department of Labor
labor.vermont.gov

For questions about this newsletter or for more information about the Economic & Labor Market Information Division of the Vermont Department of Labor, please reach us at:
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