Economic Impact of Promoting Advanced Manufacturing Employment and Entrepreneurship in the Lakes Region, New Hampshire

prepared by

Economic and Labor Market Information Bureau
New Hampshire Employment Security

for

Lakes Region Planning Commission

Granite State Future

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Definitions

Advanced Manufacturing: Advanced manufacturing involves the use of <u>technology</u> to improve products and/or processes, with the relevant technology being described as "advanced," "innovative," or "<u>cutting edge</u>." For example, one organization defines advanced manufacturing as industries that "increasingly integrate new innovative technologies in both products and processes. The rate of <u>technology adoption</u> and the ability to use that technology to remain competitive and add value define the advanced manufacturing sector.

Entrepreneurship: Entrepreneurship is a process of identifying and starting a business venture, sourcing and organizing the required resources and taking both the risks and rewards associated with the venture.

Gross Domestic Product (GDP): The market value of goods and services by labor and property in the United States, regardless of nationality. As the changes were made at the county level in each of these scenarios prepared for the Lakes Region Planning Commission, GDP would refer to the value of goods and services by labor and property in Belknap and Carroll counties.

This impact analysis of promoting *Advanced Manufacturing* employment and *Entrepreneurship* in the Lakes Region was conducted using the Economic and Labor Market Information Bureau's New Hampshire Econometric Model – a REMI Policy Insight + ® model.[1] Regarding advanced manufacturing, the Lakes Region Community College and Huot Technical Center provided information.

Using this econometric model, we are able to estimate both the number of direct jobs added in Belknap County, as well as the indirect and induced jobs gained in the region (the model results will include the impact on both Belknap and Carroll counties).

The Lakes Region Planning Commission is interested in promoting economic opportunity through a vibrant economy and high quality jobs. LRPC is interested in qualitative growth and sustainable development. A scenario of an aging population combined with slow population growth could lead to a shortage of talent in manufacturing. In addition, slow population growth could decrease the number of young professionals in the region, which are usually viewed as the prime demographic group for creating new entrepreneurial businesses.

Derived from this overall slow population growth are the following two concerns for which scenarios were developed:
1. Attracting skilled workers in *Advanced Manufacturing* to support the manufacturing base in Laconia, Meredith, and Bristol.
2. Attracting more entrepreneurs

[1.] Product of Regional Economic Models, Inc. of Amherst, MA.

The first scenario was built upon an initiative in the Lakes Region to facilitate the training and hiring of skilled workers in *Advanced Manufacturing*. Lakes Region Community College and the Huot Technical Center (part of Laconia High School) are currently offering educational degree programs related to *Advanced Manufacturing*. A leading manufacturing employer in the region has indicated that the company will employ any qualified persons that complete such a program.

The second scenario is an attempt to estimate the economic impact of attracting more entrepreneurs to the region. Attracting an additional 25 entrepreneurs to the region over the next five years was set as a reasonable goal.

Scenario 1: Promoting Advanced Manufacturing

Inputs and assumptions

The estimated number of direct jobs created in Belknap County was modeled based on an input of training and hiring an incremental number of students each year over a five-year implementation period, from 2014 to 2018. The employment estimate is accumulative, so by 2018, 220 jobs would be created in Belknap County. To capture the longer term impact of this scenario, the model time period was extended another five years to 2023, without additional program completers entering the labor force. These *Advanced Manufacturing* jobs were distributed across 54 detailed *Manufacturing* industries in proportion to 2023 forecasted employment share, to account for future growth patterns.[2]

The assumed number of direct jobs in *Advanced Manufacturing* — students completing the training program and entering the local labor force — was added accumulatively to Belknap County's economy between 2014 and 2023 as follows:

Job Training Promotion	Five year implementation period					Stabilization period				
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Advanced Manufacturing Jobs	20	50	95	150	220	220	220	220	220	220

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2. The REMI model is based on NAICS, the North American Industry Classification System, which is used to classify business establishments according to type of economic activity (process of production) in Canada, Mexico and the United States. An establishment is typically a single physical location, though administratively distinct operations at a single location may be treated as distinct establishments. Each establishment is classified to an industry according to the primary business activity taking place there.

The direct jobs created in Belknap County were added to *Manufacturing* industry employment based on the following shares:

| REMI Model detailed Manufacturing NAICS Industries	Share of 2023 forecasted employment base
Other fabricated metal product manufacturing	21.70%
Foundries	17.00%
Computer and peripheral equipment manufacturing	16.88%
Machine shops; turned product; and screw, nut, and bolt manufacturing	11.24%
Coating, engraving, heat treating, and allied activities	4.38%
Semiconductor and other electronic component manufacturing	3.78%
Medical equipment and supplies manufacturing	3.77%
Textile mills and textile product mills	2.72%
Cement and concrete product manufacturing	2.69%
Electrical equipment manufacturing	1.99%
Ship and boat building	1.88%
Apparel manufacturing; Leather and allied product manufacturing	1.57%
Household and institutional furniture and kitchen cabinet manufacturing	1.51%
Forging and stamping	1.37%
Other miscellaneous manufacturing	1.35%
Architectural and structural metals manufacturing	1.05%
Printing and related support activities	0.86%
Navigational, measuring, electromedical, and control instruments manufacturing	0.70%
Other wood product manufacturing	0.51%
Aerospace product and parts manufacturing	0.44%
Sawmills and wood preservation	0.43%
Engine, turbine, power transmission equipment manufacturing	0.39%
Sugar and confectionery product manufacturing	0.39%
Other electrical equipment and component manufacturing	0.34%
Beverage manufacturing	0.16%
Cutlery and handtool manufacturing	0.15%
Glass and glass product manufacturing	0.10%
Communications equipment manufacturing	0.08%
Bakeries and tortilla manufacturing	0.08%
Dairy product manufacturing	0.07%
Pulp, paper, and paperboard mills	0.06%
Petroleum and coal products manufacturing	0.06%
Motor vehicle body and trailer manufacturing	0.04%
Converted paper product manufacturing	0.03%
Rubber product manufacturing	0.03%
Soap, cleaning compound, and toilet preparation manufacturing	0.03%
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	0.03%
Pharmaceutical and medicine manufacturing	0.03%
Paint, coating, and adhesive manufacturing	0.03%
Pesticide, fertilizer, and other agricultural chemical manufacturing	0.03%
Basic chemical manufacturing	0.02%
Other chemical product and preparation manufacturing	0.02%
Industrial machinery manufacturing	0.01%
Metalworking machinery manufacturing	0.01%
	100.00%

It is assumed that the anticipated increase in output due to these 220 *Advanced Manufacturing* jobs is driven by an increase in demand for the products from outside the Lakes Region. In other words, the output produced by these added workers is mainly exported to markets outside of Belknap County as well as outside of the United States (international exports).

The following results are the anticipated implications of training and hiring 220 *Advanced Manufacturing* workers in Belknap County. The results include the direct jobs generated in Belknap County, as well as the secondary (in-direct and induced) jobs added in Belknap and Carroll Counties. The results also include the impacts that this expansion will have on the region in terms of added gross domestic product, personal income and population.

Results: Impact from promoting job creation in *Advanced Manufacturing*

- In 2014, a total of 38 direct, indirect and induced jobs[3] would be created in Belknap County. Additionally, 1 job would be created in Carroll County.

- By 2018, at full implementation of the *Advanced Manufacturing* training and hiring scenario, total impact on jobs will have increased to 453 direct, indirect and induced jobs for the entire region (the combined results for Belknap and Carroll counties). The jobs are mostly replacement jobs along with some new ones.

- By 2023, five years after the full implementation of the scenario, total job creation will reach 463 jobs above the employment baseline in the region (the combined results for Belknap and Carroll counties).

Comparison of the baseline employment outlook for Belknap County with the employment outlook with the Advanced Manufacturing scenario

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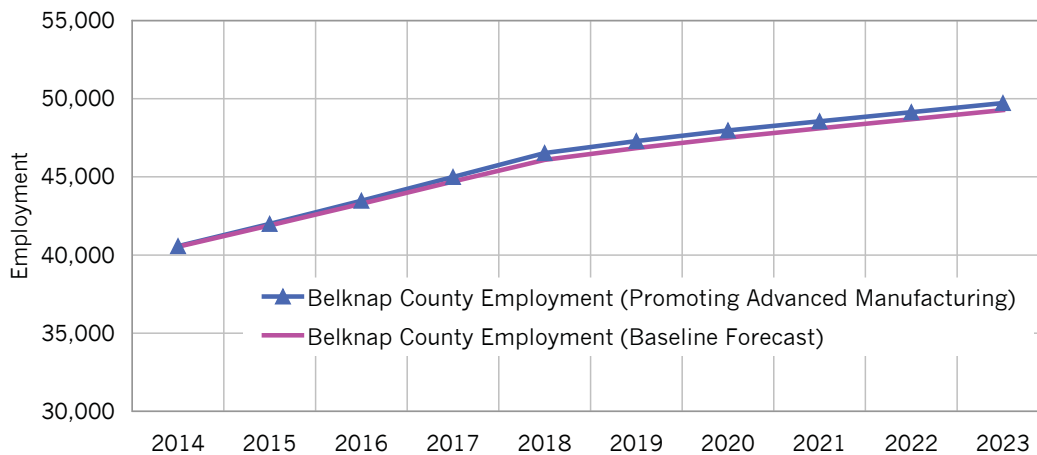
3. Employment in the REMI model is based on Bureau of Economic Analysis (BEA) definition of employment. The BEA estimates of employment and wages differ from covered employment data because BEA makes adjustments to account for self-employment. The employment count in the REMI model is larger than what is regularly reported by the Economic and Labor Market Information Bureau (ELMIB), New Hampshire Employment Security, which excludes self-employment. The REMI model does not distinguish between full-time and part-time jobs.

- By 2018, the distribution of the secondary jobs created in Carroll County would be as follows: *Construction* would create 56 jobs; *Retail trade* would create 21 jobs; and *Wholesale trade* would create 19 jobs. *State and local government* would create 64 jobs.[4]

Industry	2018	
	Direct Jobs	Total jobs created
Manufacturing	220	223
Construction		56
Retail Trade		21
Wholesale Trade		19
Administrative and Waste Management Services		13
Health Care and Social Assistance		11
Real Estate and Rental and Leasing		10
Accommodation and Food Services		10
Other Services, except Public Administration		7
Professional, Scientific, and Technical Services		6
Arts, Entertainment, and Recreation		2
Utilities		1
State and Local		64
Total Jobs	220	443

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4. The impact on local and state government jobs would best be interpreted as employment (above the baseline projected government employment) that would be required in order to provide for the overall increase in the demand for shared government services. Shared services could include education, public safety, water and sewage treatment, road construction and maintenance, and other services related to an increase in business activity and resident population.

Gross Domestic Product

- For this scenario, Gross Domestic Product (GDP) in the region in 2014 will have increased above the baseline by $3.7 million in fixed 2005 dollars. By 2018, the GDP in the region will have grown to $48.7 million in fixed 2005 dollars above the baseline, and GPD will continue to grow throughout the forecast period.

- The economic activity of this scenario will account for 0.2 percent of total GDP in Belknap County. By 2018, total economic activity due to the hiring of 220 *Advanced Manufacturing* workers will account for 1.7 percent of the county's GDP.

The impact on GDP from the hiring of Advanced Manufacturing workers in the Lakes Region
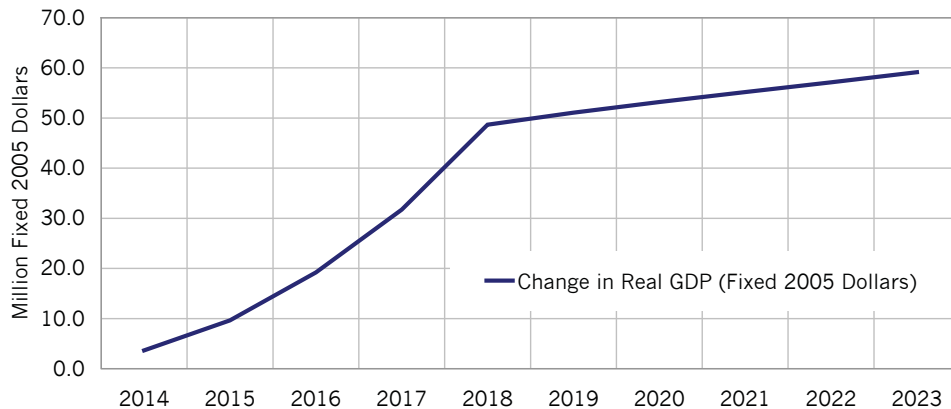

Personal Income

- Based on this scenario, total real personal income will have increased by $1.2 million in fixed 2005 dollars in 2014. By 2018, the increase in real personal income will have grown by $16.2 million in fixed 2005 dollars.

- Real personal income per capita in Belknap County will gain $15 fixed 2005 dollars in 2014. By 2018, real personal income per capita will be $153 in fixed 2005 dollars above the original baseline for the county. The impact on real personal income per capita in Carroll County will be minimal in 2014 but will increase to $12 in fixed 2005 dollars in 2018.

Population

- There would be no significant change to population in 2014. By 2018, Belknap County would gain 125 residents above the forecast baseline and Carroll County would gain 11 residents. By 2023, the population of Belknap County would gain 319 persons above the projected population baseline (a 0.5 percent increase above the forecasted baseline) and Carroll County would gain 25 residents above baseline.

The anticipated population growth in Belknap and Carroll counties due to the hiring/retaining of 220 Advanced Manufacturing workers

Belknap Population (Advanced Manufacturing Scenario)
Belknap County (Population Baseline)
Carroll County (Advanced Manufacturing Scenario)
Carroll County (Population Baseline)
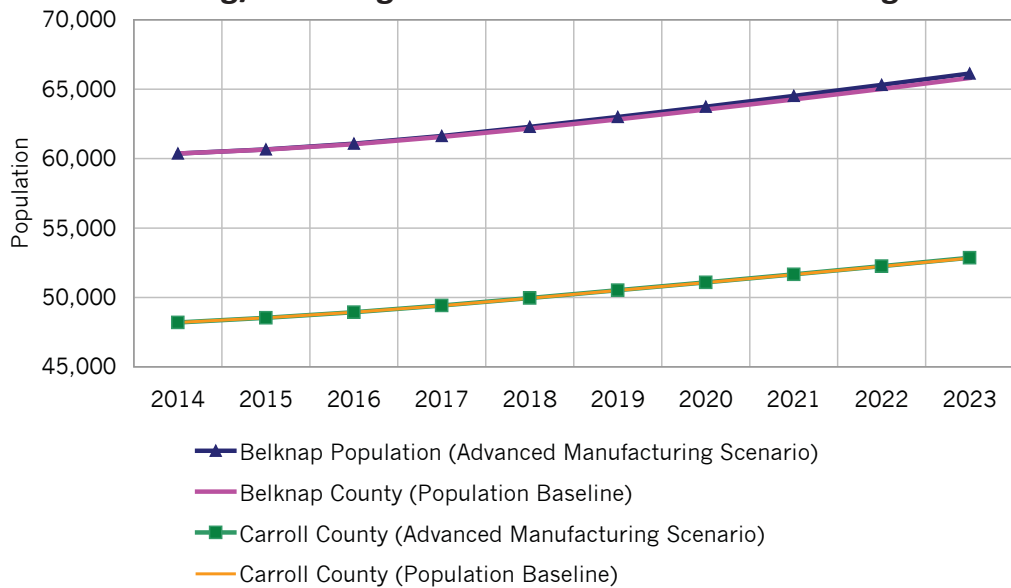
Job Multiplier

- The multiplier effect on the Lakes Region for each *Advanced Manufacturing* job created is between 1.9 and 2.1 jobs annually [5] — including the direct job created —over the entire simulation period.

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5. A job multiplier of more than one indicates that the new job created in the local economy has a ripple effect that generates more employment in the region. A multiplier of less than one indicates that some of the current employment in the region would be eliminated due to the competition from the expanding businesses.

Scenario 2: Promoting Entrepreneurship

Inputs and assumptions

The direct jobs created in Belknap County due to an increase in the number of entrepreneurs in the region were entered into the REMI model for the time period of 2014 to 2018. It was assumed that on average, four jobs would be created with each entrepreneur. These 25 entrepreneurs were phased in over a five-year period in increments of 5. It is assumed that each entrepreneur is producing 4 jobs on average, so 20 jobs will be created in the first year. Accumulatively, by 2018, 100 additional jobs will be added.

The assumed number of direct jobs created in Belknap County was added to the REMI model as follows:
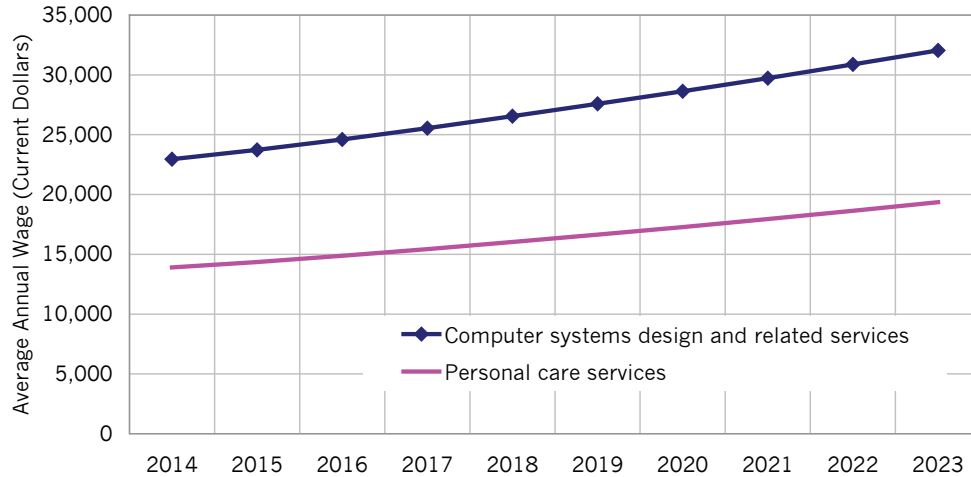
Increased Entrepreneurship

NAICS Industry	Five year implementation period					Stabilization period				
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Computer systems design and related services	10	20	30	40	50	50	50	50	50	50
Personal care services	10	20	30	40	50	50	50	50	50	50
Total Jobs Created	20	40	60	80	100	100	100	100	100	100

To capture the longer term impact of this scenario, the period for running the model was extended to 2023. The additional jobs created due to the increase in entrepreneurs in the region were distributed equally into the following two NAICS industries:[6] Computer systems design and related services and Personal care services.

These two industries were chosen as businesses in these service-oriented industries are likely to be created by entrepreneurs, are mostly made up of small-scale operations, and are likely to be developed within the region. As the chart above indicates, the average pay rates in the two selected industries are very different. Keep in mind that these averages are based on both full- and part-time positions.

[6.]   See NAICS explanation on page 3.

Baseline average annual wages for Belknap County in the two selected industries

It is assumed that the anticipated increase in output due to the increase of entrepreneurship in the region is driven by an increase in total regional demand. In other words, the output produced by these added workers is either exported to markets outside of Belknap County or the output is provided to people from outside the region, such as tourists or seasonal homeowners, or to residents that currently travel outside the region to obtain these services.

The following is the anticipated implications of increasing entrepreneurship in the region.

**Results: Impact from promoting entrepreneurship in the region**

- In 2014, a total of 28 direct, indirect and induced jobs would be created in Belknap County. There would be a minimal impact on Carroll County.

- By 2018, at full implementation of the increased entrepreneurship scenario, total job impact would be 138 direct, indirect and induced jobs.

- By 2023, five years after the full implementation of the scenario, total impact on jobs has declined to 125 jobs above baseline in the region. This indicates that the secondary job impact of entrepreneurship declines over time. Based on the declining impact, a conclusion may be drawn that entrepreneurship needs to be nurtured on an ongoing basis.

- By 2018, the distribution of the secondary jobs created would be as follows: *Construction* would create 14 jobs; *Retail trade* would create 6 jobs; and *Administrative and waste management service* as well as *Health care and social assistance* each would create 3 jobs. *State and local government* would create 8 jobs (see footnote 4 on page 5).

Industry	2018	
	Direct Jobs	Total jobs created
Professional, Scientific, and Technical Services	50	50
Other Services, except Public Administration	50	50
Construction		14
Retail Trade		6
Administrative and Waste Management Services		3
Health Care and Social Assistance		3
Accommodation and Food Services		3
Real Estate and Rental and Leasing		2
Wholesale Trade		1
State and Local		8
Total Jobs	100	140

Gross Domestic Product

- In 2014, Gross Domestic Product (GDP) in the region will have increased above the baseline by $1.1 million in fixed 2005 dollars. By 2018, the GDP in the region will have grown to $5.7 million in fixed 2005 dollars above the baseline. After 2018, the GPD added above the forecasted baseline will start to decline.

- The economic activity of this scenario will account for 0.05 percent of total GDP in Belknap County. By 2018, total economic activity due to increased entrepreneurship in the region will account for 0.2 percent of the county's GDP.

The impact on GDP from the promoting entrepreneurship in the Lakes Region
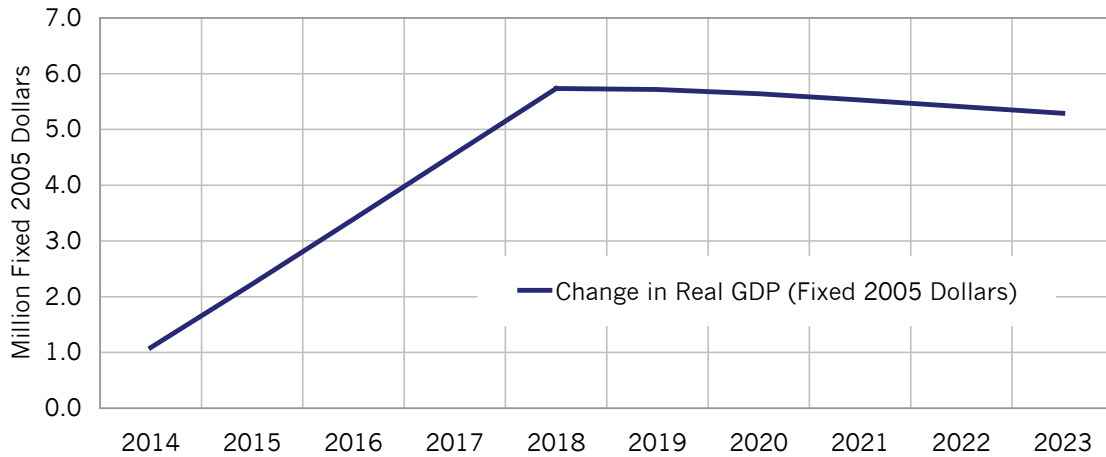
Personal Income

- Total Real personal income will have increased by $0.8 million in fixed 2005 dollars in 2014. By 2018, the increase in real personal income will have grown by $4.7 million in fixed 2005 dollars.

- Real personal income per capita in Belknap County will gain $12 in fixed 2005 dollars in 2014. By 2018, real personal income per capita will be $62 in fixed 2005 dollars above the original baseline for the county.

Population

- Belknap County's population would gain two persons above baseline in 2014. By 2018, Belknap County would gain 19 residents and by 2023, the population of Belknap County would gain 37 persons above the projected population baseline.

Job Multiplier

- The multiplier effect on the Lakes Region of each job created by entrepreneurs is 1.4 annually — including the direct job created — during the implementation period. After the implementation period, the job multiplier declines.

Summary

The two scenarios create very different results. This is partly due to the different size of the employment shock to the model; 220 *Advanced Manufacturing* jobs versus the 100 jobs created by increased entrepreneurship. But there are two comparisons important to note:

- In the *Advanced Manufacturing* scenario, GDP continued to grow throughout the entire simulation period, versus the *Increased Entrepreneurship* scenario, where the additional GDP value started to decline as the employment shock to the model was stabilized.

- The job multiplier of an *Advanced Manufacturing* job was between 1.9 and 2.1 jobs, whereas the job multiplier of a job created by increased entrepreneurship was 1.4.

- The total economic activity due to the hiring of 220 *Advanced Manufacturing* workers will account for 1.7 percent of the Belknap County's GDP whereas total economic activity due an increase in entrepreneurship (25 additional entrepreneurs creating a total of 100 new jobs) in the region will account for only 0.2 percent of the county's GDP.

- Despite the fact that the economic impact of an *Advanced Manufacturing* is much less than the overall impact of jobs created by entrepreneurs, an economic development strategy involving goals for multiple avenues is still important due to the need for diversification of the regional economy. There are risks associated with both strategies, but mergers and acquisitions of the larger corporations can lead to plant closure and displacement of large amounts of manufacturing employment. *Manufacturing* employment in the Lakes Region Planning Commission dropped 27.4 percent from 2005 to 2012. However, if the region is known for highly skilled workers in a specific industry cluster, the likelihood that other highly specialized manufacturers will relocate to the area is greater.

Please note that Economic and Labor Market Information Bureau under New Hampshire Employment Security projects that there will be 55 openings, annually, in the *Production occupations* in the Lakes Region and more than 1,000 annual openings in *Production occupations* for New Hampshire. ELMIB also projected 5 annual openings for *Engineers and Drafters, Engineering Technicians, and Mapping Technicians*. These numbers of projected job openings are based on a *Manufacturing* sector that is <u>not</u> projected to experience employment growth over the ten-year period from 2010 to 2020.

The explanation below is the economic theory and empirical data behind the REMI model.

The REMI Model

REMI Policy Insight® is a structural model, meaning that it clearly includes cause-and-effect relationships.

The model is based on two key underlying assumptions from mainstream economic theory: households maximize utility and producers maximize profits. Since these assumptions make sense to most people, lay people as well as trained economists can understand the model. The tool is often used by economic developers and planners to gage the potential impact on a regional economy of proposed projects such as transportation infrastructure, office and retail development, relocation or expansion of businesses, etc.

In the model, businesses produce goods and services to sell locally to other firms, investors, governments, and individuals, and to sell as exports to purchasers outside the region. The output is produced using labor, capital, fuel, and intermediate inputs. The demand, per unit of output, for labor, capital, and fuel depends on their relative costs, since an increase in the price of any one of these inputs leads to substitution away from that input to other inputs. The supply of labor in the model depends on the number of people in the population and the proportion of those people who participate in the labor force. Economic migration affects the population size. People will move into an area if the real after-tax wage rates or the likelihood of being employed increases in a region.

Supply and demand for labor determine the wage rates in the model. These wage rates, along with other prices and productivity, determine the cost of doing business for each industry in the model. An increase in the cost of doing business causes either an increase in prices or a cut in profits, depending on the market for the product. In either case, an increase in costs would decrease the share of the local and U.S. market supplied by local firms. This market share, combined with the demand described above, determines the amount of local output. Many other feedbacks are incorporated in the model. For example, changes in wages and employment impact income and consumption, while economic expansion changes investment, and population growth impacts government spending.

The effects of a change scenario to the model are determined by comparing the baseline REMI forecast with an alternative forecast that incorporates the assumptions for the change scenario.