Vermont Economic Stimulus

Abstract:

In order to increase economic activity in Vermont, I propose linking an industry that is failing in the state, while thriving in the nation as a whole, to a larger industry that is seeing strong growth in both the state and the nation. By fostering a relationship between the industries, I hope that the success of one will lead to the recovery of the other.

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CIS 512 – Into. To Data Science and Analytics
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https://github.com/brennap/cis-512

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Introduction

In this analysis, I hope to better formulate a plan for economic stimulus of a state, in particular Vermont. Admittedly, this state was chosen rather arbitrarily, although it does posses some notable advantages, such as its small size and proximity to large economic centers like New York and Boston. The size should mean that an investment will go further, and the proximity to those centers equates to a potential source of capital, market, and labor. Regardless of these advantages, the approach for this project began by browsing through economic data for the State of Vermont. It was noticed that one industry, with the description “Data processing, internet publishing, and other information services” had seen a drastic decline over the past decade, with its portion of the GDP falling from $103M to $46M. This seemed strange, as the information fields are generally seen as high growth. Later analysis would show that this hunch was correct, as the sector had seen positive growth nationwide. (Figures 1 and 2) Considering that information services are ubiquitous across disciplines, it occurred to me that the industry could stimulated by fostering synergy with a larger, more successful industry. Thus, the analysis focuses on finding a candidate industry to match with our target sector, with some focus on understanding the overall economic climate of Vermont and of the identified information sector.

Summary

Linear models were created for sectors on the state and national level. (Table 1, Figures 3, 4, 5, and 6) These were used to determine the direction each industry was headed, as well as provide some semblance of rate of growth and stability. It was important that our paired industry saw strong growth both nationally and on the state level, as that not only ensures high growth opportunity from our project, but also because, as we have seen with the “Information” sector we wish to recover, strong national growth is not necessarily connected to strong growth in state. By

narrowing our pool of candidate sectors on these criteria, I was able to single out a single industry: “Health care and social assistance”.

Some analysis was attempted on population and income, but conclusions were lacking due to the type of data I was able to obtain. Change in population from 2006 to 2015 was negligible, with no more then a 5% change per county. Overall Vermont saw less then 1% total population growth, all due to four out of the fourteen counties. All counties saw income per person increase. At this point, it is unclear if this is from wage increase, employment increase, or some combination. This information may be used for targeting our programs geographically. Keeping with the stance of leveraging existing growth, it would seem we should focus on the counties of Addison, Chittenden, Franklin, and Lamoille. These counties are all situated around the City of Burlington (Figure 11), the largest city in Vermont (US Census). Further analysis is required in understanding any changes in the labor force for our paired industries.

Conclusion and Discussion

From this analysis, I believe we should use our resources to foster synergy between our identified information sector, and the healthcare sector. The healthcare sector seems to have strong growth both in Vermont and nationwide. By investing in cross disciplinary activity, we hope to leverage the success of healthcare to aid in the recovery of our information sector. Potential methods include hosting conferences to expose practitioners of each industry to the other, investing in shared incubation space to foster more daily interactions, and grants or competitions to encourage startup growth and company expansion. However, several questions still remain. A better understanding of the labor force, as well as the economic breakdown by county, may help us better focus our areas of investment. Case studies of similar investments may also help guide our approach, as would consultation with an economist.

Bibliography

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Appendix

A. Figures

Figure 1: GDP of Target Sector in Vermont

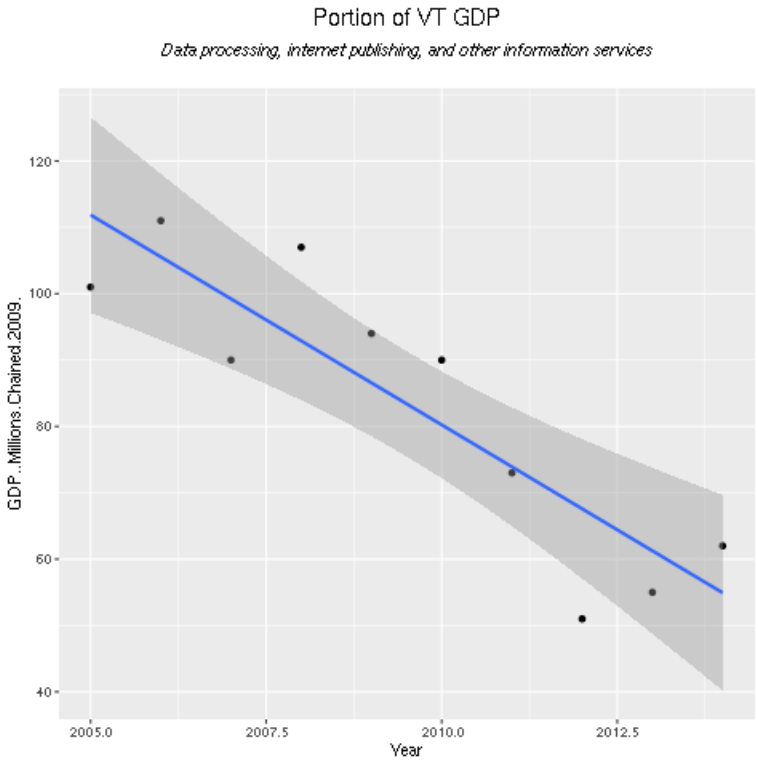


Figure 2: GDP of Target Sector in US

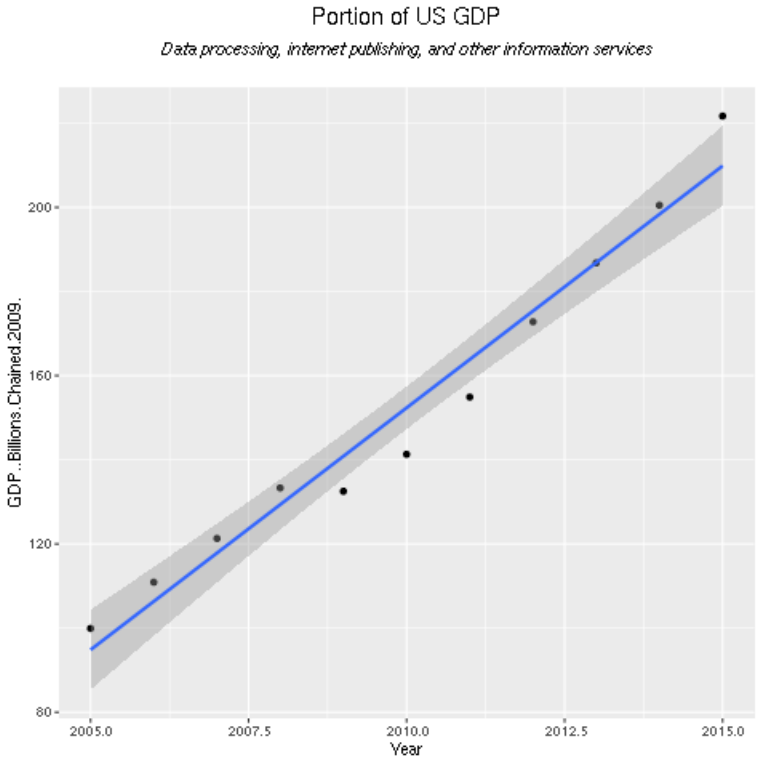


Figure 3: Slopes from Linear Regression Models for Portion of VT GDP by Major Sector

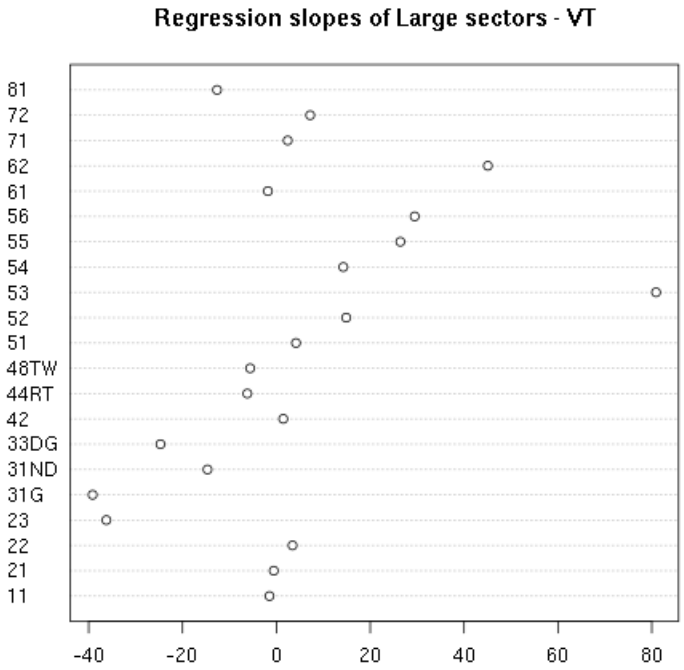


Figure 4: Slopes from Linear Regression Models for US GDP by Major Sector

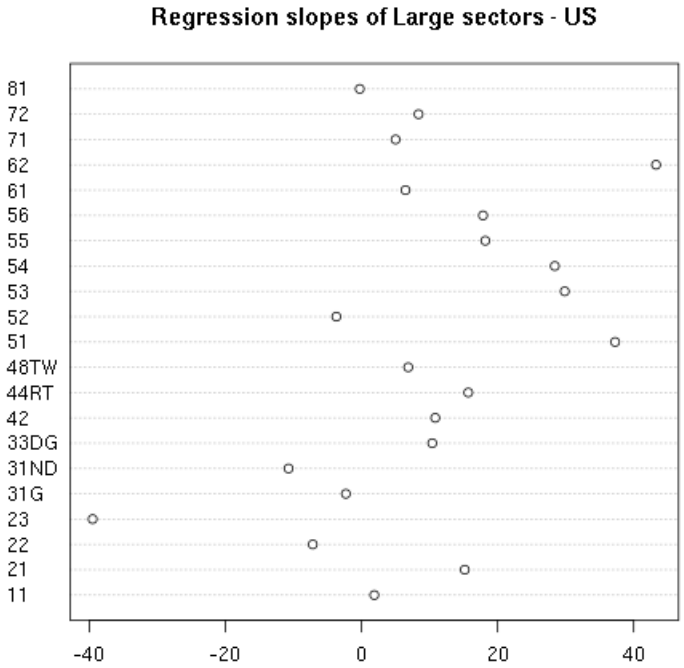


Figure 5: Vermont's GDP in Millions Chained USD (2009) for Candidate and Target Sectors

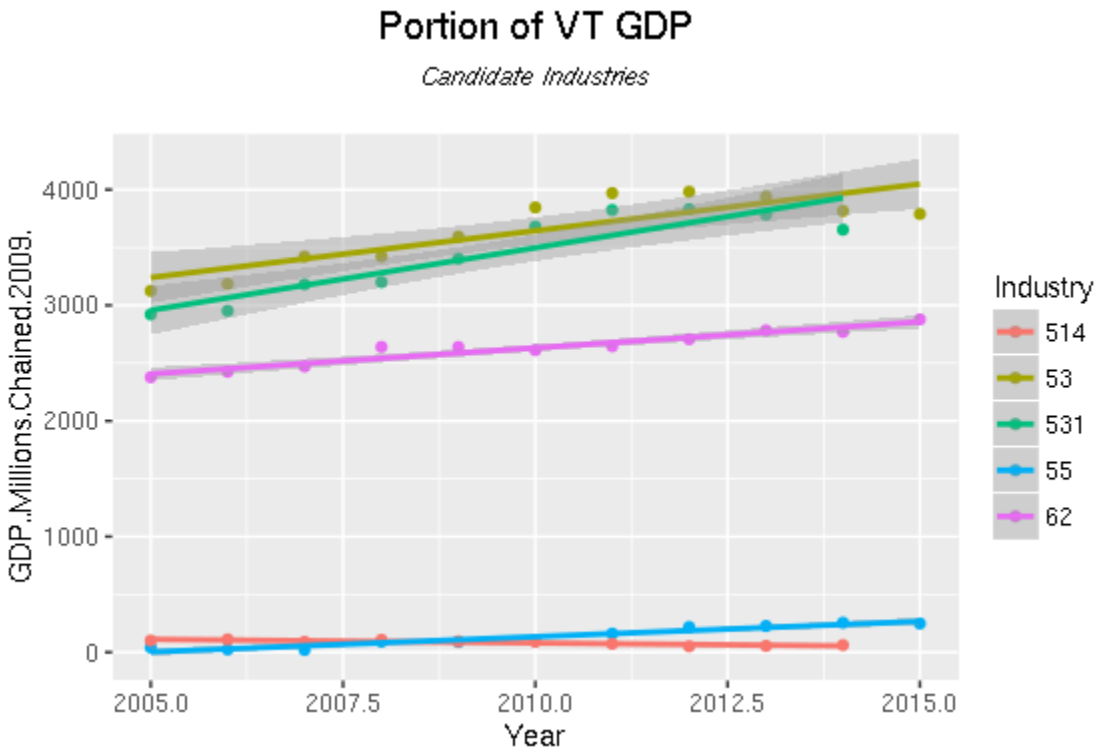


Figure 6: US GDP in Billions Chained USD (2009) for Candidate and Target Sectors

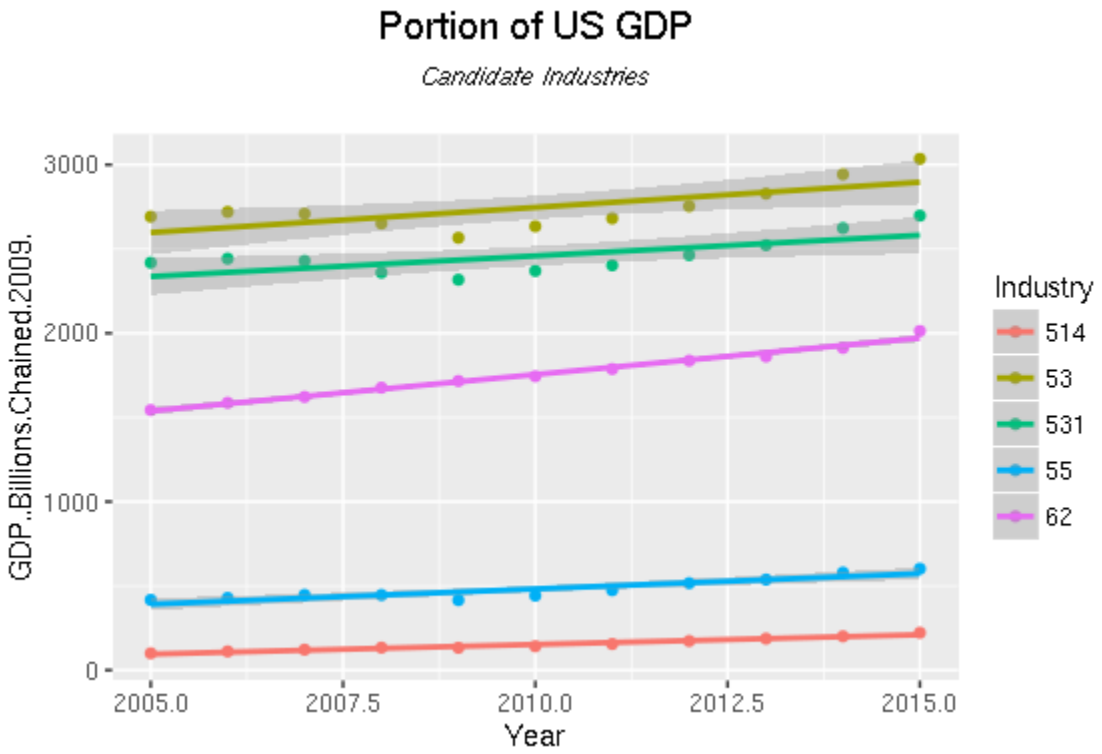


Figure 7: Value Added in Billions Chained USD (2009) for Candidate and Target Sectors

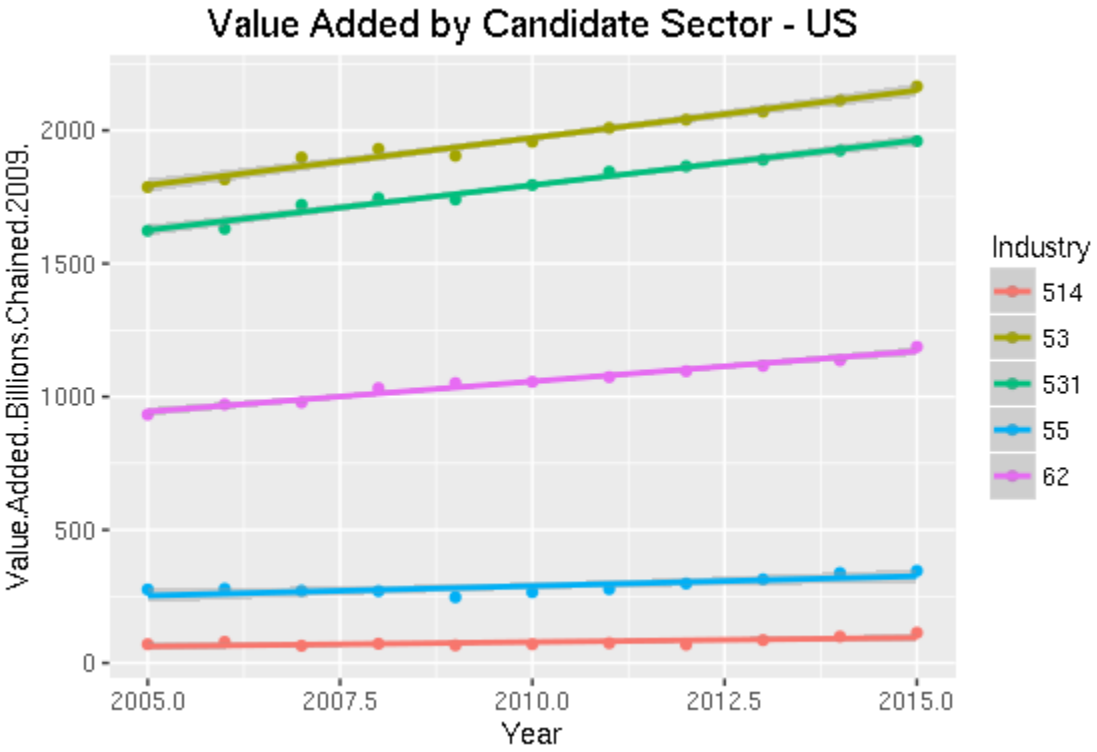


Figure 8: Slopes from Linear Regression Models for Population in Vermont by County

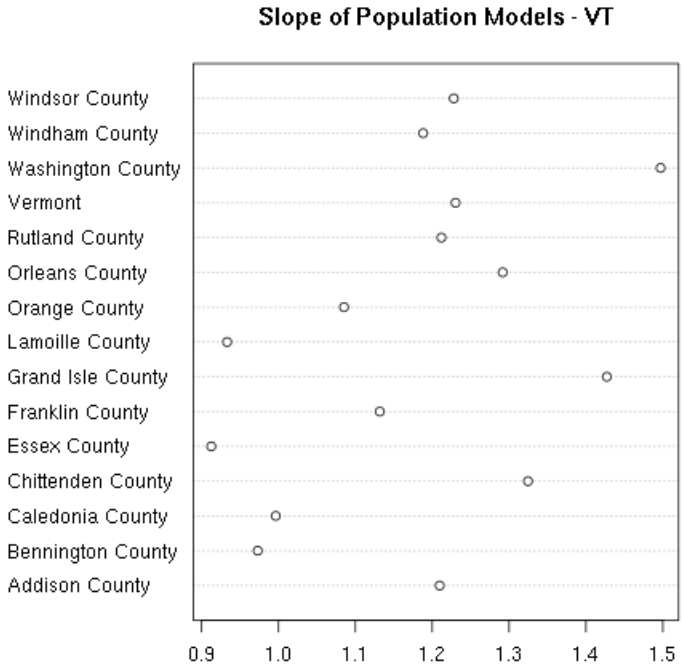


Figure 9: Plotted Linear Regression of Population in Vermont by County

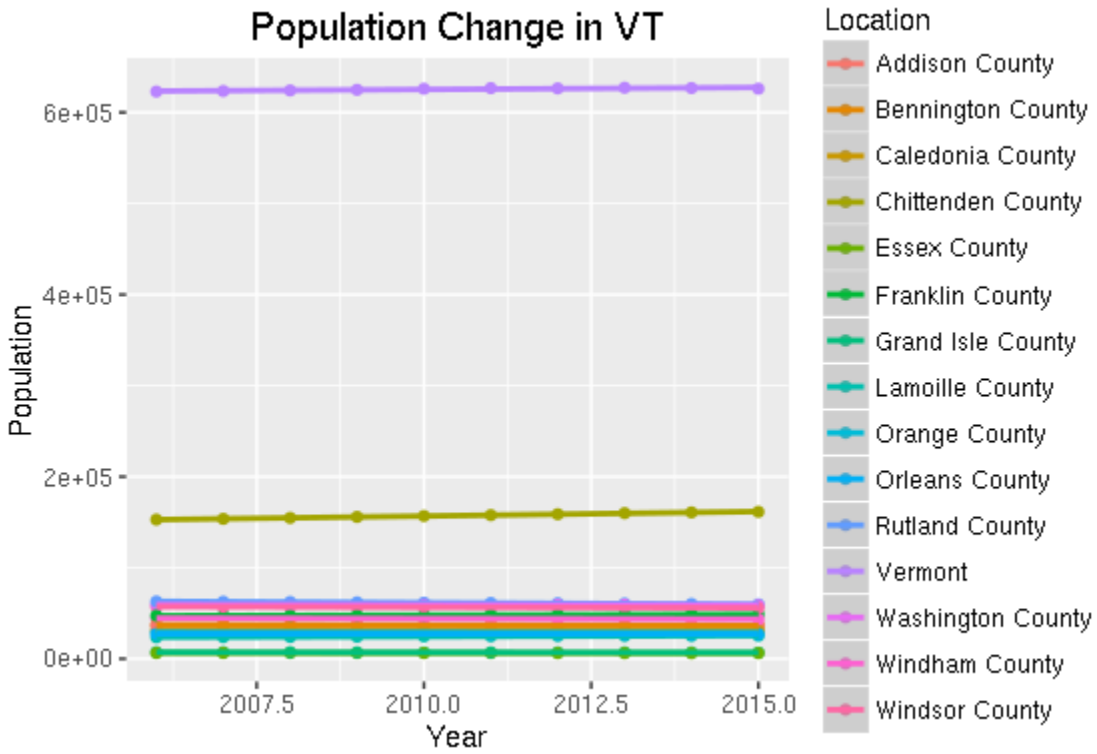


Figure 10: Plotted Linear Regression of Income Per Person in Vermont by County

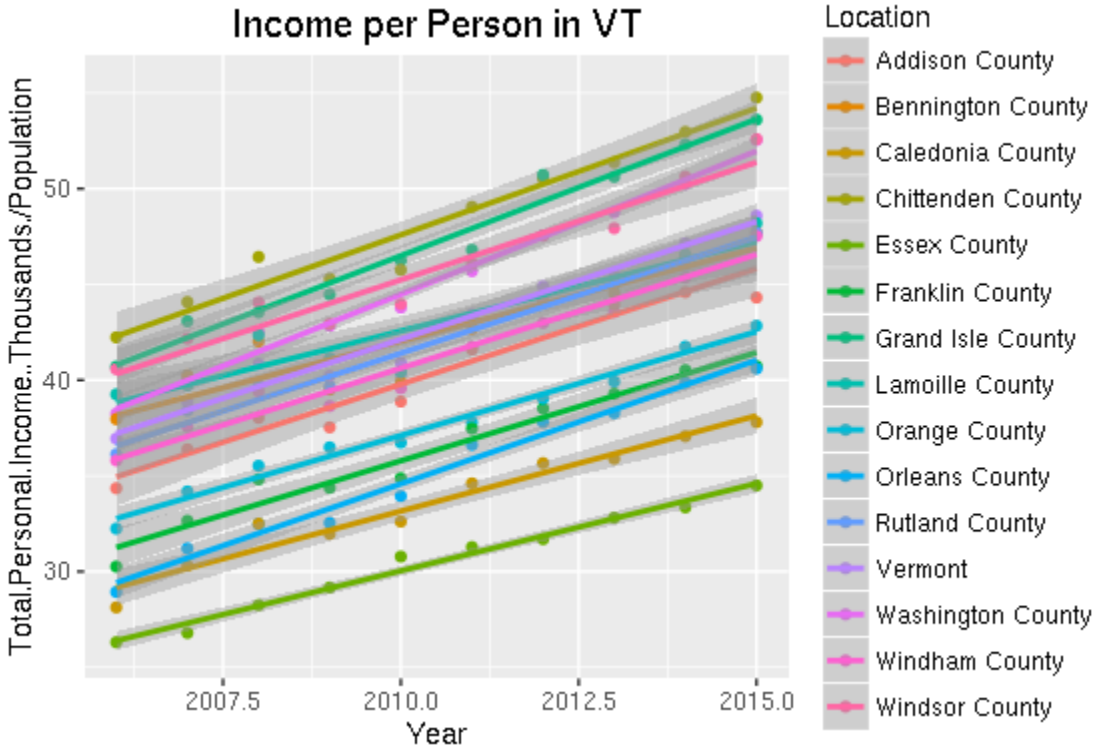


Figure 11: Map of Vermont's Counties

(Yellow Maps)

B. Tables

Table 1: Growth and Fit of Linear Models for Candidate Industries

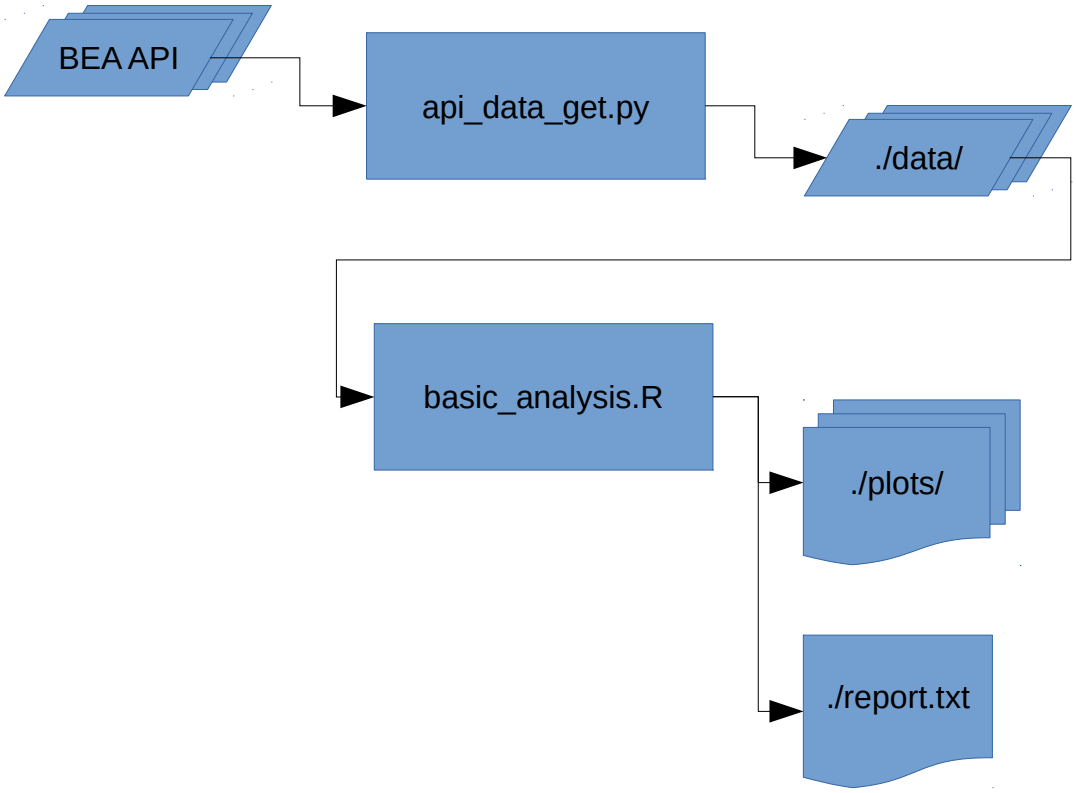
Industry	Industry Description	VT Growth	US Growth	R^2 VT	R^2 US
514	Data processing, internet publishing, and other	-6.33	11.50	0.78	0.97
53	Real estate and rental and leasing	80.91	29.86	0.73	0.51
531	Real estate	107.99	24.52	0.83	0.50
55	Management of companies and enterprises	26.42	18.19	0.93	0.83
62	Health care and social assistance	45.06	43.29	0.92	0.99

Table 2: Population Change, 2006-2015

Location	Population 2006	Population 2015	Difference	Percent Change
Vermont	622892	626042	3150	0.51%
Addison County	36758	37035	277	0.75%
Bennington County	37127	36317	-810	-2.18%
Caledonia County	31252	30780	-472	-1.51%
Chittenden County	152861	161382	8521	5.57%
Essex County	6341	6163	-178	-2.81%
Franklin County	47392	48799	1407	2.97%
Grand Isle County	7173	6861	-312	-4.35%
Lamoille County	23642	25235	1593	6.74%
Orange County	29249	28899	-350	-1.20%
Orleans County	27215	27100	-115	-0.42%
Rutland County	62894	59736	-3158	-5.02%
Washington County	59414	58612	-802	-1.35%
Windham County	44390	43386	-1004	-2.26%
Windsor County	57184	55737	-1447	-2.53%

C. Workflow

Diagram 1: High Level Work Flow



Description 1: Workflow Detail

Most of the data for this project was obtained from the Bureau of Economic Analysis, through their Data API. It was necessary to obtain an API key to issue queries. Data was gathered using a Python script, the chosen language due to its proficiency in text analysis and data structure processing. Several tables of interest were identified, queried through the REST API as JSON, and formatted into CSVs. The CSVs were then read into R for further processing and analysis. R was chosen due to it's ability to quickly analyze and graph data. The primary data used was GDP breakdown by Industry for both state and national, as well as value added by industry nationwide, income per county, and employment rates.

The analysis in R began by creating linear regressions for GDP portion by Year per Industry, for both the state and the nation. Additional data cleaning was needed at this step as the BEA data had used industry codes in the state data that did not conform to the NIACS codes used in the national data. By looking at the regressions for each industry, we could get an idea of which were generally increasing their production, and which where decreasing. The top ten highest growth industries were selected from both the state and national set. From the two top ten lists, I further narrowed the scope to those industries appearing in both lists. That left me with three industry sectors: "Real estate", "Management of companies and enterprises", and "Health care and social assistance". Out of those sectors, real estate was by far the largest sector by GDP portion. Health care saw the highest growth nationwide, although it lagged behind real estate's growth in Vermont. However, of when looking at the models, health care had the best fit, with an R value over 0.9. This suggests to me that the growth in health care may be more stable and

predictable then that of real estate. There is a question of whether growth should be measured in percentage change or in dollar amounts. (Figure 7) Although percentage change is arguably a better method for modeling growth, I believe change in dollars is more apt for this application. Another potential source is value added by industry, however this data is lacking for the state level.

Description 2: Reproduction Account

I was able to reproduce Bill Siegler's analysis. It was rather straight forward. I was able to download two of the data sources directly, and Bill provided a third table that he scraped from a webpage (which I verified for accuracy). His scrips required minor adjustments in terms of file locations. I had to create a blank spreadsheet for the script to write data to. Beyond that, running the script provided clear results. The two healthcare sectors combined, "Healthcare Support" and "Healthcare Practitioners and Technical Occupations" had large projected increase in growth. This was backed by Bill's population projection graph, which showed the elderly population (65+) growing significantly.