

Modeling the Effects of a Minimum Wage Increase On State Economies

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Problem and Purpose

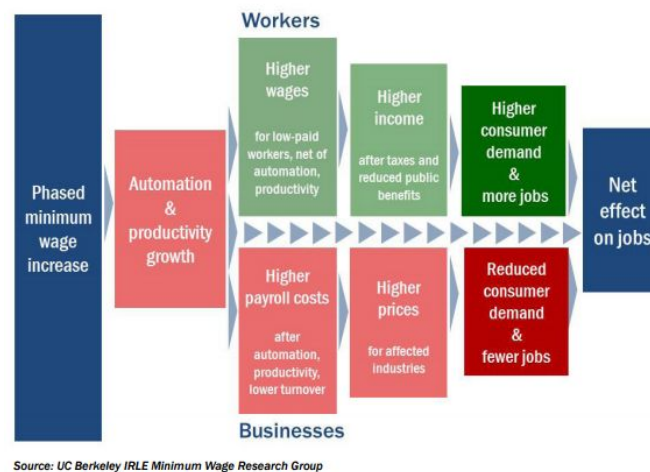
Problem: Often minimum wage calculations are conducted by think tanks with partisan intentions. This causes results that are biased and policy positions are made from two different polarizations of results. There is a need for a model that is unbiased and accurate so that proper policy positions can be made one day.

Purpose: To create a minimum wage calculator that can be used as a template for better and more complete models.

Review of Literature:

There is much debate over which economic policies truly help the economy, one of which is whether or not to increase the minimum wage. Some say the increase in wages will increase the stress on companies and cause more unemployment and/or higher prices. Others say it will increase how much consumers have to spend so companies will be relatively unaffected leaving minimum wage workers with a higher quality of life.

Figure A:



If a model (with a design like figure A) could be created so we know how a wage increase would impact each state, it could serve as a guide on how to properly pursue policy changes impacting minimum wage increases. To create a model for minimum wage increases, there are three main topics one must understand and take into consideration; how companies respond to an increase in employment costs, how consumers spend money they gain from raises, and cost of living before

and after minimum wage increases. Understanding how companies deal with increased employment cost is very important because raising the minimum will increase the amount of money companies of all sizes spend on paying their employees. How consumers spend money also is very important since that money gets spent on the goods of companies that have to pay for a wage increase, the increased velocity of money (the rate at which money is exchanged from one transaction to another and how much a unit of currency is used in a given period of time) increase demand which in turn increases the need for companies to produce more and hire more employees as well as create other positive effects to be weighed against all cons of a minimum wage increase (Mooney, 2016). Another large factor is the cost of living index. The cost of living has the potential to increase because some companies often deal with increased cost by increasing the prices of goods and services; if the cost of living increases enough then the increased wages will do little for the workers and cause significant damage to those who did not receive a wage increase. So what about the past? Haven't there been state wage increases before? While there have been state wage increases before there is high variability in state economies to do a retrospective study on the effect of the minimum wage increases, even if it were possible the results would be mixed.

Many surveyed business owners said they would have to fire employees or raise prices before Seattle raised its minimum wage but this is far from the first wage hike (Kelley, 2016). For example, the minimum wage was first created in 1938 right at the end of the great depression and it did not appear to hurt workers at that time but many argue that since the economy was already hurt at the time it was added it had little observable negative effects. As for times when the minimum wage was increased on a federal level it was during times of low unemployment, it

has never been raised with an unemployment rate above 7.5 percent. In figure B and Figure C below, there is no direct correlation between minimum wage and unemployment rates both at the state and national levels.

Figure B (John Gabourel, 2015):

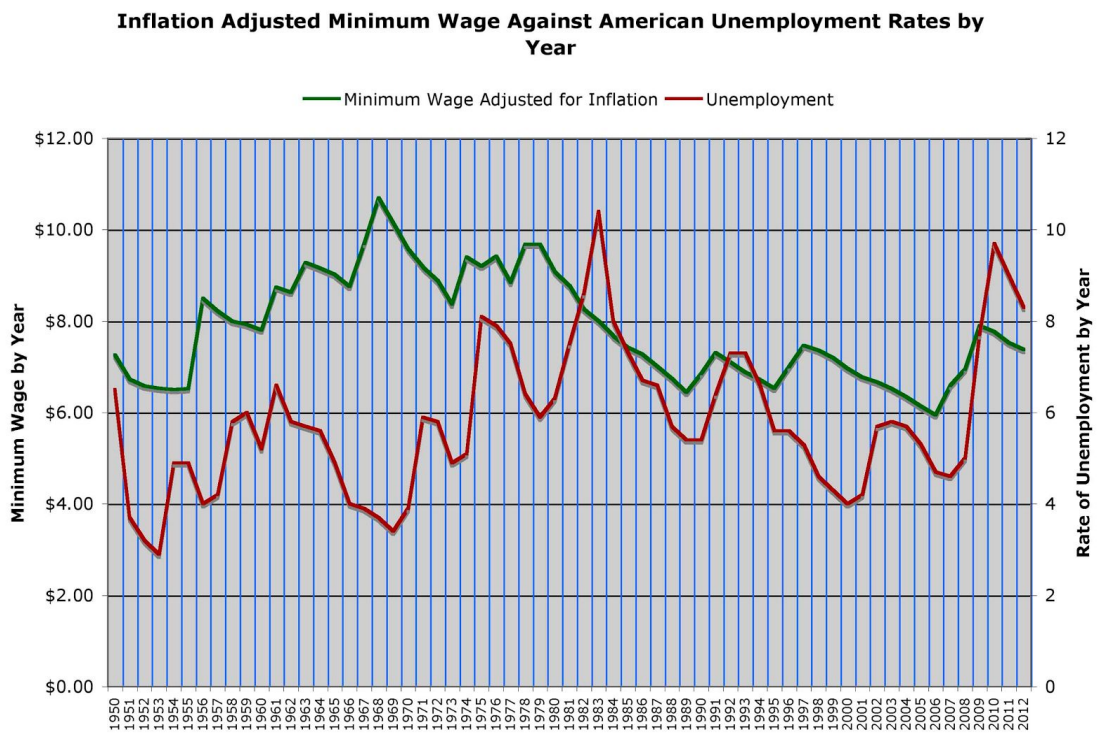
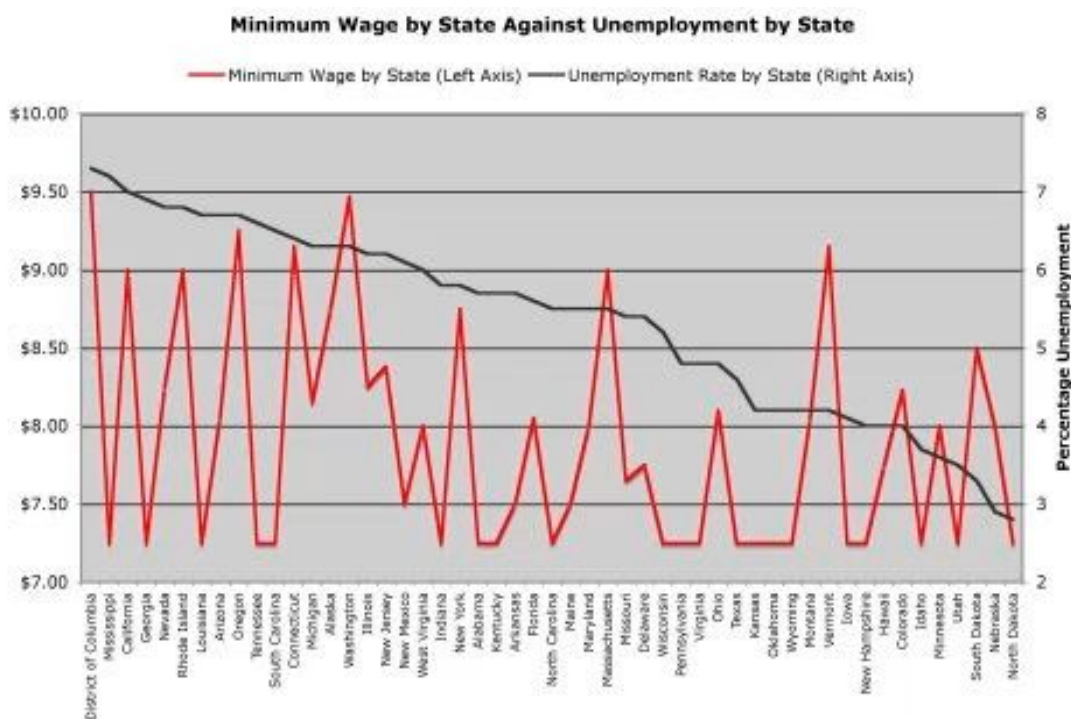


Figure C (John Gabourel, 2015):



The mixed results have not kept people from doing research. In fact many different economists have looked at job loss from minimum wage increases, but as expected, there were more mixed results. Doucouliagos and Stanley for example conducted a study that showed elasticity of -0.19 (2009) (An elasticity of -0.1 , for example, means that a 10% increase in the wage floor reduces employment by 1%). Other studies have elasticity at 0 all the way to -0.5 (Baskaya and Rubinstein, 2012; Liu, Hyclak, and Regmi, 2015; Powell, 2015; Totty, 2015). Since there is no consensus of job loss from minimum wage, the idea of a model becomes more appealing. While there is a measurable downside to wage increases there is also a measurable upside to wage increases. If the minimum wage was increased to ten dollars in each state (or ten dollars federally) then roughly 20 million people will get a wage increase and that could act as a sort of stimulus package (Drew DeSilver, 2015). If one were to create a model on state specific

income, the amount of people affected is different and the effects of increased income would have to be measured along with increased employment cost to see what the elasticity of a given state is. But there is even more to deciding if minimum wage is good to raise. One also need to look at people who do get their wages increased and see if it helps them.

Getting a pay increase doesn't always mean one has have more money to spend; raising their income may cause them to lose tax credits and other forms of benefits or welfare. SNAP benefits (Food Stamps), for example, go down thirty cents for every dollar a family earns (Monica Potts, 2015). For people on SNAP benefits, any percentage in wage increase is effectively only seven tenths of what is should be. On top of that, one of the ways employers handle the burden of employment costs is to raise the prices of their goods and services. To see if minimum wage increases actually benefit the people whose wages are increased we need to see how much they actually benefit with their effective incomes and the cost of living for them factored in. To calculate if the minimum wage has increased the usable income of workers who receive a wage increase, we need to see their income after taxes and welfare losses then see how much the money is worth based on calculated inflation. It should also be noted that raising the minimum wage increase would save the government billions with the exact amount being based on the size of the wage increase and amount of unemployment caused from the wage increase (Kevin Short, 2014) . While this extra money could be spent anywhere in the government's discretionary budget, it could be used to help small businesses handle the new burden or increase unemployment benefits (David Cooper, 2016).

The immediate impacts on businesses must also be accounted for. A jump from ten

dollars to fifteen dollars is a sudden 50% increase. Most minimum wage policies are phased in over time so that employers can adjust. Some say this percentage is deceiving, if the minimum wage for New York State was raised from nine to fifteen for example then there would be a payroll increase of 3.2% (Long Term) in the for-profit economy, but it would be mostly paid for by lower turnover rates, more automation, and better productivity while the remaining payroll costs could be covered by raising prices 0.14 percent per year, less than yearly inflation (Michael Reich, Sylvia Allegretto, Ken Jacobs and Claire Montialoux 2016). Others argue that a minimum wage increase will result in an immediate loss in jobs. For example, Daniel S. Hamermes says: “Increasing the minimum wage that employers must pay their workers reduces employment and increases unemployment if not enough people give up looking for jobs” (2014). Hamermes also claims that most of the negative effects will be shouldered by minorities, the elderly, and young people. To factor in unemployment into a model there is an important factor many forget. Different industries have a different amount of employees working at the minimum wage which is a huge factor in any model.

The fact that different industries have different amount of minimum wage employees matter because the 0.14 percent per year increase in prices mentioned earlier can't possibly work in practice since some companies would get a surplus of income if they don't have many minimum wage employees or would still have a deficit if they had more minimum wage employees then the average of a business of a similar size (Baum, 2015). And since the size of industries changes by state, it needs to be part of the input of a model (Bureau Of Labor Statistics, 2015). The types of products and services that these industries offer also matter; if they

are goods that will be bought by those with extra money from wage increases, than those industries will have more profit than companies who won't see increased demand from the minimum wage increase. So, to find out how different industries can handle a minimum wage increase, one must look at both how consumers spend money in general and how any new income is spent.

Minimum wage has two main direct impacts, increased wealth to those with minimum wage jobs and increased employment costs to many companies. In a model one must account for how companies handle these increased costs and what workers do with the extra money. A model must use past data to see what influences the decisions of the companies and how workers choose to spend there money and then do the math to see what affect those decisions have on unemployment and company profits. Wealth and health of the economy can be measured with median household income, unemployment rate, cost of living, and the Gini coefficient which measures income inequality. There is no consensus on the minimum wage for several reasons. Many economists do their work to show that their opinion on a policy is correct making their research biased and a lot of economic research comes from partisan think tanks. Also economists often use old models when researching topics. Our goal is to create a model that is unbiased and uses current data to simulate minimum wage increases. If We can find a conclusive result on the effects of minimum wage increases, We can determine determine what political policy positions work and see if it's more effective to increase minimum wage on a state level or a national level. If I can also identify the lurking and confounding variables involved with the minimum wage in each state, I can determine if the better political policies would somehow affect these variables as well.

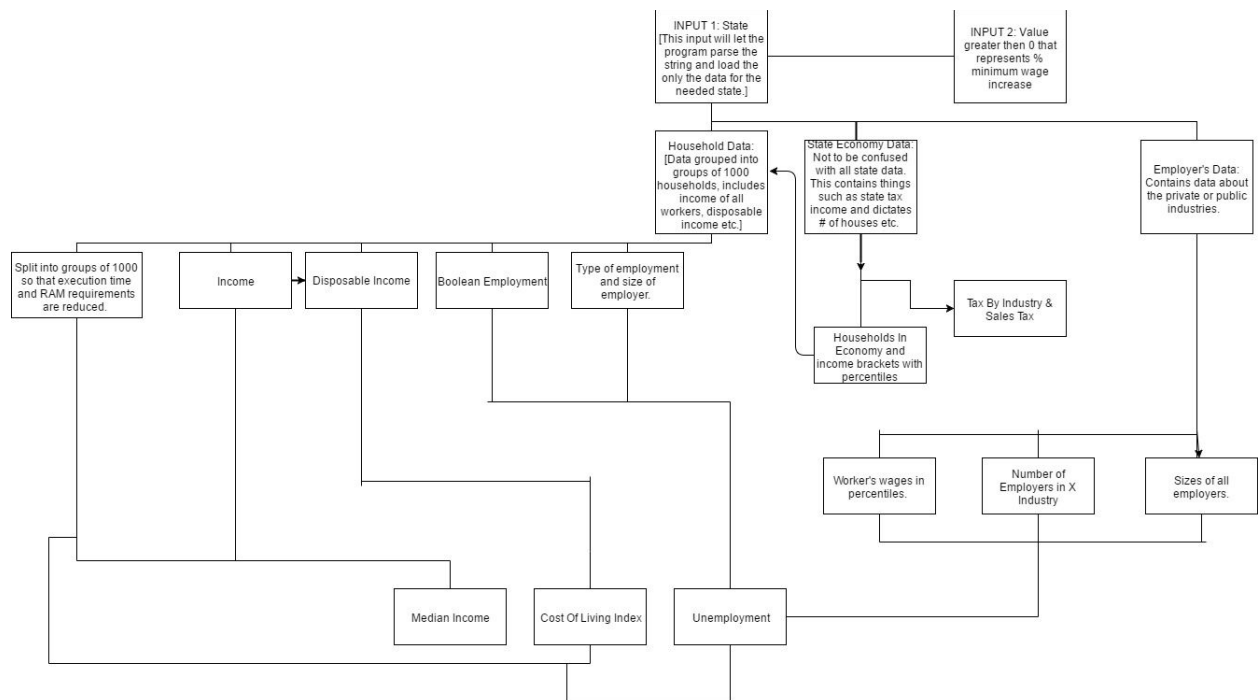
Materials

- Computer to run and create software
- Gradle
- Google Drive (Google Sheets in Particular)
- Atom Text Editor and a Java Compiler Plug-In
- Access to Command Prompt and Environmental Variables

Procedure

1. Find out what data is required to calculate the outputs of median income, cost of living index, and unemployment rate.
2. Collect Data
3. Determine how the minimum wage manipulates that data
4. Write program the handle the manipulation of said data and run the necessary
5. Calculations to return your outputs.
6. Compare results to real results of apst increase and redesign to get more realistic results.

Design Flowchart:



Model Test Results and Comparison:

```
Data for California
Mean Income of Household: 71328.54633186839
Cost of Living index 1.035 (Index of 1 is this state before calculation)
Unemployment %: 6.277700395841315
```

Model Compared to Similaur past wage increases in California					
Year	MODEL	2014-15	2007-08*	1998-99	1996-97
Minimum Wage Increase %	12.5	12.5	11.1	11.65	11.76
Mean Income % Change	Up 11	Up 5	Up 1.4	Up 5.25	Up 4.88
Unemployment % Change	Up .877	Down 1	Up 1.8	Down 0.7	Down 0.9
*Indicates Recession Year					

Constructing and testing the design prototype:

The Initial design plan was to use Google App Scripts to retrieve data from a google sheet and use the data to conduct calculations. It was quickly realized there was nothing built into Google App Scripts to export to java which required created the need to use Gradle to import the data as an two dimensional arraylist of objects which can can convert to strings for searching and integers or doubles to do calculations. Since the gradle quickstart guide on the Google Sheets API had the gradle program run in the command prompt, it was decided to just have the entire program run there as well since you can easily print to the command line in java and read user input. The entire program is based around one main function `checkMethodIndex()` which is called recursively until the user simply types “exit” at an appropriate time. Upon navigating to the correct folder in the command prompt all that is needed is on command to run the program, Some basic data is also loaded at this time. When the program loads it allows the user input. After loading you have three options, load a state, load basic data, or exit the program, If something is types wrong it will say “method not recognized” and ask the user for input again. To run the program one first set your state in with the command “`setState [stateName]`”. After loading finishes and the program is ready for input all that one needs to do is type the command “`runSim [decimal percentage to increase wage by]`”. As for the actual code objects that represent groups of 1000 households are made based on the data imported. Using these objects one can calculate the stress on a business by the wage hike. After firings are made to keep profit calculate what the new mean household wage is. Then

the increased wages are used to calculate the cost of living. Finally one can look at the firings again to calculate the unemployment rate.

```
Income Percentiles Loaded
Number of Households Sorted By Income Loaded
Size of Household Income Sorted Loaded
Number of Earners Per Houshold Sorted By Income Loaded
Basic State Information Loaded
Misc Data Loaded

Loading Complete...

All Tasks Complete - Awaiting Prompts....
Your Command Line:
█
```

Results of testing and redesign:

On my first test the unemployment rates were much greater than expected and outside the realm of possibility, This result was likely because we failed to account for increased consumerism from increased wages. When this is factored in the businesses have much payroll increase that needs firings to make up for. This was created by spending the new disposable income (not the same as the overall wage increases) evenly over the companies that would of had to fire employees . Another redesign was changing median household income to mean household income because it better showed the benefit the the wage increase.

Redesign and retest:

After my previous change and optimization both in code and equations my results are relatively

realistic but could not be compared with many past increases like originally intended due to the difference in parameters.

Design Flaws and Errors:

Some National Data is Extrapolated to be used as data for a state. Calculations do not currently account for industries and size of Industries like intended. Lurking Variables are probably present

Some Calculations based of other researches' equations might be flawed. Also the design of household objects and business objects being representative of A group instead of an individual reduces accuracy.

Conclusion:

In the end the calculator was able to produce realistic results but it is hard to say how accurate it actually is. The change in unemployment rate it produced was within the maximum and minimum change of recent wage increase of the same magnitude. The mean Household income change percentage was approximately twice that of other years that did not have a recession with the same wage increase. Since it used estimation of some data as opposed to the exact data in a state and also makes some assumptions it's highly unlikely it returns perfect or near perfect values. But the models ability to return realistic values for the output shows how our complete design could produce very accurate results given enough time and access to all necessary information. All issues with the model were due to time constraints and data availability. Future models should include factors like size of industries, amount of minimum wage workers in a industry, and how much increased consumerism impacts the industry. Also if better hardware is available use objects that represent individuals as opposed to groups and avoid extrapolating national data to estimate state data. If those corrections are made, a much more accurate model can be created.

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