

Team #128

M³ Challenge Third Place: Cum Laude Team Prize of \$10,000

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**787 Billion Dollars vs. Rising Unemployment:
Who Will Win?**

787 Billion Dollars vs. Rising Unemployment: Who Will Win?

Summary:

The recent \$787 billion economic stimulus package passed by Congress is a hot topic in the news. How will it affect the national economy? How will it affect employment rates? How will it affect me personally? Such questions are weighing heavily on the minds of all American citizens. In this paper, we attempt to understand the effects of the stimulus package on employment rates and analyze how the success of the package, or lack thereof, can be determined. Additionally, we discuss methods to determine whether a second stimulus package is needed, and if so, how it would be structured.

In trying to determine what elements of the stimulus package will result in the greatest improvements in employment, the largest of the various aspects of the package were split into four broad categories: tax cuts and credits, healthcare spending, education spending, and spending towards the development of “green” energy industries.

The elements of the stimulus package receiving the most funding, namely, tax credits and tax cuts, are also those with the most direct results on lowering the unemployment rate. These elements which reduce the tax burden combine to create 1,609,900 jobs in a time interval of three years. The aspect of the budget receiving the next most funding is healthcare. We found that healthcare is responsible for the creation of only 339,187 new jobs. Stimulus package funding going to education-related interests were found to be responsible for the creation of 620,330 new jobs, as well as being the genesis of many long-term positive effects. The elements of the stimulus package going to green energy industries and interests were found to contribute 869,506 new jobs. Thus, between the four different aspects of the stimulus package we considered, the order of their positive effect on employment, from lowest to greatest, is health care, education, green energy, and tax cuts and credits. This would result in the total production of 3,439,423 jobs.

The next most important discussion pertaining to the stimulus package is simply how people can tell if it is succeeding. In considering this question, we decided to analyze the impact of the stimulus package on unemployment rates and the growth of the labor force. In this analysis, our findings suggested that the effects of the stimulus package in terms of change to GDP and unemployment rates will be far less significant than current projects. Predictions by the Economic Policy Institution found that the change in the unemployment rate would be -3.11 percent and the change in GDP would be 9.21 percent over the course of the following three years. Our findings, however, indicated much more modest results, leading to a change in unemployment of -2.16 and a change in GDP of 7.46 percent.

In the third and final section of the paper, we address the issue that the news has recently been buzzing about, the possibility of a second stimulus package. When considering if a second package is needed, we carefully considered our response to the second question. If, by the guidelines we established in the second section, we determine that the stimulus package is not working, we concluded that a second package would be necessary. For our analysis of what such a package would look like, we took the stance that public investment, tax cuts, and unemployment insurance reform will work for immediate economic stimulation, while in the long-term, education funding, health care reform, and expansion of job training would help the U.S. achieve a stable and sustainable economy.

Assumptions

Assumption #1: Data we obtained is accurate.

Reason: The sources we used are trustworthy, thorough, and unbiased.

Assumption #2: We do not expect rapid inflation—for the purposes of our models, inflation remains constant.

Reason: The occurrence of rapid variations in inflation would severely hamper the effects of the stimulus package as whole, and subsequently, data used in any attempts to forecast the effect of the package would be rendered inaccurate.

Assumption #3: We do not expect unforeseen political, social, or economic events, such as a war or natural disaster.

Reason: The effects of such events are beyond our capacity to compute and could cause rapid swings in the economy.

Assumption #4: The correlation between the rate of unemployment and the rate of GDP can be expressed with a linear model.

Reason: By the principle of Occam's Razor, the simplest economic models often hold the greatest applicability to real-life economic results. In the time intervals we are dealing with, a linear model is sufficient to model these relationships.

Assumption #5: Keynesian curves are sufficient to model the short-term effects of elements of the stimulus package.

Reason: In the time intervals we are working with, the principle of a Keynesian curve allows accurate modeling.

Question 1: Which elements of the stimulus package will produce the greatest reductions in unemployment levels?

We split this question into four sections addressing different aspects of the stimulus package. In order of the amount of money being spent on them, these categories are tax cuts and credits, healthcare spending, education spending, and spending towards the development of “green” energy industries. We first state general assumptions and methods for all four aspects, then individually analyze their respective effects.

Assumptions:

1. The Federal Reserve prestimulus estimate that the real GDP will decrease by 0.9% in 2009 is accurate.
2. We assume that a linear model will produce an accurate relationship between changes in real GDP and changes in unemployment levels.
3. The National Accounts Identity holds true.

Approach:

In an economic stimulus package of such unprecedented scope and fiscal size, it is obvious that the large increase in government spending will, by its very nature, decrease unemployment levels. The benefits from different portions of the package are not created equal, however, which makes it important to compare the effects of separate portions of the program. In order to perform such an analysis effectively, considering the difficulty of obtaining direct correlations between many of the programs and unemployment rates and the sheer number of programs, it will be sufficient to focus on the top 4 portions of the stimulus package in terms of monetary spending; tax credits/cuts, healthcare spending, education reform, and “green energy” investments. To address the difficulty of determining the effect of a specific project on unemployment levels, it would be appropriate to use a two-step process; first calculate the effects of each policy on real GDP growth, and then use linear regression to indirectly determine the effects on the unemployment rate. Note that the GDP will be measured by the National Accounts Identity, which states that Y (real GDP) = C (consumption) + I (investment) + G (government spending).

General Calculations:

The first step in creating our models of the stimulus package was to perform a regression analysis, using data from 1951–2008 (the long time period ensures that the correlation isn’t greatly affected by short-term crises such as the OPEC embargo or Savings and Loan scandal) to determine the relationship between GDP growth rates and percent changes in unemployment. Using the data from the Bureau of Labor Statistics’ Current Population Survey and the Bureau of Economic Analysis (BEA), we observed the relationship in Figure B1.

The curve generated by our linear regression has an r -value of -0.864 , showing a strong negative correlation between real GDP growth and percent change in unemployment. (The deviances can mostly be attributed to instances when the economy was at the peak of a boom, where GDP growth was sustained at a high rate, but most of this growth was expressed through investment in capital rather than in labor investments.)

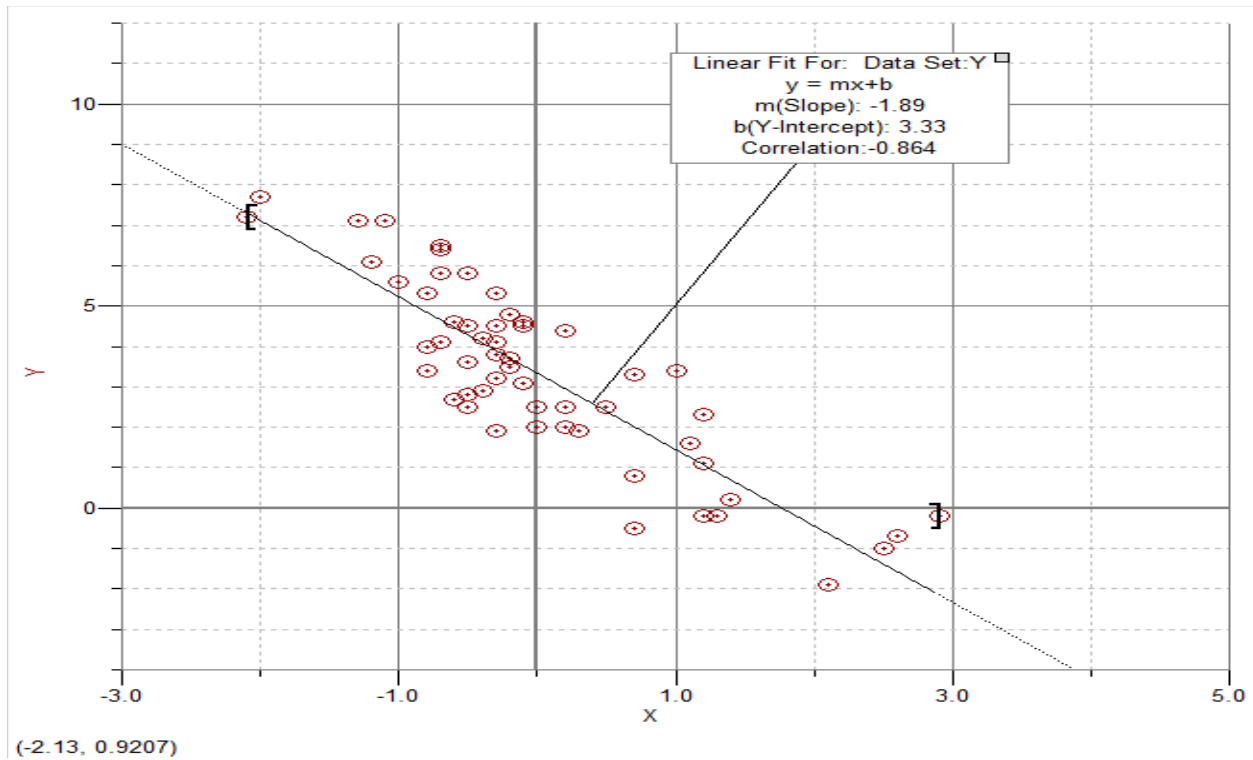


Figure B1. Linear correlation between % real GDP change and change in the unemployment rate

Using the Federal Reserve's prestimulus forecast that real GDP growth will be -0.9% in 2009, we can determine our predicted prestimulus unemployment rate, which will be reduced by each disjoint element of the package:

$$\% \text{ Change in real GDP} = -1.89 * \% \text{ change in unemployment} + 3.33\%$$

$$-0.9\% - 3.33\% = -1.89 * \% \text{ change in unemployment}$$

$$2.23\% = \% \text{ change in unemployment}$$

Tax Credits and Cuts:

Assumptions:

1. The difference between a tax credit and tax cut is negligible since we are only concerned with the total relief of the tax burden.
2. The economy is in equilibrium when planned expenditure is equal to actual expenditure.
3. The marginal propensity to consume is 0.5 (Paul Krugman gave this figure in the New York Times).

Approach:

As one of the most popular solutions proposed during times of economic recession, and as the largest single component of the stimulus package (a total of 231.6 billion dollars, or 29.5% of the package), it is extremely important to analyze the effects of this program on national unemployment rates. Of particular importance to our model is the effect of a reduction in taxes on consumption levels, which will in turn affect real GDP growth. In order to model the change in unemployment due to the tax cut portion of the stimulus package, it is necessary to calculate the final GDP (as determined by poststimulus consumption) and subtract the starting GDP (as determined by prestimulus consumption). The resulting change in GDP can then be plugged into our linear regression to determine its effect on unemployment levels.

Calculations:

To construct our Keynesian cross, we begin by constructing the curve that plots *planned expenditure* in terms of income. (Planned expenditure is the amount that households, firms, and the government would like to spend on goods and services in a year. This may differ from actual expenditure if the demand for a certain good is much larger or smaller than anticipated.) Considering these factors, we determine that the equation for planned expenditure is $E = C + I + G + NX$. Since we are only concerned with the tax cut for individuals program here, we can hold I, G, and NX all constant. Finally, we can rewrite C as a linear function of *disposable income*, $C = C(Y - T)$, where $Y - T$ is post-tax income. Our second curve is the graph of *actual expenditure*. Since actual expenditure should equal planned expenditure at equilibrium, our second curve gives us the equilibrium condition that $Y = E$. We now observe that a decrease in taxes should lead to an increase in disposable income that translates to an increase in consumption of MPC (marginal propensity to consume, or the amount that a consumer spends when given an extra dollar of income) * change in T. Since the increase in consumption increases expenditure, it must increase income by our constraint $Y = E$, giving us a feedback effect of change in T * MPC². This yields yet another feedback effect, and we eventually find that the multiplier of the tax effect is

$$\prod_{n=1}^{\infty} \text{MPC}^n * \Delta T = -\Delta Y = \Delta T * \text{MPC} / (1 - \text{MPC}).$$

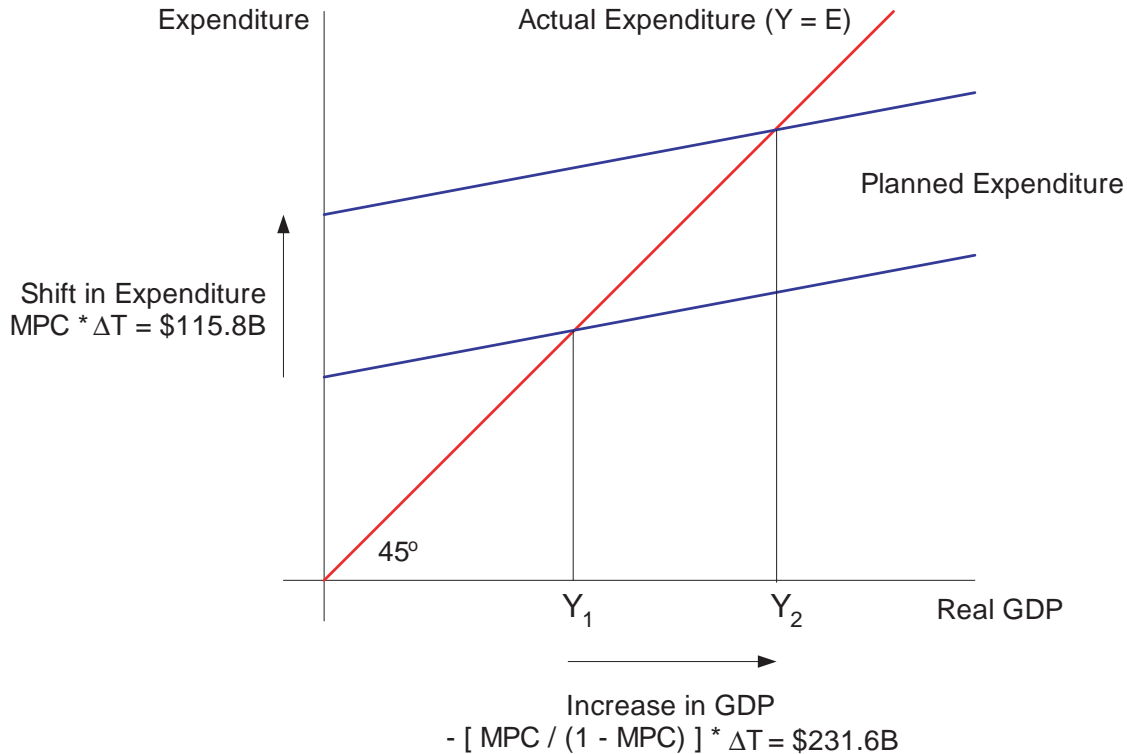
Plugging in the values given on our graph, we find that that $\Delta Y = \Delta T = 231.6$ billion dollars.

We solve for the percent change of GDP, and substituting into linear regression for unemployment:

$$\% \text{ Change real GDP} = -0.9 + 100 * 231.6 \text{ billion} / 11.65 \text{ trillion} = -0.9 + 1.99 \% = 1.09\%$$

$$\% \text{ Change in unemployment} = (3.33\% - 1.09\%) / 1.89 - 2.23\% = -1.04\%$$

$$\text{Number of jobs created} = \text{Labor Force} * (\% \text{ change in unemployment}) = 1,609,990 \text{ jobs.}$$

Figure X1. Keynesian Cross Model of Tax Cuts, $MPC = 0.5$

Healthcare Funding:

Approach:

We found that health-related aid was one primary factor of the economic stimulus package. According to the New York Times, 152 billion dollars of the stimulus package is going towards said aid. Of this 152 billion, 87.1 billion will go towards helping states pay for their Medicaid costs, essentially helping states close their budget gaps. Medicaid as it stands today primarily pays for the costs of health insurance for those earning under a certain income threshold. While the 87.1 billion dollars provided to the states will be helpful to those who cannot afford their own health insurance, as the states would feel less pressure from their current Medicaid debts, it is unlikely that much of that money would help increase the nation's GDP or reduce unemployment. This aid serves an important purpose, as states will now be more able to provide Medicaid to those who qualify for it but do not currently receive it. However, due to the pressures of poverty, those who qualify for Medicaid are unlikely to return much of their newfound savings to the job market, and so the Medicaid funding would simply provide an important service, but not improve the job market or GDP.

However, another 25.1 billion of the 152 billion dollars will be going towards expansion of the COBRA program. Currently, employers are required to continue the health insurance coverage of an employee for up to nine months after that employee's termination. The 25.1 billion dollars provided by the stimulus package would share some of this burden with the employers, paying for 65% of the coverage for terminated employees. This opens up a source of previously unavailable funds for businesses, who no longer have to pay the full premiums for terminated employees. This money would then return to the market and job creation, helping to increase the GDP and reduce

unemployment. In fact, we observed that for each of the 25.1 billion dollars the government is giving back to businesses by sharing the costs of COBRA, business owners will spend the dollar increased investment in capital and labor stocks (I). Since the National Accounts Identity tells us that $GDP = C + I + G + NX$, we realize that 100% of the money being transferred to businesses will go towards increasing real GDP, and hence reducing unemployment, from the linear regression we developed earlier.

Calculations:

Our beginning step in modeling the effects of increased health care spending on unemployment levels is to calculate the effects of the program on real GDP. Applying our model of the Keynesian cross from the tax cut section, we find that $Y = E$ and $E = C(Y - T) + I + G + NX$. Now we observe that, holding net exports and government spending fixed (since we consider the spending to be a reallocation of debt), an increase in business investment of ΔI gives us a change of ΔY in real GDP. This contains a feedback effect, as increased income leads to increased consumption based on the MPC, so we find that the multiplier effect of the increased investment can be described by another geometric series:

$$\sum_{n=1}^{\infty} MPC^{n-1} * \Delta I = \Delta I / (1 - MPC) = 50.2 \text{ billion dollars.}$$

$$\begin{aligned} \% \text{ Change in real GDP} &= -0.9 + 100 * 50.2 \text{ billion} / \text{Real GDP}_{2008} \\ &= -0.9 + 100 * 0.0502 \text{ trillion} / 11.6527 \text{ trillion} \\ &= -0.9 + 0.431 \% \\ &= -0.469 \% \end{aligned}$$

Plugging this value back into our linear regression, we solve for the new percentage change in unemployment:

$$\begin{aligned} \% \text{ Change in real GDP} &= 3.33\% - 1.89 * \% \text{ Change in unemployment} \\ -0.469 \% &= 3.33\% - 1.89 * \% \text{ Change in unemployment} \\ \% \text{ Change in unemployment} &= 2.01 \% \end{aligned}$$

Therefore the net effect of the increased healthcare spending is $2.23 \% - 2.01 \% = 0.220 \%$. Using the labor force values from the BEA, we now translate the percentage reduction in unemployment into a number of jobs:

$$\text{Number of jobs created} = 0.220/100 * 154,287 * 1,000 = 339,187 \text{ jobs.}$$

Education Funding:

Assumptions:

1. Students never illegally drop out of school before their junior year of high school.
2. Increased funding for high school and other education would increase the quality of said education, and would have a direct effect on the retention of students until graduation.
3. Jobs would be available for the students with higher educations who graduate over the next few years.

Approach:

We examined the effect that education aid would have on the nation's GDP and unemployment rate. According to ProPublica, \$29.1 billion of the \$48.4 billion set aside for education would go towards K-12 education, and \$15.9 billion would go towards public colleges and universities. We examined how monetary aid for schools and colleges would affect graduation rates, and how those graduation rates would lead to employment rates.

We found that there is a direct correlation between the average test scores, or cognitive skills, of students in a particular country and the growth of that country's GDP. Due to unrelated factors, the U.S. has historically had an unusually high growth rate for its mediocre test scores, but there is no reason to believe that an improvement in education and student cognitive skills would not additionally increase this high growth rate. The following graph, acquired from the Hoover Institution, plots various countries in terms of their average test scores and growth rates, indicating a strong correlation between education and a strong economy.



The question, then, is how effective the education aid included in the stimulus package would be in improving the quality of education in America, and to what extent this improved quality would lead to the creation of jobs. As employment rates for high school graduates are higher than employment rates of those who never receive a degree, and employment rates for college graduates are higher still, helping American students graduate from high school and college will cause the unemployment rate to drop. Students only have the option of dropping out of high school after their junior year, and so to determine approximately how many high school students would be prevented from dropping out of high school, we simply have to look at how many students the stimulus package would be able to provide a meaningful enough and well-funded enough education to prevent them from dropping out. The change in graduation rates and corresponding change in the number of people in the workforce with degrees would change the lower unemployment rate, as more people would be qualified to work in more jobs. It is important to note that of the \$29.1 billion given towards primary school education, \$19.2 will be focused on high school education.

Also, while the following calculations calculate the direct effects of education aid on unemployment, the improvement done to school facilities, quality of teaching, and education reform will outlive the funding provided by the stimulus package. This means that even without the addition of increased funding, the effects of the package would continue to be significant over a period of many years. The initial improvement to the unemployment rate when current students join

the workforce, shown below, would therefore only be the short-term manifestation of this education aid. Additional benefits would continue to be seen on a long-term basis, although by their nature they would not be possible to predict quantitatively and precisely.

Calculations:

First, the increase in high school graduates (I_{hs}) can be calculated based on the cost of sending a high school student through a year of school (C), the number of years dropping out is available to a student (2), and the money gained from the stimulus package (S_t).

$$I_{hs} = S_t / (C * 2)$$

$$I_{hs} = 19.2 \text{ billion dollars} / (4,525 \text{ dollars} * 2 \text{ years})$$

$$I_{hs} = 2,121,546 \text{ students}$$

Next, the total unemployment for those with no degree (U_0) and those with just a high school degree (U_1) can be calculated based on unemployment rates for those without degrees (R_0) and with degrees (R_1), the percentage of the population for those without degrees (X_0) and those with degrees (X_1), and the total population that is old enough to be in the workforce (P).

$$U_0 = (X_0 * P) * R_0$$

$$U_0 = (14\% * 233,788,000 \text{ people}) * 9\%$$

$$U_0 = 2,945,729 \text{ people unemployed}$$

$$U_1 = (X_1 * P) * R_1$$

$$U_1 = (84\% * 233,788,000 \text{ people}) * 5.7\%$$

$$U_1 = 11,193,769 \text{ people unemployed}$$

The current total unemployment for these two groups (U_t) can then be found by summing the partial unemployment.

$$U_t = U_0 + U_1$$

$$U_t = 2,945,729 \text{ people unemployed} + 11,193,769 \text{ people unemployed}$$

$$U_t = 14,139,498 \text{ people unemployed}$$

Now, the same calculations can be performed to find the unemployment for both of these groups (U_{0new} and U_{1new}) after those gaining high school diplomas increase by I_{hs} .

$$U_{0new} = (X_0 * P + I_{hs}) * R_0$$

$$U_{0new} = (14\% * 233,788,000 \text{ people} - 2,121,546 \text{ students}) * 9\%$$

$$U_{0new} = 3,136,668 \text{ people unemployed}$$

$$U_{1new} = (X_1 * P) * R_1$$

$$U_{1new} = (84\% * 233,788,000 \text{ people} + 2,121,546 \text{ students}) * 5.7\%$$

$$U_{1new} = 11,581,216 \text{ people unemployed}$$

The new total unemployment for these two groups (U_{tnew}) can then be found by summing the partial unemployment.

$$U_{tnew} = U_{0new} + U_{1new}$$

$$U_{tnew} = 3,136,668 \text{ people unemployed} + 11,581,216 \text{ people unemployed}$$

$$U_{tnew} = 14,717,884 \text{ people unemployed}$$

The change in unemployment, and therefore the number of jobs created through improved education (J), can then be found by finding the difference between U_{new} and U_t .

$$J = U_{\text{new}} - U_t$$

$$J = 14,717,884 \text{ people unemployed} - 14,139,498 \text{ people unemployed}$$

$$J = 578,386 \text{ new jobs}$$

An identical process can be followed to calculate the number of new jobs created by aid to universities (J_u), except I_{hs} needs to be added to the pool of those eligible for a college degree.

$$J_u = 41,944 \text{ new jobs}$$

Therefore, the total increase in jobs (J_t) would be the sum of jobs gained from high school and university aid.

$$J_t = J + J_u$$

$$J_t = 578,386 \text{ new jobs} + 41,944 \text{ new jobs}$$

$$J_t = 620,330 \text{ new jobs}$$

“Green energy” spending:

Approach:

Some of the major beneficiaries of the stimulus package are interests in green energy industries. The transition from the current U.S. energy sector emphasis on fossil fuels such as coal, oil, and natural gas is costly, and is of extreme importance to U.S. economic evolution and national security interests. This venture requires a large input of capital from a trusted investor, and in this environment the best such investor is the U.S. government. The production of green energy will require three specific inputs: government spending in the form of research and state and local grants, business investment in the form of developing new energy products and converting old energy supplies to a “clean” basis (and the labor force required to develop these technologies), and consumption effects in the form of energy tax credits and home weatherization programs. We will also want to calculate the amount of energy expected to be produced under this program, in order to determine if generating green energy is a cost-efficient solution that will benefit the economy, and indirectly, unemployment rates, in the long run.

Calculations:

We develop a model of the Keynesian cross similar to our calculations for the tax cut and healthcare programs. The effects on the green energy program on real GDP growth can be divided into two parts: tax credits/cuts and direct consumption in the form of government spending and business investment. The effect of the tax credits on GDP growth can be measured by the equation we developed in the tax credit section, and the effect of direct spending can be measured by the equation we developed in the healthcare section:

$$\sum_{n=1}^{\infty} \text{MPC}^n * \Delta T = \Delta Y_T = \Delta T * \text{MPC} / (1 - \text{MPC}) = 9.5 \text{ billion dollars.}$$

$$\sum_{n=1}^{\infty} \text{MPC}^{n-1} * (\Delta G + \Delta I) = \Delta Y_{G+I} = (\Delta G + \Delta I) / (1 - \text{MPC}) = 116.4 \text{ billion dollars.}$$

$$\Delta Y = \Delta Y_T + \Delta Y_{G+I} = 125.9 \text{ billion dollars.}$$

$$\% \text{ change in real GDP} = -0.9\% + 100*(125.9 \text{ billion} / 11.6527 \text{ trillion}) = 0.18\%$$

Plugging our value into the linear regression and solving for unemployment, we get

$$\% \text{ Change in real GDP} = 3.33\% - 1.89\% * \% \text{ Change in unemployment}$$

$$0.18\% = 3.33\% - 1.89\% * \% \text{ Change in unemployment}$$

$$\% \text{ Change in unemployment} = 1.66\%$$

$$\% \text{ decrease in unemployment} = 2.23\% - 1.67\% = 0.56\%$$

Using the labor force values from the BEA, we now translate the percentage reduction in unemployment into a number of jobs:

$$\text{Number of jobs created} = 0.560/100 * 154,287 * 1,000 = 869,506 \text{ jobs.}$$

In calculating the effect of this green energy expansion, we will operate under the assumption that the average price of solar energy is 20.5 cents per MJ. We solve for the amount of energy created under the program:

$$\text{Amount of green energy} = (42.5 \text{ billion} / (20.5 \text{ cents/MJ of energy})) = 207.2 \text{ billion MJ.}$$

Now, using the DOE estimate that US energy consumption will be 101.25 quadrillion BTU in 2011, we find that the amount of energy expressed in MJ is:

$$101.25 \text{ quadrillion BTU} / (\text{BTU}/1055 \text{ J}) * (1/10E-6) = 106.8 \text{ trillion MJ.}$$

Therefore the green energy program will only cover 0.2% of total energy production, and will not prove to be a cost-efficient method of developing jobs in the long run.

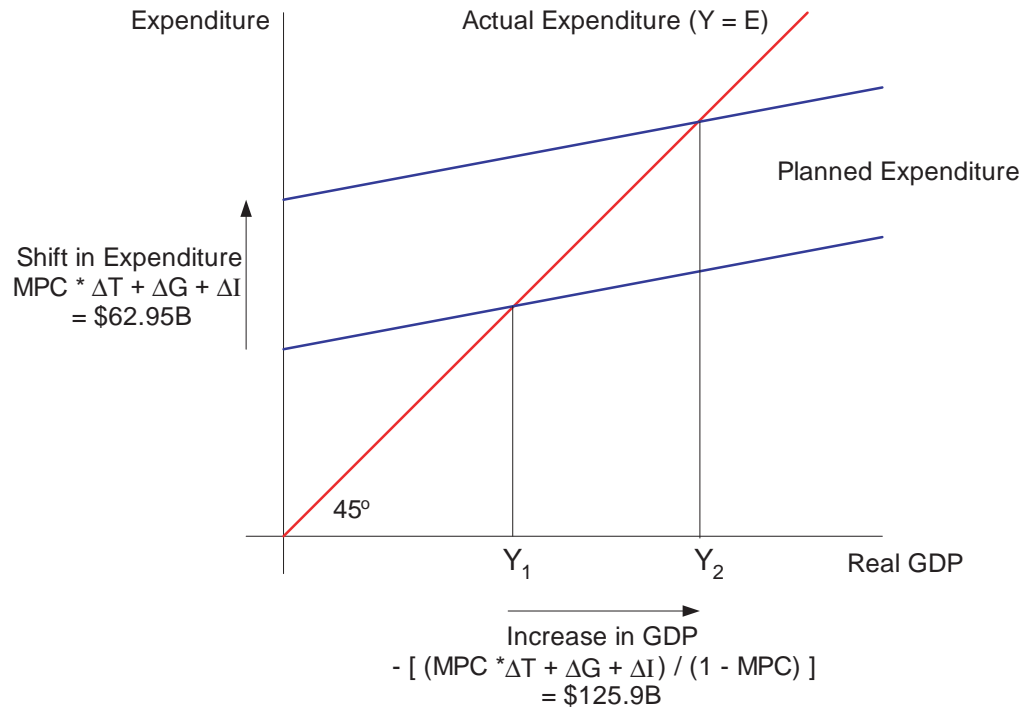


Figure X2. Keynesian Cross Model of Tax Cuts, MPC = 0.5

Problem #2: How quickly can they be expected to produce results? How will we know whether the stimulus package is “working”? How confident are you in your predictions?

Assumptions:

1. The United States' labor force will continue to grow at the linear rate it has followed for the last 28 years.
2. The jobs that result from the stimulus package will be created within the next few years, as all government models suggest.

Approach:

While it is clear that the 787 billion dollar stimulus package will bring benefits to the United States' economy, the timeframe for the benefits to be felt by the average American is not immediately obvious. The most immediate results will be from the tax cuts and tax credits that comprise more than 200 billion dollars of the stimulus package. Tax credits will provide the most immediate results, since American citizens will directly receive this money. However, the major economic benefits of the tax cuts will take more time to present themselves. These more major benefits to the economy will only be felt once Americans have built up enough confidence to spend the money that they gain from these tax cuts. This increase in spending will cause an increase of production, which will ultimately create new jobs.

On the other hand, the results of the 45 billion dollars being invested into improving education will take a significantly longer amount of time to be felt. This part of the bailout bill will ultimately secure prosperity of the United States' economy in the future. Improving our school systems today will help to better educate the rising work force. As a result, in the future they will be more likely to be employed. This theory is clearly supported by the trend that people with a higher degree of education have significantly lower unemployment rates. However, job retraining will provide a faster result, since it does not require sending someone through four years of high school and possible four or more years for college. This job training can be completed in a short period of time, allowing these citizens to seek out new higher-paying jobs.

The money being given to healthcare, while not providing the almost instant results of tax cuts and credits, will still provide relatively fast results. Once the stimulus package begins to cover 65% of the COBRA expenses, businesses will immediately see a decrease in their expenses and an increase in their revenue. This money, whether it is used directly to hire more workers or invested into the economy, will more directly strengthen the economy than the money given to tax cuts and education.

Ultimately, we will know that the stimulus package is working as soon as we begin to see a decrease in the unemployment rate and an increase in the gross domestic product.

Calculations:

According to the Economic Policy Institution (EPI) we can ultimately expect to see the creation of 4,965,000 new jobs as the result of the stimulus package in the next 3 years. Using the correlation that we derived in the first question, we can calculate the total effect of the stimulus package over the next three years:

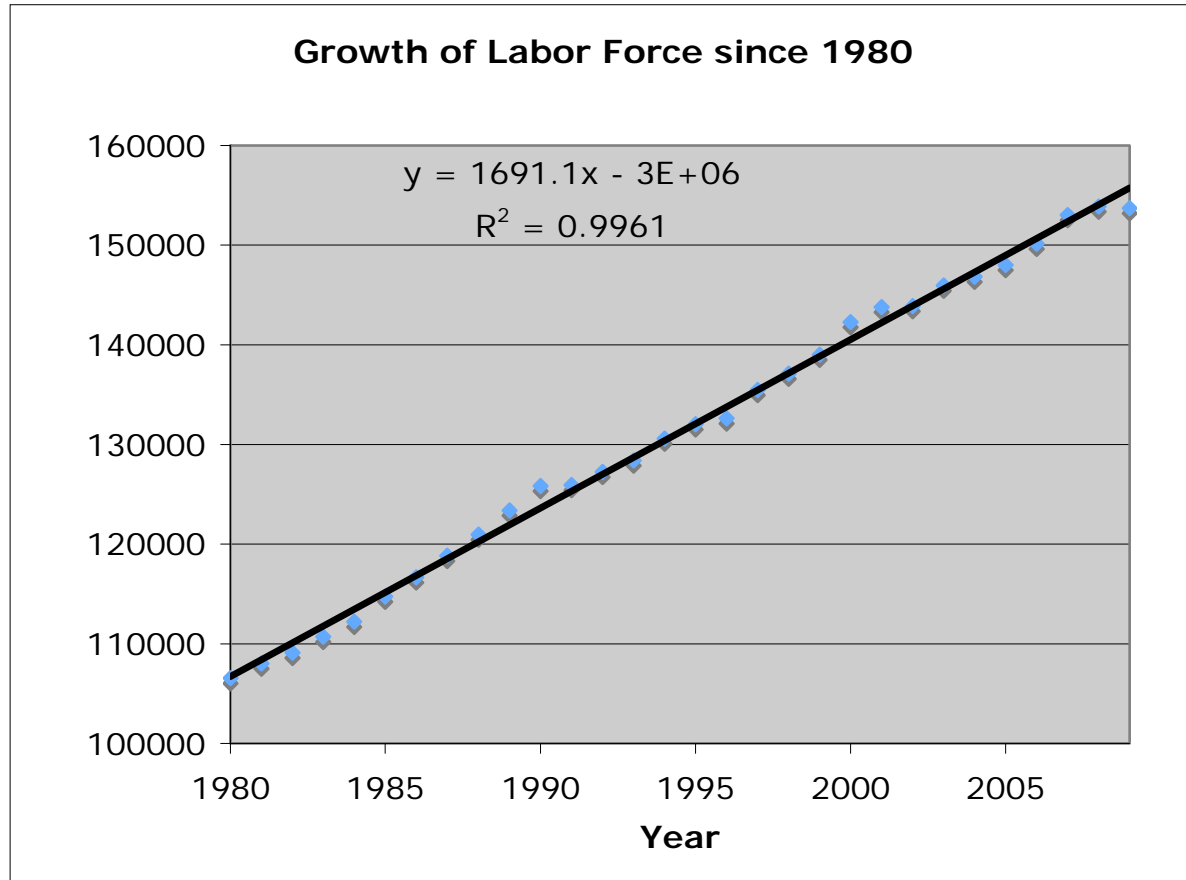
$$3.33 - 1.89(\text{change in unemployment rate}) = \text{percent change in GDP}$$

$$\text{Change in unemployment rate} = -(\text{Total new jobs created})/(\text{Total labor force}) * 100$$

$$\text{Total new jobs created in the next 3 years} = 4,965,000$$

In order to calculate the size of the labor force at the end of 2011, we plotted the size of the labor force since 1980 and found that it followed a linear trend with .996 correlation. Our data and graph are shown below.

Year	Size of Labor Force (Thousands)	Year	Size of Labor Force (Thousands)
1980	106562	1995	132038
1981	108026	1996	132616
1982	109089	1997	135456
1983	110695	1998	137095
1984	112209	1999	139003
1985	114725	2000	142267
1986	116682	2001	143800
1987	118845	2002	143883
1988	120969	2003	145937
1989	123390	2004	146842
1990	125833	2005	148005
1991	125955	2006	150148
1992	127261	2007	153012
1993	128400	2008	153873
1994	130596	2009	153716



Using this equation and the linear fit, we are able to predict the size of the labor force in 2010 and 2011:

Size of Labor Force in 2010 = 157,774,700

Size of Labor Force in 2011 = 159,465,800

Change in unemployment rate = $-4,965,000/159,465,800 \times 100$

Change in unemployment rate over next 3 years = -3.11

$3.33 - 1.89(-3.11) =$ percent change in GDP

Percent change in GDP over the next 3 years = 9.21%

Using this same method, the EPI estimates that 1,179,000 jobs will be created in the next year and 3,655,000 created in the next 2 years, and our graph, we can also estimate the expected change in the unemployment rate and GDP for the next year and two years.

Change in unemployment rate over next year = -.767

Change in GDP over next year = 4.78%

Change in unemployment rate over next 2 years = -2.31

Change in GDP over next 2 years = 7.71%

We will know if the stimulus is “working” to the extent that it is expected to if we see the GDP and unemployment rates correspond with these rates that we reached using our model. However, if the GDP and unemployment rates do not hold up to these predictions, it does not suggest that the stimulus package is not “working,” but rather it may just suggest that the EPI is overestimating the amount of jobs that are going to be created by the package. This theory is further supported by our estimates of the amount of jobs going to be created by the most significant portions of the stimulus package, which are only 1,609,990 jobs because of tax cuts, 339,187 jobs because of healthcare, 620,330 jobs because of education, and 869,500 jobs because of green energy investments. This gives us a total of only 3,439,423 jobs. This would suggest the total amount of jobs produced by the stimulus package to be significantly less than the EPI’s prediction of 4,965,000. The EPI may have put out this overestimate in order to increase consumer confidence. In order to make more accurate predictions of the expected results of the stimulus package, we have rerun the method outlined about using our own estimation and the 2011 labor force prediction (this would be most accurate since it will take time for these jobs to be created):

Predicted change in unemployment rate: -2.16%

Predicted change in GDP: 7.46%

These predictions are only a bottom line since they do not include all the jobs created by the smaller portions of the stimulus package. However, some of the education jobs may take longer than three year to be created, but this should not make a significant difference in our calculations. This means that if the unemployment rate drops by less than 2.16% and GDP rises less than 7.46% in the next three year, the stimulus package is not “working.”

In order to express our confidence of these predictions, we only need to figure out our confidence of the conversion between the % change in GDP and the change in the rate of unemployment, since these conversions are solely reliant on this correlation. To do this we decided to calculate a 95% confidence interval for the slope of the regression line. Our calculations are shown below:

$n = 58$ (number of data points used)

$SS_{xx} = \sum x^2 = 54.55$

Error Sum of squares = $SSE = \sum e^2 = \sum (y - \text{avg}.y)^2 = 4.828$

$S_e = \sqrt{(SSE/(n-2))} = 0.294$

Convergence interval for $b = S_b = S_e / \sqrt{(SS_{xx})} = 0.0398$

Confidence interval for the slope of the regression line is $(1-\alpha)$, where α is 0.05. This is calculated to be $b \pm tS_b$, where b is the slope of the regression line from the data, and t is obtained from the distribution table for $\alpha/2$ area in the right tail of the t-distribution and $n-2$ degrees of freedom. From the table:

$t = 2.003$

$b \pm tS_b$ is between -1.97 and -1.81

These values are relatively close to the slope of the regression line of the data, so we can be very confident that our predictions are accurate.

Question 3: Is a second stimulus package necessary? If so, how would it be structured? Are there other alternatives?

Assumptions:

1. The economic situation if and when the second package is needed will be due to the same causes as led to the first.
2. The policies of the first package have been implemented as intended.

Approach:

A second package would certainly be needed if the changes to the GDP and unemployment do not match our predictions, and should be considered if they do not meet EPI / White House employment targets. Since our predictions for the results of the initial package leave a 1.25 million job gap and a 1.75% gap in real GDP growth, it seems safe to assume that a second stimulus package should and will be implemented. This second package should focus on the same four main targets of the first package (tax breaks, healthcare, education, and green energy), while also expanding to include experience-rated unemployment insurance, expansion of job training programs, and reform on collective bargaining.

First, an additional tax break should be implemented to provide immediate relief. While ideally we would be able to construct an economy stable and sustainable enough to not require these economic “jolts,” we saw from our study that tax breaks were the most efficient means of job creation, both in terms of time and in cost of each job.

In contrast, a greater focus should be placed on high school education. If the first stimulus package is not enough to meet its stated goals, then Americans may have to accept that we are dealing with a more long-term issue than we hoped, one that requires a more long-term solution. Education could be that solution, as even though it has negligible effects in the short term, like the creation of teaching jobs, it can have long-term, self-sustaining effects in the future. Stronger education would ensure that more students continue through high school and college to graduation, and that the education they receive is more interesting and valuable to them. These students would be better suited for the service-oriented economy that the U.S. has recently developed into (from a manufacturing-based one), and would prove more competitive in a global economy. As manufacturing jobs become increasingly unavailable inside the U.S., a stronger national focus on education will be necessary to provide a new kind of workforce, for the new kind of economy. Also, any improvements made in educational facilities, teaching ability, or teaching reform would be long-lasting, having effects even after funding from the government ceased. A strong education would be necessary for the U.S. to remain competitive in a global market.

For health care, there should be a shift from a focus on helping individuals receiving healthcare to helping business to provide healthcare for their employees. While Medicaid should certainly still stand, as most Medicaid aid simply goes to paying back state debts, it would do little to help improve the job market or national GDP. Instead, the new stimulus package should provide relief to business that pay healthcare to their employees. First, this would allow more businesses to provide healthcare to their employees, not only providing a necessary service to their current employees but also giving those relying on or abusing the Medicaid system incentive to go out in search of jobs. Second, this would provide relief to businesses for which paying for the health insurance of their current employees or their terminated employees is a burden. The money these businesses saved would then be added to spending or job creation, in the end increasing the nation's

GDP and lowering the unemployment rate. This would also provide helpful healthcare reform, lifting the burden of healthcare for those who struggle to acquire, or simply cannot afford, health insurance.

Also, green jobs and environmental policies promoted by the original economic policies should be analyzed to determine the feasibility and efficiency of specific green strategies. Whether these successful institutions are the production of hybrid cars, solar energy, wind power, or something else entirely, whatever shows the most promise should be promoted most aggressively while other policies take a second seat. This would not only ensure that the U.S. backs the most economically successful energy policy, but also that the U.S. would acquire the most useful and efficient energy systems. This would allow for increased energy independence within the U.S. and lead to a stronger and more stable economy.

In addition to these changes in the major current issues, certain other issues would certainly be worth implementing or significantly expanding. Job training should be expanded, because as it stands in the current stimulus package, it will only receive 4 billion dollars in aid. As much of the unemployment is caused by U.S. manufacturing jobs being out-competed by foreign industries, like China where no minimum wage allows for the production of extremely cheap products, the U.S. is going to have to increasingly make the shift towards a service-based economy. To achieve this shift, the U.S. is going to have to be successful in training those who find themselves out of a manufacturing job so they could perform service-based jobs. This shift is not likely to occur spontaneously, as untrained workers are not likely to search for jobs they are not qualified for. But as more and more unemployed workers find themselves competing over fewer and fewer manufacturing jobs, it will become necessary for them to begin filling service-based jobs after government training. This will not only provide a relief to the unemployed, but also allow the U.S. to move into its service niche to create a more internationally competitive and sustainable economy.

Another change made in the second stimulus package would be a shift towards one hundred percent experience-rated unemployment insurance. As unemployment insurance currently stands, employers only pay a small portion, usually between ten and twenty percent, of the unemployment benefits received by terminated or laid-off employee. This keeps the cost of laying off an employee relatively low. However, as shown in figure X3 on the following page, with one hundred percent experience-rated insurance, employers must pay all the costs of unemployment benefits. This changes the threshold at which laying off an employee becomes economically beneficial to a company, preventing unnecessary lay-offs and temporary lay-offs, where a company, to save costs in the short term, lays off employees with the intention of rehiring later. This would provide more job security, keeping more people in the workforce and halting the proliferation of unemployment. This policy could be reconsidered later as the job market begins to regain a foothold, as it would be a more temporary fix instead of fixing the entire problem.

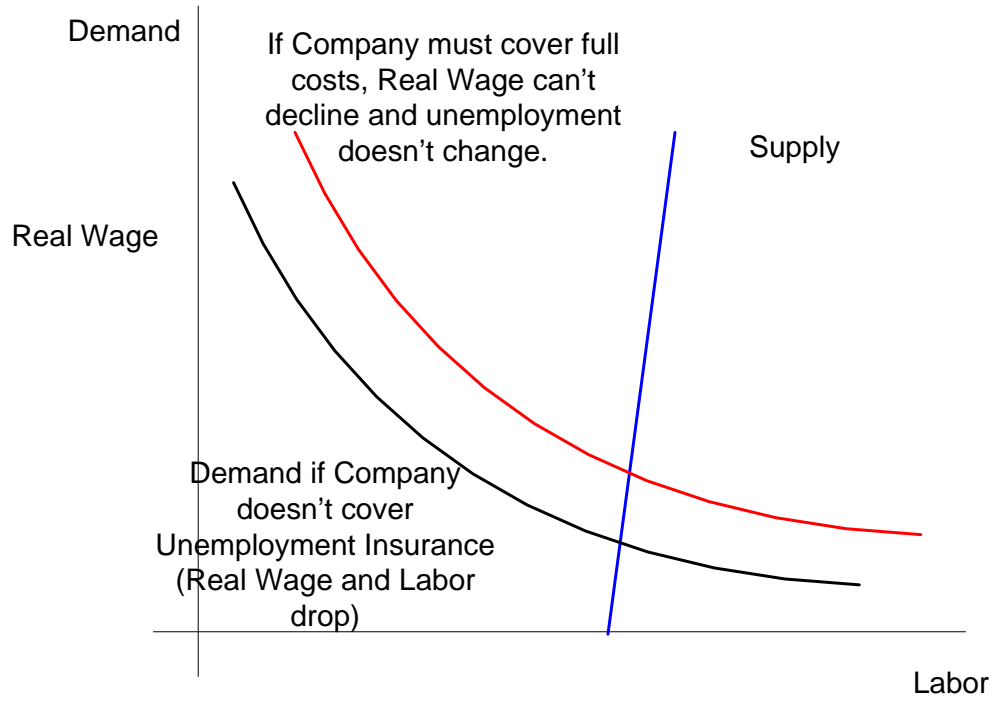


Figure X3. Effect of 100 Percent Experience Rated System on Unemployment

Bibliography

<ftp://ftp.bls.gov/pub/special.requests/lf/aat7.txt>
<http://arxiv.org/ftp/arxiv/papers/0811/0811.0490.pdf>
<http://brainflation.wordpress.com/2008/02/09/just-how-much-does-it-cost-to-educate-our-students/>
<http://cep.lse.ac.uk/pubs/download/dp0361.pdf>
<http://economistsview.typepad.com/economistsview/2009/02/tax-cuts-vs-government-spending.html>
<http://krugman.blogs.nytimes.com/2009/01/05/is-obama-relying-too-much-on-tax-cuts/>
http://money.cnn.com/2009/03/03/news/economy/karydakiss_obama_budget.fortune/?postversion=2009030313
http://projects.nytimes.com/44th_president/stimulus/
http://projects.nytimes.com/44th_president/stimulus/education-and-job-training
<http://query.nytimes.com/search/sitesearch?query=economic+stimulus+package&srchst=cse>
http://topics.nytimes.com/topics/reference/timestopics/subjects/u/united_states_economy/economic_stimulus/?scp=2&sq=economic%20stimulus%20package&st=cse
<http://www.bea.gov/>
<http://www.bls.gov/emp/emptab7.htm>
<http://www.bls.gov/opub/mlr/2002/05/art2full.pdf>
<http://www.census.gov/Press-Release/www/releases/archives/education/011196.html>
<http://www.chron.com/disp/story.mpl/front/6288421.html>
<http://www.cms.hhs.gov/home/medicaid.asp>
http://www.data360.org/dsg.aspx?Data_Set_Group_Id=230
http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html
<http://www.energy.gov/news/4855.htm>
http://www.epi.org/analysis_and_opinion/entry/house_bill_creates_nearly_three_times_more_jobs_than_gop_alternative/
<http://www.federalreserve.gov/monetarypolicy/fomcminutes20090128ep.htm>
http://www.google.com/hostednews/ap/article/ALeqM5hNKpRIDbRV_-CUGJzJxHBOhGmmSQD96P5AHO0
<http://www.hoover.org/publications/ednext/16110377.html>
<http://www.kff.org/insurance/employer.cfm>
<http://www.kff.org/uninsured>
<http://www.lasvegassun.com/news/2009/mar/04/without-solutions-gops-criticism-hollow/>
<http://www.medicalnewstoday.com/articles/139735.php>
<http://www.mvass.com/2009/01/obama-stimulus-package-urgent-need-to.html>
<http://www.nchc.org/facts/cost.shtml>
<http://www.nytimes.com/interactive/2009/01/26/business/economy/20090126-recessions-graphic.html>
http://www.propublica.org/special/the-stimulus-plan-a-detailed-list-of-spending#stim_education
<http://www.westernu.edu/xp/edu/university/university-value.xml>
<https://www.cia.gov/library/publications/the-world-factbook/geos/us.html>