Where Will the Jobs Come From?

WPI

An Interactive Qualifying Project Report

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Submitted by

Xingchi Dai
xdai@wpi.edu

Ian James Schuba
ijschuba@wpi.edu

Approved by

Project Advisor: Prof. John Orr

orr@wpi.edu

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We, Xingchi and Ian, send our best greetings to you all.

Abstract

This project evaluates and analyzes the question of where enough future jobs will come from in the United States to end the unemployment crisis. Since the spike in the unemployment rate in 2009, the U.S. government has been trying to find a reasonable solution to the loss of jobs across the country. This project attempts to find the solution to this problem by investigating three aspects of the employment situation. The first part of the report shows how many jobs could be created through the high technology job sector. The second part of the report focuses on the impact of political policies, and gives projections for impactful policies that could create more jobs. The third part of the report investigates whether the United States has enough money to pay "well" for all the new jobs coming in. The conclusion of this project points out that a large amount of jobs can come from high-tech companies and the government has the potential to make decisions that result in job creation to adjust the unemployment situation.

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1. Introduction

One goal of an Interactive Qualifying Project (IQP) at WPI is to benefit the world in which we live, either through solving, raising awareness of, or informing people about a particular problem. The project, "Where will jobs come from?" focuses on the research of the employment condition in the United States, and aims at explaining the complicated relations existing in the employment issue. The IQP group investigated this problem through three perspectives: prospering job sectors, constructive political policy, and economic evaluation. The result of the research provides concrete suggestions for stabilizing the United States job market and employment economy.

The "job market" is crucially important to people. And this project can benefit us in many ways. The "job market" not only affects people's daily life, but also society's stability. Society would be more stable once people have stable jobs and incomes. On the contrary, a bad employment condition will jeopardize the stability of the whole society. Iraq faces this problem right now. In Iraq, unemployment is concentrated among young people, with nearly 28 percent between 15 and 29 years of age unemployed. These idle young men and women have high risk being lured into militant factions and the joblessness fuels insurgency in Iraq. Thus, UN has warned that "growing unemployment threatens stability" in Iraq.

The unemployment rate always attracts attention among governmental administrators and common citizens. The government officials will change economic policies according to current employment and economic condition, either to inspire the market or restrict economic growth from expanding too fast. These policies affect

people's lives. Therefore, during the presidential election, many voters chose their candidate based on whom they believed would be best for the job market and economy, but few people really understands what's going on under the surface.

This IQP project aims to simplify and analyze the complicated relations existing in the employment issue. There are hundreds of factors affecting our local job market, such as the development of high technologies, economic condition, higher education and governmental policies. Each one has significant effects on the job market, and many professors and experts have been researching on these individual topics.

The following figure, employment growth Vs. GDP growth in 2012, indicates an interesting fact that economic growth does have correlation with employment rate. Most countries follow the fact that a good economic growth creates more jobs. However, Singapore is an exception in 2012. When Malaysia kept a high GDP growth and a high employment rate, Singapore, on the contrary, remained a high employment rate but very low economic growth. What happened to Singapore? How can we explain this phenomenon? Can the United Stated create more jobs even though the economy is still weak?

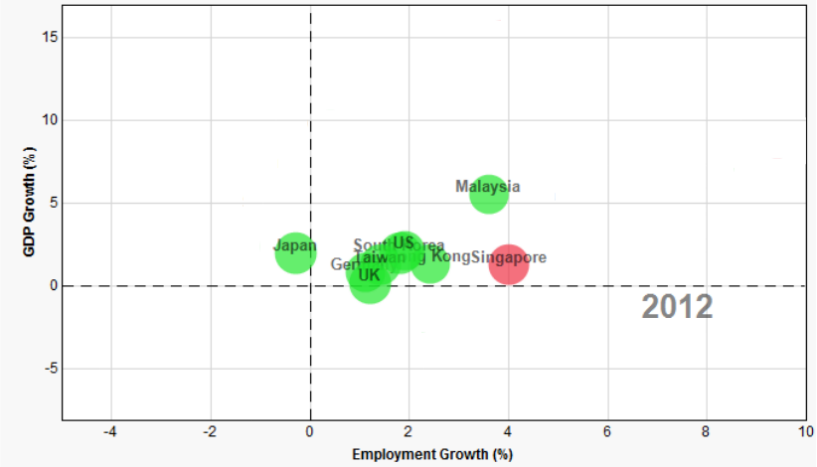


Chart 1 GDP vs. Employment Growth

In order to approach the project's goal step by step, three questions should be answered: Can the blossoming high technology sector help to create more jobs? In this project, we found the high technology sector has the highest potential for upcoming jobs since American society has been constantly integrating itself and growing along with advancements in technology. What government policies are most likely to produce enough jobs? Government policy has historically provided the most change in areas like this. It is important to investigate the impact of policies, and their potential to bring drastic chance to the job market. Is there enough money in the U.S to pay everyone a decent wage? It won't be worth it to create an overwhelming amount of jobs if there is not enough money in the economy to pay for the lives of these workers. It is important to investigate this in order to determine if America has the money to reasonably support enough new jobs. Group members will work on these three questions one by one. The methodology part elaborates how to approach and answer these three questions.

2. Goals and deliverables

Our primary goals for "Where will the jobs come from?" include:

- Determine a correlation between developing high technologies and the economic growth on the different economic sectors.
- Determine if American government policies to reduce unemployment rates are effective.
- Determine if there is enough money in the US to pay everyone a decent wage
- Determine if U.S. can offer enough job opportunities to people

The IQP group has decided that this project should be divided into three major parts and each part should have specific goals.

Part 1: Technology

- Determine effects brought by developments of high technologies on different economic sectors
- Research on current events of people who lost their jobs due to developments of high technologies
- Determine new jobs created by high technologies in upcoming years

Part 2: Politics

- Research recent and famous cases in which government policies changed the weak employment condition.
- Determine common methods used by the government to improve the employment condition.
- Determine pros and cons of those methods used by governments
- Research current methods used by the American government to propel the local job market, and research if these methods are effective.
- Determine if American government can use other countries' methods effectively.

Part 3: Economics

- Find what determines a person's salary.

- Determine what a decent wage is.
- Determine the current economic condition (overall economic condition, GDP growth, CPI) in America.
- Determine if there is enough money in the US to pay everyone a decent wage? (Determine if U.S. can offer enough job opportunities to people)

3. Background

GENERAL INFORMATION

America is fresh out of an economic recession. According to publications by the U.S. Bureau of Labor Statistics, our most recent recession spanned December of 2007 to June of 2009[1]. In this period annual consumer expenditures fell, meaning less capital circulation through America's economy. Americans spent less money in this time due to instability in the job market. As creation of new businesses diminished, and destruction of new businesses increased in this period, there were fewer jobs being created, and more being destroyed. Businesses struggled to stay competitive in this time of economic downturn, so mass layoffs became fairly common. Unemployment rose more rapidly in this recession than in any economic recession in the history of the U.S., peaking just after the recession ended at 10% [1], doubling the pre-recession unemployment rate of 5% [1]. Before this time, the unemployment rate over 10 percent only happened between September 1982 and June 1983, during which time the unemployment rate hit 10.8 percent. The chart below shows unemployment rate from 1948 to 2011.

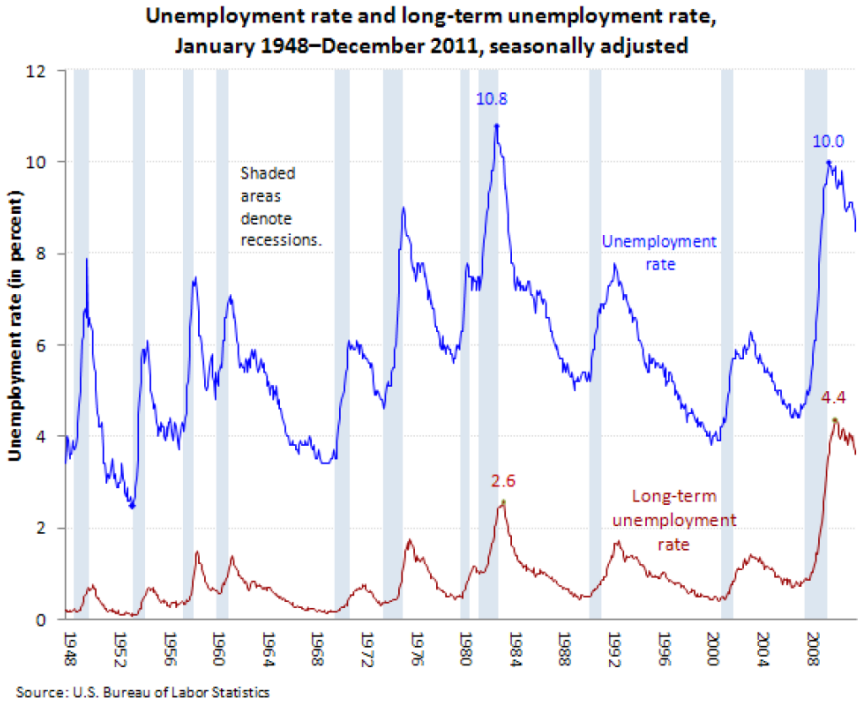


Chart 2 Unemployment rate from 1948 to 2011

From the graph above, we can see in the recent economic recession, the unemployment rate rose to 10 percent (the long-term unemployment rate rose to 4.4 percent), which was the second highest in near 60 years, and long-term unemployment is the highest in these 60 years. The long-term unemployment rate refers to the category of unemployed workers that have been unemployed for longer than 27 weeks. Compared to those 10 recessions in the past 60 years, the recent one is notable and depressing.

America's economy is not out of the woods just yet. While employment is recovering, it is doing so at a leisurely pace. We have not quite reached our pre-recession unemployment rate of 5%. While employment conditions in this country are increasing, America has remained above 7% unemployment for all recorded months in 2013, and more than 20% of Americans believe that employment is the most important issue facing

the US [2]. The table below shows unemployment rates in recent 10 years. After October in 2009, employment is recovering in a very slow speed.

The United States of America prides itself in its representative government, in which the citizens select those who they believe to be best suited to represent them on local, state, and federal levels in policy decisions. As the adult population evaluates and elects people to the most relevant positions to policy decisions, we also indirectly vote

Table 1 Unemployment Rate from 2003 - 2013 in U.S.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2003	5.8	5.9	5.9	6.0	6.1	6.3	6.2	6.1	6.1	6.0	5.8	5.7	
2004	5.7	5.6	5.8	5.6	5.6	5.6	5.5	5.4	5.4	5.5	5.4	5.4	
2005	5.3	5.4	5.2	5.2	5.1	5.0	5.0	4.9	5.0	5.0	5.0	4.9	
2006	4.7	4.8	4.7	4.7	4.6	4.6	4.7	4.7	4.5	4.4	4.5	4.4	
2007	4.6	4.5	4.4	4.5	4.4	4.6	4.7	4.6	4.7	4.7	4.7	5.0	
2008	5.0	4.9	5.1	5.0	5.4	5.6	5.8	6.1	6.1	6.5	6.8	7.3	
2009	7.8	8.3	8.7	9.0	9.4	9.5	9.5	9.6	9.8	10.0	9.9	9.9	
2010	9.8	9.8	9.9	9.9	9.6	9.4	9.5	9.5	9.5	9.5	9.8	9.3	
2011	9.1	9.0	8.9	9.0	9.0	9.1	9.0	9.0	9.0	8.9	8.6	8.5	
2012	8.3	8.3	8.2	8.1	8.2	8.2	8.2	8.1	7.8	7.9	7.8	7.8	
2013	7.9	7.7	7.6	7.5	7.6	7.6	7.4	7.3	7.2				

for the ideas and goals we wish to see present in the same capacity. And in such a time when misinformation and disinformation travel close to the speed of light, producing valuable information is all the more critical, lest the citizenries decisions will not be properly informed on such critical issues.

Furthermore, with the job market still recovering, Americans should take care in planning their career and future. In 2010 there were more than 4 million Americans at the age of sixteen. In the United States, this is the age at which education is no longer mandatory, and students may drop out of high school, perhaps constituting the first major decision regarding one's status in the national labor pool. Many of these students continue to get a high school degree, and a number of those will continue to choose a field of study at an institution of higher education. Before a student decides upon a field of study, if graduate school is necessary, or whether or not to settle for a high school diploma or GED, the student should know what employment and quality of life are available to them with their chosen credentials. To make a truly informed decision, one

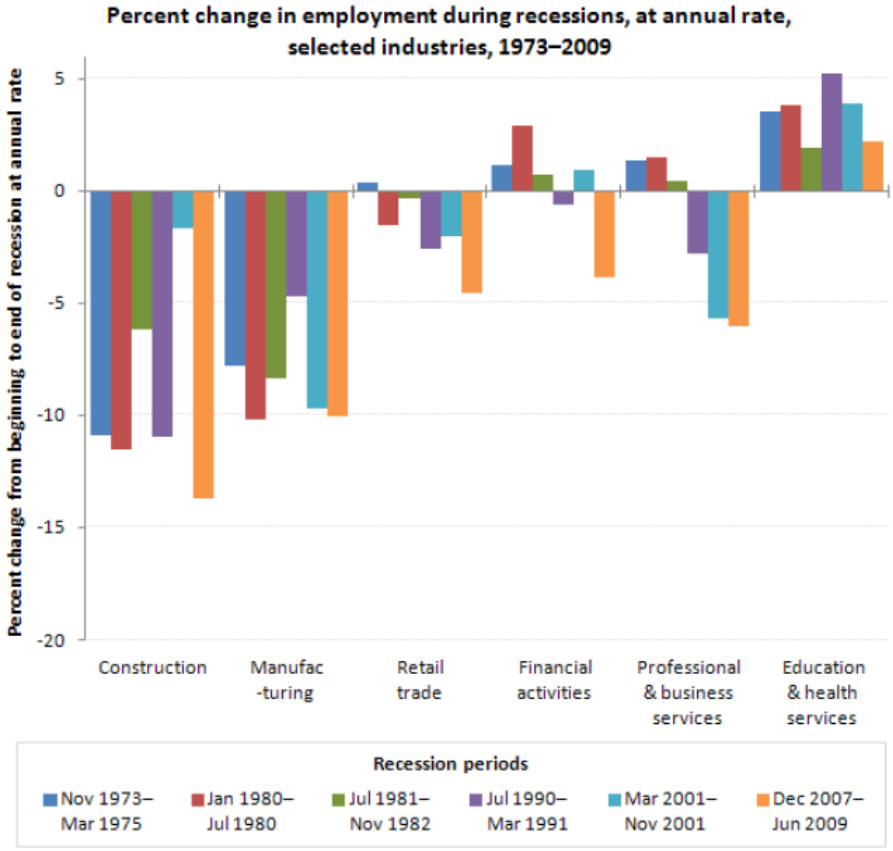


Chart 3 Percent Change in Employment during recession

needs to have some knowledge of the recent economic trend and current employment conditions. The following figure shows an interesting fact that employment actually increases in education and health services during the recession time while others have decreased significantly. Thus, the project group should take different economic sectors into consideration to make sure the conclusion is objective and comprehensive.

HIGH TECHNOLOGY IMPACT

In the winter of 1860, William Russell, William Waddell and Alexander Majors met to organize a fast mail delivery system to western United States. Their project, the "Pony Express" would achieve a delivery time of roughly 10 days between Atlantic and Pacific coasts [3]. Initially they assembled hundreds of employees, including 120 riders, who would have to traverse the lesser-settled half of the United States.

This system, although state of the art for its era, is utterly antiquated by modern standards. In the year of authorship of this document, 2013, 10 days is a startlingly long delay for a letter, and even more so for any of the letter's more modern equivalents. For email, phone calls, and text, the delay between sending and delivery is more easily measured in seconds, instead of days. Rarely if ever do authors of communiqués need to concern themselves with couriers encountering Native Americans, and the message going undelivered. Modern standards are no longer are restricted by the occupants of a particular territory, with increased speeds and lesser latencies for alternate routes.

With these increased speeds of the future comes a vast increase in technology available to developed nations. Technology provides much simplicity to all aspects of modern life, whether it is communication through cell phones or instant access to the

entire world's information through the Internet. However, with the simplicities of daily life come simplicities in the workforce, too. The printing press used to require manpower to operate, but now in the future, printers provide that service very simply, without the use of other people. So then where do the people that worked at the printing press go? Those jobs are obsolete, but there must be another area those workers can find a job. This is what we are investigating. With the prevalence of technology or other aspects that make certain jobs obsolete, we are attempting to discover where new jobs are spawning or have been hiding, to replace the old ones.

With technology being so important to modern society, it will continue to provide developed nations with a relatively growing area of potential jobs. Jobs that involve making sure technology is working properly and efficiently will still be important. High-

Chart 4 Unemployment Rate by Industry Group

Tech is an important employment area that should not be ignored. Even with increasing unemployment rates, high-tech jobs aren't as affected by recessions since even though money isn't flowing as fast as it usually is in the economy, people still rely on technology.

The following figure depicts the comparison between total unemployment rate and high-tech industry employment rate. Most of time, the high-tech industrial sector has lower unemployment rate. From 2010 to 2011, a period when the employment condition is recovering, the unemployment rate subsequently declined more quickly [3], which proves the fact that people who work for high-tech industrial, could find new jobs easily.

PUBLIC POLICY IMPACT

The governmental policies adjust the employment condition through the supply-demand condition in the job market. The government tried to make the supply and demand balanced.

DEMAND SIDE POLICIES

Governments can decrease unemployment by offering more government-related jobs opportunities, for example, jobs opportunities from infrastructure construction or military.

America has a tendency towards military spending. For every $100 spent by the world in 2012 on military and defense expenditures, roughly $39 is spent by the United States. We outspend China, with the second largest military budget, more than three times over, and spent roughly as much as the next 18 countries combined [4]

When the government spends such large sums of money, that money is released into the economy and is distributed as pay for military personnel, commissions for defense contracts, orders for arm manufacturers, where it can be spent by those businesses and employees. While military spending is a reasonable way to stimulate the economy, it does not mean that it is the definitive answer to solving an economic crisis. However, it can prove to be somewhat helpful, even if it is small.

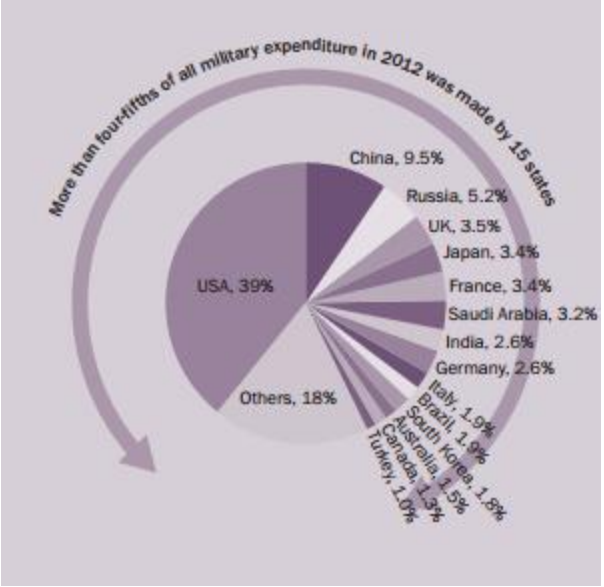


Chart 5 Comparison among different countries on military expenditure

North Carolina proves a good example, as it is home to seven United States military bases. Military bases, in turn, are home to military personnel, who receive pay from the United States federal government. Infusing so many employed people into the area introduces further money into the economy, as soldiers patronize local businesses. These businesses can then afford to hire more employees. The military's contribution to the economy of North Carolina in 2007 amounted to 8% of the state's employment count, and 7% of the state's GDP [5]

The United States also engages in more progressive and constructive federal spending, focused on the welfare of the society. Boston's recent "Big Dig" product addressed a critical traffic issue in the city that was estimated to cost $500 million annually [6]. The

Chart 6 Boston Big-Dig Map

project greatly improved the city's traffic situation and created thousands of jobs for those employed by the MTA and more created by the money saved returning to the city's economy [7].

Whether as a direct employer or a hub that collects and distributes wealth, the government can always be observed as a major player in employment, and should be considered in any examination of the employment conditions in America.

SUPPLY SIDE POLICIES

Supply-side policies normally focus on microeconomics issues. These policies try to repair imperfections in the labor market. The government hopes people who lost their

jobs could get their jobs back through some training or education. For instance, a manufacture worker can work for an I.T. department once he/she has some I.T. knowledge. Through some trainings or professional continuing education, those people can get back to work. In other words, this way increased the "supply" in the job market.

GLOBAL ECONOMIC INTEGRATION

The global economic trend is another major factor affecting the local job market. The job outsourcing has become a popular term recently. Job outsourcing describes exchanging or transferring services or employers. Outsourcing helps companies perform well and many expertise are allocated to the place where need them the most. At the same time, it gives company greater budget flexibility. Companies can buy the services they want directly instead of hiring people. In this way, companies avoid costs associated with defined benefits in labor-union contract and taxes for government-mandated benefits.

Table 2 Reason why companies outsource

Reasons Why Companies Outsource (Multiple Answers Allowed)	Percent
Reduce or control costs	44 %
Gain access to IT resources unavailable internally	34 %
Free up internal resources	31 %
Improve business or customer focus	28 %
Accelerate company reorganization / transformation	22 %
Accelerate project	15 %
Gain access to management expertise unavailable internally	15 %
Reduce time to market	9 %

Table 2 above gives the reasons why companies outsource their jobs. The first reason is "reduce or control costs". Outsourcing raises companies' performance and profits. Many software engineering companies send their work to other countries. Some other companies give their products' design to third-world countries to manufacture. The

Apple Company gets their products assembled all in China. In this way, Apple lowers their cost and raises profits.

Therefore, due to the popularity of job outsourcing, it has already affected American local market. In 2011, there were 139.296 million jobs in America. The unemployment rate in September 2011 was 9.1%. However, in September 2011, the United States outsourced 2,273,000 jobs to other countries, 53% of them are from manufacturing. Under this situation, how America can balance job insourcing and outsourcing becomes a topic that attracts our attention.

After finishing up all parts above, a number of estimated future job opportunities can be gotten. However, the IQP group has to rationalize this number to see if it's a reasonable number. The practical question is if the country has enough cash supplies to pay a decent salary to these new jobs. According to the data from the Federal Reserve System, the money supply totaled approximately $1.22 trillion in circulation as of October 23, 2013[8]. The IQP group will use this number later in the report to determine if the estimated number of "decent" salary jobs we obtained from the total money supply is reasonable.

SUMMARY

The high pace of technology development creates plethora of job opportunities. The government plays an important role on affecting the labor market. At the same, a strong and good economic condition supports the labor market. Therefore, the project group chooses these three factors, high-tech development, politics, and economics, which are dominant in leading the future labor market, as major research targets.

4. Methodology

GENERAL METHODOLOGY

For the sections pertaining to the creation and destruction of jobs, the analysis will be conducted through the lenses of:

- The effect of the STEM sector on the re-creation of jobs
- The effect of the public sector in the form of federal and state governments on the creation and destruction of jobs.
- Domestic and general economic conditions that affect the state of the job market.

The data and resources will be gathered from online sources, primarily first party government and private sector data collection sites, such as the United States Bureau of Labor Statistics and the United States Department of Homeland Security, group members will also gather data from the WPI library resources, and credible journals such as The Economist and the New York Times. Once the data is ready, the project group will review, analyze and formulate conclusions based on its research.

Each member will be assigned at least one major part of this project and he will be in charge of the in-depth research of his designated topic. Joey Keogh was a member of this project, and he contributed to the structure of the project and provided valuable research for the time he was a part of the IQP group. The other two members of the IQP group expanded on the initial structure of the project. The following sections outline the individual methodology for each part in this project.

TECHNOLOGY METHODOLOGY

The first step in technology research is to look for contributions made by high technology companies on the American economy. This information can be found on news, online reports and websites of companies. For example, the Apple and the Amazon companies list the opening jobs and archives of previous years on their websites. The information found by the project group should answer the following questions: Do those high technology companies need more employees or do they already have enough employees?

The second step is to look for information on how high technology affects economic sectors. Group members will investigate what sectors are losing jobs, and if and where these 'disappearing' jobs are reappearing in the job market. This information can be found through news, journal and online report. The Wall Street Journal is one good resource. The information should be able to answer the following questions: Do those high technologies create or destroy jobs? What could people do if they lost their jobs?

The third step is to look for information on continuing education in STEM fields. This information could be found on websites of universities. The following questions should be answered in this step: Does continuing education in universities help solving unemployment issue? Does continuing education in universities provide hope for people who have lost their old jobs?

After these three steps, the project group should address the following issues: How does high technology affect job market? Can people get their jobs back through Continuing Education? How many new jobs can be created in high-tech companies?

POLITICS

The first step in political research is to look at how governments solved unemployment problem in history. Some famous examples should be included, for example *The New Deal*. The project group is planning to analyze data of economic status and job data. For instance, group members will gather current and past economic conditions, particularly, but not exclusively, employment conditions for a number time samples the greatest of which spans no more than 65 years in the past. The focus of this inquiry and the subject nation for most of this data will be the United States, but will include some information on the economic conditions of countries relevant to the discussion including China, Argentina, Japan, and a selection of industrialized European nations.

After collecting enough information, the following questions should be addressed: What are common methods governments used to solve unemployment problems? Can we use these common methods to solve our current employment problems?

The second step should focus on American policies. Group members will compare the U.S with other countries. Group members could find much useful information on government websites. Other resources, such as journals and online reports will be useful. The following questions should be answered through the information found: What is the current condition of American job market? What policies have

implemented to improve the weak employment condition? Does American government need to change current policies?

In republics such as the United States, it is important that candidates are capable and informed, and the voters have enough knowledge of the issues at hand to weed out those politicians who are not. It is our goal that this project provide information valuable to a voter's decision as to what plans proposed are truly productive in improving employment. There are many political views, and just as many stances on the solution to the current unemployment rate, for example: tax cuts, decreases in interest rates, or increases in federal spending toward education or other areas. This project should contain information to aid policy makers and active citizens in effectively analyzing how a proposed law or political decision affects the job market. After these two steps, the project group should address the following question using materials collected before: What government policies are most likely to produce enough jobs? Does United States government offer enough jobs? Can more jobs be created, if can, why is the government not making those choices?

ECONOMICS

The Economic research would be focusing on local economics condition. The group member should look for information about economics growth and employment condition in recent 10 years. This information can be found online and in many journals articles. Then the project members will focus on one question: Is there enough money in the US to pay everyone a decent wage? To approach this question, the first piece of information group members need to gather is how much cash is flowing in the market.

This information can be found on the publications of the Federal Reserve. The next step is to determine what factors decide people's wages. One more important question would be what a "decent wage" is. Once the concept of this "decent wage" is determined, the first question, is there enough money in the US to pay everyone a decent wage, will be answered. In order to find the value of "decent wage", group members should look for papers about life quality. Some very important economical concepts, such as CPI, will be needed. The project group should elaborate the standard they used to determine this value in the paper.

SUMMARY

In project's summary part, the group members should combine all questions addressed above and get one conclusion to answer the following question: How many new jobs will America have in the next 5 years? How will America's job market change in the next 5 years?

5. High Technology Impact Research

GENERAL OVERVIEW

The first section of high tech part explains how those high tech companies affect the local job market and explains why those high-tech companies have lower correlation with the economic conditions. The second section, the major part, delves into the question of how many jobs can those high-tech companies created. The third section discusses the demands and supply of STEM fields and its equilibrium status. The last part is a case study of the decline of the newspaper Industry.

High technology has become one of the major factors that affect the local job market and economy of America. The goals of this research are to look for the financial information of some high-tech companies, check if high-tech companies need more employees, to answer questions about when those companies may reach their capacities and how many job opportunities STEM education will create.

HIGH-TECH COMPANIES' IMPACTS ON JOB MARKET

MICROSOFT AND APPLE'S IMPACT

Microsoft, a company which has 100,518 employees worldwide by 2013 [9], impacts the whole world economy and labor market. In the Microsoft's starting stage, it focused on programming language designs. In 1980, a personal computer contract was signed with IBM. Year of 1980 becomes a milestone in the Microsoft history. Since then, the personal computer market has been opened, and Microsoft gets a large amount of profits out of it. Microsoft sales have increased at a 25[10] percent rate and the whole industry has rose at a 25 percent annual rate. Without a doubt, Microsoft is the world's

largest software producer. There are 59,032[9] Microsoft employees in the USA right now.

Current Employment Headcount

Location	Employees
Worldwide	100,518
USA	59,032
Puget Sound (Washington State)	42,912

Chart 7 Microsoft Employment Fact

Apple also affects the United States economy and the local labor market. From 2007, when Apple introduced iPhone, the company's business was booming. The chart below shows the Apple's revenue from 2007 to 2010. The release of one new product brings a

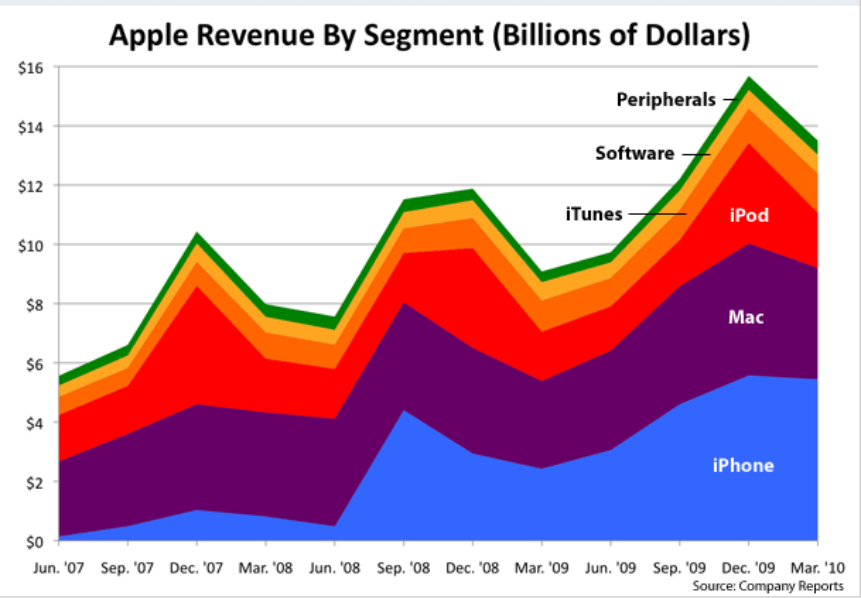


Chart 8 Apple Revenue by Segment

large amount of profit. And a new product always brings more job opportunities.

According to the website [11], there were 598,500 U.S. jobs created or supported by Apple in 2012. There were 257,000 jobs supported by Apple in fields including the development and manufacturing of components, consumer sales, transportation and other sales. However, this number is not accurate because Apple didn't use an accurate statistics method. What the more important fact our IQP group has noticed is Apple keeps hiring more people even when the economy is in a recession. The Apple Company, from 2007 to 2013, keeps hiring employees. In 2010, when unemployment rate was at the highest peak in recent 10 years, Apple had recovered from economic depression way before other companies did and hired more people. Apple barely was affected by 2009 economy depression.

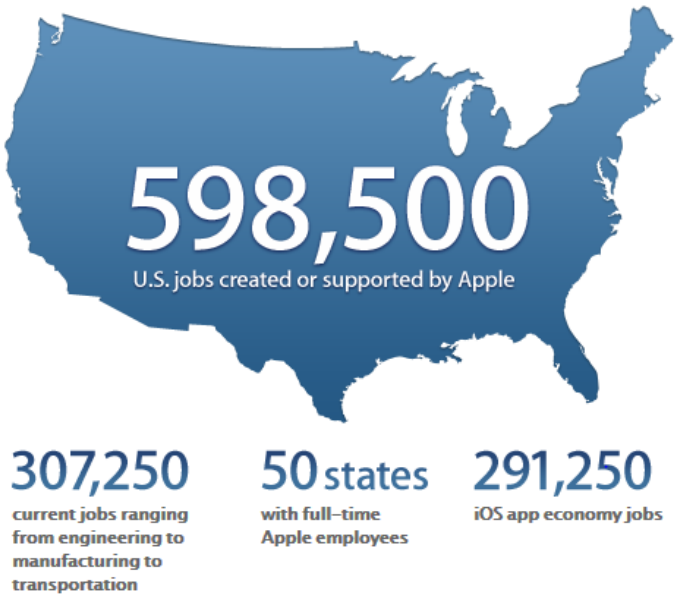


Chart 9 Apple current employees' statistics

Figures below show the Microsoft's employment data and the unemployment rate in the United States from 1985 to 2013. According to the American unemployment rate graph, there were nearly three employment depressions; however, the Microsoft's employment rate keeps increasing. During those employment depression periods, the increasing rate decreased a bit, but the companies were still need more people.

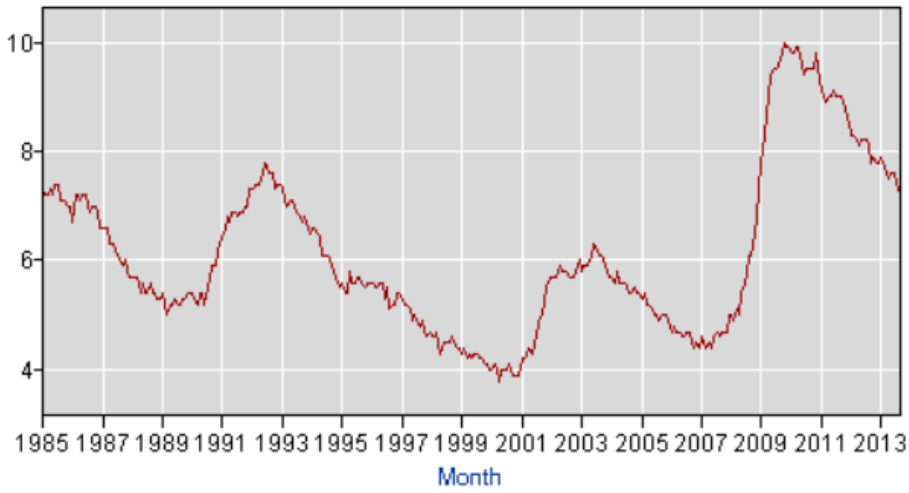
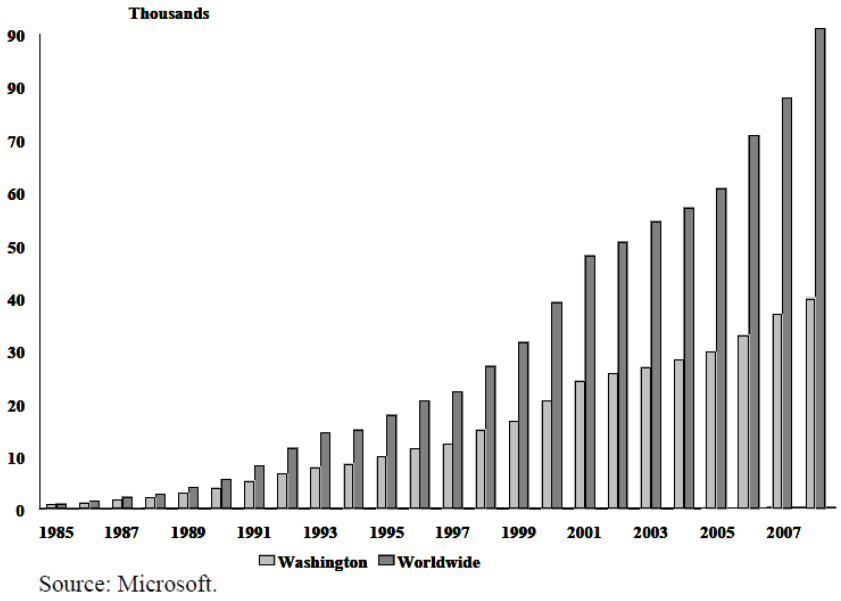


Chart 10 Unemployment Rate in the U.S. from 1985 to 2013

Figure 2
MICROSOFT EMPLOYMENT



Source: Microsoft.

Chart 11 Microsoft Employment from 1985 to 2008

The following graph shows the Apple Company's employee number from 2007 to 2013. During 2009 to 2010, the United States had very high unemployment rate, around 10%. However, from 2009 to 2010, the increase rate of Apple's employee number was 35.8%. Therefore, one conclusion can be drawn that high-tech companies has lower correlation with economic condition and more related to the new product research conducted by companies.

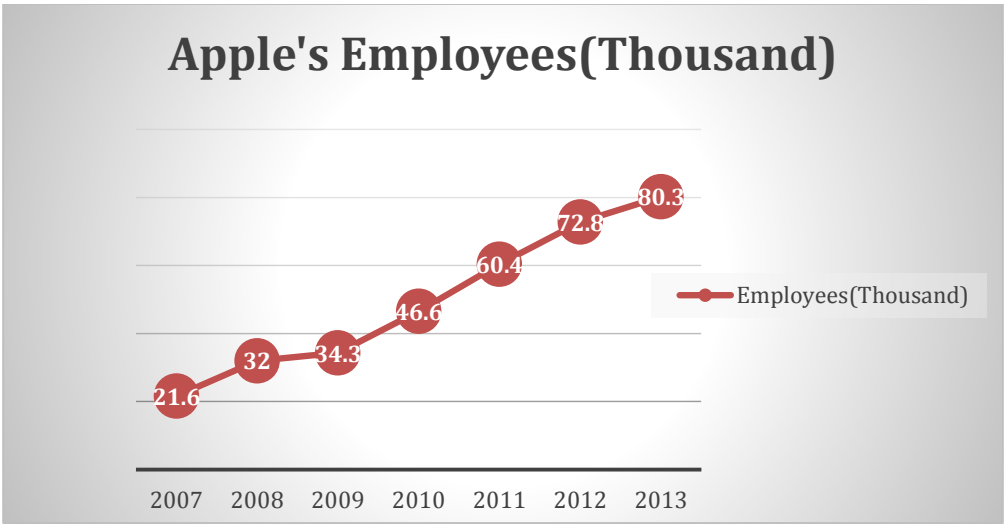


Chart 12 Apple Employees statistics from 2007 to 2013

WHAT CAUSES AN ECONOMIC RECESSION?

Based on the graph of unemployment rate in the U.S., we can pinpoint the economic boom, which took place from 1995 to 2001. This increase in economic performance lowered unemployment to its lowest point. If we investigated this year span, we can determine whether the unemployment decrease is related to high-technology industries or some other unknown factor. According to NASDAQ, the U.S. stock market fell by half between March and December 2000, which is roughly the same time there was a steady decline in the growth rate of computer investment after the beginning of 2000.

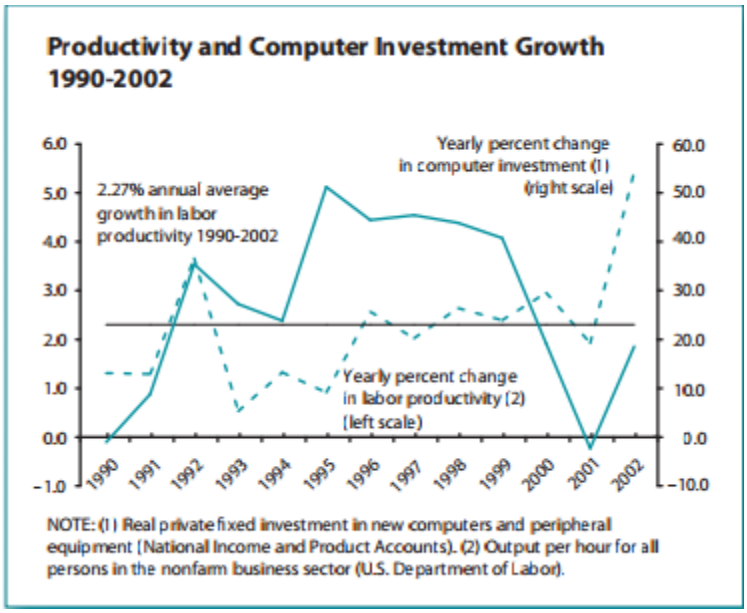


Chart 13 Productivity and Computer Investment Growth 1990 to 2002

The essence of the boom was the combination of low unemployment and low inflation. Federal policy avoided any sharp spikes in short-term interest rates such as had happened during the previous expansion in 1988-89 because of the perception that accelerating inflation was not a problem, despite a much lower unemployment rate than the minimum achieved in the earlier expansion. Policy reactions were less aggressive in the late 1990s than in the late 1980s, because the economy appeared to have experienced a change in behavior. Unemployment could be allowed to decline because inflation remained low.

If there was a consensus about anything as the boom years of this growth were followed by a slowdown and perhaps a subsequent recession, it was that the core of the miracle was acceleration in technological progress centered on a new economy of computers, IT, and the Internet. The post-1995 productivity growth revival could be

traced directly to the IT revolution. The acceleration in technical change in computers,

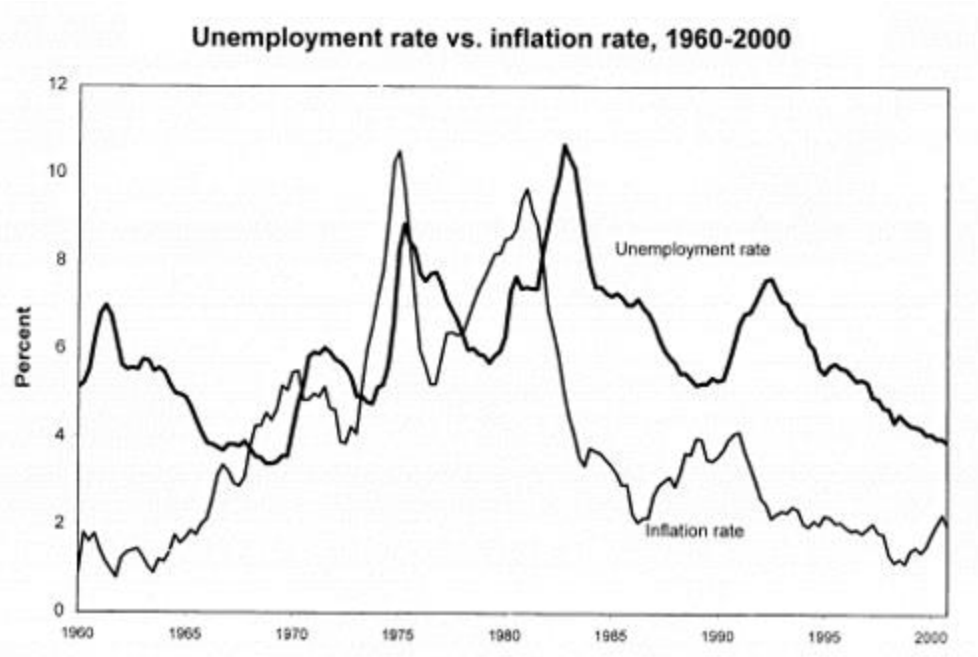


Chart 14 Unemployment rate V.S. Inflation rate, 1960-2000

peripherals, and semiconductors explains most of the acceleration in overall productivity growth since 1995, but virtually all the progress has been concentrated in the durable manufacturing sector, with surprisingly little spillover to the rest of the economy. The remarkable event which occurred at the end of 1995 was an acceleration of the rate of price change in computer hardware (including peripherals) from an average rate of 12 percent during 1987-95 to an average rate of 28 percent during 1996-98. Computers did not become more important as a share of dollar spending in the economy, which stagnated at around 1.3 percent of the nonfarm private business economy. The counterpart of the post-1995 acceleration in the rate of price decline was acceleration in the rate of technological progress.

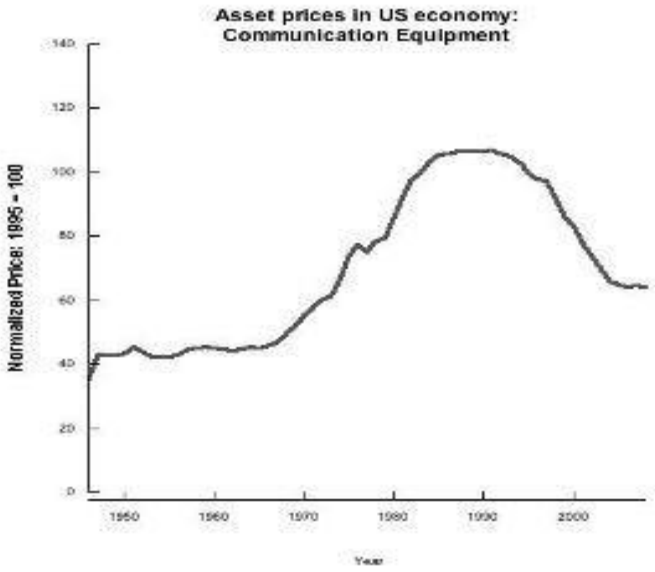


Chart 15 Asset Prices in US Economy

"REVENUE PER EMPLOYEE" PROJECTIONS

Apple and Microsoft are just two examples among high tech companies. They have created job opportunities for sure, however, one more question is: how many jobs can they create in the future? Have they reached their job capacity or can they still hire more people? One easy way to approach this problem is to compare their "Revenue per Employee".

Revenue per employee ($\frac{total\ revenue}{total\ employee}$) is one index to determine the productivity of employees in one company. Either overpaying employees or hiring too many employees will result in bankruptcy. Thus, comparing this index can predict the potential job opportunities in one company. In this report, the IQP group compare Apple, Microsoft and Black berry Companies.

Table 3 Revenue per Employee for Apple, Microsoft and Blackberry

	Revenue	Employee	RPE
Apple	170910	80300	2.128393524
Microsoft	77849	99000	0.786353535
Blackberry	11073	12700	0.871889764

According to the table above, the productivity in Apple Company is highest. Microsoft Company has lower than Blackberry Company. Blackberry Company currently is cutting off employees, because Blackberry Company faces deficit problem. Even under this situation, Microsoft has lower RPE than Blackberry. Therefore, Microsoft may keep this amount of employees for some years unless Microsoft has new high technology under research.

In order to estimate the potential employment in the high tech area, the revenue for per employee for some high-tech companies is shown below. In these ten companies, four of them are above the average number.

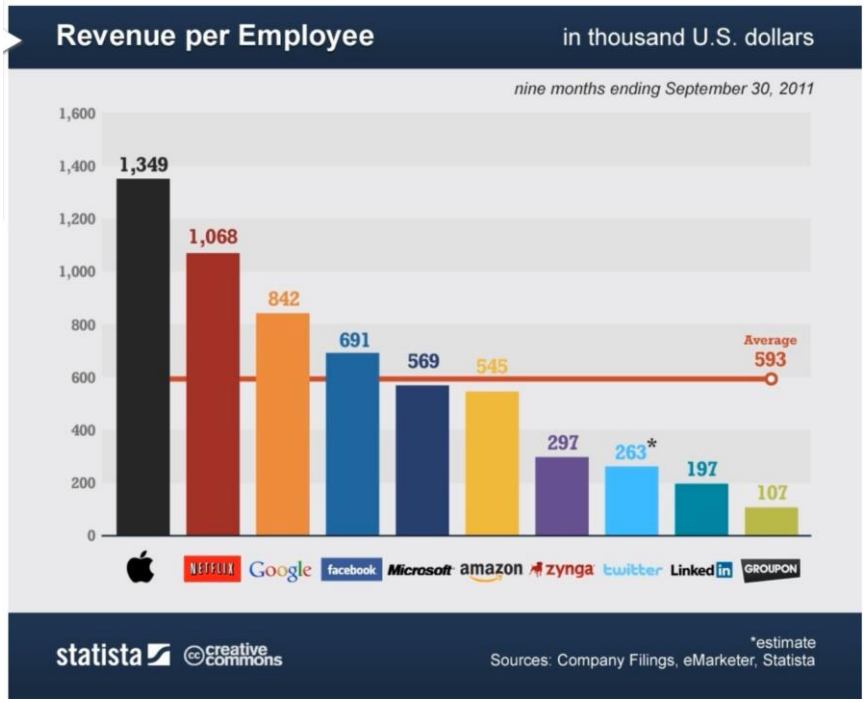


Chart 16 Revenue per Employee of some high-tech companies

If those four companies lower their RPE to the average number, the new number of jobs would be (let us assume the average revenue in 2011 for those companies were 50000 million dollars), there would be $new\ jobs(estimate) = 1235371.23$ new jobs. Thus, in the near future, high-tech companies will create enough job opportunities.

According to myCollegeOptions's report, by 2018, there are five bulks of STEM jobs. They are: Computing (71%), Traditional Engineering (16%), Physical Sciences (7%), Life sciences (4%) and Mathematics (2%). There will be maybe 8.65 million U.S. STEM workers in 2018.

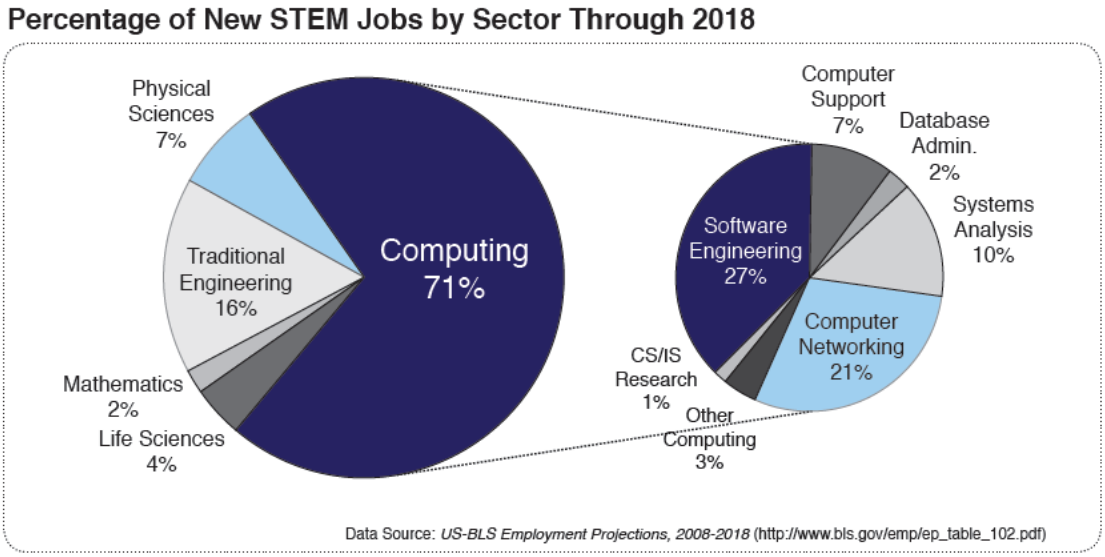


Chart 17 Percentage of New STEM Jobs by Sector Through 2018

In order to fill those high tech companies' new jobs, more STEM major students are needed. In other words, does the United States have enough "supply" to the high "demand" from high-tech companies? The following figures show the fact that more students are interested in STEM jobs. Also, President Obama has called for the industry to bring 10000 new engineers to support the high-tech development.

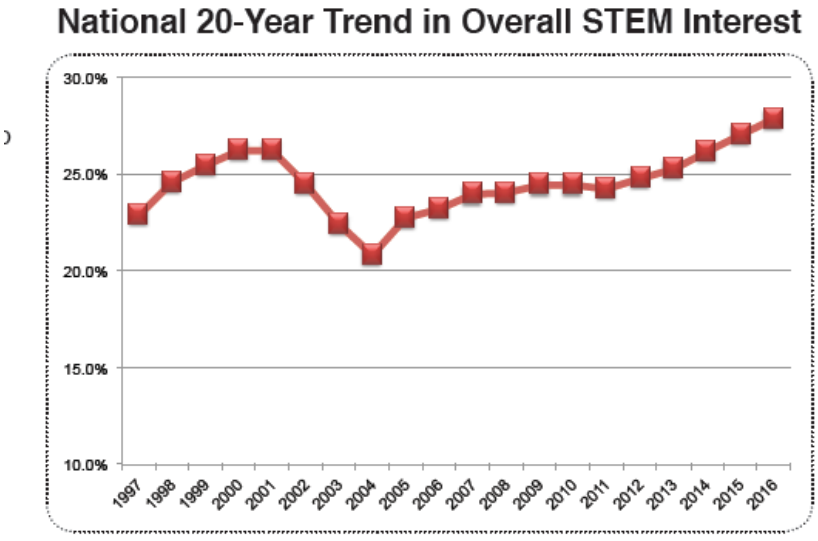
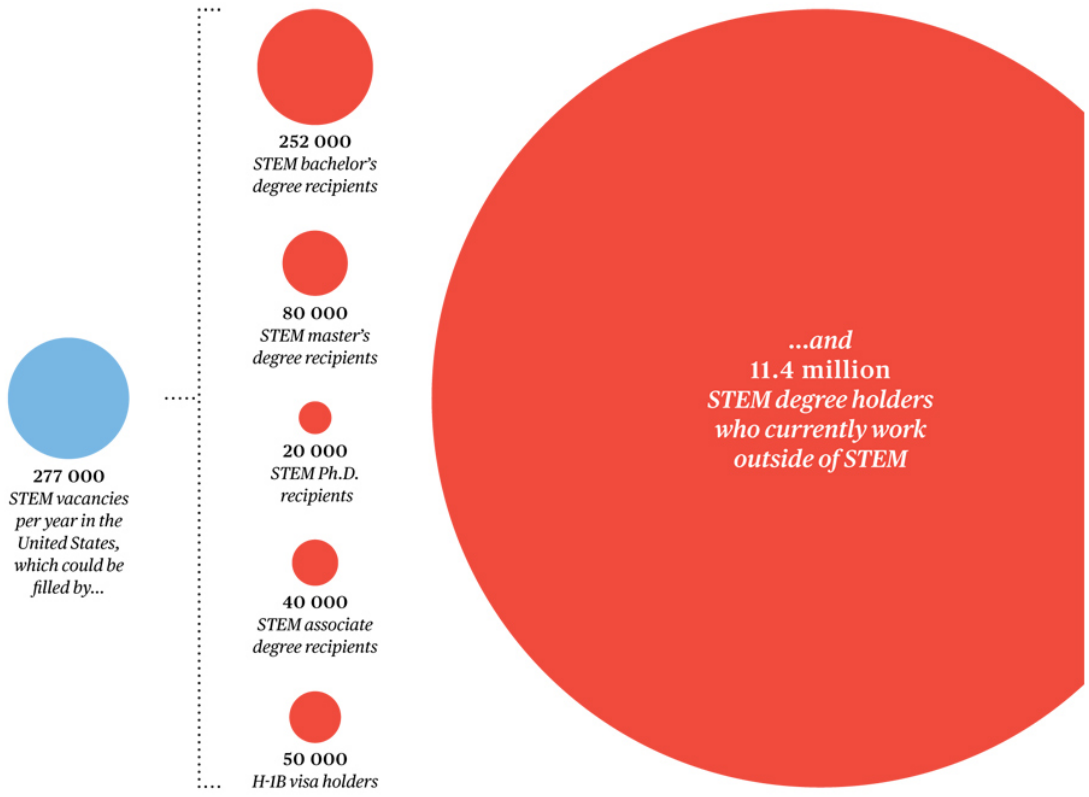


Chart 18 National 20-year Trent in Overall STEM interest

The following figure shows the demand and the supply of STEM education. As this graph shows, there will be enough STEM students for those jobs. Currently, there are much more qualified employees to fill in those potential STEM jobs.



A Matter of Supply vs. Demand: Every year U.S. schools grant more STEM degrees than there are available jobs. When you factor in H-1B visa holders, existing STEM degree holders, and the like, it's hard to make a case that there's a STEM labor shortage.

Chart 19 Demand and Supply of STEM education

From the discussion above, the IQP group finds out that high-tech companies have lower correlation to economic condition. Tech companies have to keep focusing on new product research to keep that company competitive. Revenue per employee is a way to measure one company's productivity. On the same time, this index can indicate the potential employee one company could hire. Hiring too many employees will result in

bankruptcy to one company if there is too much money going into the employees than coming from revenue. As for STEM education, in the near future, there will be more demand and interest of the STEM field workers and the United States currently has enough STEM workers to fill this need.

WORKERS AND JOBS IN STEM FIELDS ARE IN A DYNAMIC EQUILIBRIUM

TABLE 1: Ratio of Online Job Postings to Unemployed People, by Occupational Category and by State*

MORE JOB POSTINGS ← → MORE UNEMPLOYED

4+ postings per unemployed person	3-3.99 postings per unemployed person	2-2.99 postings per unemployed person	1-1.99 postings per unemployed person	One posting per unemployed person	1-1.99 unemployed people per posting	2-2.99 unemployed people per posting	3-3.99 unemployed people per posting	4+ unemployed people per posting

	RATIO OF JOBS OVER UNEMPLOYED						
STATE	ALL STEM	STEM (WITHOUT HEALTHCARE)	STEM (HEALTHCARE ONLY)	ALL OCCUPATIONS	FINANCE	MANAGEMENT	ADMIN
US	1.91	1.43	3.20	0.26	0.58	0.45	0.23
AK	3.63	1.50	9.82	0.49	1.26	0.97	0.63
AL	1.42	1.27	1.54	0.20	0.53	0.42	0.18
AR	2.36	1.41	3.41	0.23	0.72	0.52	0.24
AZ	1.70	1.12	3.05	0.24	0.62	0.31	0.23
CA	1.43	1.17	2.42	0.20	0.43	0.35	0.18
CO	1.49	1.07	3.36	0.34	0.45	0.47	0.31
CT	2.82	2.88	2.70	0.45	1.34	0.76	0.33
DC†	16.23	18.12	10.59	1.72	3.27	2.64	1.11
DE	3.82	3.17	6.02	0.61	1.87	1.24	0.42
FL	1.36	0.67	3.03	0.24	0.36	0.28	0.21
GA	1.95	1.39	4.32	0.22	0.36	0.36	0.17
HI	2.34	1.79	3.71	0.34	0.92	0.58	0.36
IA	3.39	2.25	5.67	0.37	1.07	0.87	0.47
ID	2.41	1.04	14.50	0.27	0.56	0.43	0.25
IL	1.63	1.29	2.65	0.22	0.64	0.48	0.18
IN	2.36	1.90	2.93	0.20	0.63	0.37	0.24
KS	2.02	1.01	4.99	0.29	0.44	0.42	0.22
KY	1.45	0.89	2.34	0.19	0.43	0.36	0.16
LA	2.77	1.53	4.70	0.27	0.60	0.64	0.27
MA	2.14	1.61	5.28	0.43	0.64	0.72	0.30
MD	3.39	3.37	3.44	0.50	0.75	0.78	0.38
ME	3.29	2.01	5.32	0.35	0.82	0.47	0.35
MI	1.05	0.79	1.86	0.17	0.41	0.29	0.18
MN	2.44	2.19	3.12	0.37	0.66	0.63	0.38
MO	3.06	2.55	3.73	0.27	0.58	0.39	0.23
MS	1.68	0.78	2.79	0.15	0.48	0.29	0.12
MT	2.96	1.20	5.03	0.32	0.61	0.33	0.41
NC	1.69	1.32	2.45	0.22	0.44	0.29	0.20
ND	8.59	4.87	14.62	0.65	1.96	0.82	0.69
NE	4.75	4.16	5.31	0.59	0.80	0.79	0.51
NH	2.26	1.25	6.87	0.49	0.87	0.53	0.36
NJ	1.44	1.29	1.83	0.32	0.56	0.44	0.23
NM	2.11	0.75	5.19	0.31	0.41	0.43	0.24
NV	1.59	0.71	3.59	0.24	0.41	0.33	0.21
NY	1.69	1.72	1.64	0.30	0.78	0.69	0.25
OH	2.28	2.04	2.63	0.26	0.71	0.47	0.27
OK	2.92	1.68	4.91	0.36	0.50	0.66	0.38
OR	1.75	1.16	3.85	0.24	0.28	0.26	0.22
PA	2.42	1.96	3.28	0.33	0.64	0.67	0.28
RI	2.40	1.92	3.33	0.30	0.67	0.52	0.23
SC	1.81	1.08	2.99	0.20	0.28	0.36	0.23
SD	2.69	1.19	6.56	0.43	0.68	1.59	0.33
TN	2.14	1.17	4.70	0.23	0.47	0.38	0.24
TX	2.52	1.64	5.38	0.31	0.73	0.51	0.27
UT	1.48	1.04	4.29	0.32	0.73	0.42	0.31
VA	3.34	2.98	4.55	0.47	1.16	0.74	0.34
VT	4.75	2.54	8.56	0.43	0.77	0.63	0.37
WA	2.08	1.56	3.90	0.30	0.71	0.47	0.27
WI	2.19	1.45	4.19	0.27	0.78	0.41	0.23
WV	3.12	1.70	5.76	1.03	0.38	0.49	0.28
WY	3.83	1.53	10.54	0.40	1.02	0.51	0.33

* "All STEM" refers to all occupations included in Change the Equation's STEM definition. "STEM (without Healthcare)" refers to the same definition without Healthcare Practitioner and Technical occupations. "STEM (Healthcare only" refers to only those Healthcare Practitioner and Technical occupations we included in our STEM definition. "Finance" refers to all Business and Financial Operations occupations. "Management" refers to all Management occupations except the three management occupations we included in our STEM definition: Computer and Systems Information managers, Architectural and Engineering managers, and Natural Sciences managers. "Admin" refers to Office and Administrative Support occupations.

† Ratios for the District of Columbia are almost certainly vastly inflated as a result of its unique job market. Jobs advertised in the District attract many candidates from neighboring Maryland and Virginia, yet our ratio counts only the unemployed who live in the District.

Chart 20 Ratio of Online Job Postings to Unemployed People

Many critics have been arguing about the issue of whether the United States has shortage of jobs or workers. With having been said above, the United States needs more STEM jobs for sure. The table below gives specific data of ratios of online-posting jobs position for each unemployed person in different states. According to this table, there are many opening STEM field jobs. Also, we have enough qualified people to fill these shortages. The jobs and workers of STEM fields are in a dynamic equilibrium.

Regardless if the market needs more STEM field students or not, more students should be encouraged to learn STEM related major. A nation must have enough

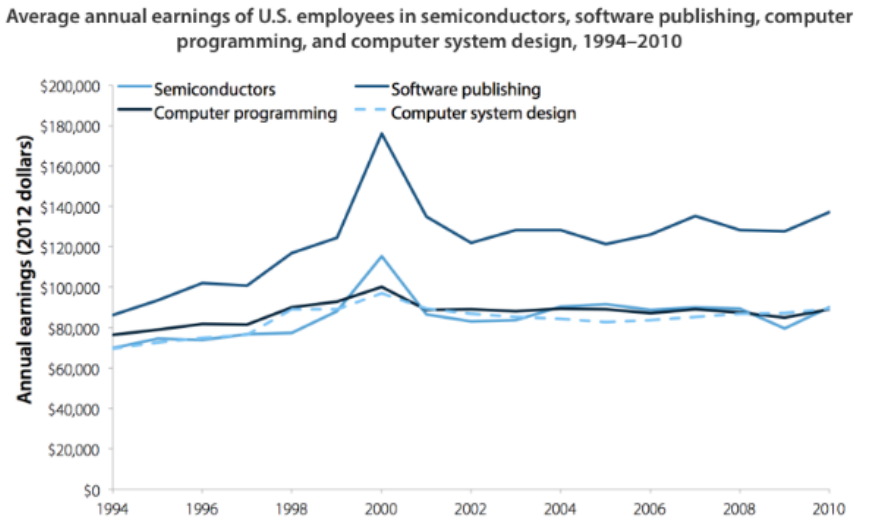


Chart 21 Average Annual Earnings of U.S Employees in semiconductors, software publishing, computer programming, and computer system design

engineers and scientists to keep this country's "innovative edge". Thus, it is always good to see the market needs more STEM students, and those empty spots will be, and can be filled by corresponding students. After those spots are filled, more jobs are created and some engineers quit due to promotion or other reasons. One thing people shouldn't ignore

is the fact that most STEM works needed to be done by young engineers and those experienced senior engineers will mostly like to be promoted as managers after some years of working. Another reason the dynamic equilibrium could be developed is the fact that our government adjusts the immigration law according to the workers and jobs of STEM fields to keep them balance.

Therefore, the equilibrium will be developed eventually. One more question is if currently the U.S market reaches the equilibrium point.

The United States will have more STEM jobs opportunities. With having been stated above, those high tech companies have potential to hire more people. As the table shown above, for one unemployed person, there might be 3 to 5 job opportunities in front of him. Even in this case, according to the basic rule of supply and demand, price of goods will increase when the "demand" is larger than "supply". The STEM supply-demand curve keeps a constant price, as shown in the figure below.

When the salary keeps on the same level for nearly five years, the demand and supply should be in a dynamic equilibrium state.

The United States will have more workers in STEM fields each year. "President Obama has called for one million new STEM graduates and 200,000 new teachers in those fields over the next decade." More workers will be filled for those spots. On the other hand, the government will adjust its immigration law regarding about opening visas for those foreign tech workers. In this case, government uses its power to adjust the balance of demand and supply.

In conclusion, the workers and jobs in STEM fields will keep in the state of dynamic equilibrium for the near future unless a special incentive to change the current equilibrium, for example, a new high technology which may change the world.

6. Political Policy

HOW THE GOVERNMENT TRIES TO LOWER UNEMPLOYMENT

In order to lower employment, the main idea would be creating jobs. It is easier said than done to create jobs out of thin air. The two major tactics the American government can and have employed in its job-creating strategies are making changes to its monetary policy and/or changes to its fiscal policies. Different solutions have been applied at different times in our history with different results. Depending on the situation, politics always plays a role in determining what particular tactic is going to be used.

MONETARY POLICY

Monetary policy is controlled by the Federal Reserve Bank of the United States, the independent central bank responsible for control of the country's money supply. To stimulate the economy into creating more jobs, the Federal Reserve Bank often offers helps in one of two ways.

The first way is lowering the interest rates in the overall economy so that it is cheaper for banks and businesses to borrow money. The goal for this is to encourage banks to invest and businesses to expand, thus stimulating economic vitality and increasing hiring of new jobs. Lower interest rates also decrease individual borrowing costs, encouraging consumers to spend more money.

The second tool of the Federal Reserve Bank is increasing the amount and/or the availability of money in circulation by buying and selling various financial instruments

(treasury bills, bonds, etc.). As more money enters the economy, the results of the first tool occur. Commerce and businesses expands and look into hiring new jobs.

FISCAL POLICY

If the Federal Reserve Bank's broad monetary policy is not adequate to reverse the economy's downward trend, then the federal government will employ various fiscal policies in order to combat continuing high levels of unemployment. Some things the government might try to do include:

- Cut taxes for businesses and individuals to increase spending and stimulate economic growth
- Increase government spending in targeted industries in order to spur employment
- Hire workers to build things like mass transit systems or provide services like infrastructure upkeep and repair.
- Provide benefits to unemployed workers so they can spend money on basics like food, clothing, and housing, which drives retailers and manufacturers to hire more people.

Most of these tools used to counter low employment have been used to moderate effect within the past century. The IQP group will investigate these situations and how they played out, as well as predicting these policy effects on our current situation and/or future.

The Great Depression is a worldwide economic depression before World War II. People believe the Great Depression was the deepest and most widespread economic depression. The IQP group will focus on "employment" issues during this period and doing the research on how United States government handled this problem. In the last part of this section, the report discusses if the same methods can be used to solve current employment issues.

The following graph shows the unemployment rate from 1910 to 1960. The highlighted area is the years during *the Great Depression*. The peak point on this graph was around 22%, and after 5 years, the unemployment rate dropped down to 15%. In 1942, the unemployment rate even decreased to around 3%. Franklin Roosevelt led the *New Deal*, in an attempt to help solve this employment issue. The *New Deal* focused on

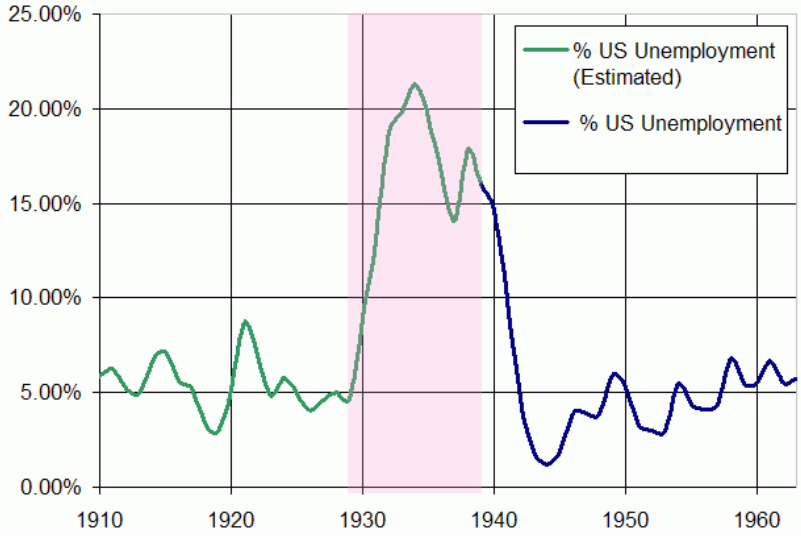


Chart 22 Unemployment rate from 1910 to 1960

what historians call the "3 Rs": Relief, Recovery, and Reform.

OVERVIEW OF RELIEF PROGRAM

Relief was to help unemployed people get jobs. The government gave temporary help to those unemployed people. Some famous projects or organizations, which were critical pieces for resolving employment issues are explained below.

In 1933, the United States Congress passed the National Industrial Recovery Act (NIRA). This law authorizes the president to regulate industry in an attempt to raise prices after severe deflation and to stimulate economic recovery. It established the Public Works Administration (PWA), which is a major program of public works. PWA gave funds to many infrastructure constructions. Those infrastructure constructions included airports, government buildings, hospitals, schools, roads, bridges, and dams. Those funds were used largely on those large-scale projects, and those projects hired many skilled workers who got paid well. In this way, projects not only help solve the temporary employment, but also developed and repaired the American transportation infrastructure and, in addition to that, built the foundations of National Park across the US, which is called the CCC.

Civilian Conservation Corps (CCC) aims to conserve the nature resource in the United States. More than three million men were doing tasks related to the environment, such as planting trees, building flood barriers, fighting fires, and maintaining roads and trails. Through the development of the CCC, the government not only solved the employment issue, but also helped protect country's environment.

The Roosevelt Administration established the Federal Emergency Relief Administration (FERA) during the First Hundred Days. This organization distributed money to the states in order to use this money to help people reach a minimum standard of living. The reason of doing so is to provide immediate support in the form of cash payments and temporary employment. The goal was to get more available opening jobs and compensate their salary. Therefore, those people who got funds were normally educated people.

Table 4: Outlays for public works (millions of dollars)

Outlays for public works (millions of dollars), 1929–38

Year	Federal public works & aid to local units	State and local public works	Total government public works
1929	357	2,952	3,309
1930	445	3,288	3,733
1931	540	2,884	3,424
1932	590	1,949	2,539
1933	785	1,133	1,918
1934	1,266	1,208	2,474
1935	1,433	1,125	2,548
1936	2,180	1,316	3,496
1937	1,938	1,391	3,329
1938	2,099	1,612	3,711

Source: Alvin H. Hansen, *Fiscal Policy and Business Cycles* (New York: W. W. Norton, 1941), 86.

The table above shows how much money the government paid to the public service during 1929 to 1938. From the year of 1933, the outlays for public works increased significantly, most of the new money came from federal government. If we look at the growth within the federal public works column, we can see the increase rate of federal public works from 1933 to 1934 was 61.2% while that of the local public works was only 6.6%. The lower graph shows the unemployment rate from 1929 to 1941.

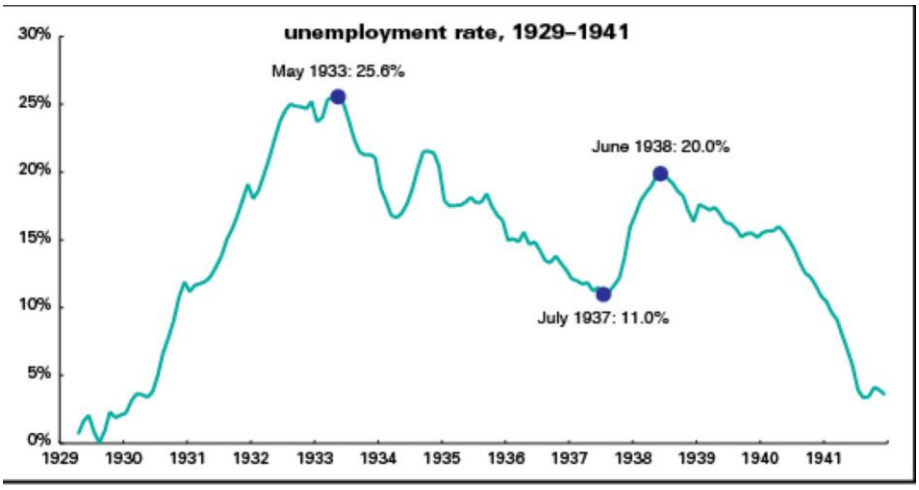


Chart 23 Unemployment rate, 1929 - 1941

Based on the unemployment rate graph, after the federal government invested much money on public works, the unemployment rate decreased significantly. However, from 1937 to 1938, the unemployment rate raised from 11% to 20%. In 1938, outlays for public works were 3711 million dollars according to the table. This period of time is labeled as the recession of 1937 to 1938 in history. In the mid-1937, the American economy took a sharp downturn, which lasted for 13 months. Many economists have different opinions regarding about "the recession within the Depression", and this recession remains a mystery. However, many experts believe the main causes are related to government's fiscal policies. This topic is beyond the scope of this project; however, this recession doesn't change the fact that public works have positive impact on the job market.

After this depression, the US job market didn't recover significantly until World War II. The IQP group will focus on the time before World War II.

If American government wants to solve the current employment problem through investing public works, we have to figure out if we have enough public works to invest, in other words, do we need to build more infrastructures. The answer is yes. It's time for a "New Deal" for American infrastructure. American government should take this chance. On the one hand, government can create a large amount of job opportunities; at the same time, more highways and bridges will be built. Many countries, like China, have invested large amount of money on public modern infrastructure. China, for example, built the world's longest high-speed rail line. Unfortunately, the United States is falling behind. Therefore, the United States has the potential to expand its infrastructure to new levels.

According to the report released by American Society of Civil Engineers, nearly $3.6 trillion investment is needed by 2020. It is beyond the scope of this project to figure out the correlation between infrastructure investment and job opportunities creation. The IQP group uses an approximate number given by the Federal Highway Administration of the U.S Department of Transportation. According to their data, "each $1 billion of Federal investment creates or sustains 34,779 jobs and $6.2 billion in economic activity". The IQP group will use this number to estimate potential job opportunities. Thus, ideally, if federal government could give $3.6 trillion investment, by the end of 2020, there would be 615,588,300 new jobs. However, in reality, the federal government may not be able to invest this amount of money. The first question IQP group that has been addressed is how many jobs would be created according to current investment plan made by the federal government. We listed some major infrastructure construction examples in the following.

AVIATION INDUSTRY

Aviation infrastructure in the United States cannot satisfy the high demands, and according to the Federal Aviation Administration (FAA)'s estimation, the national cost of airport congestion and delays cost almost $22 billion in 2012. And if the federal funding is maintained, the cost of congestion and delay will rise from $34 billion in 2020 to $63 billion by 2040. In this case, investing in the aviation industry will definitely be beneficial. In 2012, Congress authorized AIP $13.4 billion over four years, and according to this trend, there would be $4.3 billion gap from anticipated funding and the capital needs projected by airports. If we add these two numbers and multiply 34,779, we would get 615,588 new jobs.

BRIDGES

According to the report from American Society of Civil Engineers, almost one in nine of the nation's bridges are rated as structurally deficient, and the average age of 607,380 bridges in currently 42 years. The figure below shows the total number of bridges in the US, which are either structurally deficient or functionally obsolete. From 2005 to 2012, the country only fixed 16376 bridges, and there are still 151,497 left.

Table 5 Structurally and functionally obsolete bridges by year

STRUCTURALLY DEFICIENT AND FUNCTIONALLY OBSOLETE BRIDGES BY YEAR

YEAR	STRUCTURALLY DEFICIENT	FUNCTIONALLY OBSOLETE	TOTAL
2012	66,749	84,748	151,497
2011	68,759	84,832	153,591
2010	70,431	85,858	156,289
2009	72,402	87,460	159,862
2008	71,469	89,189	162,072
2007	72,066	89,080	163,146
2006	75,422	89,591	165,013
2005	77,863	90,010	167,873

The Federal Highway Administration (FHWA) estimates that $76 billion is needed to eliminate the nation's bridge deficient by 2028. Thus, 2,643,204 jobs could be created.

DRINKING WATER

Drinking water is another important infrastructure, since it affects people's lives. The United States has very high quality of drinking water among the world. However,

Table 4 Safe Drinking water act appropriations

SAFE DRINKING WATER ACT APPRORIATIONS

FISCAL YEAR	STATE REVOLVING LOAN FUND (SRF) APPROPRIATIONS
FY 2008	$0.84 BILLION
FY 2009	$2.83 BILLION
FY 2010	$1.39 BILLION
FY 2011	$0.96 BILLION
FY 2012	$0.917 BILLION
TOTAL	$6.94 BILLION

many drinking water pipes and mains are more than 100 years old and in need of replacement. The failure of drinking water infrastructure may result in water contamination, which will cause public safety disaster. According to the figure above, the federal government invests a small amount of money on the water infrastructure. Congressional appropriation has declined during 2008 to 2012. According to American Water Works Association, $2.1 trillion dollar is needed to replace all water pipes. However, it is not necessary to replace all pipes at one time. The average annual congressional appropriations are $1.38 billion or $27.6 billion over 20 years. Thus, in the future 20 years, there could be 959,900 new jobs. However, many experts believe there is a huge gap between actual needs and federal loan, as shown in the following figure.

If we assume the federal government had enough money, $334.8 billion to invest drinking water infrastructure, there would be 116,440,09 new jobs.

Table 5 National 20-year Water Investment Needs

NATIONAL 20-YEAR WATER INVESTMENT NEEDS	
SYSTEM SIZE AND TYPE	**NEED**
LARGE COMMUNITY WATER SYSTEMS SERVING 100,000 OR MORE PERSONS	$116.3 BILLION
MEDIUM COMMUNITY WATER SYSTEMS SERVING 3,301 TO 100,000 PERSONS	$145.1 BILLION
SMALL COMMUNITY WATER SYSTEMS SERVING 3,300 AND FEWER PERSONS	$59.4 BILLION
NONPROFIT COMMUNITY WATER SYSTEMS	$4.1 BILLION
TOTAL STATE NEEDS	$324.9 BILLION
NATIVE AMERICAN AND ALASKAN NATIVE VILLAGE WATER SYSTEMS	$2.9 BILLION
COSTS ASSOCIATED WITH PROPOSED AND ADOPTED SAFE DRINKING WATER ACT RULES	$7 BILLION
TOTAL NATIONAL NEEDS	$334.8 BILLION

The energy infrastructure construction consists of the electric grid, high-voltage transmission lines, gas pipelines and other transmission facilities. Although the country has a comprehensive electricity transmission network, many transmission lines are pretty old. The other problem is power outages. Most of the time inclement weather is the reason which causes power outages; however, system operation failure has become another major reason. Significant power outage has risen from 76 in 2007 to 307 in 2011. The figure shows average cost of a power interruption in the U.S.

Table 8: Average Cost of a Power Interruption in the U.S.

AVERAGE COST OF A POWER INTERRUPTION IN THE U.S.

DURATION OF INTERUPTION	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MOMENTARY	$2.64	$733	$2,294
1 HOUR	$3.27	$1,074	$3,943
SUSTAINED INTERRUPTION*	$3.62	$1,293	$5,124

** Note that the mean time of sustained interruptions is 106 minutes.*

Source: LaCommare and Eto, 2004

According to this table, we can see the importance of a stable electrical transmission system, especially for industrial sector, it will be a large amount of cost. Therefore, annual capital investment in electricity infrastructure is approximately $63 billion. And this number is increasing. Since the year of 2001, the increase rate is around 7%. The power equipment failure normally arouses angry among people, so the government pays much more money on the construction of energy infrastructure. However, there is still a large gap between the actual needs and federal government's

investment.

Table 9: The gap between actual needs and federal loan

INVESTMENT GAP BY REGION IN 2020

REGION	TRANSMISSION GAP ESTIMATE	DISTRIBUTION GAP ESTIMATE
FLORIDA	$1.8 BILLION	$2.4 BILLION
MID-ATLANTIC	$6.4 BILLION	$11.8 BILLION
MIDWEST	$1.4 BILLION	$3 BILLION
NORTHEAST	$1.6 BILLION	$6.4 BILLION
SOUTHEAST	$10.9 BILLION	$18.8 BILLION
SOUTHWEST	0	$2.4 BILLION
TEXAS	0	$2.3 BILLION
WEST	$15.2 BILLION	$10.3 BILLION
TOTAL	$37.3 BILLION	$57.4 BILLION

Source: ASCE, "Failure to Act: The Economic Impact of Current Investment Trends in Electricity Infrastructure," 2012, p. 35

According to the figure above, the investment gap for distribution infrastructure is $57 billion, larger than the investment gap for transmission infrastructure construction, which is $37 billion. If we assume that in the next 20 years, the investment rate was still $63 billion dollar per year, the country would have 43,821,540 new jobs. If we add the gap, which is $94 billion, there would be 47,090,766 jobs total.

SUMMARY

Some major infrastructure constructions are stated above, the IQP group is not be able to elaborate every infrastructure, and the following table summarize the potential job opportunities in every infrastructure construction. (All amount of investment's unit is billion dollars; some data are not available)

Table 6 Summary of how many jobs could be created through infrastructure spending

Title	investment(before gap)	Investment(after gap)	new job(before gap)	new job(after gap)	difference
Aviation	3.35	4.425	116,510	153897.075	37,387
Bridge	5.07	8.06	176329.53	280318.74	103989.21
Inland Waterways	0.085	0.9	2956.215	31301.1	28344.885
Ports	9.2	9.2	319966.8	319966.8	0
Rail	20	20	695580	695580	0
Roads	91	131	3164889	4556049	1391160
Transit	52	77	1808508	2677983	869475
Public Parks(Recreation)	37	56	1286823	1947624	660801
Schools	10	25	347790	869475	521685
Energy	63	94.7	2191077	3293571.3	1102494.3
Dams	NA	NA	1982403	2851878	869475
Drinking Water	1.38	16.74	47995.02	582200.46	534205.44
Hazarfous Waste	0.1678	0.6678	5835.9162	23225.4162	17389.5
Levees	0.145	0.145	5042.955	5042.955	0
Solid Waste	NA	NA	948000	948000	0
Waste Water	2.1	15	73035.9	521685	448649.1
		total:	13,172,742	19757797.85	6,585,056

According to the table above, ideally, every year there would be around 13 million new jobs because of new infrastructure projects. From the table above, we can see the large gap between ideal investment and actual investment; for example, energy infrastructure construction needs almost 94.7 billion per year, however, the federal government only grants 63 billion dollars. This difference results in the difference in the number of new jobs. The United States could have had 1 million new jobs if we maximize our investment. The potential new jobs in infrastructure construction projects, according to this table, are around 19.7 million, only if federal government grants maximized money or loan. Thus, the federal government should invest more money on the infrastructure projects at this stage, however, should the government maximize their investment? There is complex trade-off in this relationship.

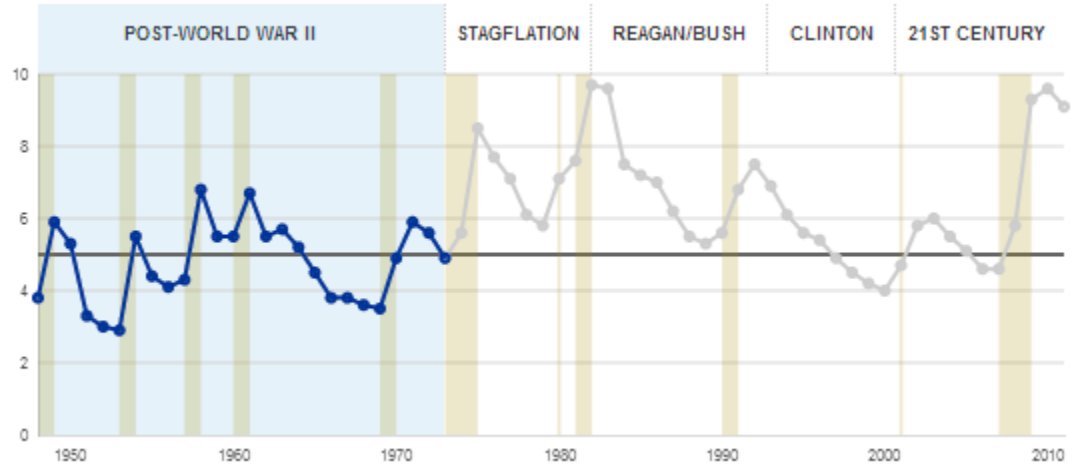


Chart 24 Unemployment Rate (Highlighting the Post-World War II period)

The first period in post-war United States economic history lasted a long time from about 1947 to 1973 and it was a period of very strong economic growth and low rates of unemployment, typically 3 to 5%, occasionally a little bit more. The postwar economy was characterized by hearty consumer spending, low energy prices, heavy military and social spending.

During the Truman and Eisenhower administrations, there were some dips and thus sometimes the government took action. After the war, President Harry S. Truman put forth a plan to ease the country into a postwar economy, but the measure Congress passed in 1946 was weak. So there was not a lot of federal support for federal action of unemployment. However, the government was spending a lot on the cold war and it also had this new social welfare system in place from the *New Deal* spending on social security, which was expanded after World War II. So those two things actually caused continuous federal stimulation of the economy.

During the recession of 1953, President Dwight D. Eisenhower took no action. But he acted more aggressively to combat the recession of 1957 by signing the Federal Aid Highway Act, which authorized the construction of the interstate system. In response to a brief recession, President John F. Kennedy expanded Social Security and unemployment benefits and cut taxes. The recessions were short; unemployment rates were low by our current standards. The government didn't do very much to specifically target the unemployment rate prior to 1973.

STAGFLATION (1970-EARLY 1980S)

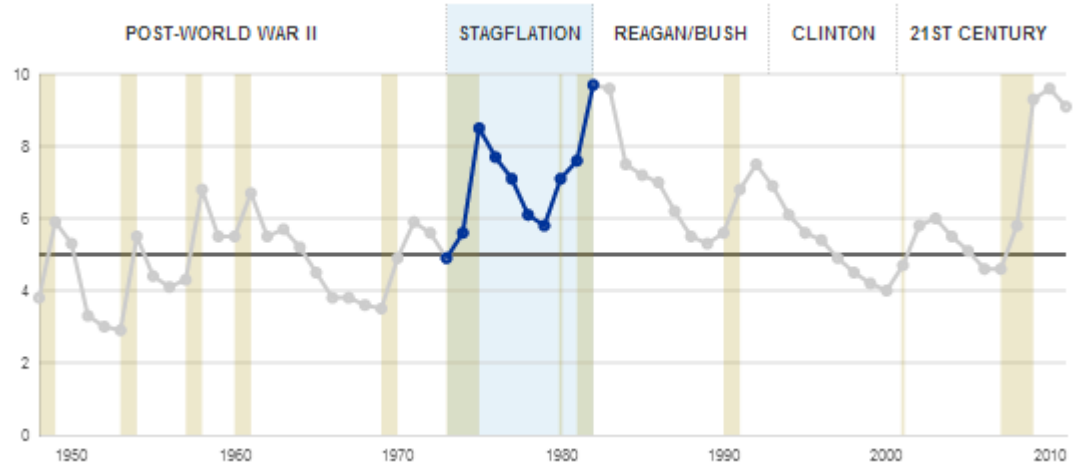


Chart 25 Unemployment Rate (Highlighting the Stagflation period)

From 1973 to the early 1980s was a very troubled period for the United States economy. This is when we had what became known as stagflation. Stagflation was the unfortunate combination of high rates of inflation with stagnation (economic inactivity). This generally wasn't supposed to be possible, but because of energy crises (1973 oil crisis) and lots of other things going on (1973-1974 stock market crash, influx of imported manufacturing goods, and the shift of the economy after war) the United States was really staggered during this period of time.

The federal government, in order to address this took some measures. These measures were not normally targeted specifically at the unemployment problem, but there were some tax rebates, which, according to the overview above, should hopefully stimulate the economy and help unemployment. President Richard M. Nixon sought to ease inflation by implementing price and wage controls. These controls are measures taken by the government under its incomes policy to control wages in an attempt to check inflation. When Jimmy Carter became president in 1976, he began deregulating the oil and gas industries. Unemployment, inflation and interest rates crept up during Jimmy Carter's last year in office.

In the early 1980s, the economy entered the "Reagan recession". The unemployment rate reached nearly 11% which is the highest in the entire post war period, including now. This was basically because the government, particularly the Federal Reserve was trying to ring a cut of inflation out of the economy. Their tactic worked, but the trade-off was extraordinarily high rates of unemployment. Economists have known for a long time there was a trade-off between inflation and employment, and at that time in our history, the United States were pushed for lower inflation. (As shown in the figure below)

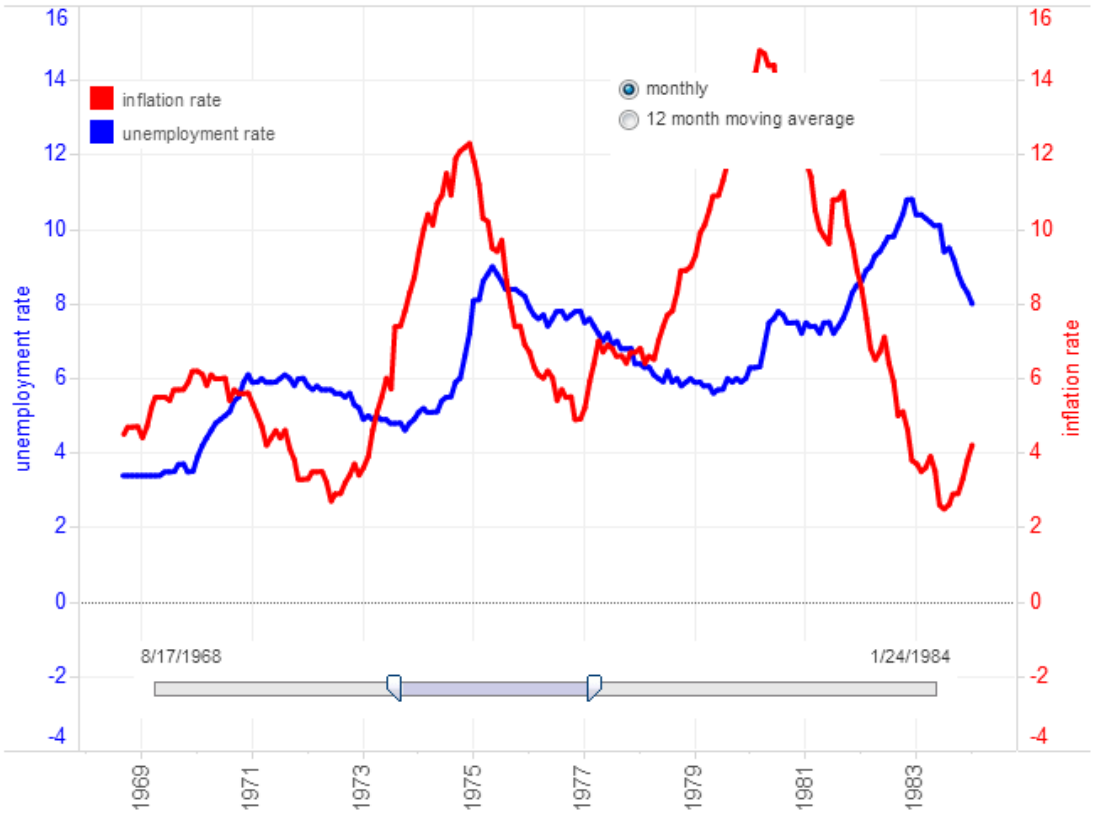


Chart 26 Unemployment Rate and Inflation Rate (1968-1984)

REAGAN/BUSH UNEMPLOYMENT POLICIES

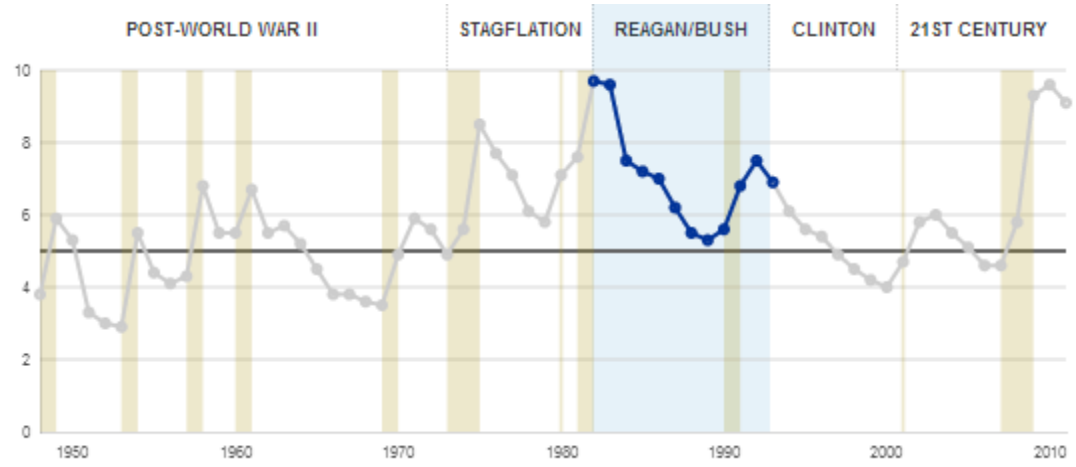


Chart 27 Unemployment Rate (Highlighting the Reagan/Bush period)

During the period between the early 1980s and the early 1990s, the economy performed reasonably well, the Reagan administration had squeezed high inflation out of the economy, and there was some job recovery.

In order to encourage employment, there were some limited tactics performed. One of these was in 1981-1982 called the Surface Transportation Assistance Act. This act added a nickel to gas tax in order to federally fund interstate highways and bridges. This was essentially federal infrastructure investment to open up employment, and hopefully the economy to follow. Another measure that hoped to encourage employment was called the Emergency Jobs Act of 1983. These were not terribly ambitious because during that period, but they got the job done using reasonable unemployment-repairing tactics.

THE OVERVIEW OF CURRENT FEDERAL INFRASTRUCTURE INVESTMENT

As mentioned above, it is important to invest infrastructure construction at this stage to solve employment issues. The Federal government definitely realizes this; therefore, the IQP group decides to take look at the current condition of Federal infrastructure Investment.

Another reason the government should invest on the infrastructure construction is the multiplying effect. There are some debates about the efficiency of investing on infrastructure. The main argument is after the projects are done, people would lose jobs again. For some projects, yes, but others public projects have multiplier effects which may not cause the same problem. A paper on the San Francisco Fed shows the fiscal multiplier of infrastructure spending is larger than people expected.[1] According to Sylvain Leduc and Daniel Wilson, who studied the effect of unexpected infrastructure grants on state GDPs, "each dollar of infrastructure spending

increases the GSP (gross state product) by at least two dollars". This conclusion from the study was based off the financial results of highway grants. This shows the hidden potential of infrastructure spending. The definition of a fiscal multiplier effect is that every dollar in government expenditures can increase GDP (GSP) by more than one dollar by starting economic chain reactions. In infrastructure spending, the initial investment starts a cascade of events that increases economic activity. That cascade is difficult to calculate because of the indirect and induced economic activity, never mind the additional complication of how the transportation dollars are spent. Thus, economists could use this "multiplier effects" to determine the efficiency of one investment. Those investments will eventually go to paychecks for employees. The higher multiplier effect means the more employees will be benefited from this investment. Among all infrastructure investments, transportation ranks the highest one.

The reason the Federal government doesn't give full investment is the shortage of money. Thus, government only invests on the highest-value projects to make sure their investments are as efficient as possible. At the same time, the federal government should encourage a private investment. By doing so, there will be new jobs coming from those infrastructure projects and at the same time, the government wouldn't spend too much taxpayer money. In order to encourage private investment to infrastructure construction, government should change tax policies accordingly. However, the federal government also understands the wavering impact of investing in infrastructure during the time when the country has a high unemployment rate. The following figure shows the federal nondefense gross fixed investment from 1950 to 2010.

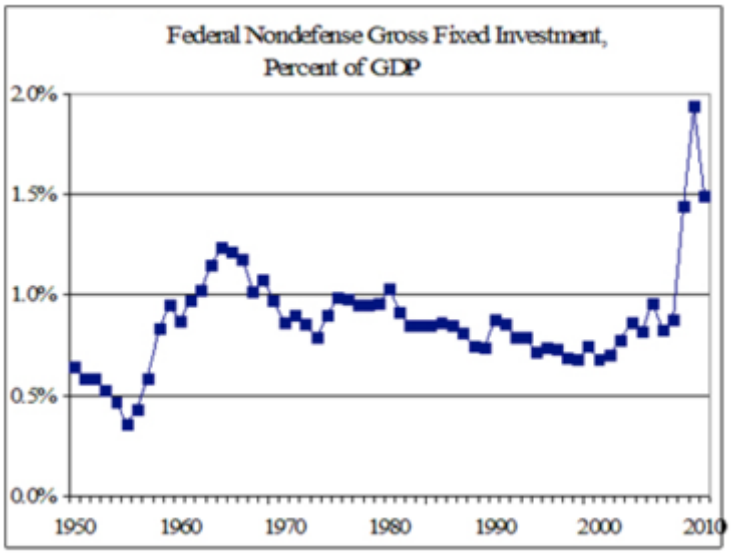


Chart 28 Federal Nondefense Gross Fixed Investment

The graph above shows some important information. From 1950 to 2010, there were two years when the government had very high investment on infrastructure construction, 1965 and 2009. In 1965, when there was around 1.3 percent GDP was used for federal investment; the majority of it was used for building interstate highway. The year of 2009 has the highest gross investment percent over the 60 years. Thus, the federal government started taking actions, such as investing more public infrastructure projects, when they noticed the instability of unemployment rate. And the government doesn't use up all taxpayer's money; instead, the government is more reasonable. The important thing about infrastructure is to focus on allocating funds efficiently, not to maximize the amount of government spending. On the other hand, infrastructure spending can lead to huge payoffs. Due to multiplier effects, the result of infrastructure investment can lead to long-term economic and financial growth. So it is up to federal government spending on making the choice to invest in the best long-term economic project.

Without a doubt, there is a trade-off between the public infrastructure construction and job created. This topic, however, is beyond the scope of this project. The Federal Infrastructure Investment is a useful tool and it does have potential to a large amount of job opportunities, just as what we have discussed above.

7. Economics

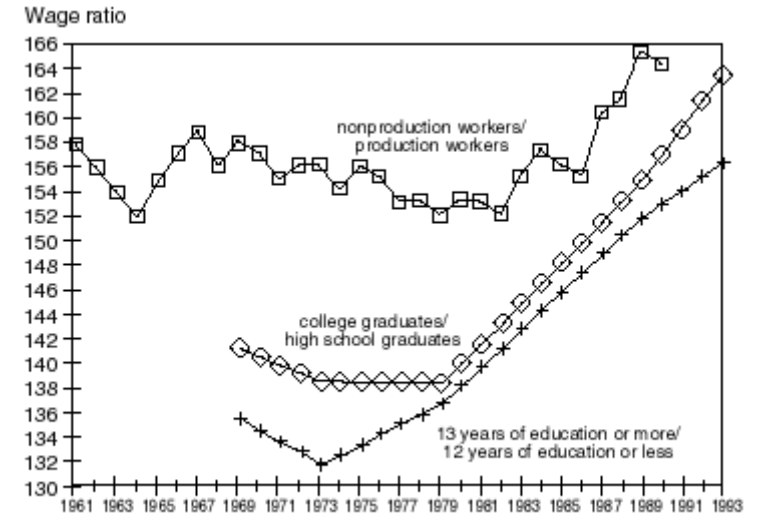
WHAT DETERMINES A WAGE?

Some say that a nation should strive to acquire high-paying jobs if it wants a high standard of living. From this perspective, jobs are boxes that workers jump in and out of. Each box has a bar code that determines how much the job pays. The goal is to get a good box with a high wage attached to it. An alternative view of the world is that the bar code is on the worker's forehead. The worker gets scanned not the job. The wage depends not on the job title but on the skills of the worker. This sounds like silly semantic distinction, since workers with lots of skills are in high-paying jobs. But I think the distinction keeps you from making errors of reasoning about the source of prosperity. For example, the bar code-on-the-box view of wages worries about outsourcing and technological change because these often destroy high-paying jobs. The bar code-on-the-forehead view of wages embraces outsourcing and technological change because they create wealth. The workers that are displaced will use their skills somewhere else.

The economic debate about the causes of widening wage inequality may be seen as primarily reflecting differing views on what influences are driving outward the demand curve for skilled relative to unskilled labor. Those who blame trade invoke such an outward shift from trade liberalization and falling transport and communications costs. Those who instead emphasize technology argue instead that "skill biased technical change" has caused a rapid outward shift in the demand curve for skilled relative to unskilled labor. For its part, immigration of unskilled labor can shift the relative-skills supply curve backward to the left (by increasing the number of unskilled workers in the

denominator), causing the equilibrium skilled/ unskilled wage ratio to rise. (Chart 29) In large part there has been a "trade versus technology" division among economists that has spanned the sub-disciplines of labor and trade economics. These are the divisions:

Chart 29: Skilled/Unskilled Wage Ratio, 1961-93



Sources: Sachs and Shatz (1995); Feenstra and Hanson (1995); Burtless (1995b).

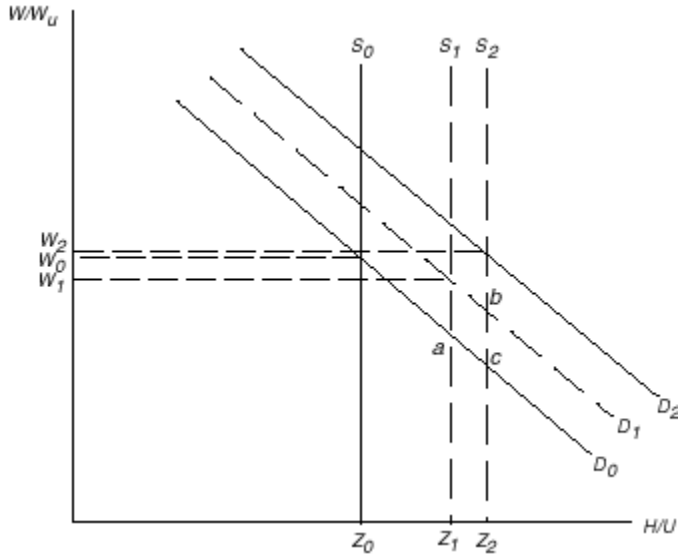
Labor Economists 1 – The first wave of empirical research was by labor economists who stressed technological change and found little to no influence from trade. As an example, Berman, Bound, and Griliches (1994) used sophisticated statistical techniques to show that changes in the sector composition of US production contributed little to the rising demand for skilled labor. Therefore, trade must not be responsible; they concluded that instead technological change must be the driving force. However, neither they nor most others directly measured the impact of technical change.

Labor Economists 2 – In contrast, another group of labor economists found larger international effects using a supply-demand framework. A prominent study by Borjas, Freeman, and Katz (1992) calculated the "labor embodied in trade," treating imports as

similar to an addition to domestic labor supply and exports as a subtraction. Applying the resulting implied changes in wages by skill type (considering existing estimates of wage response to labor supply), they concluded that up to 20 percent of the rise in the skilled/ unskilled wage ratio could be attributed to increased trade and immigration, and that the effect was even greater for those with below high-school education.

Trade Economists 1 – These estimates provoked a sharp response from some trade economists. In particular, Lawrence and Slaughter (1993) argued that the "Labor-2" group had misunderstood basic trade theory, and that trade could be shown to have had no effect at all on relative wages. They emphasized that Hechsher-Ohlin theory requires two conditions for trade to be reducing unskilled wages relative to skilled. First, trade must reduce the relative price of the imported goods using unskilled labor. Second, there should be a general shift across all industries toward greater use of unskilled labor and lesser use of skilled labor in each product line, to free up skilled workers needed for expansion of exports and absorb unskilled workers displaced by imports. They argued that the evidence contradicted both of these conditions: import prices had not fallen relatively; and rather than shifting in the required direction, the combination of skilled with unskilled labor had systematically shifted in the opposite direction across industries, toward greater skill intensity. The latter point, however, did not address the fact that the entire US economy had experienced a sharp rise in the relative availability of skilled labor. (In terms of chart 30, trade could have shifted the demand curve outward without provoking a generalized shift toward greater unskilled-intensity in each product, because of the simultaneous offsetting outward shift in the supply curve.)

Chart 30: Interaction of Supply and Demand for Skilled/Unskilled Labor



Trade Economists 2 – Some other trade economists in turn reacted sharply to the first group of trade economists, to argue that trade had in fact major effects. Leamer (1993, 1994) reshuffled trade and industry data in a way that seemed to reveal the presence of falling relative prices for imports, and argued that factor combinations (skilled-unskilled intensities) did not have to change for trade effects to be present (citing the possibility of "fixed coefficient" production conditions). Wood (1994) made the most dramatic calculations of all. He adjusted skill intensities to account for low-skilled goods that had been totally transferred to developing countries, and applied some rough multipliers for effects in services as well as induced technological change, to estimate that 100 percent of the rise in the skilled/ unskilled wage ratio could be attributed to increased North-South trade.

In reality, for the US and other OECD economies, the home country is large and trade is small, and the supply-demand approach of the “Labor 2” economists provides a good approximation of reality.

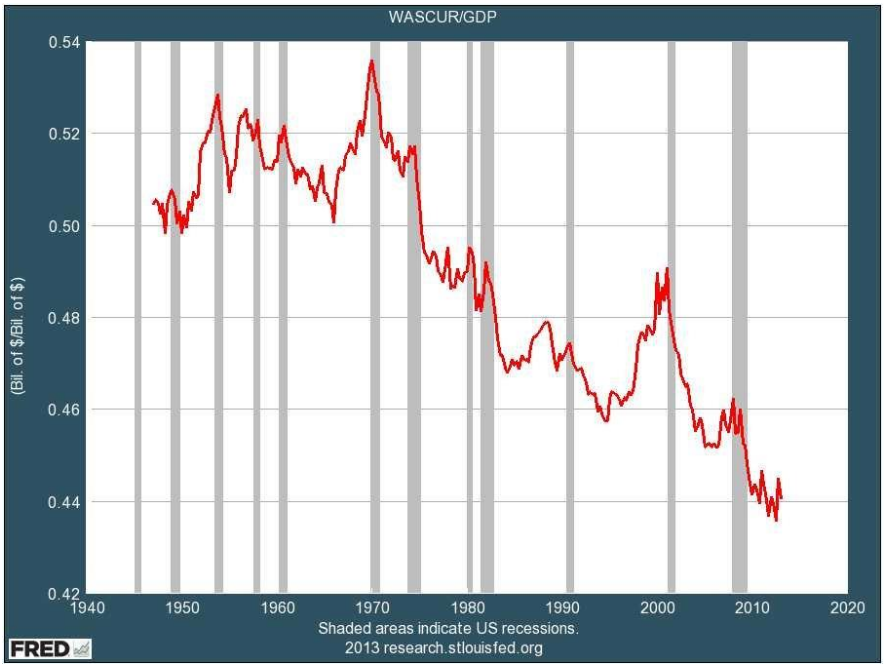


Chart 31: WASCUR/GDP: Wages as a percent of the economy are at an all-time low.

Why are corporate profits so high? One reason is that companies are paying employees less than they ever have as a share of GDP. And that, in turn, is another reason the economy is so weak. Those "wages" represent spending power for American consumers. American consumer spending is revenue for other companies. So the profit maximization obsession of American corporations is actually starving the rest of the economy of revenue growth.

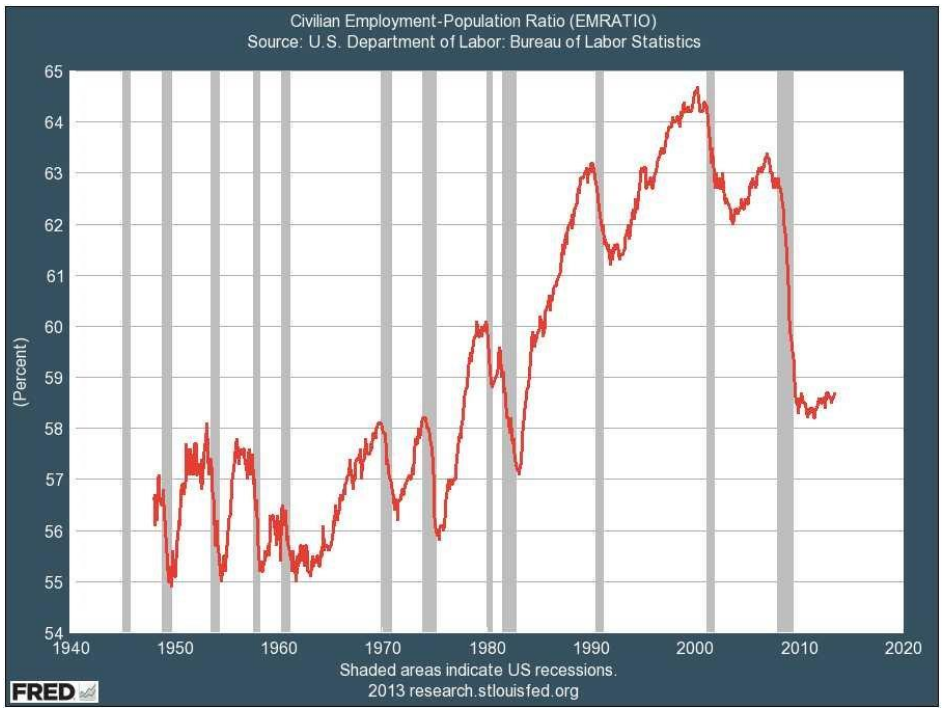


Chart 32: Civilian Employment-Population Ratio: The employment-population ratio is lower now than at any time in the past three decades.

Another reason corporations are so profitable is that they don't employ as many Americans as they used to. This is in part because greedy large-scale companies today regard employees as "costs" instead of human beings who are dedicating their lives to the organizations. As a result of frantic firing in the name of "efficiency" from declining companies, the U.S. employment-to-population ratio has collapsed. We're back at 1970s-1980s levels now.

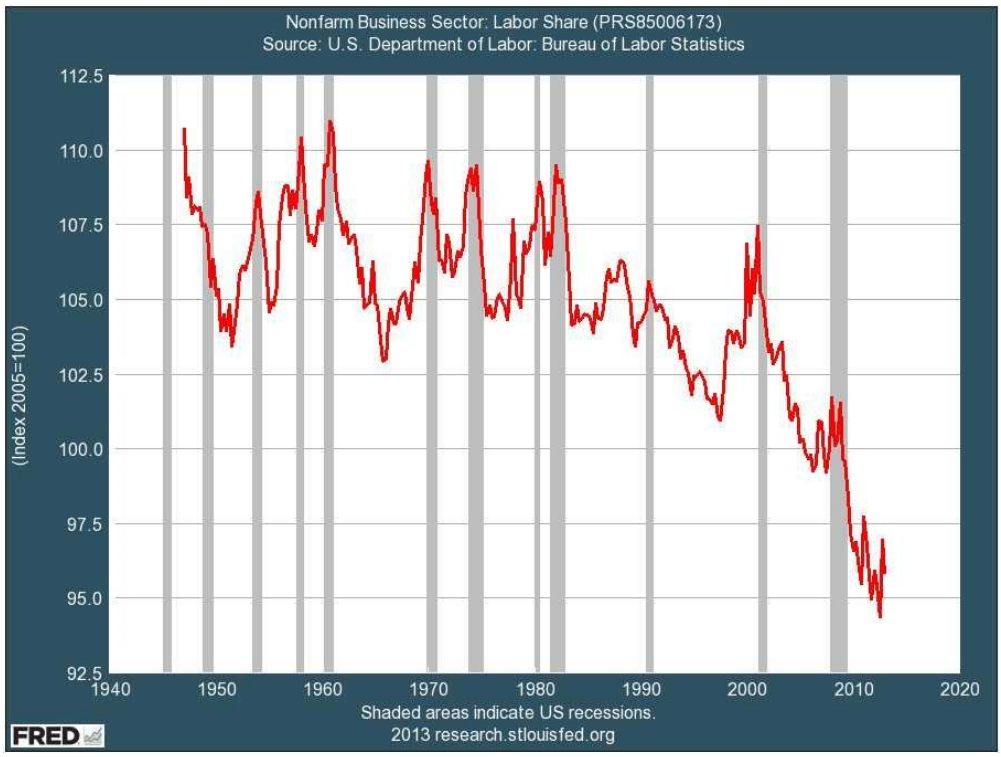


Chart 33: Nonfarm Business Sector Labor Share

The share of our national income that American corporations are sharing with the people who do the work ("labor") is at an all-time low. The rest of our national income, naturally, is going to owners and senior managers ("capital"), who have it better today than they have ever had it before.

In the past few years, scholars have proposed another possible explanation for this problem of executives with increasing income while laborers get lesser compensation for their efforts. The International Labor Organization's "Global Wage Report 2012/13" evaluates the impact of globalization, technological and institutional change, and the growth of the financial sector on workers' share of the national income. Across the most developed economies, like the U.S., the ILO found financial expansion accounted for 46% of the decline in workers' share since 1990, almost twice the impact of other factors such as unionization, and far more than globalization and technological change

combined.

According to economist William A. Galston, "for the sake of economic growth, social mobility and political stability, we must think more boldly about reforging the connection between compensation and productivity.[41] That connection must be accepted as a goal – and norm – across the economy. And to make it real, we should link the tax rates individual firms pay to the compensation strategies they adopt. The point is simple: Firms can either share productivity gains with their workers-or contribute to the public programs made necessary by their failure to do so."

According to him, any program similar to this will provoke protest. According to Galston, many private-sector leaders will say, "We live in a hypercompetitive global economy and the slow growth of compensation is a necessary response to it." But the facts do not support this argument. According to the St. Louis Federal Reserve [34] (Chart 34), corporate profits have reached their highest point as a share of GDP in the entire postwar period, and maybe ever. Meanwhile, unable to identify productive new investments, many firms are using their profits to buy back their stock, which is the exact opposite of what should occur. It would be better for the economy if worker's compensation grew with corporate profits. American companies are making more money and more per dollar of sales than they ever have before. This means that the companies have a lot of money to invest in whatever expenses they choose, but it is up to them what percent actually goes to wages.

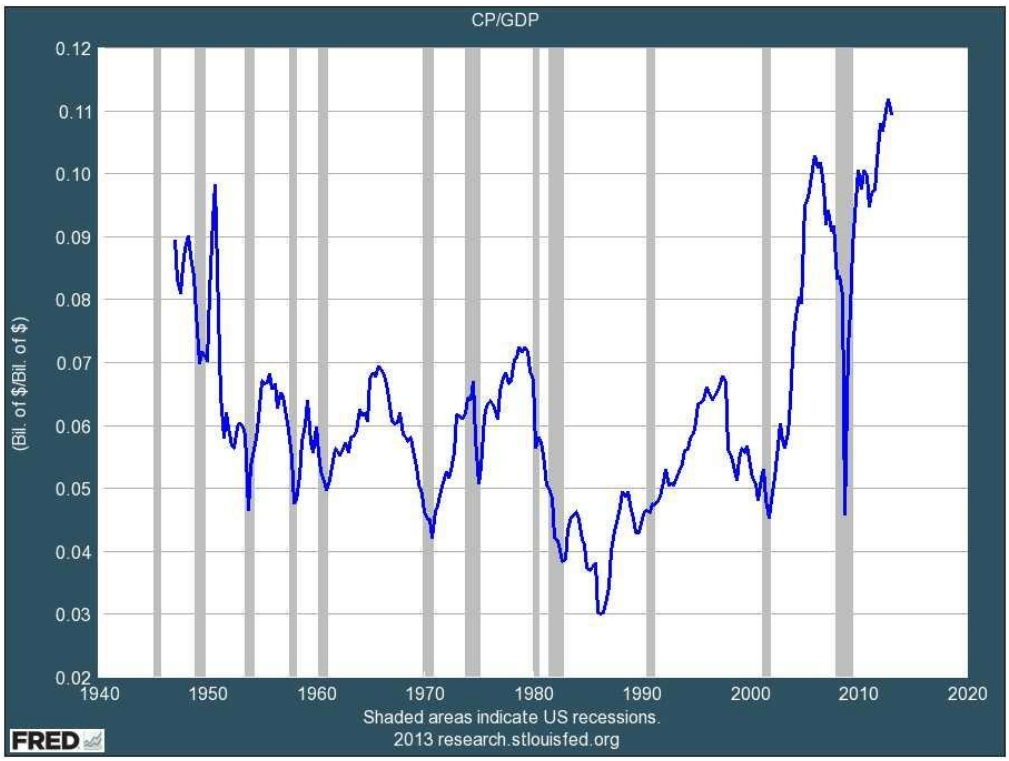


Chart 34: Corporate Profits

According to a recent article [33], a declining wage share and slow growth in the US are driven by wage stagnation, employment externalization and job polarization. Over the 39 year period from 1969–2008, wage and salary income for high school educated males aged 25–44 and college educated males aged 25–34 declined in real terms. At the time, in response to intensified international competition, employers have increasingly externalized work through outsourcing, de-unionization, and a shift from wages associated with specific positions within companies to the market-determination of wages (pay for performance, etc). As a result of these trends, job growth since the 1980s has been entirely concentrated in the lowest wage and highest wage jobs, with no growth in mid-level jobs.

Good manufacturing jobs have been sent overseas and replaced with low-wage service jobs in the retail and hospitality sectors. This low-wage, anti-union employment model was pioneered by Wal-Mart. This shows the greed of large corporations not taking care of their workers. According to the article, these institutional transformations, resulting from competition, have produced the declining wage share.

The obsession with "maximizing short-term profits" that has developed in American companies over the past 30 years has created a business culture in which executives “dance to the tune of short-term traders and quarterly earnings reports, instead of balancing the value created for employees, customers, and long-term owners” We can take one step in attempting to solve this problem by evaluating if there is enough money in the economy to compensate the average worker enough to bring the U.S. labor market and economy back into healthy terms.

GENERAL PAYROLL EXPENSES

We can quantify the wage percentage and evaluate the general guidelines for worker compensation compared to business expenses or revenue. This will allow us to make conclusions like necessary wage percentage in order to supply workers’ with livable income, based on business revenue.

The Society for Human Resource Management reports that some retail businesses operate at a ratio as low as 18 percent while businesses in health care and education report salary as high as 52 percent of expenses [42]. Divide the total salary expenses by the total operating expenses to determine your salary as a percentage of

operating expenses. For example, if you pay $100,400 in total operating expenses and $23,500 in salary expenses, your current ratio is 23.4 percent.

Instead of comparing your salary to the total operating expenses, you can also calculate your total salary as a percentage of revenue. This helps you determine how much of the money your business earns is spent on payroll. For example, if your business earns $240,000 and your salary expense is $33,500; your salaries are 13.9 percent of total revenue. The ideal target range is 15 to 30 percent, according to Second Wind Consultants, Inc. [40]

If your payroll expenditures fall within 15-30% of gross revenue, your business is in a safety zone of sorts with solid footing. Businesses that live within this range tend to be most successful, at least from a payroll perspective. However, there are many businesses, usually within the service industry, which operate with payroll making up more than 50% of their gross revenue.

WHAT IS A DECENT WAGE?

In order to figure out how much money is available to pay people a decent wage, the first thing the IQP group will need to figure out is what a "decent" wage is.

Before figuring out the decent wage, it’s important to understand the “living wage” in the United States.

WHAT IS “LIVING WAGE”?

The living wage means a basic wage a person needed to fulfill his/her basic living requirement. The basic living wage normally covers sheltering, clothing, and nutrition.

Unfortunately, the living wage isn't the minimum wage. In many countries, people who receive minimum wage will get compensation to reach the living wage level.

Poverty-line wage, another living quality index, is a different concept from living wage. The poverty lines are measured on the basis of household units while living wage is measured based on individual. On the other hand, poverty line represents a "lowest cost" while the "living wage" represents a "basic line". They represent different life qualities.

Hourly Wages	1 Adult	1 Adult, 1 Child	1 Adult, 2 Children	1 Adult, 3 Children	2 Adults	2 Adults, 1 Child	2 Adults, 2 Children	2 Adults, 3 Children
Living Wage	$11.31	$24.84	$31.74	$40.14	$16.24	$19.90	$21.31	$24.62
Poverty Wage	$5.21	$7.00	$8.80	$10.60	$7.00	$8.80	$10.60	$12.40
Minimum Wage	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00

Table 7: Hourly Wages in Massachusetts

The following figure gives these three index numbers in Massachusetts. From the table above, if we focus on the values of "one adult", we can see there is $3.31 difference between "living wage" and "minimum wage". For "2 adults, 3 children", the difference between these two numbers is $8.62(assume both adults have jobs). Therefore, individual person and the family have different living requirements. In this paper, the IQP group focuses on the research for individual wage. One problem is that different states have different minimum wages requirements, so it is difficult to generalize for the entire county based on the different wages. In order to alleviate this problem, the IQP group will investigate just one state's wages to get a general idea of the situation. Another problem is how those numbers get measured. The following figure, the basic monthly expenses in Massachusetts, gives a more specific explanation.

Table 8: Basic Monthly Expenses in Massachusetts

Monthly Expenses	1 Adult	1 Adult, 1 Child	1 Adult, 2 Children	1 Adult, 3 Children	2 Adults	2 Adults, 1 Child	2 Adults, 2 Children	2 Adults, 3 Children
Food	$242	$357	$536	$749	$444	$553	$713	$904
Child Care	$0	$942	$1,588	$2,233	$0	$0	$0	$0
Medical	$140	$376	$400	$383	$257	$358	$338	$346
Housing	$909	$1,207	$1,207	$1,448	$1,005	$1,207	$1,207	$1,448
Transportation	$262	$509	$587	$629	$509	$587	$629	$640
Other	$93	$224	$301	$399	$148	$190	$214	$244
Required monthly income after taxes	$1,646	$3,615	$4,619	$5,841	$2,363	$2,895	$3,101	$3,582
Required annual income after taxes	$19,752	$43,380	$55,428	$70,092	$28,356	$34,740	$37,212	$42,984
Annual taxes	$3,776	$8,294	$10,597	$13,401	$5,421	$6,642	$7,114	$8,218
Required annual income before taxes	**$23,528**	**$51,674**	**$66,025**	**$83,493**	**$33,777**	**$41,382**	**$44,326**	**$51,202**

From the table above, the required annual income for a single adult is $23,528 to satisfy a basic life requirement. If divide this number by 12, the required monthly income should be $1960. If this person works 40 hours/week, the required hourly paid should be $12.25(before tax). This number is a basic requirement, not a “decent wage”. The IQP group adds another type of “expense” to represent a “decent wage”. The problem in estimating a "decent wage" will be interpreting how much entertaining expenses would be a “decent” amount.

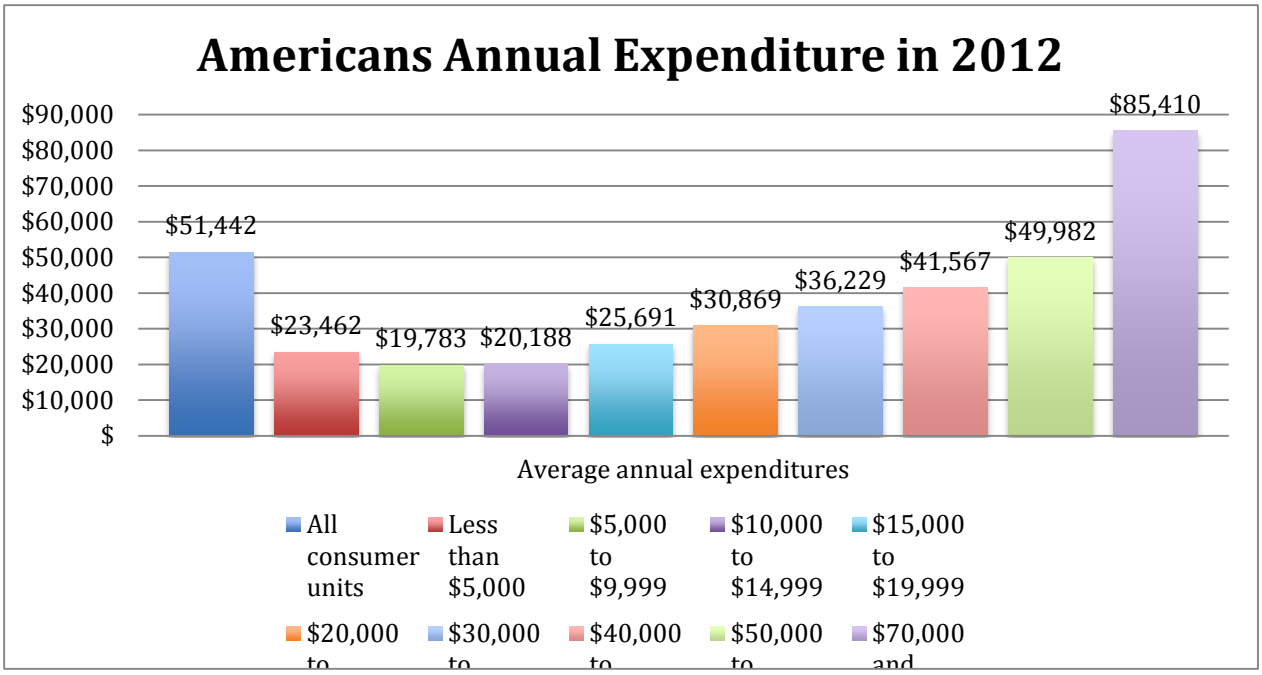
The following table gives the basic expense for a single person per year. The $19,752 is the bottom line of one’s annual wage to keep a basic life requirement. The IQP group believes a decent wage for a single person should be ranges from $20,000 to $70,000, since according to the Bureau of Labor Statistics, people who earn over $70,000 are considered as high paid employees.

Table 9: Average Annual Expenses in America

Annual Expenses	1 adult/month	1 adult/year
Food	$242	$2,904
Medical	$140	$1,680
Housing	$909	$10,908
Transportation	$262	$3,144
Other	$93	$1,116
Total	$1,646	$19,752

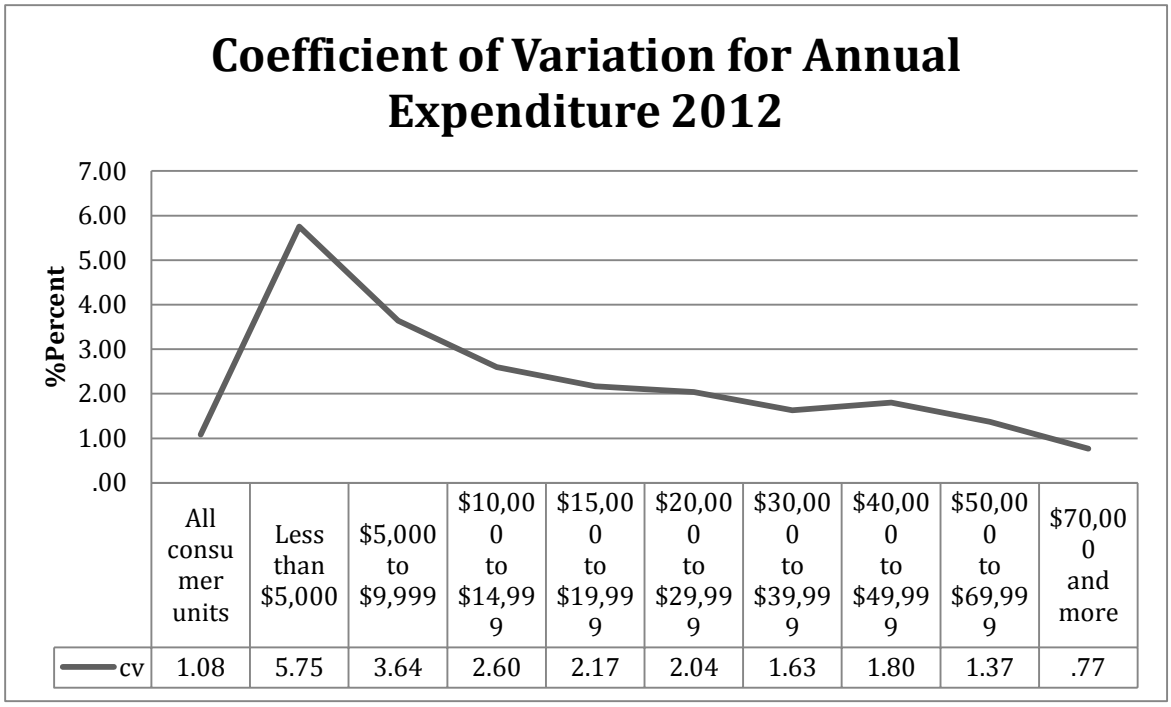
With the increase the salary, the expenses for each type increases as well. The IQP group needs to find the "decent" amount among these numbers. The following chart gives "average annual expenditure" of American people in 2012.

Table 10 Americans Annual Expenditure in 2012



The chart shows the average annual expenditure for different annual income group for individuals. Each bar represents a different annual income group. A simple trend is the more people earn, the more they spend. The next chart is the coefficient of variation (CV) for each group of people. The CV represents the variation of expenditure for a specific group. For example, the group which earns less than $5000, has a 5.75% CV meaning some people in that group spend really little while others spend a lot. The IQP group believes it is intuitive to assume there is a cap for people's expenditure in a certain time. This cap shouldn't be a certain number but a certain range. When people's salary is above this threshold, the expenditure won't have a significant change.

Table 11 Coefficient of Variation for Annual Expenditure 2012



	All consumer units	Less than $5,000	$5,000 to $9,999	$10,000 to $14,999	$15,000 to $19,999	$20,000 to $29,999	$30,000 to $39,999	$40,000 to $49,999	$50,000 to $69,999	$70,000 and more
cv	1.08	5.75	3.64	2.60	2.17	2.04	1.63	1.80	1.37	.77

The CV can tell us the habit of people's spending in a certain group. From the figure above, the IQP group notices that the trend of this plot correspond to our assumption. While people earn more money, their spending variation decreases, which means they tend to have a constant spending. We pay more attention to the range from $30,000 to $70,000, due to the reason we stated above. There is a small peak (maximum value) at the range of $40,000 to $49,999 (1.8%). After this peak value, people tend to have a constant value on their consumption, because people are satisfied about their lives already. Hence, the IQP group believes a decent salary should be in the range of $40,000 to $70,000.

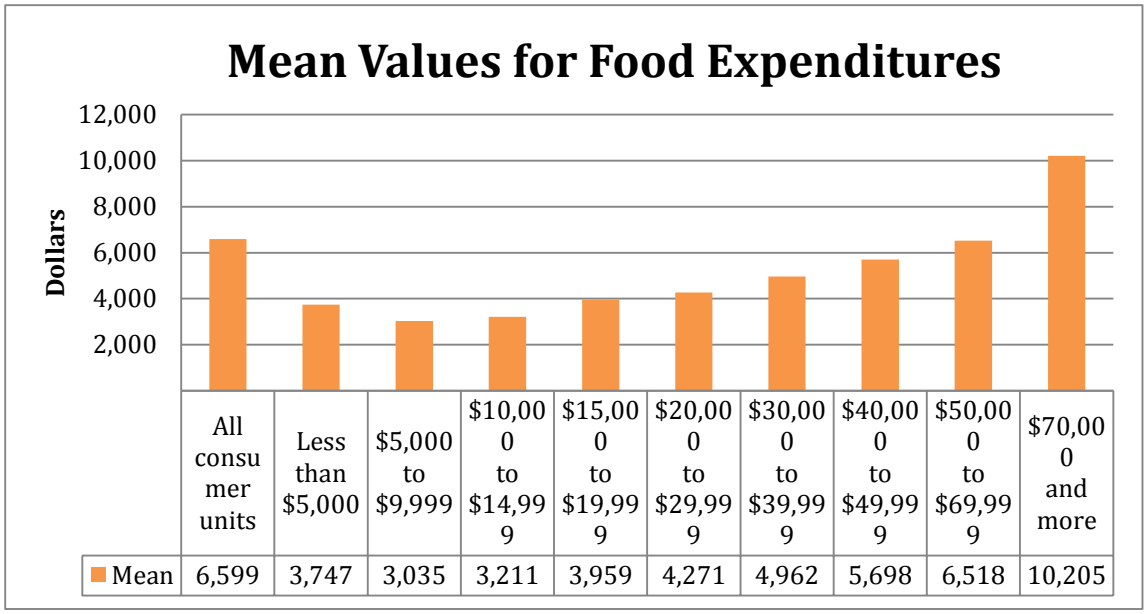
In order to narrow this range down, it is important to use this same method to get the "decent" amount of expenditure on those "basic" spending. They are: food, medical, housing and transportation. Once we get these numbers of decent basic expenditure, we could calculate the

percentage of people's non-basic expenditure in their total income. Through this way, we could find the decent salary level we are looking for.

Decent Food Expenditures

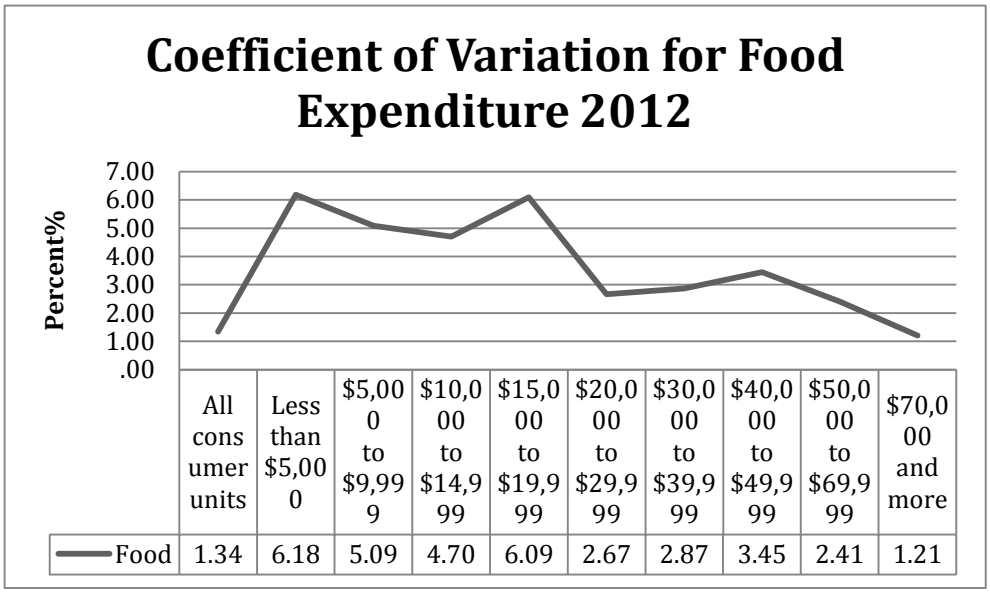
The following figures show the mean values and Coefficient of Variation for Food Expenditure in 2012. From the figure, we can see between the values of $20,000 to $69,999, the increase of expenditures is almost linear.

Table 12 Mean Values for Expenditures



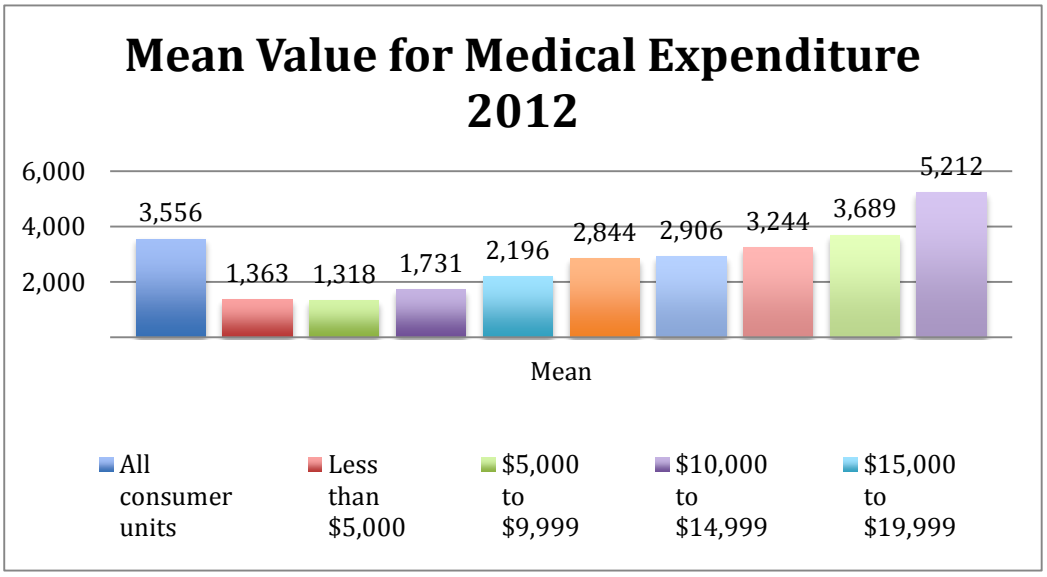
From the second plot, we noticed that after $40,000, the CV goes down quickly, which means people who earns more than $40,000 have tendency to consume the same. So, if we find the average values for food expenditures in the income range of $40,000 to $70,000, this value can represent a decent amount of food expenditure. The IQP group found the average food expenditure in this range and it is $6108.

Table 14 Coefficient of Variation for Food Expenditure 2012



	All consumer units	Less than $5,000	$5,000 to $9,999	$10,000 to $14,999	$15,000 to $19,999	$20,000 to $29,999	$30,000 to $39,999	$40,000 to $49,999	$50,000 to $69,999	$70,000 and more
Food	1.34	6.18	5.09	4.70	6.09	2.67	2.87	3.45	2.41	1.21

Table 13 Mean Value for medical expenditure

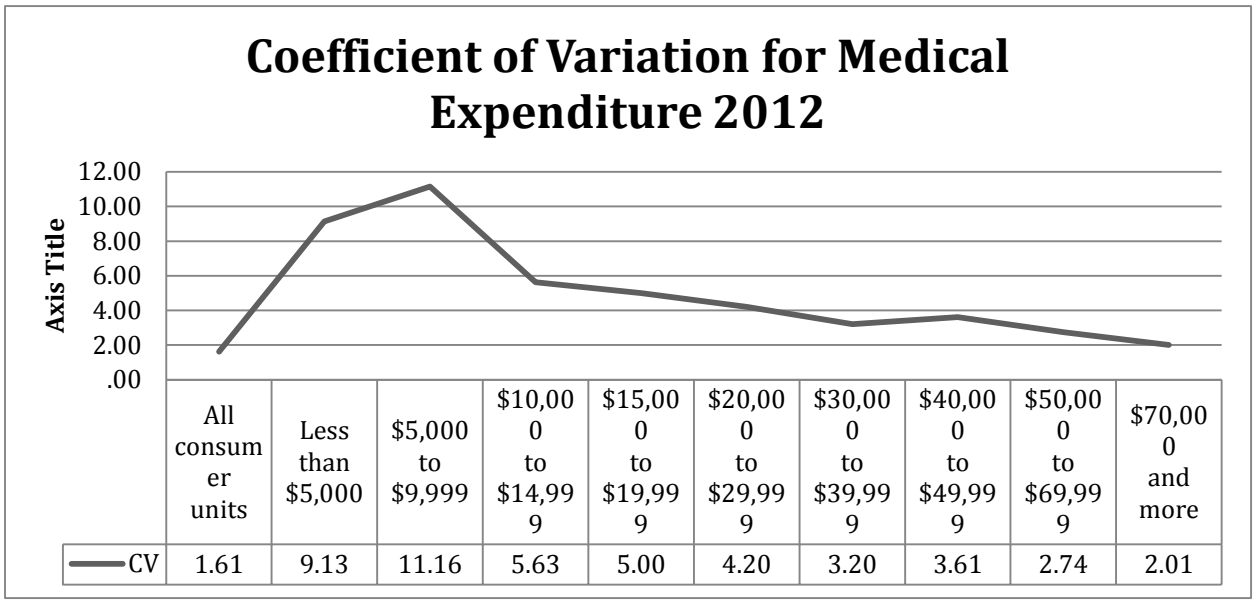


Another basic expenses is the medical expense. Medical expense has its special property. The expense normally doesn't change with the change of people's income. In other words, the medical expense CV should be a low number and almost a straightline.

The following figures show medical expenditure for different people who have different annual income. From the actual plot, we see the CV is not low enough and CV stays around 2.7%. The medical expenditure contains four major parts. They are "health insurance", "medical service", "drugs" and "medical supplies". After taking a deep research on how the United States bureau of statistics calculated those data, we found it was expendure on medical service casues such large variation on the medical expenditure. The "medical services" has largest variation, which results in the varation in the whole health care. The reason behind this large variation is partially because of political policy. In the United States, people who earn below poverty line or around the poverty line could benefit from free medical service. These services in different states have different policies. So, it is one of many reasons which cause large variations of medical service.

Although it has a largest variation, the mean values don't have a large difference. So, the IQP group believes it is ok to choose an average number to represent decent expense of medical expenditure. The average number is calculated by adding up numbers from $40,000 and $50,000 and divide by 2. The average number is $3466

Table 15 Coefficient of Variation for Medical Expenditure 2012



By using the same methods, we could get the "decent" values of Housing and Transportation. The following figure summarizes all values from analysis before.

Table 17: Annual Decent Expenditure

	Annual Decent Expenses
Food	$6,108
Medical	$3,466
Housing	$18,000
Transportation	$9,928
Total	$37,502.00

Table 16: Annual Basic Expenditure

Annual Expenses	1 adult/month	1 adult/year
Food	$242	$2,904
Medical	$140	$1,680
Housing	$909	$10,908
Transportation	$262	$3,144
Other	$93	$1,116
Total	$1,646	$19,752

Compared those two tables above, it is obvious there is a gap between decent expenditure and basic expenditure. The next step is to decide the decent salary by using a similar concept of the Engel Curve.

Engel Curve describes how household expenditure on a particular good or service relates varies with household income. In our project, the IQP group uses the following equation to explain the best value to represent the "decent" salary.

$$decent\% = \frac{total\ income - basic\ expenditure}{total} * 100\%$$

This equation should be self-explanatory. The decent percentage represents how much in percentage does one person spend in the non-basic consumption. The higher this number is, the better one's life is.

The figure below gives the decent percentage from $40,000 to $70,000.

Table 18: "Decent" Wage Percentages

Annual Income	Decent %
$40,000	6.25
$50,000	25.00
$60,000	37.50
$70,000	46.43

From all discussion above, we believe the salary between $55,000 to $60,000 would be a decent salary. We compare this number with the average income in the United States.

From the figure below, we can get a conclusion that if a person earns $55,000 per year, what he earns is 130% of the USA's average annual wage. According to recent values, the average number is $42,223.20.

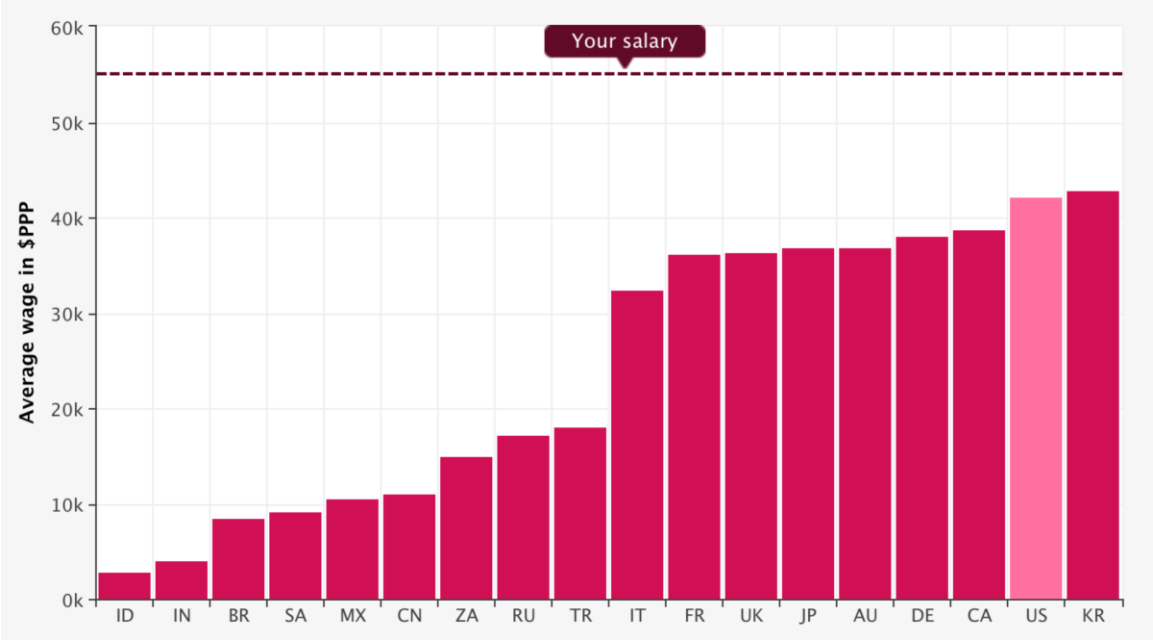


Chart 35: Average Annual Wage of various countries in Purchasing Power Parity

DIFFERENT LEVELS OF "DECENT" WAGES

The IQP group approaches this concept of "decent" wage through different ways. Thus, the IQP group could use these different numbers to estimate future employment condition. A person who earns an average salary, $42,223, in US could also be considered as a decent wage. At the same time, if a person could have the income just satisfying his/her expenditure, he could also be considered as having a decent amount of wage. According to the figure, the living wage is $11.31/hour, so the annual wage is $23524.8. The following table summarizes different approaches to a "decent" salary.

Table 19: "Decent" Salary

Title	Amount (Annual)
Average Salary	$42,223.20
Basic Living Salary	$23,524.80
Good Salary	$55,000

HOW MUCH MONEY IS AVAILABLE TO PAY PEOPLE IN THE UNITED STATES?

People should be able to use their wage immediately without any delay. Therefore employees' wage has to be paid by "cash", although this "cash" could be in different ways: check or bank deposit. In order to forecast the job opportunities in the United States, the IQP group should find out how much cash is in circulation in the United States. The IQP group summarizes some basic data of cash circulation in United States.

M0 Money Supply: Sum of currency in circulation and reserve balance. All bills and coins in people's hands, the money in bank vaults and all of the deposits those banks have at reserve banks.

M1 Money Supply: Sum of currency held by the public and transaction deposits at depository institutions.

M2 Money Supply: M1 plus savings deposits, small-denomination time deposits and retail money market mutual fund shares.

One way to forecast the potential job opportunities is to use the number of money supply divided by the "decent" amount of wage. However, the number we got will have large error. The error comes from the fact that cash in circulation won't all be used for paying wage. Among those cash in circulation, a large part of it is hold by other countries. It's beyond this paper's scope and our IQP group's ability to discuss the currency circulation in this paper.

The IQP group tries to use the cash in circulation to estimate our future job opportunities. There are two ideal assumptions behind this number. The first is that all cash in circulation are all used to paying people. The second assumption is everyone has the same wage, $55,000.

Thus we got the conclusion that the United States could have nearly 193.260 million jobs opportunities if all money in circulation is all paid as salary. In other words, if the United States

has jobs more than this number, the country wouldn't have money to pay for them. Currently, the United States has 137 million jobs opportunities. We use 193 subtract 137 to get the gap between the future job and current job. There is a 60 million job difference. As having been mentioned above, this number is inaccurate but the logic is reasonable.

It is intuitive to understand the fact that when people earn above a certain level of wage, it doesn't change much about his/her life much. In other words, he/she wouldn't feel happier even he/she has more income. It has been proved that income is much more highly correlated to happiness. If the IQP group found this number, we made all people, who earn over this level, "donate" their extra wage, and the IQP group could use this part of "extra wage" to estimate the future job.

According to the research, psychologists believe $75,000 is a threshold, at which happiness couldn't be further influenced by additional income. From the U.S. statistics bureau's data, among 243,955,000 individuals aged 15 or higher, in 2010, there were 11.9% of people who earned over $75,000. The IQP group uses this number to do a simple estimation. In 2012, there are nearly 313.9 million American people, so there should roughly be 37.35 million American people. The following figure gives detailed information about the income statistics in 2010.

Table 20: Income Statistics in America from 2010

Income	Percent%	Number of People(million)	Middle Number	Middle Number - $75,000	Total Extra Money(million)
$75,000 to $77,499	0.97	3.04483	76250	1250	3806.0375
$77,500 to $79,999	0.49	1.53811	78750	3750	5767.9125
$80,000 to $82,499	0.98	3.07622	81500	6500	19995.43
$82,500 to $84,999	0.42	1.31838	83750	8750	11535.825
$85,000 to $87,499	0.6	1.8834	86250	11250	21188.25
$87,500 to $89,999	0.29	0.91031	88750	13750	12516.7625
$90,000 to $92,499	0.69	2.16591	91250	16250	35196.0375
$92,500 to $94,999	0.24	0.75336	93750	18750	14125.5
$95,000 to $97,499	0.37	1.16143	96250	21250	24680.3875
$97,500 to $99,999	0.24	0.75336	98750	23750	17892.3
$100,000 or more	6.61	20.74879	100,000	25,000	518719.75
			total extra money		685424.1925

In this figure, the IQP estimates the number of people who earn money over $75,000, then use the average difference income times the American population; we can get the total extra money.

Although it's not feasible to ask all rich people give out all those money to other people, the government does use many ways to adjust the gap between the rich and the poor. From the table above, we see the section of money over $75,000 is total 685424.1924 million dollars. The following table shows the potential employment number, using the "decent" wage we have in the last section, can be created.

Table 21: Potential employment with given salary

Title	Amount (Annual)	Number of Employee (million)
Average Salary	$42,223.20	16.23
Basic Living Salary	$23,524.80	29.14
Good Salary	$55,000	12.46

From the table above, we see the number of employees can be created is around 12 million to 16 million.

This range we got through this way is reasonable but not accurate. The reasons are stated as follow:

It is not possible to average those people who have money over $75,000 to the same level and give that money to a certain amount of people a fixed salary. On the other hand, the money paid to the employees is not from rich people, but from companies' profits and cash in circulation in the market. So it's not accurate to just simply use this amount of people to forecast the future employment chances.

It is always impossible to predict how many jobs we could create in the future, by using this method, the IQP group gets a general idea about if we have money to pay enough jobs. As

the previous chapters have discussed, there are many new jobs could get, either from our public infrastructure construction or profitable companies. However, the final question to answer is if we created this amount of new jobs, do we have enough money to pay them. The answer is yes, judging from the numbers we got in this section. We have enough cash to pay those people.

8. Conclusion

According to the U.S. Bureau of Labor Statistics in the March 2014 employment situation analysis, there is a 6.7% unemployment rate, resulting in roughly 10.5 million unemployed people. The unemployment rate has been slowly declining for the past few years since the high 10% in 2009, without a simple solution. The problem is finding where these solutions of more jobs will come from. It would be best to get the unemployment rate at least effectiveness in solving the problem of where these jobs could come from. The IQP group researched different aspects of employment: rising job sectors, political policy, and the U.S.'s economic ability to fund worthy jobs.

The future jobs of America could come from many different sectors. The IQP group thought the best source of jobs would be from the rising high technology sector. Since the high technology sector has a low correlation with the fluctuation of the economic condition in America, the IQP group found it to be a promising sector for a reliable source of new jobs. So, we determined it was necessary to do research on how many jobs the high tech sector can produce. The research data in this study showed that the economic condition has little influence on company profit. The true gauge of a high-tech companies' profit is their product's performance. The companies Microsoft and Apple give examples of the mentioned low correlation between high-tech and economic condition, as their financial performance has not decreased as a result of the economy at all. Thus, from a qualitative perspective, as long as high tech companies keep their research active and keep releasing new products, high-tech companies profits should be ever-increasing. This higher profit could lead to more job opportunities.

From a quantitative perspective, the IQP group used "revenue per employee" to quantify how many jobs one company could potentially create. From the IQP group's perspective, we hope the companies keep a reasonable level of "revenue per employee" by hiring more employees to compensate their increase in revenue, although the goal of every company is to maximize this

ratio. The IQP group suggests companies start hiring more people until the revenue per employee decreases to the average value of "Revenue per Employee" (of the top 10 "revenue per employee" companies). Then we calculated how many jobs could be created from this equalization. We used four companies, Apple, Netflix, Google, and the Facebook, to estimate the potential jobs, and found out 1 million jobs could be created. This number is a fairly large number and it is reasonable to estimate that high-tech companies have potential to create more jobs to fill some of the 10.5 million total unemployed jobs. Unfortunately, the companies probably wouldn't listen, but if the federal government pressured them to by enacting a policy for a maximum revenue per employee, it could cause companies to hire much more employees. Then the only problem would be the worker supply for high tech jobs. In order for a person to get a high tech job, they most likely have to meet a skill requirement, often resulting from STEM education.

It is based on this conclusion the IQP group decided to research STEM (Science, Technology, Engineering, and Math) education, which creates future scientists and engineers. The high-tech companies' developments depend on STEM education. If there are not enough students or apprentices studying STEM, the high-tech companies could have problems in the future. There are many debates regarding the current STEM education situation. One major arguing point is if there are enough STEM students to satisfy the high technology development needs. From the recent years' data, we see that there are always increasing openings in STEM jobs on the job market. Thus, debaters conclude that the country is short supply of STEM workers and students. The federal government and States governments have started many programs to cultivate more students' interest in STEM fields. If we take look at the STEM-field workers' salary, it is obvious that the average salary has been kept at a stable level without any significant fluctuation. It is through this observation that we realized that workers and jobs in STEM fields are in a dynamic equilibrium of job openings and job filling.

The IQP group interprets this equilibrium as a good sign of the current STEM situation. It means the technology area in the United States is active and energetic. There will be more STEM jobs that are created and those new jobs will be filled in a certain time period. After this time period, new jobs will come out, and then those openings will need to be filled, and so on. Therefore, it reaches a state of equilibrium, and there won't be a large gap of unfilled jobs. That being said, high-tech development in the United States is active and the industry needs more people constantly, which means the high-tech companies have potential to create more jobs in the future. If one day, the salary of STEM workers wasn't stable anymore and people stopped being interested in studying STEM education, that is the time when people should start worrying about our future of high tech development. However, for now the stability of STEM areas is dependable. There are different aspects of the U.S. job market that are not as stable and have much more complex aspects. For example, the government can produce major impacts to the employment and unemployment of America through political policies. The potential of these policies must be investigated.

The New Deal, from 1933-1936, inspired people to solve the employment problem through changing political policies. The governments' actions allowed it to control the market. According to our research, the United States needs more investment on infrastructure construction. Thus, it is might be a good time to start another political policy similar to The New Deal. However, currently the federal government hasn't put much investment in our infrastructure construction. A major reason is this solution is just temporarily solving the employment problem. After most infrastructure projects are done, the same unemployment issues reoccur. However, for some innovative infrastructure projects, there is an opening to future additional jobs from the long-term operation of the infrastructures and potentially from the expansion of its structure. This increase in communication and invention results in an increase in the health of society and economy. (For example, the internet requires server maintenance workers and provides growth

potential for communication and creation of online companies like Netflix and Facebook) This growth in the economy (GSP) from spending is called a multiplier. According to a recent study, the economic multiplier for infrastructure spending is 2.0. So every dollar spent invested in infrastructure increases the national GSP by two dollars. Quantitatively, that is a worthy investment. However, the federal government prefers investing tax money on investments that don't have potential multipliers, resulting in negative long-term results. Since we do need to work on our infrastructure, the way government does this is to attract more private investment on these constructions. With these private investments, the federal government saves some tax money, but at the same time, those private investments also create some job opportunities.

In the previous sections, the IQP group has observed that more jobs could be created in the future. It is through the third (economic) section that we determined whether the American economy has the ability to pay those new jobs. The IQP approached this problem first by estimating the level of a decent wage in the United States. We found that the annual wage of $55,000 is an ideal salary and the $42,223 is an average salary that also can satisfy the basic living requirement. The IQP group used two ways to justify the statement that the American economy could pay new jobs at a decent wage. The first way is to divide the amount of "money supply" in the market by our “decent wage” level to see how many job opportunities could be paid. After our calculation, we found there will be roughly 193 million jobs if all the "money supply" is used to fund salary. Unfortunately, this number is inaccurate because of the defects in the methodology; not all of the “money supply” is in economic circulation, and not all of this money would be used exclusively to fund salaries. The second way the IQP group used to find if we have enough cash to pay the employees from the amount of money summed from salaries larger than $75,000. We found 12-16 million jobs would be created if we paid a decent wage by using this portion of cash. This method is also not accurate either. The reason is the government

wouldn't use this way to balance the poor and the rich. And this is not the way we pay the future new jobs.

However, these two ways give us the idea if it is the possible to pay those new jobs a "decent wage", since the available job we got in the third part is much larger than the available jobs we calculated in the first two parts. This proves two things: 1) the salary wouldn't be on the same level and it will have a large difference. 2) We have enough cash to pay new jobs a decent wage.

After all the research and conclusions from this project, the IQP group has found that there are two ways to fill the 10.5 million job gap in the U.S. job market. However, the ideal solution is not so easy. The high tech industry has shown to be a stable sector that is going to provide consistent inflow of jobs, but will not be a solution to a large gap of jobs without outside reinforcement. However, the first way to fill a portion of the job gap is if there is a new political policy that promotes better use of money for extremely wealthy companies. This would force companies to hire more workers and create a large influx of job openings. This would also help balance the inequity between the minimum wage workers and high salary jobs. This solution would fill approximately 12-16 million jobs. The second and more longstanding way to fix the economic crisis comes from new political policy such as infrastructure construction or salary/revenue policies. In order for this to occur, there needs to be strict federal government participation. The government investing in growing infrastructure could lead to a multiplying effect which would increase economic health. So, an investment in a high-multiplying area from the federal government would lead to the best outcome of economic growth.

References

[1] U.S Bureau of Labor Statistics. "The Recession of 2007 - 2009." February 2012. Bereau of Labor Statistics. October 2013.

[2] Bureau of Labor Statistics. *Labor Force Statistics form the Current Population Survey*. 28 October 2013. 28 October 2013.

[3] Bradley, Glenn Danford (1913). *The story of the Pony Express*. A. C. McClurg & Co. Retrieved from http://www.bayareaeconomy.org/media/files/pdf/TechReport.pdf (A Bay Area Council Economic Institute)

[4] "Trends in World Military Expenditure, 2012." *sipri.org*. Stockholm International Peace Research Institute. Web. 18 Oct 2013. <http://books.sipri.org/files/FS/SIPRIFS1304.pdf>.

[5] Nienow, Sara, Chris Harder, Tim Cole, and Anna Lea. "North Carolina's Military Footprint." North Carolina Department of Commerce. North Carolina Department of Commerce, n.d. Web. 18 Oct 2013. <http://www.nccommerce.com/Portals/47/Publications/Industry Reports/North Carolinas Military Footprint.pdf>.

[6] Massachusetts State Government. massDOT. Big Dig. Web. <http://www.massdot.state.ma.us/highway/TheBigDig/ProjectBackground.asp&xgt

[7] "Transportation Impacts of the Massachusetts Turnpike Authority and the Central Artery/Third Harbor Tunnel Project." massDOT. Economic Development Research Group, Inc, n.d. Web. 18 Oct 2013. <http://www.massdot.state.ma.us/portals/0/docs/infoCenter/additionalDocs/MTA-Economic-V1.pdf>.

[8] Board of Government of the Federal Reserve System. "How much U.S. currency is in circulation?" 2013.

[9] “Facts about Microsoft” <http://www.microsoft.com/en-us/news/inside_ms.aspx>

[10]“The Microsoft Economic Impact Study” http://www.economicforecaster.com/uploads/visitors/studies/Microsoft%20Impact.pdf

[11] “Creating Jobs through Innovation” http://www.apple.com/about/job-creation/

[12]"Population Estimates." : Historical Data. U.S. Department of Commerce, n.d. Web. 19 Nov. 2013<http://www.census.gov/popest/data/historical/index.html>.

[13]"Newspaper Circulation Volume." Newspaper Association of America. Newspaper Association of America, 04 09 2012. Web. 19 Nov 2013. <http://www.naa.org/Trends-and-Numbers/Circulation-Volume/Newspaper-Circulation-Volume.asp&xgt;.

[14] U.S. Census Bureau, 1900-1930, U.S. Census of Population: 1950, Vol. IV, Special Reports, General Characteristics of Families ; Census, 1950-2000, Demographic Trends in the 20th Century, Census 2000 Special Reports, Series CENSR-4. See also <http://www.census.gov/prod/2002pubs/censr-4.pdf> (released 17 December 2002); and Current Population Reports, Series P-20, No. 547; and earlier reports. For 2001 and 2002, see <http://www.census.gov/population/socdemo/hh-fam/cps2001/tabH1-all.pdf> (released 17 July 2003) and <http://www.census.gov/population/socdemo/hh-fam/cps2002/tabH1-all.pdf> (released 12 June 2003).

[15] Silen, Andrea. "90 Years Ago in News History: The First Election Results on Radio." Newseum. Newseum, 01 11 2010. Web. 19 Nov 2013. <http://www.newseum.org/news/2010/11/the-first-election-results-on-radio.html>.

[16] "Broadcasting, Radio and Television," Microsoft® Encarta® Online Encyclopedia 2000 http://encarta.msn.com © 1997-2000 Microsoft Corporation. All rights reserved.

[17] Gordon, Robert J. Technology and Economic Performance in The American Economy NBER Working Paper No. 8771. February 2002.

[18] McAfee, Andrew. "HBR Blog Network." Harvard Business Review. N.p., 29 Mar. 2010. Web. 20 Nov. 2013. <http://blogs.hbr.org/2010/03/the-weird-and-wonderful-econom/>

[19] Mortensen, Dale T., and Christopher A. Pissarides. "Technological Progress, Job Creation, and Job Destruction." REVIEW OF ECONOMIC DYNAMICS. 1. (1998): 733-753. Web. 20 Nov. 2013. <http://cdn.elsevier.com/assets/pdf_file/0017/105083/Mortensen_Technological-Progress,-Job-Creation,-and-Job-Destruction_1998.pdf>.

[20] Stangler, Dane, and Robert E. Litan. "Where Will The Jobs Come From?." Ewing Marion Kauffman Foundation. Ewing Marion Kauffman Foundation, n.d. Web. 20 Nov 2013. <http://www.kauffman.org/~/media/kauffman_org/research reports and overs/2009/11/where_will_the_jobs_come_from.pdf>.

[21] "A Brief Overview of Depreciation." IRS. United States Internal Revenue Service, 16 09 2013. Web. 20 Nov 2013. <http://www.irs.gov/Businesses/Small-Businesses-&-Self-Employed/A-Brief-Overview-of-Depreciation>.

[22] Charette, Robert, “The STEM Crisis Is a Myth” IEEE Spectrum, 30 Aug 2013 <http://spectrum.ieee.org/at-work/education/the-stem-crisis-is-a-myth >

[23] myCollegeOptions and STEMconnector, “Where are the STEM Students” <http://www.stemconnector.org/sites/default/files/store/STEM-Students-STEM-Jobs-Executive-Summary.pdf>

[24] Todd Bishop “Microsoft adds thousands of jobs in 2012, mostly overseas” <http://www.geekwire.com/2012/microsoft-adds-thousands-jobs-2012-overseas>

[25] Verne Harnish “Revenue per Employee” <http://www.gazelles.com/columns/Revenue%20per%20Employee.pdf>

[26] “What is a Revenue Per Employee” <http://www.wisegeek.com/what-is-a-revenue-per-employee.htm>

[27] “How Much Do Tech Companies Make Per Employee” http://mashable.com/2012/02/07/tech-company-value-per-employee/

[28] Cohen, Arthur M., Carrie B. Kisker, and Florence B. Brawer. "Commentary." The Chronicle of Higher Education. N.p., 28 Oct. 2013. Web. 20 Nov. 2013. <http://chronicle.com/article/The-Economy-Does-Not-Depend-on/142641/>.

[29] "Trends in World Military Expenditure, 2012." *sipri.org*. Stockholm International Peace Research Institute. Web. 18 Oct 2013. <http://books.sipri.org/files/FS/SIPRIFS1304.pdf>.

[30] Nienow, Sara, Chris Harder, Tim Cole, and Anna Lea. "North Carolina's Military Footprint." *North Carolina Department of Commerce*. North Carolina Department of Commerce, n.d. Web. 18 Oct 2013. <http://www.nccommerce.com/Portals/47/Publications/Industry Reports/North Carolinas Military Footprint.pdf>.

[31] Massachusetts State Government. massDOT. *Big Dig*. Web. <http://www.massdot.state.ma.us/highway/TheBigDig/ProjectBackground.asp&xgt;.

[32] "Transportation Impacts of the Massachusetts Turnpike Authority and the Central Artery/Third Harbor Tunnel Project." *massDOT*. Economic Development Research Group, Inc, n.d. Web. 18 Oct 2013. <http://www.massdot.state.ma.us/portals/0/docs/infoCenter/additionalDocs/MTA-Economic-V1.pdf>.

[33] Vidal, Matt. “On the Persistence of Labour Market Insecurity and Slow Growth in the US: Reckoning with the Waltonist Growth Regime.” *New Political Economy.* <http://www.tandfonline.com/doi/abs/10.1080/13563467.2012.630459>

[34] Blodget, Henry. "Sorry It's Not A 'Law of Capitalism' That You Pay Your Employees As Little As Possible" Business Insider. Aug. 7, 2013. <http://www.businessinsider.com/companies-need-to-pay-people-more-2013-8>

[35] University of Rhode Island. "The Labor Market." 2010. <http://www.uri.edu/artsci/ecn/lardaro/lectures/LABOR_MARKET.pdf>

[36] Roberts, Ross. "What determines wages." *Standard of Living.* May 25, 2006. <http://cafehayek.com/2006/05/what_determines_1.html>

[37]Cline, William R. "Trade and Income Distribution: The Debate and New Evidence" Peterson Institute for International Economics. 1997. <http://www.iie.com/publications/pb/pb.cfm?ResearchID=94>

[38] Kauffman Foundation. "Young Firms Lead Recovery in Hiring and Creation" Nov, 28, 2012. <http://www.kauffman.org/newsroom/2012/11/young-firms-lead-recovery-in-hiring-and-job-creation-according-to-kauffmanfunded-census-brief>

[39] Vidal, Matt. "National Income has Increasingly gone to Profits Instead of Wages, Leading to Slower GDP Growth" American Sociological Association's Organizations, Occupations, and Work Section. April 15, 2013.<http://workinprogress.oowsection.org/2013/04/15/national-income-has-increasingly-gone-to-profits-instead-of-wages-leading-to-slower-gdp-growth/>

[40] Todrin, Donald "What percent of your revenue should be allocated to your payroll?" Second Wind Consultants. December 13, 2008. <http://secondwindconsultants.net/blog/2008/12/13/what-percent-of-your-revenue-should-be-allocated-to-payroll/>

[41] Galston, William A., *Closing the Productivity and Pay Gap*. Wall Street Journal. Feb 19 2014 < http://online.wsj.com/news/articles/SB10001424052702303945704579391070814416410 >

[42]"Sales as a Percentage of Operating Expense." Society for Human Resource Management. <http://www.shrm.org/research/articles/articles/pages/metricofthemonthsalariesaspercentageofoperatingexpense.aspx>

[43] Bureau of Labor Statistics. "Employment Situation Summary - March 2014" April 4, 2014.<http://www.bls.gov/news.release/empsit.nr0.htm>

[44] Leduc, Sylvian. Wilson, Daniel. "Highway Grants: Roads to Prosperity?" Federal Reserve Bank of San Francisco. November 26, 2012 <http://www.frbsf.org/economic-research/publications/economic-letter/2012/november/highway-grants/>