Imprisoned Jobs, Imprisoned Workers: The Relationship between Prison Population and Free Market Labor

1) Introduction

This paper is part of a broader research that is looking to the interaction between labor market and the prison population. As a first step of the research I am looking how the conditions of labor market are affecting the prison population.

Particular strata of the labor market, I am going to focus on, is the market of low wage jobs. I expect that the particular workers who are participating in this market will have less wealth accumulation, less connection, a limited education. Increase in unemployment rates, and change in wages in low wage market is expected to have a more significant effect in the lives of the workers participating in this market.

It should be noted that increase in prison population depends on different factors. First increase in the crime rates would increase the number of prisoners in case number of people arrested per crime remains same. In case the crime rates remain same but more people are arrested per crime committed this would also increase the number of prisoners. Thirdly in case length of sentences per crime gets longer, this would mean same criminal will stay for a longer time in prison, which would increase the overall prison population.

Labor low wage market can affect each of these factors that are influencing the prison population.

Both high unemployment rates and low wages might push the workers in this market into illegal activities, either because they might expect to get higher or they might not get any other choice. Also a significant decrease in income level might decrease the life standards of the workers in this market below the level, which they need to maintain in order to maintain their psychological health. As a result decrease in wages in low wage job market might increase the violent crimes and drug offences committed and use of drugs by the workers within this market.

As unemployment within low wage labor market increases, and wages fall, fourth force might be created as a result of expansion of the police force. Especially the municipalities might respond to the worsening low wage labor market conditions, by hiring more police force. As a result police department might want to justify their expansions, by arresting more people.

Lastly as conditions in low wage labor market get worse, this might increase the tensions between workers within those markets and the remaining part of the society. As a result, the remaining part of the society might prefer to exert a stronger control on the particular part of the society which created supply for the low wage labor market. They might do that, by increasing the police force, increasing sentences for the crimes, and worsening conditions within the prisons.

The second part of my paper is the literature survey. The third part is time series data analysis. In this part I am going to first show the basic time series trends of prison population and two labor market parameters average wage and unemployment. Then I am going to make specify other parameters that are expected to affect the prison population and make an econometric analysis. In the fourth part I am going to make same analysis using panel data on USA states. In the last part, I am going to look how labor market parameters as well as other parameters affect prison population through specific channels, namely through crime rates, through arrest/crime ratio, and through length of prison sentences. In this part I am going to discuss each specific hypotheses I have specified above, and particular evidences in favor or against those hypotheses. Last Part is the conclusion.

2) Literature Survey

First we are going to look to the articles that are describing overall trend of prison population increase. As stated by Wakefield and Uggen (Wakefield, 2010), USA prison population per 100000 people is highest in the words with a rate around 750 per 100000. It should be noted that finding the reasons for increase in prison population is a difficult tasks, since the reasons on the surface might easily hide the reasons which the core factors that are affecting the crime. Blumstein (Blumstein, 1988) discusses possible trends leading to increase in prison population and possible ways to reverse the trend. He wrote that the black/white population ratio is very high throughout USA, ranging from 3 in South Caroline to 22 in Minnesota. According to Blumstein's research in USA there are 23 prisoners per murder, and only 0.88 prisoners per robbery. In both cases USA is in the middle of the list compared with other countries Blumstein has in the list. In case of prisoner/murder ratio UK has the highest number 66 prisoner per murder, and Sweden lowest number 3.3 prisoners per murder. In case of prisoner/robbery ratio New Zealand has the highest number with 8.1 prisoner per robbery, and Sweden again has the lowest number, which is 0,45 prisoner per robbery. According to Blumstein three responses that could be taken against the prison population increase is, finding other types of punishments, which he names as front door policy, reducing sentence lengths which he calls backdoor policy.

Davenport introduce in his report some date for specific states. (Davenport, 2010) According to the report the prison population growth rate between 2000 and 2008 in Arizona was 5,1% annually, in Colorado 4.1, in Utah 1,9, in Utah 0,8. He also wrote that the in 1979 in Arizona 4,3% of state budget was spent for the department of corrections, in 2010 this number become 11,2%. Davenport also suggests that other punishment alternatives besides prisons should be considered in addition to the prisons. According to the report prepared by James (James, 2013) cost of prisons has risen from 0,2 billion to 7 billion $. Same report also shows in newly constructed prisons cost per inmate is also increasing.

Next how three particular factors, namely how the role of the crimes, arrest/crime ratio and sentence lengths in increase in prison population will be looked. Mallik-Kane,

Parthasaraty and Adams, (Adams, 2012) looked the major crimes that lead increase in the federal prison population between 1998 and 2010. They found out that increase in crimes related to drugs is the leading crime that leads to increase in prison population. Other crimes that are affective in increase of prison population are crimes related to public order, immigration and weapons. There is some increase in property offences and almost no increase in violent crime offences in that period. It should be noted however in this paper, the increase in crime is not thought as the major reason that lead to increase in prison population. The expected time served in the prison is according to the paper main reason that leads to an increase in prison population. According to their analysis one third of the increase in prison population between 1998 and 2010 is caused by changes in prison sentence length.

Ehrlich (Ehrlich, 1996) in his article model a crime market, where supply of crime is affected by positive incentives, namely whether there are better options outside crime market. Demand in market is a kind of negative demand, namely demand to reduce crimes. So demand creates negative incentives, namely increasing the risk and intensity of punishments, in other words increasing expected cost of crime.

How affective prisons are in reducing the crimes is something discussed by Nangin (Nangin, 1978). The empirical work done by Nangin found no correlation between length of sentences, punishment risk and the crime rates, in other words his empirical work shows that prisons aren't an effective way of reducing crimes rates.

Another paper written on this issue was written by Corman and Mocan (Corman, 2005) basically introduce "broken window" approach of New York City mayor Giuliani. Giuliani argues that tolerance of small crimes lead to an increase in more serious crimes, so in order to reduce crime in general, the people committing small crimes should pay for it. In other words, the arrest/crime ratio for small crimes should be increased, so that crime rates can fall down. According to Corman's analysis almost in all crimes as arrests increase, crime rates fall down.

Also according to Spelman the risk and intensity of punishment was most effective factor in reduction of crime rates in 1990's in Texas, while demographic factors especially migration was a factor which was slow down the fall of the crime rates in USA. (Spelman, 2005) According analysis made by Levitt (Levitt, 1996) using cross-sectional data of states punishment is especially effective in reducing crimes of burglary and larceny. Adding one more prisoner will reduce 2.6 reported larceny cases and 1.3 reported burglary cases. The effect of punishment is very little in case of murder and rape, adding one more prisoner reduces only 0.004 reported murder cases and 0.031 rape cases.

King, Mauer and Young for example (King, 2004) wrote on the trend of life sentences and in general on sentence length. According to the data analysis they made in USA at national level average sentence length increased from 21 years in 1991 to 29 years in 1997. Percentage of people with life sentence increased from 18% to 26% between 1992 and 2003. In his data analysis made for the years between 1977 and 1995 in USA,

Spelman (Spelman, 2009) found that sentencing policies and crime rates are both effective in increasing prison population.

Now we may look how the effect of labor market on prison population is discussed in literature. Chrious an Dolene (Chorious, 1992) wrote in their article, the literature is rich both in developing theories that show the relation between surplus labor (unemployment) and the prison admissions, and testing those relations empirically. The relation between two parameters are strong according to them, even though how different factors building relations between two parameters are interacting with each other is something that is not much studied in the literature according to them. Jancovic (Jancovic, 1977) wrote the relation of labor market and the imprisonment rates is affected by production relation. He wrote at times of crises and high unemployment the punishments become more severe, both because incentive of crime increases, and a higher prison population is a way to reduce unemployment to acceptable levels. In his data analysis, he found high correlation between unemployment and prison population for the post war era, especially for state prisons. He wrote that in the Great Depression Era, probably as a result of New Deal, which changes political structure of USA completely, the correlation between two variables doesn't exist.

Freeman (Freeman, 1994) writes in his article one of the important variables that might be affective in increase in prison population might be earnings from the crimes, as earnings from the crime get higher compared with earnings from the legal work, crime rates might increase. According to the analysis made by Edmark (Edmark,2005) in Sweden between 1988 and 1999 unemployment is effective in increasing the property crimes but it is not a significant factor in increasing violent crimes. The theoretical model they use just represents crimes as choices individuals face, and as income of people increase, opportunity cost of crimes would increase so that less people will choose to commit crime. Similar results are found by Raphel and Winter-Ebner (Raphel, 2013) using panel data of USA states between 1971 and 1997 period. Box and Hale (Box, 1982) found that similar correlation for England and Wales 1949- 1979 data.

In his article Spelman writes that the elasticity of crime, with respect to unemployment is crime rates, highest at local level, and lower at federal level. (Spelman, 2005) He also wrote that economic factors were effective in reducing property crime rates in 1990's in Texas, but not very effective in reducing violent

Next we will see what a place the low income groups have within the literature that is discussing prison population increase. One of the most interesting studies on this issue was done by Bass and Dobbins (Bass, 1958). Bass found out unemployment was more correlated in Louisiana between 1941 and 1958 with correlated with prison admissions of white, who have a higher monthly income, in other words, who are part of the high income labor market. In case of black people, who have low income the correlation is low. Bass states that this is mainly because the unemployment compensation the black people get is higher relative to their income levels, compared with the compensation get by white people, which also means people with relatively higher income level.

Moreover he argues that unemployment lead to a higher decrease in socioeconomic status of whites with respect to black people.

Particularly Pettit and Western show that the education and race plays important role in prison admissions in their various works. In their article published in 2000 (Pettit, 2000) they show that between 1982 and 1996 prison admissions of all groups have been increasing. They also show, for all three low income group, namely uneducated, young and black males the percentage of people admitted to the prisons was and remained higher. For whites whose age is between 18 and 65 the percentages of people in prison increase from 0.54 to 1.12, for blacks within the same group the percentage increase from 3,6 to 7,5. For white males whose age is between 20 and 35 the ratio 0,88 to 2.22, for whites it increased from 5.55 to 12.2. For the high school dropouts within the same age group, the ratio for whites increased from 3,5 to 7,4, for blacks it increased from 15,4 to 36. In their article written in 2002 they wrote, percentage of high school dropout males between ages 30 to 35 ever incarnated was 10% for whites and 40% for blacks in 1989, in 1999 the ratio become 15% for white and 60% for blacks. The overall ratio is in 1999 5% for white males, and 20% for black males. According to data they provided in their 2004 article (Pettit, 2004), between 1974 and 1997 percentage of people in state prison who were high school dropouts decreases significantly from 62% to 40%. The percentage of high school graduates without collage degree increased from 27% to 50%. Percentage of collage graduates remained constant at 11%. Percentage of white population in state prisons in the same prisons fell from 45% to 33%, black population ratio remained constant at 46%, while Hispanic population increases from 6% to 11%. At federal prisons between 1991 and 1997, both percentages of high school dropouts, high school graduates increase 2% while percentage of college graduates fell 4%. Both percentage of white and Hispanic population fell in the same period, white prison population fell 9%, Hispanic 1%, while black population increase 9%.

Waqcuant (Waqcuant, 2001) wrote in his article, the increase in black prison population rate is one of the policy tools to keep the socioeconomic status of black population at low level. He argues that slavery, Jim Crow Laws, and black ghettos were all institutions that were serving to the same purpose. He wrote that as a result of Civil Right Movement, the effectiveness of black ghettos decrease, so the prisons took over as the primary institution that keep the status of black population low.

The reasons of increase in prison population after 80's are widely discussed in the article Caplow and Simow (Caplow, 1999). According to Caplow and Simov increase in the wave of crimes, created fear towards the dangerous classes, which are the people who belong to the lower stratum according to them, as a result; the policies against criminals changed according to them. In a way the increase in the crime rates made the classes who are in the lower strata more suspicious, so the control over them was increased, increasing number of people from these groups join to prison population.

As it was mentioned before changing age composition was also taken as one of the factors driving the increase in prison population by Blumstein (Blumstein, 1988).

Lastly we can look to the other factors mentioned in the literature as factors that are related to prison population increase. According to American Civil Liberties Union, private prisons are one of the factors that lead increase in the prison population. (American Civil Liberties Union, 2011) In their report they mention, that when prisons are privatized, it become necessary to keep the prison population high so that private prisons can keep their profit levels high. As a result, especially the state legislatures might be pressured to pass laws that will keep prison sentence lengths for crimes high.

Blumstein argues that changing age composition and the politicization of imprisonment, which lead to decrease in number of parole releases. (Blumstein, 1988) Caplow and Simon also argue that (Caplow, 2013) politics may have played an important role in increasing prison population, he argues, that as fighting with crimes become more important issue, especially in case of drugs, longer prison sentences may become a norm. He also argues, when the moral system of the society begins to be opposed, this might lead to a panic, which might end up with less tolerant justice system. In his article Smith make an analysis using data of 49 states for the years 1980 and 1995, he find out that republican successes in state elections was an important factor that lead to increase in prison population. (Smith, 2004)

Clear states in his article that actually incarnation might increase the crime rates. (Clear ,1996) This is mainly because when more people go to the prison, being in prison will become something more normal. In other words increasing prison population will have according to him a positive feedback effect.

Donohue and Siegelman (Donuhue, 1998) discuss in their paper whether shifting resources from incarnation to welfare programs will reduce crimes. They conclude that the welfare programs have some negative effects on crime, but whether benefit created by them is worth the cost is something questionable. Using census data of 1960, 1970 and 1980 of USA, Lochner and Moretti (Lochner, 2001) find out that high school graduation reduces crime rate significantly. They wrote, that 1% increase in graduation rate among males save USA 1.4 billion$ as a result of reduced cost of crimes.

Hulling (Hulling, 2002) wrote that especially for rural economies prisons might increase economic activity. So we might conclude that in case of low economic activity in states with high number of prisons, especially federal prisons, the demand for more prisons and prisoners might increase.

3) Time Series Analysis

In this part, using the data for the years between 1981 and 2011, time series analysis will be made, where the relation of several labor market variables and other variables will be tested.

3.1) Overview of Data (Trends and Basic Correlations)

The data I am using for the time series analysis, contain one dependent variables, and 10 independent variables. The dependent variable is increase of prison population per

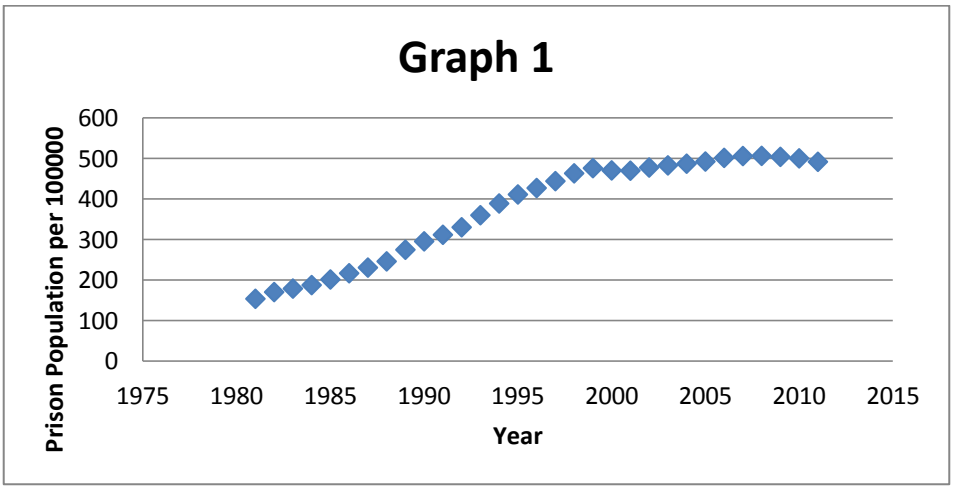
10000 people in USA, which is derived using prison population per 10000 between 1980 and 2011. The prison population itself is a dependent variable, which is showing the feedback effect created existing prison population on the rate of increase.

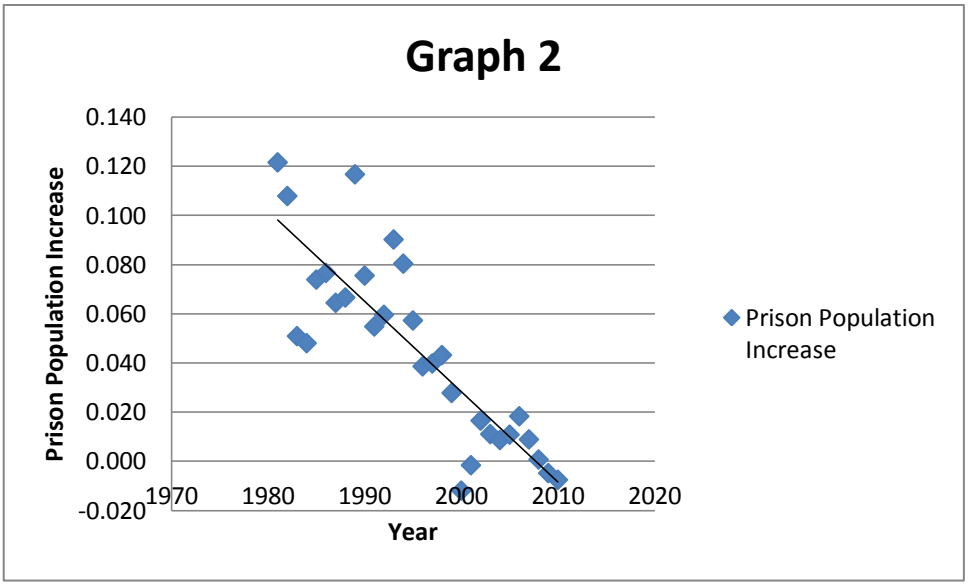
There are four labor market variables, avarage wage of nonsupervisory workers working in production, the wage gap, the unemployment rate and average unemployment length. There are four variables that are measuring demographics, namely percentage of the hispanic and black population, percentage of the population under 30, and percentage of population with a university degree. There are two variables, representing political structure, the number of republican seats in congress, and a dummy variable that is measuring whether having a republican president in power has any effect on prison population. It should be noted that most of the independent variable are expected to have and effect on each other. Unemployment and wage are expected to be interrelated, as it was discovered by original Phillips Curve Analysis, as well as wage rate and the variables related to demographics. It is reasonable to expect a relation between political structure and labor market variables.

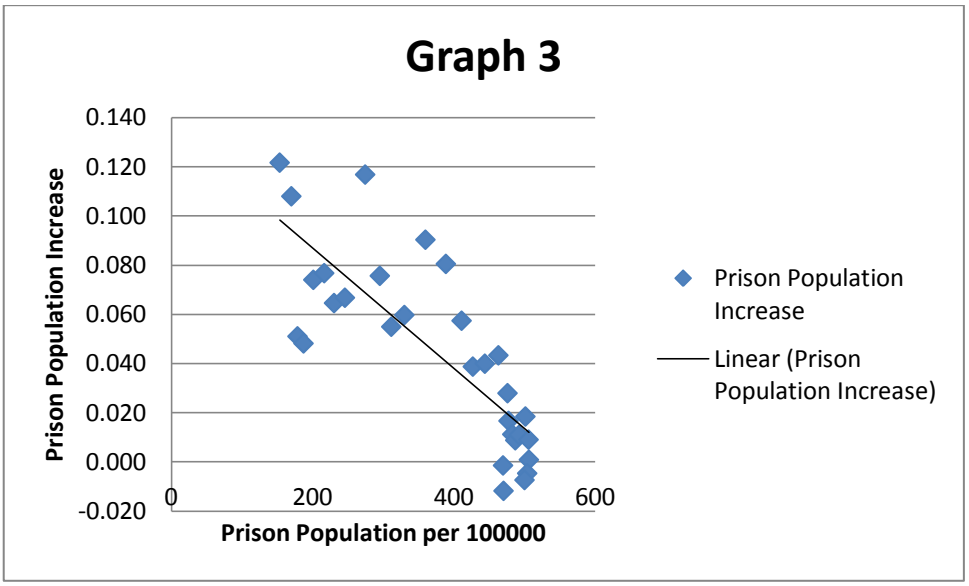
In addition to the main variables I have also created four indexes, the indexes measuring labor market characteristics, one demographics, and one representing political structure. So in this analysis, correlations are expected to look like weaker than they really are, so any strong correlation found in this part for an independent variable, can be regarded as a strong sign for a significant relation between prison population and that variable, but having no correlation should not make us reject a possiblility of relation completely.

Prison Population Increase

You can see on graph 1, 2 and 3 the prison population trend in USA.







Prison population data is taken from Bureau of Justice Statistics, and it is the number of sentenced prisoners under the jurisdiction of state or federal correctional authorities per 100,000 U.S. residents. Prison population in USA kept increasing between 1981 and 2006. The increase is from 153 people per 100000 person to 506 people per 100000 people in 2006, which means it increased 12% per year. Between 2006 and 2011, it declined slightly from 506 to 492. The rate of increase of prison population was positive, but it was mostly declining between 1981 and 2011 from a rate equal to 12% per year to a rate that is equal to – 1,7% a year in 2011. So it is possible to conclude that in general when prison population was low, increase in prisoner population was high, while when prison population was high, increase in prison population was low.

This particular trend could be explained in several ways. First, high number of prisoners might be creating a credible treat on the population outside of the prisons, which might in turn decrease the crime rate, and number of new prisoners who are sentenced. If this hypothesis is true, than the counter hypothesis that was stating prisons are actually

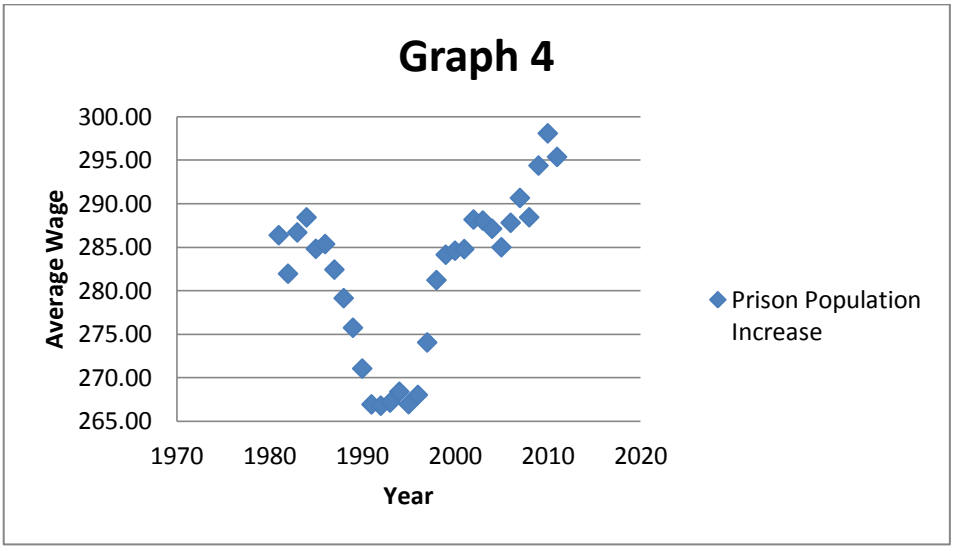
transforming the people who accidently commited the crimes to carier criminals and therefore increasing crime rates, should be wrong. Or at least if there are two opposite effects created by prisons affecting the crime rates, the one that is decreasing crime rates should be stronger.

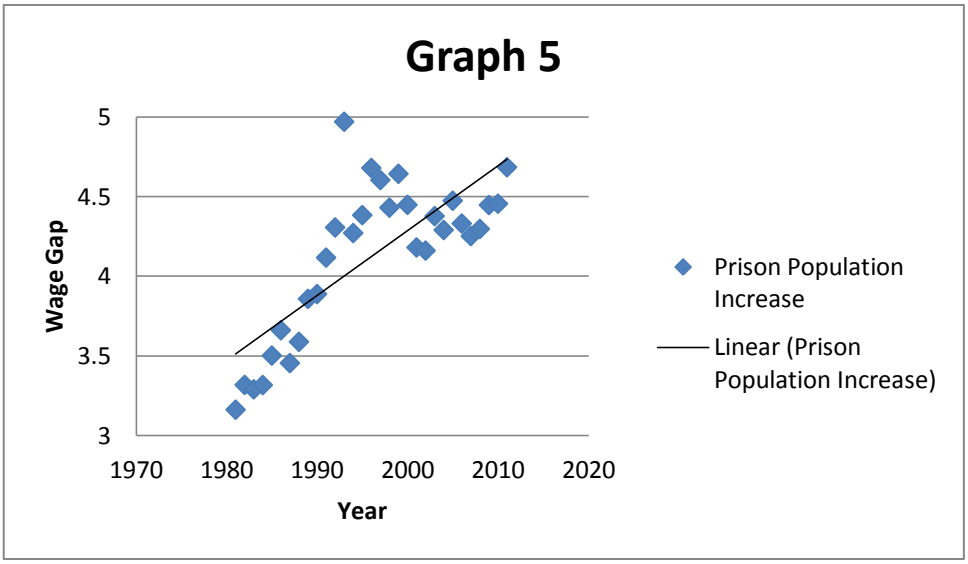
We should note however the fact the prison population increase was falling, doesn't necessarily mean number of people who are arrested is also falling. The rate of increase of prisoners is equal to number of people getting in, and number of people getting out. So as the total number of prisoners get higher, since number of prisoners getting out of prisons (after completing their sentence) will also get high, even if number of new prisoners sentenced remain same, the net increase of the number of prisoners will fall.

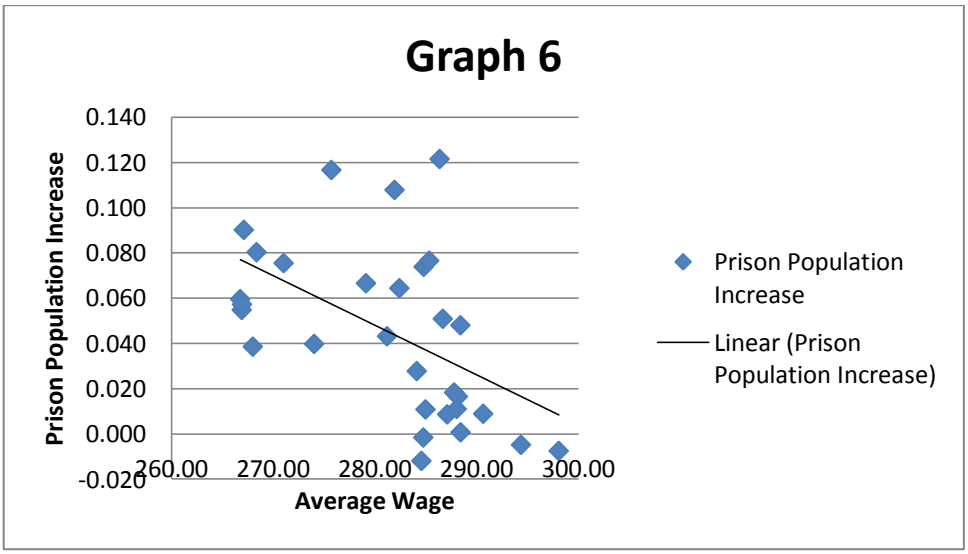
Lastly we should also take into account the effect created by the increasing costs of prisons. As number of prisoners per USA resident gets higher, more and more resources should be directed to the prisons. This in turn, might create some pressures to reduce number of prisoners. It should be noted that increased costs of prisons also create a pressure to reduce the cost of prisones per prisoners, which can be a driving force behind employing more prisoner labor inside of the prisons, and privatizing the prisons, which might in turn transform the prisons into production units.

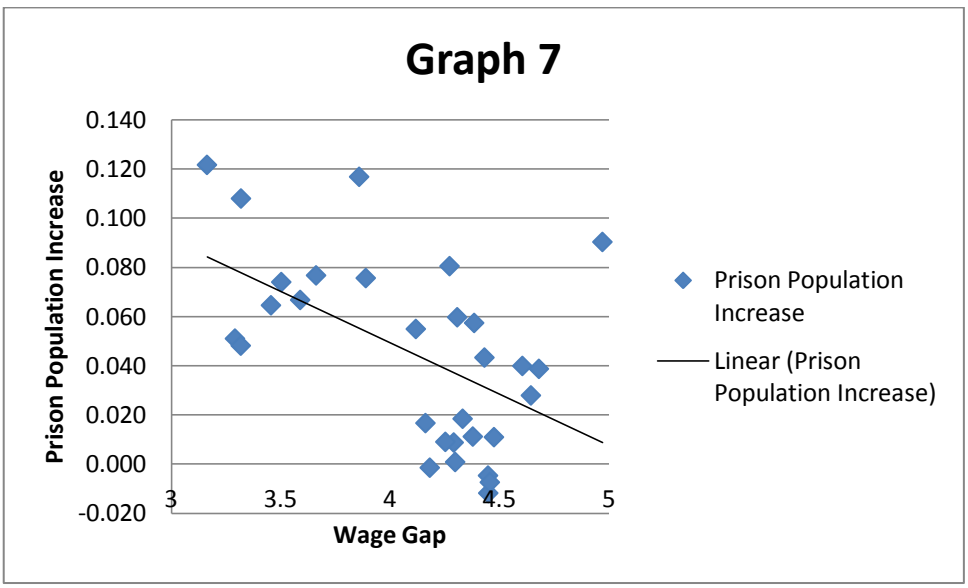
Average Wage, Wage Gap and Adusted Wage (Labor Market Variables 1, 2 and 3)

The graphs show basic trends of average wage and the wage gap.




Graph 5
Wage Gap
5
4.5
4
3.5
3
1970
1980
1990
2000
2010
2020
Year
Prison Population Increase
Linear (Prison Population Increase)


Graph 6
Prison Population Increase
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
260.00
270.00
280.00
290.00
300.00
Average Wage
Prison Population Increase
Linear (Prison Population Increase)


Graph 7
Prison Population Increase
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
3
3.5
4
4.5
5
Wage Gap
Prison Population Increase
Linear (Prison Population Increase)

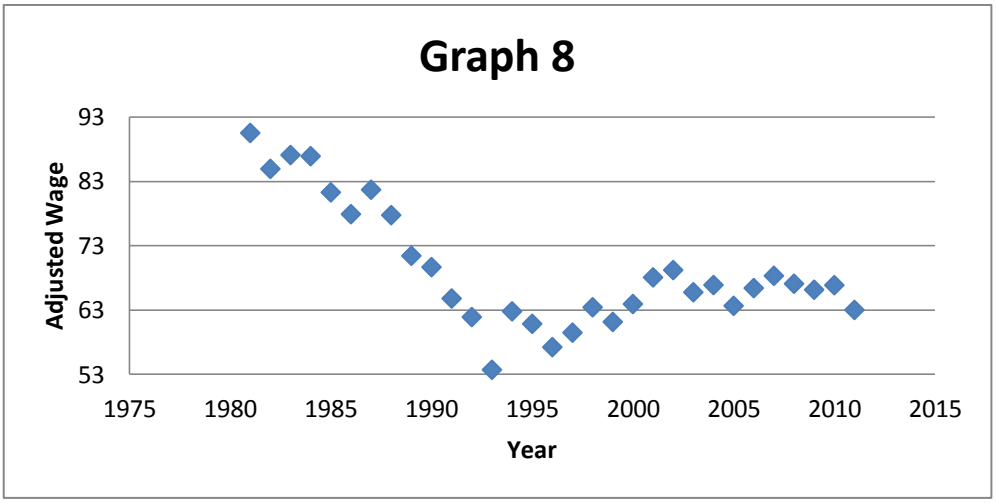
The average wage shows average weekly earnings of production and nonsupervisory employees in 1982 and 1984 dollars, and the data is taken from BLS. Wage gap is calculated by using the data taken from USA census, which shows average yearly earnings of people with different level of education in different ethnic groups. I have taken the average wage of a white person with an advence degree as the wage1, and I take average value of the average wage of a black person and a hispanic person without a high school degree as wage2, and calculate wage gap by dividing wage 1 to wage 2.

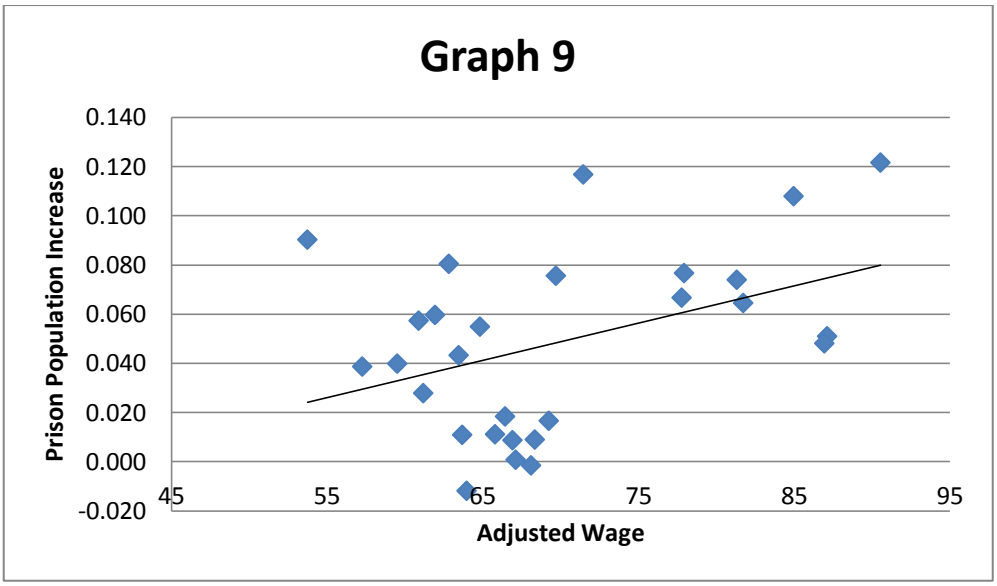
It could be seen on the graph 4 that average wage for production had first fallen down and than increased again. In 1981 the average weekly earnings in production was 286 dollars, in 1992 it fell to 267 dollars, after 1992 it started to increase again, it ultemelty increase to 295 dollars in 2011, which almost a 20 dollar increase. In graph 6, it can be seen average wage is negatively correlated with prison population increase. Immediate possible explanation for this trend is the pull effect created by wages. Namely when wages are high, first people won't need to do crimanal activities in order to stealing, and more importantly, they will have less incentive to accept criminal jobs like drug trade, which will decreaase organized crime. It is also possible to argue that when wages are high.

On graph 5 and 7 it is possible to see the wage gap trend. Between 1981 and 2011 wage gap kept increasing 3.16 to 4.70. In 1980 average wage of a white worker with advenced degree was 25500$, and average wage of a black worker without high school degree was 7500$, while a hispanic worker with same education level was getting 8600$. In 2011, a white worker with advenced degree was getting 90000$, while a black worker without high school degree was getting 17000$ while a hispanic worker with same education level was getting 21000$. Note the wages are representing nominal values. It can be seen on graph 7 that as wage gap increases, prison population increase seems to be decreasing, which is an unexpected result. It is possible to ask whether low wage gap might in some ways increase the number of people sentenced. It is necessary to look to this relation with caution.

Adjusted wage is a variable created by combining the wage gap and average wage. Average wage was expected to be negatively correlated with prison population increase, but wage gap was expected to be positively correlated. So adjusted wage will be calculated by dividing average wage to the wage gap. In other words as wage gap gets larger, adjusted wage will get smaller.

You can see the trend of adjusted wage on graph 8, you can see its correlation with prison population increase in graph 9.

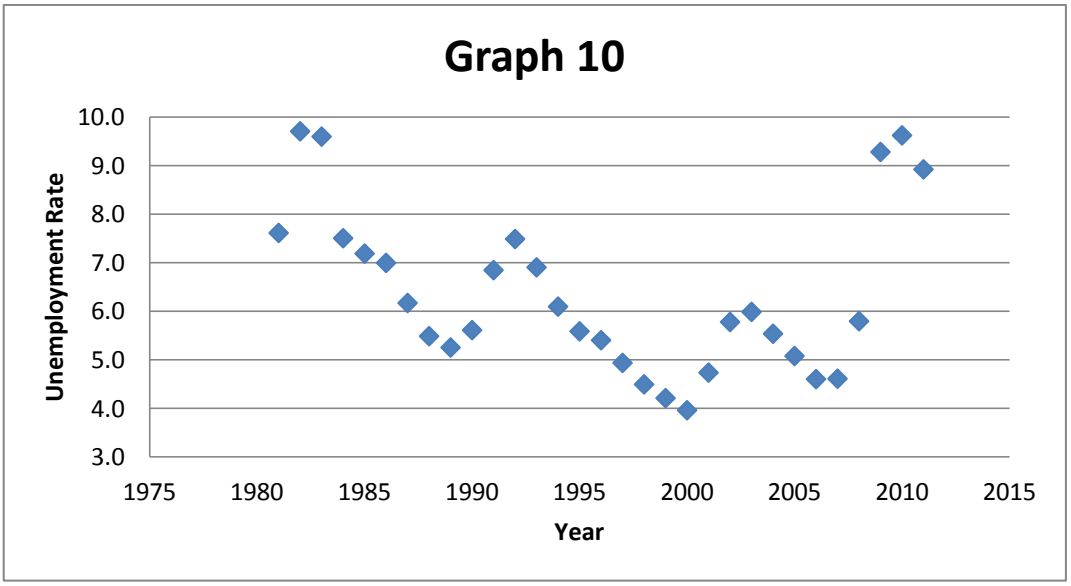


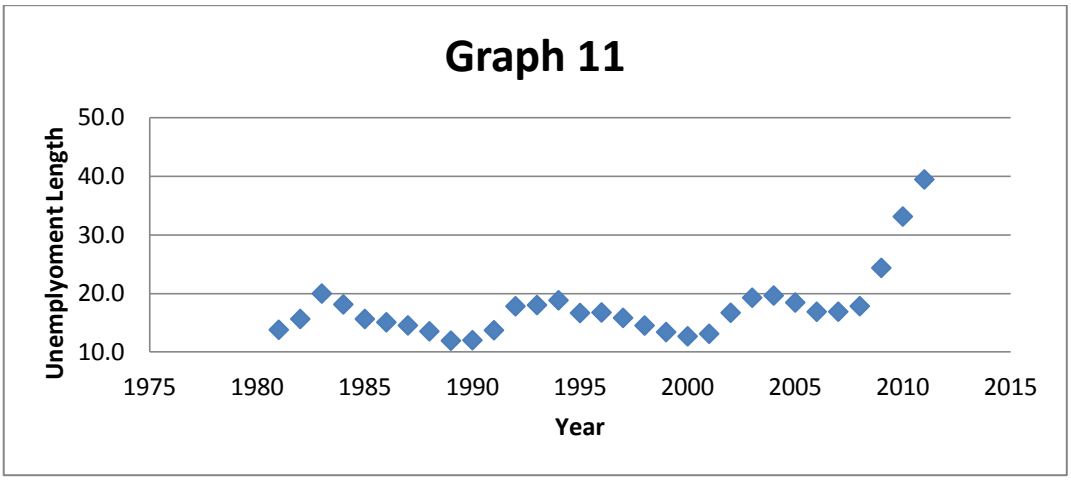


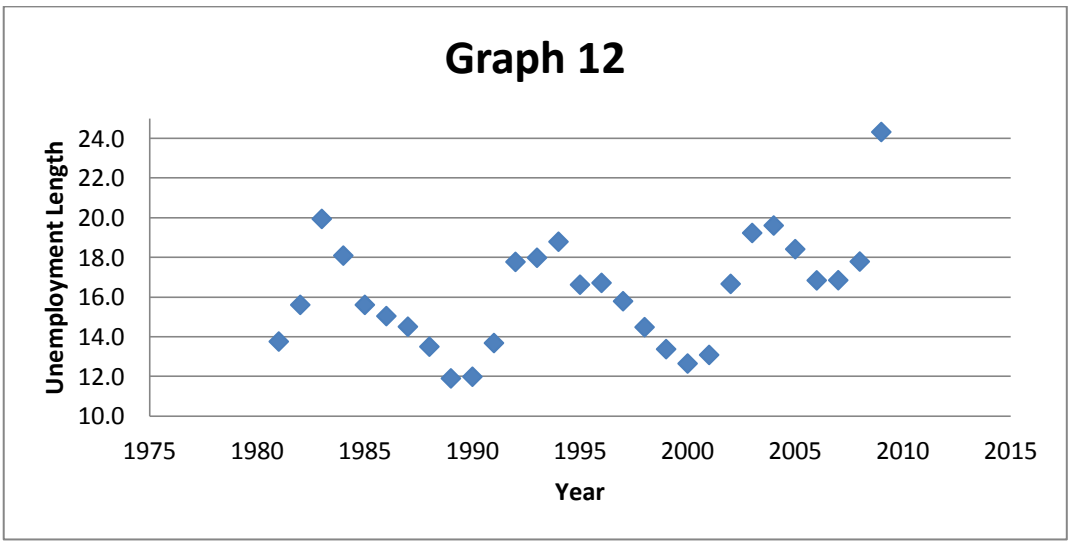
It can be seen on graph 9, that adjusted wage has fallen between 1981 and 1996. In 1981 it was 90.5 dollars, in 1996 it become 57 dollar. After 1996, it has started to increase, it became 69 dollar in 2002 and fluctuated between 69 dollar and 63 dollar between 2002 and 2011. The relation between adjusted wage and prison population increase in positive, which is again a correlation which was not expected.

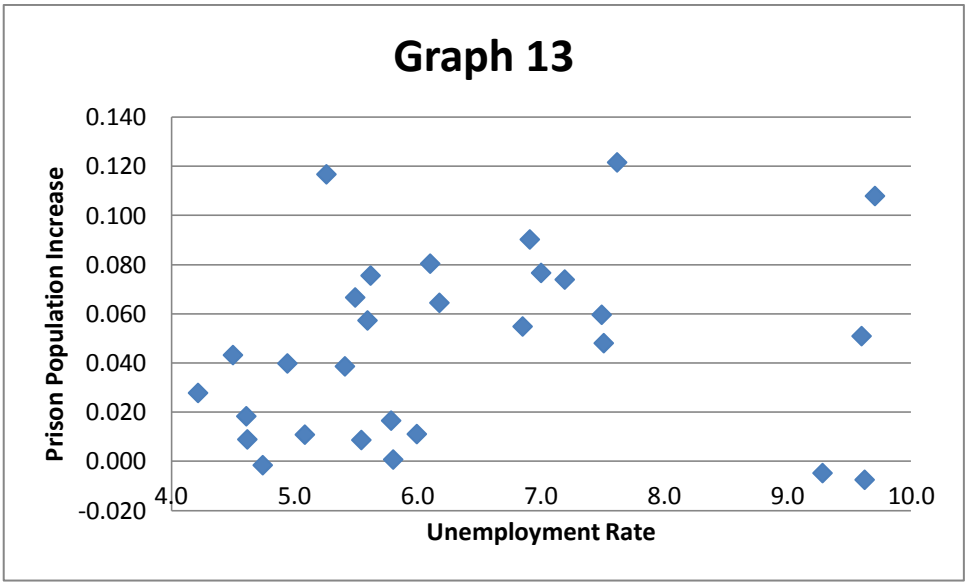
Labor Market Variables 4, 5 and 6 (Unemployment Rate, Length and Intensity)

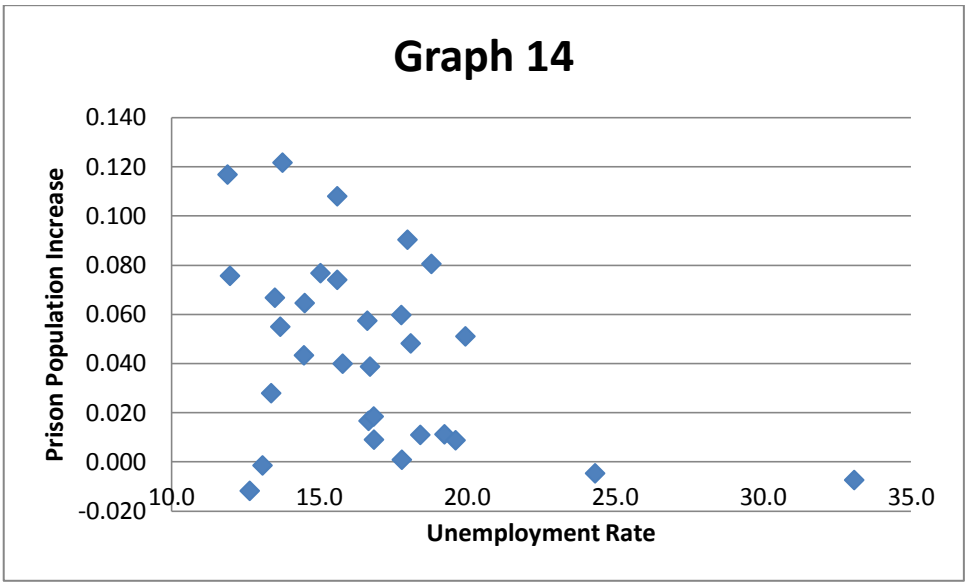
The graphs 10, 11, 12, 13, 14, 15 show the trends of unemployment rate and average unemployment length.


Graph 10
Unemployment Rate
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year


Graph 11
Unemplyoment Length
50.0
40.0
30.0
20.0
10.0
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year


Graph 12
Unemployment Length
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year


Graph 13
Prison Population Increase
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Unemployment Rate


Graph 14
Prison Population Increase
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
10.0
15.0
20.0
25.0
30.0
35.0
Unemployment Rate


Graph 15
Prison Population Increase
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
10.0
12.0
14.0
16.0
18.0
20.0
Unemployment Length

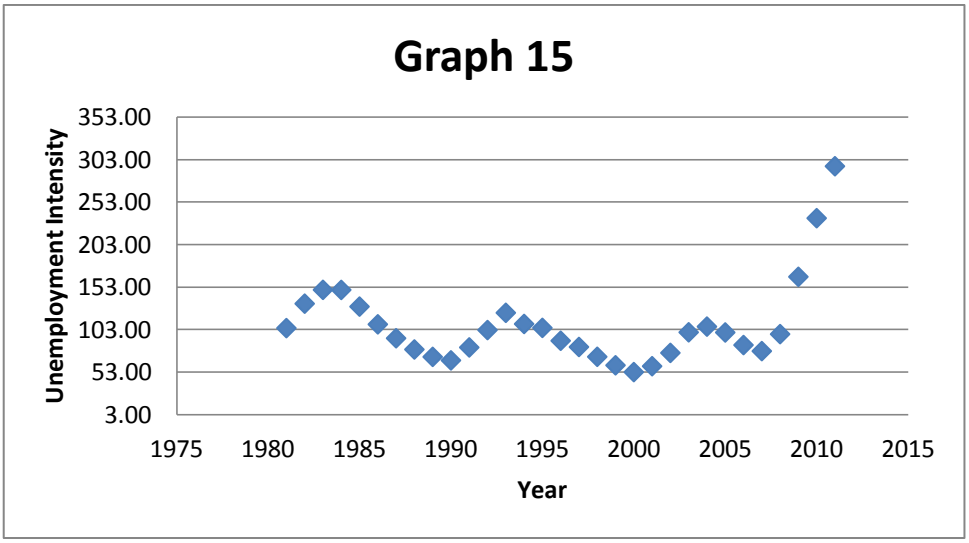
Unemployment Rate Trend can be seen on graph 8. It is possible to see from the graph unemployment came down between the years 1981 and 2000, even though the trend was certainly not a smooth trend. In 1982 it was 9.2%, in 1989 it came down to 5.3%, in 1992 it rise to 7.2% again, in 2000 it came down to 4%, which is the lowest rate between 1981 and 2000. Then unemployment started to rise again become 6% in 2004, fell to 4.6% in 2006 and rise to 9.6% in 2010 and fell to 8.9 in 2011. On graph 11 correlation between unemployment rate and prison population increase can be observed. It can be seen there is no significant correlation between two variables.

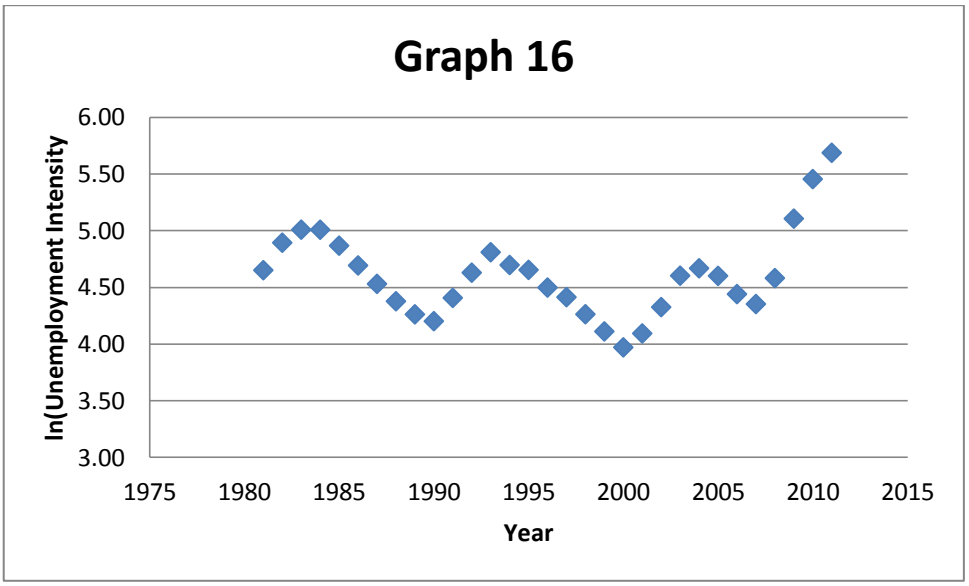
The graph 9 and 10 shows the trend of average unemployment length, which is measured in weeks. The data is taken from BLS data base. It is possible to see that between 1981 and 2008 the trend was cyclical varying between 10 weeks and 20 weeks. After 2008 the length started to increase to record high values for the time frame data is measured. It became 24 weeks in 2009, 33 weeks in 2010, and 39 weeks in 2011. On graph 12 and 13 it can be seen that there is no visible correlation between unemloyment length and the prison population increase.

So unemployment rate and length might not be effecting the prison population increase, or its effect might be more complex. It is possible to expect that when unemployment is high and long, the incentives for commiting property crimes might be higher, because being unemployment might force people to commit crimes to get income. However it should also be noted that since unemployed people are also looking for jobs, they are attached to market, which might mean they are not expected to choose crime as a way to get income permanently, so unemployment might have both a positive and negative effect, which might be cancelling each other.

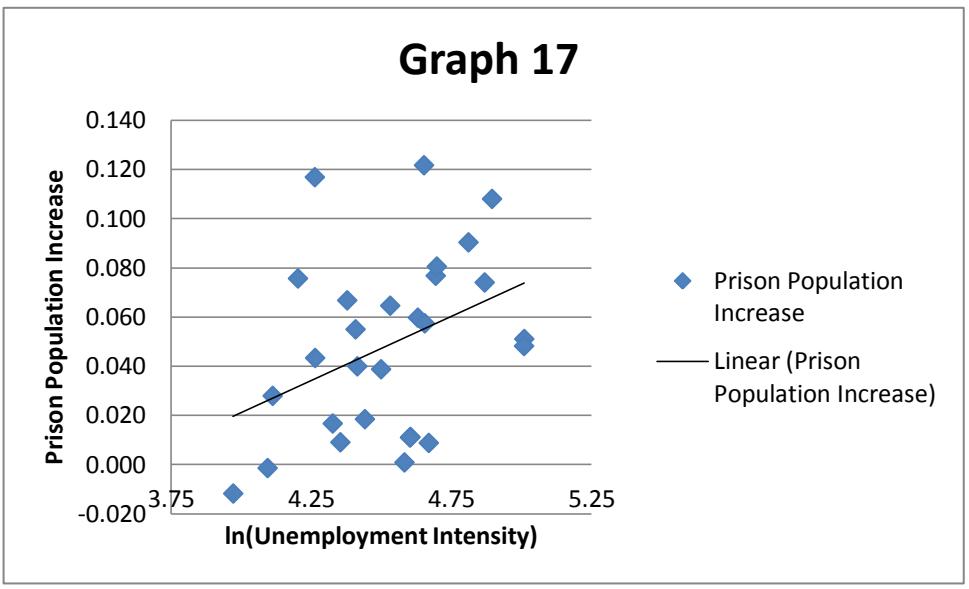
We should also take into account another possibility. Even though two variables seperately not correlated, when both unemployment rate and unemployment length is high, this might have a significant effect on prison population. In order to see whether this is the fact, another independent variable, which will be called unemployment intensity, will be created by multiplying unemployment rate and length.

As it can be seen on the graph unemployment intensity has stayed mostly stable between 1981 and 2008, but in 2009, 2010 and 2011 it has increased drastically. So especially the unemployment intensity in 2010 and 2011 is an outlier. In order to decrease the effect of the outlier, ln(unemloyment rate*unemployment length) will be used in the analysis. You can see on graph , how ln (unemployment intensity) has changed between 1981 and 2011.





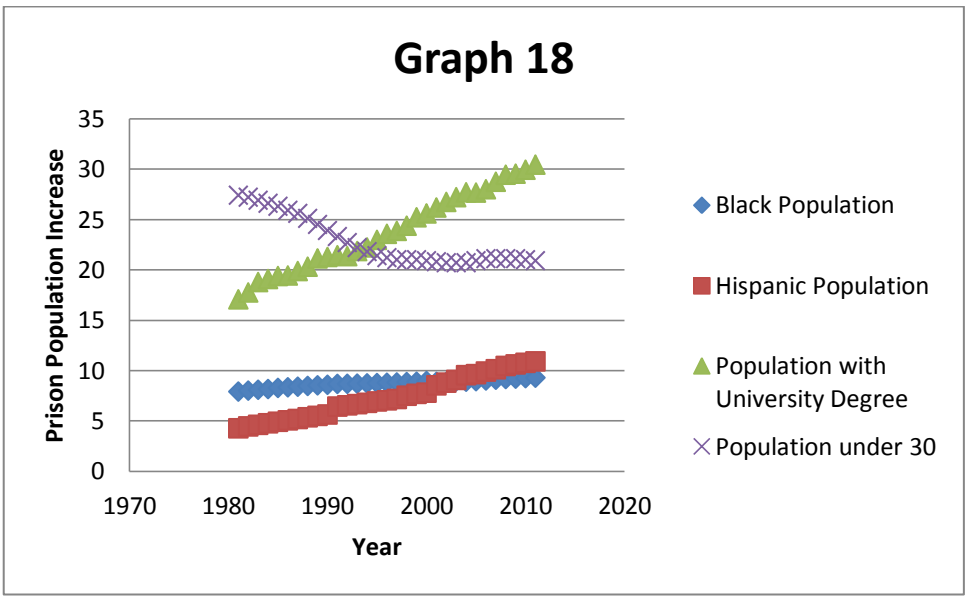
You can see the relation between unemployment intensity and prison population increase on Graph 16.

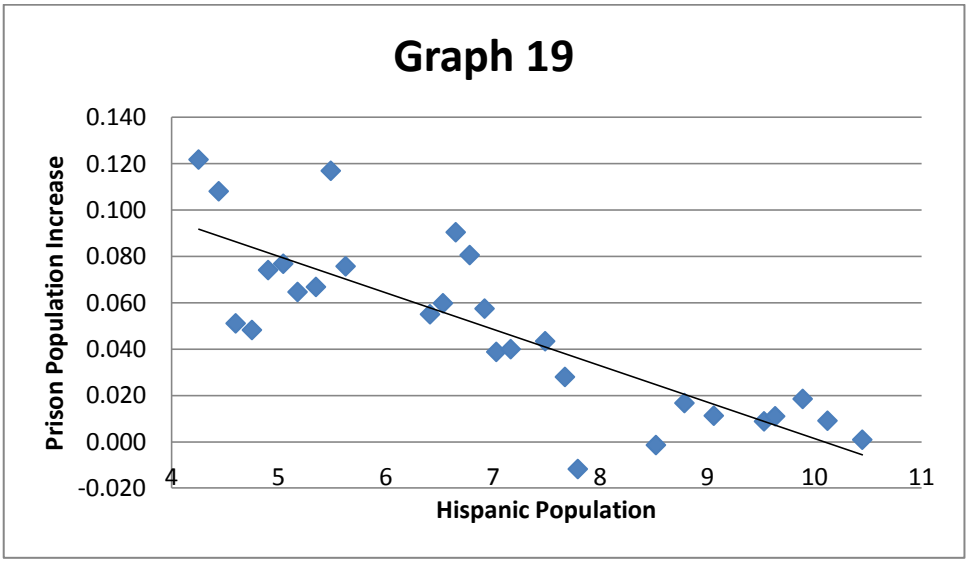


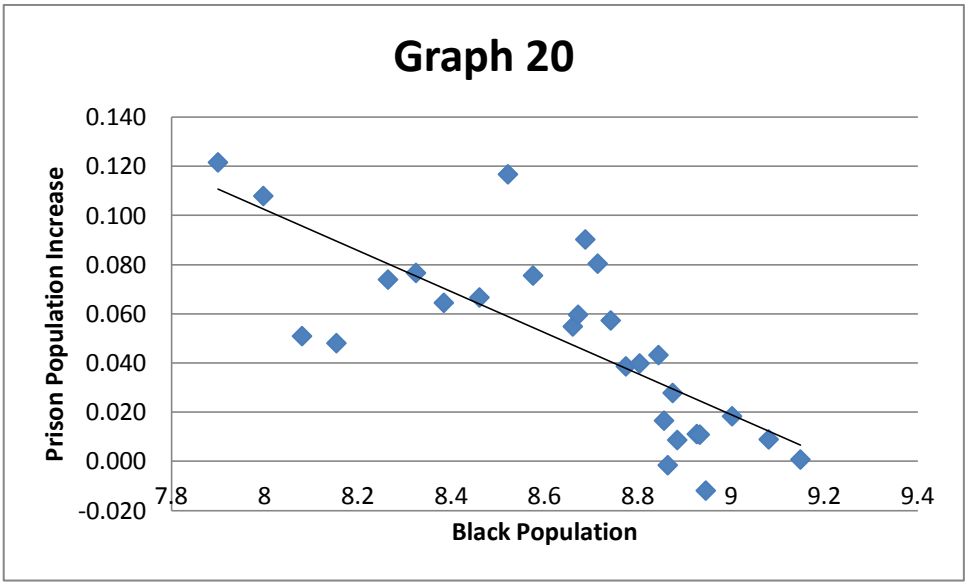
It is possible to observe from graph 16 that unemployment intensity is highly correlated with prison population increase, so unemployment length and rate together might have some effect on the prison population increase. It might be possible that when both unemployment rate and length is high, this might not only force people who cannot find jobs, to commit property crimes in order to survive, it might also send signal to the people outside of the labor market that would make them think conditions in legal labor market are bad. As a result, incentives to following a criminal carriers (like the ones in drug trade) might increase, pulling prisoner population increase rate up.

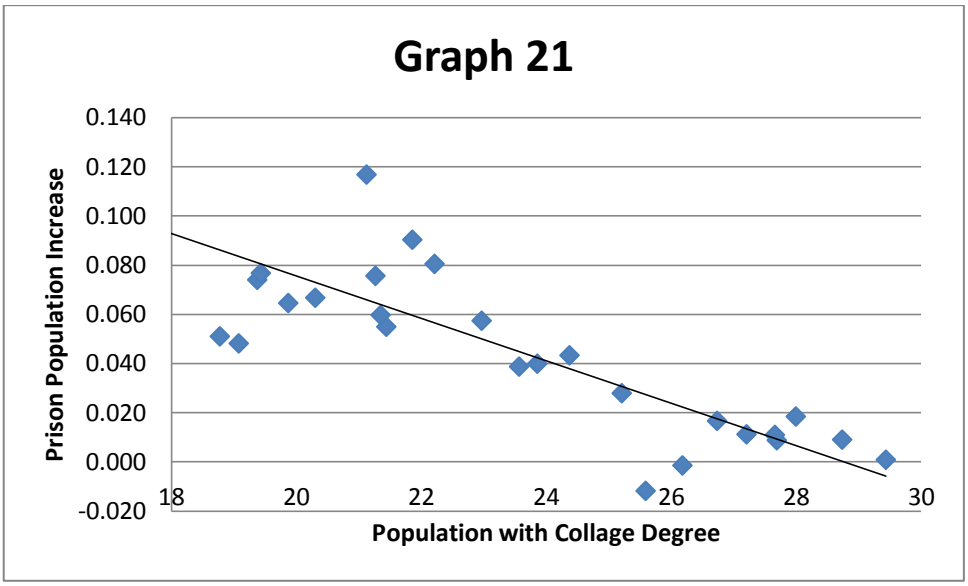
Labor Force Characteristics (Race, Age, Education)

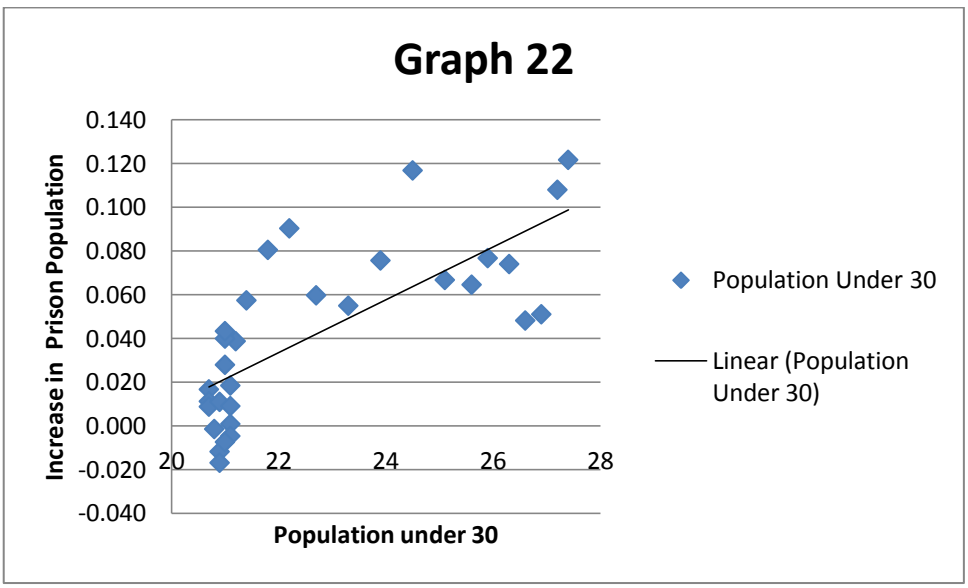
The trend of black, Hispanic Population, age, and education level can be seen on the graphs 18-22 below.






Graph 20
Prison Population Increase
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
7.8
8
8.2
8.4
8.6
8.8
9
9.2
9.4
Black Population


Graph 21
Prison Population Increase
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
18
20
22
24
26
28
30
Population with Collage Degree


Graph 22
Increase in Prison Population
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
-0.040
20
22
24
26
28
Population under 30
Population Under 30
Linear (Population Under 30)

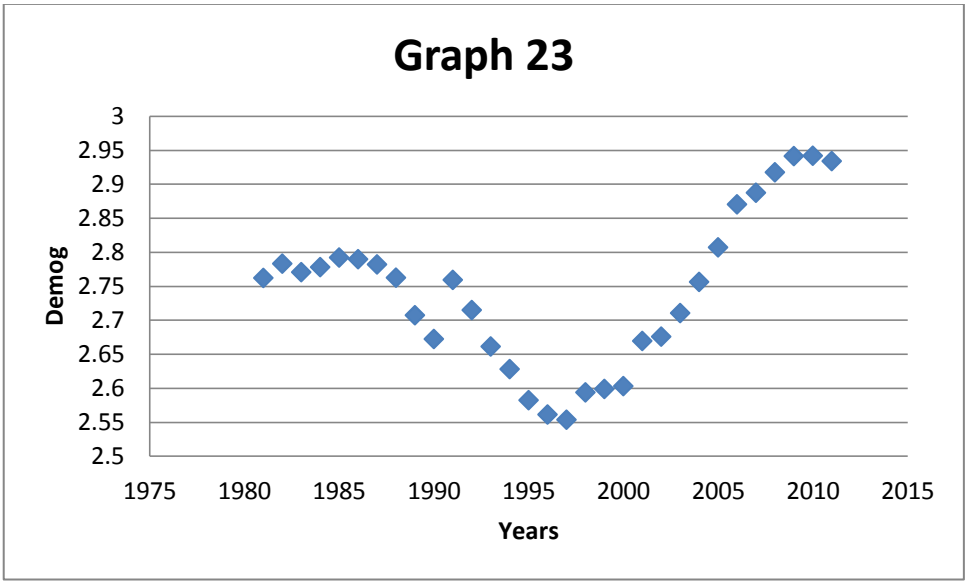
Usually in USA the groups that are initiated with low wage labor groups, which are also associated as the groups who are most likely to commit crime, are black and hispanic people, young people, and people with low education level. It can be seen in graph 18, between 1981 and 2011, the black and hispanic population was increasing, black population increased slightly from 7,9% to 9,3%, while hispanic population increased from 4,25% to 10,9%. It can be seen, that both black population ad hispanic population trends seem to be highly correleted with the prison population increase rate. Suprisingly it seems as black and hispanic populations increase, the increase in prison population gets smaller. It should be noted that at this stage, it is too early to conclude whether the relation between black and hispanic population and prison population is really negative, but one hypothesis that might justify such a relation might be, as black and hispanic populations, gets larger within USA, they might be better suited build organisations which might help the black and hispanics to get better education and better jobs, which might also defend the blacks and hispanics better, if they are brought up to the courts, so the incentives within those populations to commit crime might fall, as well as the members of those populations brought to trials, might be getting shorter sentences than before on average as a result of better defence. Also as percentage of hispanics and blacks gets larger, the tension between the non-hispanic and non-black society and black and hispanics might get smaller, which might in return reduce the crimes created by these tensions.

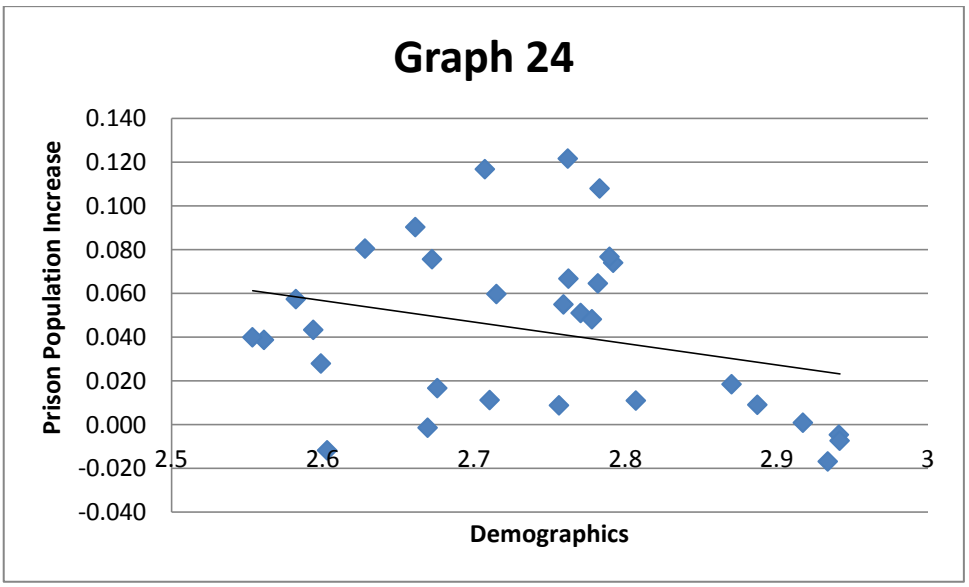
It can be seen from the graph 18 that population with university degree has risen drastically from 18% to 30% from 1981 to 2011 and the increase has been an almost a steady incrase, while the population under 30 27.4% to 20.7% from 1981 to 2002, and it stayed around this value between 2002 and 2011. On graph 21 and graph 22 it can be seen that both population with university education and population under 30, are variables that are correlated with the prison population increase. In both cases, the correlation is as it is expected, as more people get educated, the prison population increase rate decreases, as population under 30 gets relatively smaller, again prison population increase rate gets smaller.

As it was done in previous cases, in order to see the joint effect of all four variables, a demographics coefficient will be constructed. Demographics coefficient will be obtained, by adding up percentages of black and hispanic populations and multiplying it with the population under 30 and population without university degree. The trend of the demographics variable constructed in this way can be seen on the graphs 23 and 24.

When we look to the components of demographics variable, we can see that the components representing ethnicity were increasing in value, while components representing education and age were decreasing in value. So the expected trend in demographics variable is ambigous. It can be seen on graph 23, demographics coefficient decreased from 1981 to 1997 from 2.71 to 2.55. From 1997 to 2010, it increased from 2.55 to 2.94 where it remained in 2011. In general it can be seen on graph 24, that there is a negative correlation between demographics correlation and the prison population increase, which is obviously affected by the effect created by the

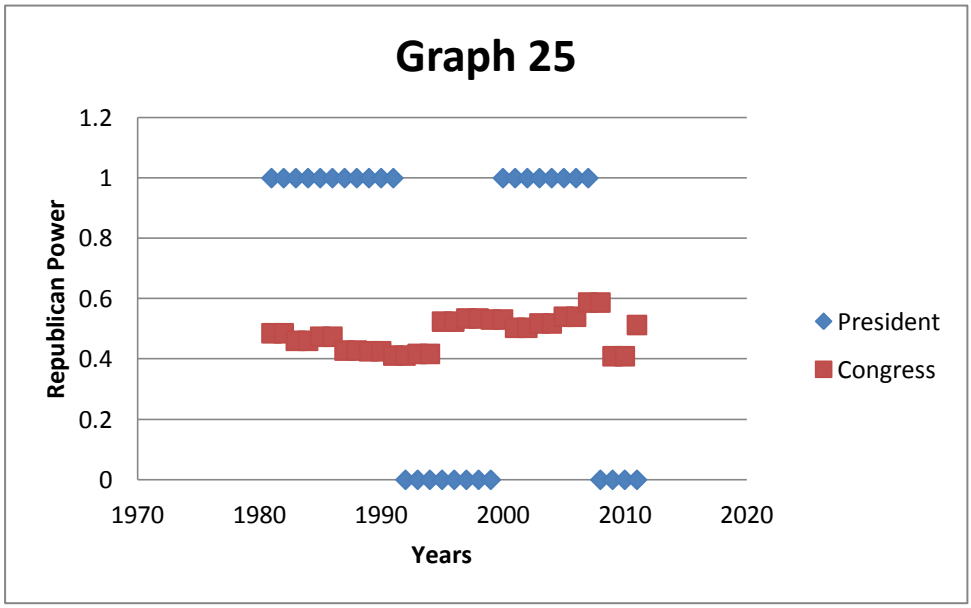
ethnicity. It should be noted that the correlation of demographics variable and prison population increase is not as strong as the correlation between prison population increase and individual compenents of the demographics. It can be seen on the graph 24, there are significant outliers.

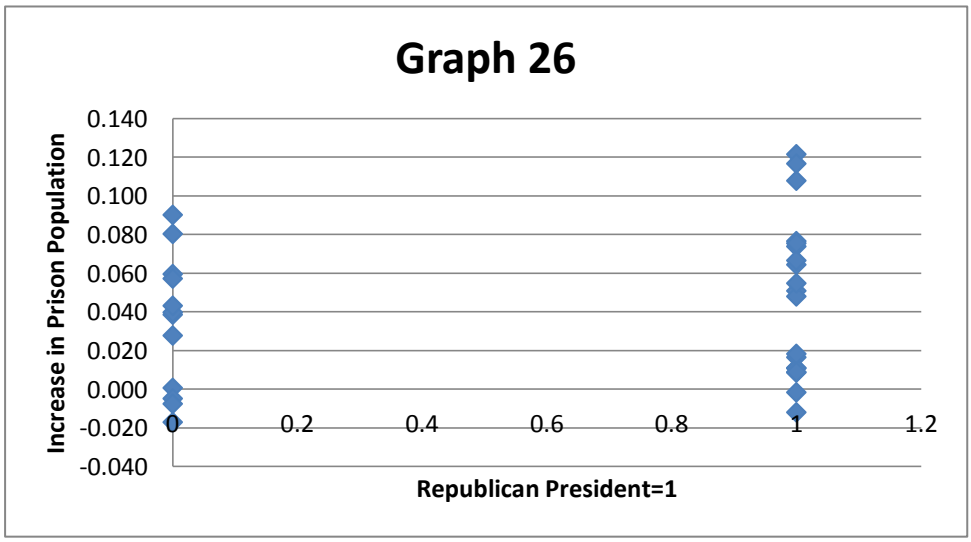


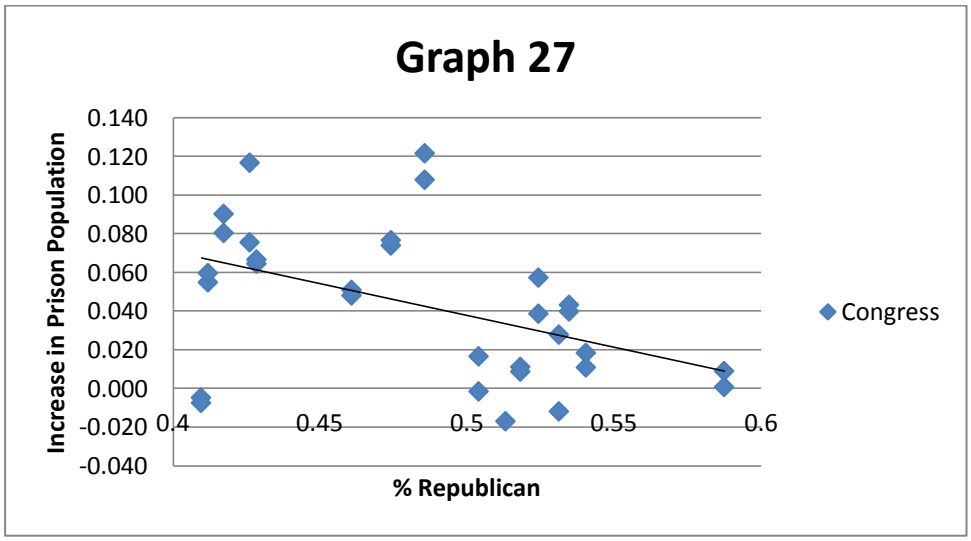


Variables of Politics (Presidency and Congress)

Political structure is one of the most commonly mentioned parameters that might have an effect on the prison population increase. Two parameters are used to take this parameter into account, first one is based on power structure in congress, the second one is the presidency. In order to capture power structure of the congress, the average of the percetage of Republican members of Senate and House of Representatives is taken. The effect of presidency is captured by taking a dummy variable representing this factor, the dummy variable presidency takes the value, 1 when Republicans have the presidency, and 0 when democrates have it. The trends of policitical structure can be seen on graphs 25-27.


Graph 25
Republican Power
1.2
1
0.8
0.6
0.4
0.2
0
1970
1980
1990
2000
2010
2020
Years
President
Congress

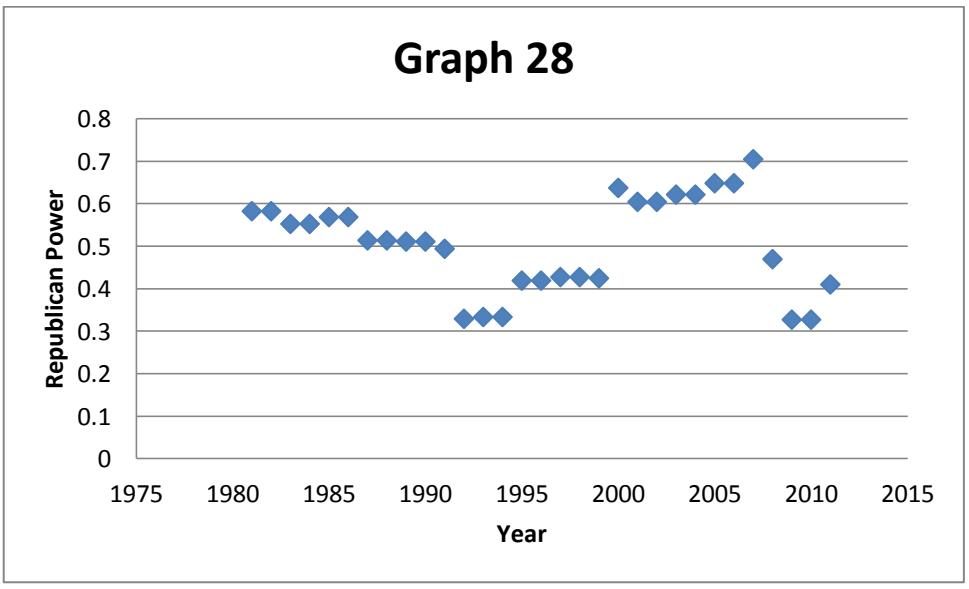

Graph 26
Increase in Prison Population
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
-0.040
0
0.2
0.4
0.6
0.8
1
1.2
Republican President=1

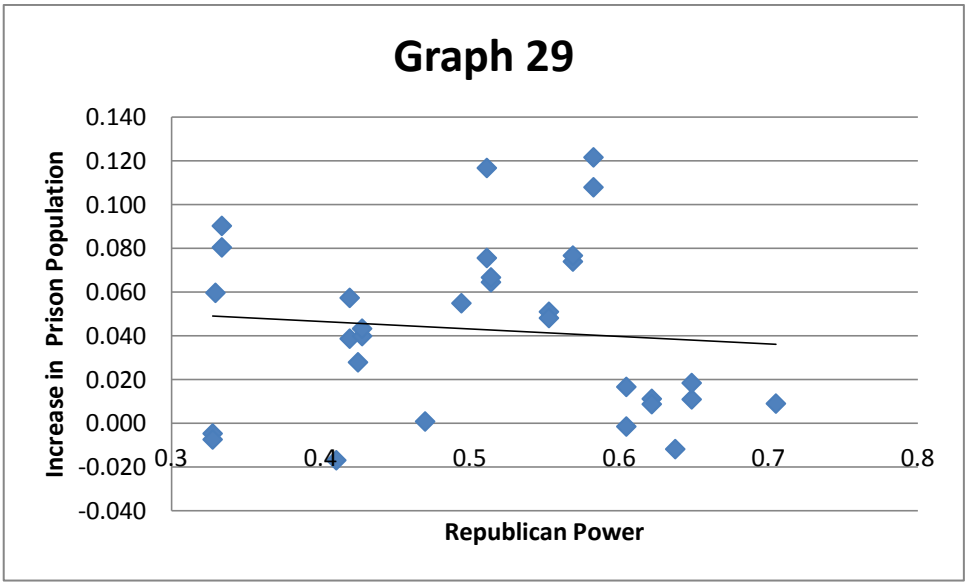

Graph 27
Increase in Prison Population
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
-0.020
-0.040
0.4
0.45
0.5
0.55
0.6
% Republican
Congress

From 1981 to 1992, republican presidents had the power, between 1992 to 2000 Clinton from Democrat Party was in the office, from 2000 to 2007, Republican Bush was the president, and from 2007 until today Democrat Obama is in the office. In the Congress, in 1981, the republicans had 48% of the seats, between 1981 and 1994, the percentages of republican seats fell almost steadly to 42%. Iın 1995, percentage of republican seats jump to 52.4%, and it remained around 52.4% and between 1995 and 2000, in 2000 percentage of republican seats fall back to 50%, it increase to 54% in 2005, increase further to 59% in 2007, fell to 41% in 2009, increase again to 51% in 2011.

It can be seen on graph 26 that usually when Republican presidents were in power increase in prison population was higher, although the difference is not very high. This is an expected results, since Republican presidents are expected to be less tolerant to crime. However the relation between republican power in congress and increase in prison population as it can be seen on graph 27 is suprising. It can be seen that republican power in congress and increase in prison population seems to be inversly related, which means, as republicans get more seats, increase in prison population seems to fall.

The joint index representing the state of the politics, will be created by multiplying effect of presidency with the republican power in congress. When there is a republican president, the percentage of republicans within the congress will be multiplied by 1.2, then there is a democratic president it will be multiplied by 0.8. The trend of the index representing the republican power in politics is shown on graphs 28 and 29.





As it can be seen on graph 28, the republican power fell between 1981 and 1991from 58% to 51%. In 1992 republican power fell to 33%, in 1995 it rise again to 42%, in 2000 it rises to 60% and fluctuated between 60-65% up to 2007, in 2007 it rise to 70% and then fell to 47% in 2008, in 2009 it fell further to 33%, and it rise back to 41% in 2011.

It can be seen on graph 27 that there is no immidietly observable correlation between the republican power and the increase in prisoner population.

3-2) Methodology of Analysis: As it will be seen in the previous part, almost all variables have very strong time trends. This has important implications. First multicolliniarity is a significant problem in this analysis, making the variables look like less correlated than they actually are. Secondly any existing correlation might be just the outcome of time trends. In other words, just running a regression with all independent variables is probably not a convinient way to make this analysis.

Instead, first in a preliminary analysis, the most important variables will be found. This analysis will be made, by looking how significantly the variables are correlated with prison population increase, when a regression is run using them and time as independent variables. It should be noted since all variables are correlated with time, even in this simple regression, coefficients might look like less significant than they really are.

Next for each less significant particular variable, b 2 regression will be run for each significant variable, a. One containing just the variables a and b, and one that contains variables a and b and time. This way if there are n significant variables, 2n regressions will be run for variable b. Looking these 2n regressions, possible relation between variable b and prison population increase will be evaluated.

Lastly running several regressions, using significant regression alone the significant variable, and lookig all regressions run using each particular significant varialbe, each significant variable will be evaluated once more.

3-3) Choosing Primary Variables

It can be seen on table 1, all variables except the one related to presidency and unemployment rate are correlated with increase in prison population. Time, Prison Population itself, average Earnings, Education, Percentage of black, hispanic population, and population under 30 are especially highly correlated with Increase in Prison Population. It can also be seen that almost all variables are highly correlated with time. Prison Population, wage gap, unemployment rate, education, Percentage of black, hispanic population, and population under 30 are especially highly correlated. When for each variable regression is run using that particular variable and time, the variables that are significantly correlated ae average eanings, wage gap and education. One notable thing is, the sign of wage gap change from positive to negative, when regression is run using this variable and time. A positive coefficient for wage gap would mean, wage inequality has a positive effect on increase in prison population. Looking to the table we can set our primary independent variables which are wage gap, average earnings and education, as a joint variable, connecting wage gap an average earnings, adjusted wage is taken a the fourth primary independent variable.

Table 1		Inc.Prison.Pop.	Year	Year+Inc.Prison.Pop.
Year	Coef.	-0.0036706	xxxxx	xxxxx
	Signf.	***	xxxxx	xxxxx
Prison.Pop.	Coef.	-7.38E-05	47597	2.38E-05
	Signf.	***	***	not significant
Ave.Earn	Coef.	-0.002426	0.4314	-0.0010412
	Signf.	***	*	*
Wage Gap	Coef.	-0.04258	0.040748	0.0236215
	Signf.	**	***	*
Unemp.	Coef.	0.002348	-0.04016	-0.0020504
	Signf.	not significant	not sign.	not significant
U-Length	Coef.	-0.00554	0.2417	-0.0009692
	Signf.	**	***	not significant
Education	Coef.	-0.85252	4.37E+00	-3
	Signf.	***	***	**
Black	Coef.	-84.987	3.87E-01	6
	Signf.	***	***	not significant
Hispanic	Coef.	-157.167	2.33E+00	-14
	Signf.	***	***	not significant
Age	Coef.	0.012137	-0.23367	-0.0026043
	Signf.	***	***	not significant
%Rep.	Coef.	-0.31683	0.002611	-0.0621195
	Signf.	*	*	not significant
Rep Pres.	Coef.	0.01439	-0.020161	-0.0125108
	Signf.	not significant	*	not significant

3-4) Evaluating Secondary Variables

In this part secondary variables will be evaluated one by one.

Prison Population: It can be seen on table 2 results of the regressions done using the prison population as an independent variable. In three of the 8 regression, prison population was a significant variable and its relation to prison poulation increase is always negative. In none of the regressions, wehere time is used as a variable, prison population could become a significant variable.

Table2								
Average Wage			-1.61E+00	-0.00141				
			***	*				
Wage Gap					4.17E+01	0.0289684		
					*	.		
Adjusted Wage	-2.14E+00	-1.59E-03						
	**	*						
Year		-0.0024123		-0.0009437		-3.23E-03		1.09E+01
		not sign.		not sign.		*		*
Education							-9.93E+00	-3.10E+01
							***	**
Prison Pop	-3.80E-01	-1.80E-04	-2.25E-01	-1.63E-04	-3.92E-01	-1.26E-04	4.45E-02	-8.07E-02
	***	not sign.	***	not sign.	***	not sign.	not sign.	not sign.

Unemployment Rate: It can be seen in table 3, that unemployment is only correlated in one of the regressions out of 8. In that particular regression, its coefficient is positive. It is not correlated in any regressions that uses time as an independent variable.

Table3								
Average Wage			-0.002732	-0.0010607				
			***	*				
Wage Gap					-0.046157	0.0197906		
					**	not sign.		
Adjusted Wage	0.0018109	-0.0010392						
	*	.						
Year		-4.37E-03		-0.0031896		-0.0044958		8.31E+00
		not sign.		***		***		.
Education							-0.0086605	-2.75E+01
							***	**
Unemployment	-0.0006836	0.0010222	0.0075711	0.0014354	-0.001017	0.0003849	-0.0005558	4.50E-02
	not sign.	not sign.	*	not sign.	not sign.	not sign.	not sign.	not sign.

Unemployment Length: It can be seen on table 4, that unemployment is correlated in 2 of 8 correlations with increase in prison population, and its coefficient is negative in both cases. It isn't correlated in any regression where time is used as independent variable.

Table4								
Average Wage			-0.0017622	-0.0010048				
			*	*				
Wage Gap					-0.03608	1.90E+01		
					**	not sign.		
Adjusted Wage	0.001457	-0.0009704						
	*	.						
Year		-0.0043995		-0.003373		-4.45E+00		8.30E+00
		***		***		***		.
Education							-8.48E-03	-2.73E+01
							***	**
Unemployment	-0.0029	0.0001132	-1.95E-03	3.03E-04	-2.34E-03	-8.22E-02	-1.73E-04	-1.86E-01
Length	**	not sign.	not sign.	not sign.	*	not sign.	not sign.	not sign.

Unemployment Intensity: It can be seen on table 5 that unemployment intensity is never correlated with increase in prison population. It isn't correlated in any regression where time is used as an independent variable.

Table5								
Average Wage			-0.00258	-0.0010779				
			**	*				
Wage Gap					-0.04558	0.0198372		
					**	not sign.		
Adjusted Wage	0.0018954	-0.001044						
	*	.						
Year		-0.0044337		-0.0032715		-0.0045233		8.32E+00
		***		***		***		.
Education							-8.61E-03	-2.75E+01
							**	**
Unemployment	-0.0184048	0.0054687	0.013734	0.0077505	-0.01336	0.0024751	-3.03E-04	8.51E-01
Intensity	not sign.	not sign.	not sign.	not sign.	not sign.	not sign.	not sign.	not sign.

Black Population: It can be seen on table 5 that percentage of black population correlated with increase in prison population in 3 of 8 regressions run. In all cases its coefficient is negative. It isn't correlated in any regression where time is used as an independent variable.

Table6								
Average Wage			-0.0015899	-0.0013945				
			***	*				
Wage Gap					0.03751	0.022519		
					*	not sign.		
Adjusted Wage	-0.0021255	-0.0014845						
	**	.						
Year		-0.0026158		-0.00097		-0.003973		0.010181
		not sign.		not sign.		*		.
Education							-0.011141	-0.030003
							***	*
Black	**-0.1302983**	-0.0541261	-0.0773657	-0.0551489	-0.12976	-0.016796	0.029125	-0.019751
Population	***	not sign.	***	not sign.	***	not sign.	not sign.	not sign.

Hispanic Population: It can be seen on table 7 that, percentage of Hispanic population is correlated with increase in prison population in 3 out of 8 regressions run. Its coefficient is always negative. It isn't significantly correlated in any regression where time is used as an independent variable.

Table7								
Average Wage			-0.0007864	-0.0011804				
			.	*				
Wage Gap					0.008883	0.027826		
					not sign.	.		
Adjusted Wage	-0.0005102	-0.0014414						
	not sign.	*						
Year		-0.01018		-0.0070861		-0.009214		0.006838
		*		.		*		not sign.
Education							-0.018604	-0.029544
							*	**
Hispanic	-0.0170373	0.0235941	-0.0140964	0.0166903	-0.017141	0.018772	0.018831	0.010201
Population	***	not sign.	***	not sign.	***	not sign.	not sign.	not sign.

Age: It can be seen on table 8 that age is significantly correlated with increase in prison population in 5 out of 8 regressions run, even though in 2 out of 5 significance level is 10%. In all five cases coefficient is positive.

Table8								
Average Wage			-0.0021922	-0.001974				
			***	**				
Wage Gap					0.055873	0.0331442		
					*	.		
Adjusted Wage	-0.0037583	-0.0023189						
	***	*						
Year		-0.0027502		-0.0005718		-0.0038511		0.01143
		*		not sign.		***		*
Education							-0.009519	-0.032887
							***	**
Age under	0.0252056	0.0108014	0.0116709	0.009763	0.022552	0.0051537	-0.001752	0.003215
30	***	.	***	.	***	not sign.	not sign.	not sign.

Demographics: There are only 6 regressions run for demographics variable, since education is one of the variables used to construct this variable, in none of the regressions demographics and education is used together. The results of 6 regressions can be seen on table 9. In 3 out of 6 regressions, demographics is a significantly correlated even though in some cases the significance level is 10%. Note except the particular case there significance level is 10%, coefficient of demographics variable is negative, which means, as part of the population which is considered as a disadvantaged segment increases, rate of increase in prison population decreases. However still not in all cases the coefficient is negative.

Table9						
Average Wage			-0.00285	-0.00149		
			**	**		
Wage Gap					-0.05158	0.034571
					**	*
Adjusted Wage	0.002402	-0.00184				
	***	*				
Year		-0.00526		-0.00331		-0.00536
		***		***		***
Education						
Demographics	-0.1625	0.081077	0.05749	0.064137	-0.14116	0.062691
	**	.	not sign.	not sign.	**	not sign.

Congress: In 3 out of 8 regressions the percentage of seats hold by republicans look significant. In all cases the coefficient is negative. In none of the regressions where time is used as an independent variable, distribution of seats in congress looks significant.

Table10								
Average Wage			-0.00195	-0.0009				
			**	*				
Wage Gap					-0.03749	0.018288		
					**	not sign.		
Adjusted Wage	0.001445	-0.0009						
	*	.						
Year		-0.00416		-0.00317		-0.00428		0.007909
		***		***		***		not sign.
Education							-0.00826	-0.02635
							***	*
Congress	-0.28111	-0.05805	-0.23362	-0.05503	-0.23647	-0.06457	-0.0573	-0.03457
	*	not sign.	*	not sign.	*	not sign.	not sign.	not sign.

Presidency: Only in one of the 8 regressions presidency looks significantly correlated, and in that particular case, its coefficient is positive, meaning that having a republican president is likely to increase prison population increase rate. It should be noted in that particular regression, time wasn't used as an independent variable.

Table11								
Average Wage			-0.00266	-0.00079				
			***	not sign.				
Wage Gap					-0.06125	0.012754		
					***	not sign.		
Adjusted Wage	0.002129	-0.00073						
	*	not sign.						
Year		-0.00433		-0.00349		-0.00437		8.09E+00
		***		***		***		not sign.
Education							-0.00896	-2.70E+01
							***	*
Presidency	-0.01124	-0.0062	0.025059	-0.00616	-0.02464	-0.00719	-0.00884	-5.54E-01
	not sign.	not sign.	*	not sign.	not sign.	not sign.	not sign.	not sign.

Politics: In 2 of 8 correlation, the joint variable politics looks like a significant variable and in one of these 2 cases, significance level is 10%. In none of these two cases time is used as an independent variable. In both cases coefficient is negative, which means, as republican power increases, rate of increase in prison population is likely to decrease.

Table12								
Average Wage			-0.00254	-0.00076				
			**	not sign.				
Wage Gap					-0.05706	0.012269		
					***	not sign.		
Adjusted Wage	0.002368	-0.0007						
	**	not sign.						
Year		-0.00421		-0.0034		-0.00424		0.1578
		not sign.		***		***		not sign.
Education							-0.00864	0.0367
							***	*
Presidency	-0.12117	-0.03239	0.041334	-0.0309	-0.1337	-0.03686	-0.04087	0.7441
	.	not sign.	not sign.	not sign.	*	not sign.	not sign.	not sign.

Evaluation of Results: Among the secondary variables, age and demographics look strong. Having demographics as one of the significant variables might be surprising since demographics was not very strongly correlated with prison population increase, in the primary analysis, done by using graphs. It seems possible effect of demographics on prison population increase negative, while possible effect of age is positive.

Among the other variable, the possibility of a correlation prison population, percentage of black and Hispanic people and distribution of seats in congress seems to be relatively high, while there is still some possibility of correlation between the variable politics and unemployment length and dependent variable. Unemployment, unemployment intensity and presidency seems to be rejected.

3-5) Final Evaluation of Primary Variables

In order to evaluate the primary variables again, several new regressions are made using combinations of these variables only. The results can be seen on table 13. Using the regressions that can be seen on table 13 and the regressions that are shown in part 3-4, it can be inferred, that education is the strongest variable of this analysis, which is always significant. The level of education is clearly correlated with prison population increase, and its coefficient is in all cases except one negative, which means increase in education level, decreases prison population decrease. Secondly the average wage also seems as a strongly variable, which is significant in 22 of 29 regressions done with it. In all cases, where education is significant, its coefficient is negative, which means, increase in average wage decreases prison population increase.

Wage gap is only significant in 16 of the 29 regressions done with it, but more importantly in 8 of the 16 regressions its sign is positive, in other 8 it is negative. This ambiguity might mean that the relation between wage gap and prison population increase might be more complex, not a simple linear relation. It should noted however in all cases, when wage gap and time are independent variables and wage gap is

significant, coefficient of wage gap is positive. Still the actual effect of wage gap is one of the questions that remain open at this point.

Adjusted wage is significant in 20 out of 25 regressions done with it, which means, as a joint variable the possibility of its importance is high. However in only 13 of 20 significant coefficients, the coefficient is negative. So probably as a result of the effect of wage gap, the sign of the coefficient of adjusted wage is also questionable.

Time trend seems significant in 36 of 51 regressions run with it. In 30 out of 36 cases, time trend is negative which means, generally rate of increase in prison population is decreasing.

Table 13	Average Wage		Wage Gap		Adjusted Wage		Year		Education	
OLS1	-0.000944	*					-0.0032975	***		
OLS2			0.0191993	*			-0.004	***		
OLS3					-9.50E-04	.	-4.35E-03	***		
OLS4	-0.0027375	***	-0.0519047	***						
OLS5	-0.0009854	not sign.	-0.0013633	not sign.			-3.22E-03	**		
OLS6							0.008292	.	-0.02743	**
OLS7	-0.0007012	not sign.							-0.007839	***
OLS8	-2.77E-01	not sign.					6.394	not sign.	-2.28E+01	.
OLS9			0.013073	not sign.					-9.76E-03	***
OLS10			-0.001943	not sign.					-0.028621	*
OLS11	-0.0007287	not sign.	-0.0008154	not sign.					-0.0077369	**
OLS12	-5.24E-01	not sign.	-1.02E+01	not sign.			7.84E+00	not sign.	-2.49E+01	.
OLS13					-0.0007	not sign.			-0.009556	***
OLS14					-7.17E-02	not sign.	7.79E+00	not sign.	-2.64E+01	.

4) Panel Data Analysis: In this part I am going to repeat the same analysis I made in part 3 using panel data on US states for the time periods between 1981 and 2011.

5)The Channels Through Which Low Wage Labor Market May Affect the Prison Population

5-1) Increase in Crimes

In this part possible effects of low wage labor market parameters on particular crimes will be first stated. Then looking to the data it will be showed whether these effects are visible or not. The particular crimes that will be looked for are the violent crimes, the property crimes and the drug offences.

4-2) Increase in Arrest/Crime Ratio

In this part, the possible effect of the labor market parameters on the police force and arrest/crime ratio will be stated and then empirically tested.

5-3) Increase in Average Sentence Length

In this part , possible channels through which the labor market parameters might affect the sentence length will be stated and empirically tested.

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