

Senior Project
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Opioids and Unemployment

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Abstract

There has been a ton of research in economics about the effects of drugs on the employment status of individuals. These papers have looked at the effects mainly pertaining to Marijuana and Cocaine, however this paper will be examining the effects of the opioid Heroin. As a first of its kind paper I will examine the relationship between employment and heroin use. To test this connection I have compiled data from the National Survey on Drug Abuse and Health. Through the use of two econometric models: OLS and Two Stage Least Squares models I will uncover the connection we can expect to see during the opioid crisis.

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I. Introduction

Every day, about 115 Americans die from an opioid overdose (NIDA). According to the National Institute on Drug Abuse this modern day epidemic stems from medical practices in the 1990's when the pharmaceutical companies told the medical community that prescription opioids were not addictive. Today we know the consequences of prescription opioids including the highly addictive nature these medications possess. When avid consumers of opioids can no longer receive prescriptions or can no longer afford the prescriptions due to the relatively high expense users will turn to the illegal drug heroin. Heroin is an illegal opioid that is cheaper than most prescription drugs, but also has a higher risk of overdose associated with it. The impact of heroin use can be felt in the labor market as users are likely to be unemployed, and ultimately this epidemic could result in higher unemployment.

The rising abuse of opioids should be on concern to society, as there are numerous adverse effects that stem from consumption of opioids. These concerns include both issues for the abuser and for other members of the community as well. The abuser is likely to suffer from health issues namely the rising rates of death from overdose, which is now the leading cause of death for nonmedical issues. For the rest of the people in society, risk comes in the form of: impaired drivers on the road, possible complication in birth due to drug use, and cost to tax payers for the treatment. The main issue of concern for this paper is the possible adverse effect that heroin has on employment.

In past many academic papers have applied Gary Becker's rational addiction theory to assess drug use and employment status. In this paper I will again employ a similar frame work to that of Becker. This will allow for this study to make use of a utility function to determine a

set of variables to analyze the effect of heroin consumption on the employment status of an individual.

II. Literature Review

Among the studies that have been done on consumption of drugs and employment the prevailing theory is The Theory of Rational Addiction. A paper written by Becker, Grossman, and Murphy (1990) compares two models: the rational addiction model and the myopic model. Rational addiction takes both past and future prices into consideration, while the myopic model only take into consideration past prices. Findings indicated that we should reject the myopic model, and instead use the rational addiction model. A two stage least squared method is used to estimate their model to control for the endogeneity of the price variable. The results showed that an increase in the price of cigarettes would negatively impact consumption of cigarettes both in the short term and in the long term.

Cigarette consumption generally speaking does not displace a person from work except in the event that the smoker were to develop cancer. However, harder illicit drugs can be shown to have a much greater effect on the employment status of a given individual. French, Roebuck, and Alexandre (2001) look at chronic drug use or repeated drug use over time of illicit drugs like marijuana and cocaine on a given person's employment status. By employing both a multivariate regression and a two stage IV model they were able to show that chronic use of drugs has a statistically significant negative impact on an individual's employment status, while occasional drug use showed no statistically significant impact on employment.

Similarly, Van Ours (2006) looks into the effect of both marijuana and cocaine use on employment. He uses data collected in Amsterdam, because of the relaxed nature of the

country's drug laws. Hence the paper can speak about the possible consequences of legalizing drug consumption. Through the use of a bivariate regression Van Ours concludes that in Amsterdam the use of cocaine and marijuana actually have no effect on employment among citizens. This study could possibly lend credibility to the idea that legislature should consider the idea of legalizing certain illicit drugs in order to reduce their potential harmful impact on society. For instance if someone were to take an illegal substance and have an adverse reaction they would likely try to stay away from a hospital out of fear that they may receive some sort of legal reprimanding due to their use of drugs.

The use of illicit drugs does not just effect one's employment, but can also effect one's productivity. Buchmueller and Zuvekas (1998) preformed a study to find out how the use of illicit drugs effect both a person's productivity and employment. The study uses a person's income to determine their productivity. Similarly to French, Roebuck, and Alexandre (2001), they separate non-problematic drug users (those who use drugs but do not abuse them) from problematic drug users (or a person who regularly abuses drugs). To address concerns about previous research that only accounted for young workers (ages 18-29), they use data from the Epidemiological Catchment Area which contains more refined information about drug use and includes older workers (ages 30-45). In order to estimate their model they employ a grouped data regression model. Results showed that problematic drug use for both age groups has a negative impact on both income and employment. However, non-problematic drug use was shown to increase a younger person's income by up to 10% compared to their non-user counterpart, while for older workers income would increase by about 7%. Non-problematic drug use had a positive effect on employment, but this was found to be statistically insignificant for either.

In addition to the research done by Buchmueller and Zuvekas (1998) Register and Williams (1992) looks at the productivity of workers in the economy. To proxy for the individual productivity, the yearly income a person earns is used. Data was gathered from the National Longitudinal Youth Survey to determine the effect of long term use of marijuana and cocaine on the productivity of male workers. The model was estimated using basic regression of OLS. The outcome of this study suggests that using marijuana over an extended period of time has statistically significant negative impacts, while the use of cocaine over time was found to have no real effect on one's productivity. These results seem to back up the Buchmueller and Zuvekas results as problematic drug use would constitute as drug use over extended periods of time. With both studies confirming that long term drug use has a negative impact on an employee's productivity.

Research on drug use and employment is extensive, but findings of each study can contradict each other. Some studies claim that there are negative effects of drug use, while others claim drug use can result in positive impacts. There is a gap in this area of economic literature, and that gap is what the effect of heroin has been on employment during the opioid crisis. My paper will focus on this area looking at the impact that heroin use during the opioid crisis has had on the labor market.

III. Theoretical Model

In order to analyze the issue of drug usage and employment I will be applying a model similar to that used in the paper "Illegal Drug Use and Employment" (DeSimone 2002). The basic framework will be that of utility maximization function set within a static neoclassical model of individual labor supply. The function

$$U(L, D, C; X) \quad (1)$$

will be subjected to the budget constraint

$$P_D D + P_C C + WL = WT + Y, \quad (2)$$

with L representing time spent on leisure, D as drug consumption, C as composite good consumption, and X serving as other observable and unobservable factors that could affect a person's utility. P_D and P_C are prices associated with the drug and the composite good respectively. W will represent wage, T representing time available, and Y is non-income wage. The first decision in a person's employment framework is based upon the comparison between the wage received from working and the reservation wage. If an individual obtains a higher wage from their job than their reservation wage, then the individual decides to work.

$$E = E(P_D, W, Y; X) \quad (3)$$

If the individual decides to work, the second decision has to be addressed, i.e. the amount of time in hours that a person will work (H). It can be shown that the time spent working (H) and the demand for drug consumption (D) is determined by the following pair of equations

$$H = H(P_D, W, Y; X); \quad (4)$$

$$D = D(P_D, W, Y; X). \quad (5)$$

If an individual finds that the wage they would earn by working is higher than their reservation wage the following function which expresses Employment (E). By solving equation 5 for P_D and plugging the answer into equation 3, one obtains a function that directly relates employment to drug demand:

$$E = E(D, W, A; X), \quad (6)$$

Where the new variable A represents the left over income after the subtraction of drug expenditure. In order to estimate this function, though, drug demand must be separable from leisure and composite consumption. The only exception to this rule of separability is if an individual is subject to some sort of preallocated drug demand for individuals. This separability allows for a person's utility to be expressed by drug demand and a sub-utility of leisure and non-drug consumption.

This framework laid out by DeSimone (2002) allows for the decisions to be made in a two-step process. The first step in maximizing utility is to find the optimal level of drug consumption. The second step in the process is the decision on whether one should work or remain unemployed. This second stage is subjected not to their individual consumption of a drug, but to how much of the drug they actually wanted and demanded.

IV. Methodology

Based upon the economic theory that has been laid out I will attempt to model an individuals employment status as a function of their heroin usage within one year's time. The variables of interest in this empirical model will be based around one's: heroin usage, socio-economic factors, and non-income wage. These will combine together to lay out the empirical model that will provide analysis between the relationship of heroin and employment.

Heroin Use

The main variable of interest in this study is an individuals use of heroin as this measures his/her demand for drugs. This variable will be measured by the number of days that one used heroin over the course of one year. To fit with the hypothesis we can expect that an increase in an individual's heroin use this will have a negative impact upon one's chance of employment.

This has been noted before in economic literature (DeSimone 2002) as drug demand increases drugs become the main driving force for a person. Eventually drugs will become the most important part of a person's utility function and start to negatively impact other areas of a person's life our in this case their employment.

Socio-Economic Factors

For socio-economic factors I chose three main groups of dummy variables to take into account one's demographics as well as the human capital that they could offer to a firm. These three variable groups include: age, race, and level of education. These are three factors that companies will take into consideration upon hiring a new employee. Age and race are fairly ambiguous on the effects that they may actually have at your chances of obtaining a job. For these two variables it would ultimately be subjective as it would depend upon the criteria of the employers' search as well as biases that they may hold upon these two categories. However, level of education should have an overall positive impact upon chances of employment. Since additional schooling increases the human capital that a worker can bring to a company it would stand that the higher level of education that one posses the more likely they are to successfully find a job.

Non-Wage Income

For this study I chose to look at non-wage income by way of if a family receives welfare payments or not. By nature of this being non-wage income we can expect to find that this have a negative impact upon employment status. If one receives money for not working then they must make the decision of if it really benefits them to work or not. If they decide that the money they make by not working is enough to satisfy their level of utility than they opt out of working and

become unemployed. Thus, if a person receives welfare payments it is expected that this will have a negative force upon one's employment

OLS Model

Starting with the basic OLS model I will attempt to provide some insight into the relationship between employment and heroin. The OLS model is as shown:

$$\begin{aligned}
 IRWRKSTAT_i = & \beta_0 + HERYRTOT_i X_1 + Black_i X_2 + Native_i X_3 + Islander_i X_4 + Asian_i X_5 \\
 & + Mixed_i X_6 + Hispanic_i X_7 + Youngadult_i X_8 + Adult_i X_9 + Olderadult_i X_{10} \\
 & + Oldadult_i X_{11} + Highschoolgrad_i X_{12} + Associates_i X_{13} \\
 & + Collegegrad_i X_{14} + IRFAMSVC_i X_{15} + \varepsilon_i^1
 \end{aligned}$$

This model will explain the effect of heroin upon employment however it suffers from endogeneity. The reason we could see possible endogeneity is because one could work or have a job to fuel their drug habit, while at the same time the job could be causing so much stress or personal problems that the person turns to using drugs. Because of this endogeneity I decided to run the Two Stage Least Squares model.

Two Stage Least Squares

The model used for the Two Stage least Squares equation is the same as the equation used in the OLS model with the inclusion of an instrumental variable (IV). The IV was if an individual considers themselves to have a strong belief in their religion or not. The idea here is that those who have strong beliefs in their religion are more likely to adhere to that religions rules. That being said most religions have strong moral values and ideals for their followers to strive for.

¹ See the appendix on page 15 for definitions of the variables used in the model

Among these ideals many religions speak out against the use of illicit drugs. The use of this IV and model should omit the endogeneity that plagues the OLS model. This should give a clearer picture as to the effects of heroin on employment status.

V. Data

For this paper the primary source of data comes from the National Survey on Drug Use and Health for the year of 2016. The reason that the year 2016 was chosen is because of two factors. One, it is the newest year of data that the survey reports. Two, 2016 falls into the timeline of the opioid crisis.

In this study the variables that are of the most concern are the ones that measure employment and drug use. The employment variable is used to measure based upon if someone held a job in the past year. With both full-time and part-time counting as employed. Those who fall outside of the labor force were left out of the study because they do not qualify as unemployed since they are not looking for a job. Drug use is measured in the number of days that a person has used heroin in the past year ranging from those who never used it to those who used it every day. This will allow for a better understanding of the effects of heroin as some begins to use more and more. A person can find how much an users chances of employment are effected by each day of heroin use. Additionally since the data does come from a survey that is self-reported it is possible that use of heroin goes underreported. This underreporting will lead to a negative bias on the effect of drug use on employment.

To ensure that the model is robust additional exogenous variables were included like: age, race, education, and non-wage income. These will provide the models with additional estimates to give an overall picture of what truly impacts the employment of a person. Once all of these

variables were included in the model as well as cleaned and processed the total number of observations for this study comes out to be 30,600.

VI. Results

In Table 1 summary statistics are reported for all the variables included in the empirical model. The average use of heroin for a person within one year may seem low, but when taken into consideration that most people do not use heroin it fits into context. The fact that the maximum for the use of heroin within a year is equal to 365 does paint the picture that while a chunk of the population is not effected there are those who are struggling with the opioid epidemic.

Table 1 also captures all the data within the given dataset. It shows no real surprises in the data as most of the summary statistics are on par with nation averages. The table demonstrates that the data was cleaned and processed in an efficient manner that lead to no errors in cleaning the data as all values appear for zero to one except for heroin use, which is goes up to 365 as it should since it measures number of days heroin was used for a year.

As for Table 2 it shows the results of the OLS model that starts the analysis. The table shows that the effect of heroin is statistically significant as well as has a negative impact on being employed. According to the OLS model for each day that a person uses heroin they decrease their chances at employment by 0.1%. For heroin an opioids in general this seems like a rather small change in employment, but when looked in terms of the full year it could have a large impact. As an example if someone were to use heroin for 100 days in the year the likelihood that they are employed goes down by 10%. So, the use of heroin can add up quickly and effect job prospects. These numbers reported while significant do not take into account the endogeneity

between variables therefore the Two Stage Least Squares is used to uncover the true effect of heroin.

The last Table, Table 3 reports the numbers for the Two Stage Least Squares model. For the model the IV religious beliefs was used to determine the connection of heroin and unemployment. According to this model the effect of heroin is much larger than the OLS model had predicted. Table 3 states that for each day an individual decides to use heroin the chance of employment go down by 4% a much larger number than the OLS model had stated. The effects of heroin under the Two Stage Least Squares model shows a more dramatic effect that someone would expect to see in this epidemic. Instead of a person using heroin 100 days a year and only decreasing their employment chances by 10%, now using heroin just 10 days a year will decrease chances by 40%. Should the epidemic continue and spread as it has been doing this could spell trouble for the labor market especially, because of the drugs highly addictive nature as well as the profound negative impact they have.

IV. Conclusion

From here there are many places to go with the study of opioids and the effects that they have upon employment and other topics. This study was limited in its scope in several ways. There was no inclusion of a drug price variable as this would allow for a better understanding of the demand for heroin since price plays a large role in a consumers choice to consume. Also the study was limited to only one year. In the future it would be interesting to see the ramifications of the opioid crisis from beginning to end. These could be places that others may want to look into to take this study further.

In conclusion, the hypothesis has been proven true that heroin does have a negative impact on an individual's chance at employment. Through the use of both models OLS and Two Stage Least Squares the estimate is significant and negative. The epidemic could cause some trouble for the labor market if nothing is done to combat the opioid crisis. The best course of action to prevent these issues from happening would be to educate people on the effects they could see, institute methadone centers to combat overdoses, and reforms to the healthcare system to limit prescription opioids to ensure they don't fall into the wrong hands.

VII. Appendix

Table 1: Summary Statistics

Variable	Label	Mean	Min.	Max.
IRWRKSTAT	Employment Status	0.92	0	1
HERYRTOT	Total # of Days Heroin was used in the past 12 months	0.65	0	365
SNRLGIMP	Believes Religious Beliefs are important	0.65	0	1
Caucasian	Non-Hispanic White	0.62	0	1
Black	Non-Hispanic Black	0.13	0	1
Native	Non-Hispanic Native	0.01	0	1
Islander	Non-Hispanic Islander	0.01	0	1
Asian	Non-Hispanic Asian	0.04	0	1
Mixed	More than one race	0.03	0	1

Hispanic	Hispanic	0.16	0	1
Youngadult	Ages 18-25	0.33	0	1
Adult	Ages 26-34	0.23	0	1
Olderadult	Ages 35-49	0.30	0	1
Oldadult	Ages 50-64	0.12	0	1
Retirementage	Ages 65+	0.03	0	1
Highschoolgrad	Highest level of education is graduating High School	0.25	0	1
Associates	Highest level of education is an Associates degree or some college	0.35	0	1
Collegegrad	College grad or higher level of education	0.30	0	1
Dropout	Dropped out of high school	0.10	0	1
IRFAMSVC	Family recieves welfare	0.30	0	1

Table 2: OLS Regression Results

Variable	Label	Parameter Estimate
Intercept		0.87*** ²
HERYTOT	Total # of Days Heroin was used in the past 12 months	-0.001***
black	Non-Hispanic Black	-0.09***
native	Non-Hispanic Native	-0.08***

² *** indicates significance at a 99% level

islander	Non-Hispanic Islander	-0.04* ³
asian	Non-Hispanic Asian	-0.03****
mixed	More than one race	-0.04****
hispanic	Hispanic	-0.02****
young adult	Ages 18-25	-0.07****
adult	Ages 26-34	-0.04****
olderadult	Ages 35-49	-0.02**
oldadult	Ages 50-64	-0.02
highschoolgrad	Highest level of education is graduating High School	0.07****
associates	Highest level of education is an Associates degree or some college	0.13****
collegegrad	College grad or higher level of education	0.15****
IRFAMSVC	Family receives welfare	-0.05****

Table 3: Two Stage Least Squares Results

Variable	Label	Parameter	
		Estimate	St. Error
Intercept	Intercept	0.926****	0.037
HERYRTOT	Total # of Days Heroin was used in the past 12 months	-0.046** ⁴	0.021
Black	Non-Hispanic Black	-0.126****	0.022
Native	Non-Hispanic Native	-0.094****	0.032
Islander	Non-Hispanic Islander	-0.017	0.05
Asian	Non-Hispanic Asian	-0.063****	0.024

³ * indicates significance at a 90% level

⁴ ** indicates significance at a 95% level

Mixed	More than one race	-0.055**	0.022
Hispanic	Hispanic	-0.052***	0.019
Youngadult	Ages 18-25	-0.031	0.029
Adult	Ages 26-34	0.022	0.037
Olderadult	Ages 35-49	0.003	0.026
Oldadult	Ages 50-64	-0.016	0.025
Highschoolgrad	Highest level of education is graduating High School	0.039**	0.019
Associates	Highest level of education is an Associates degree or some college	0.074**	0.031
Collegegrad	College grad or higher level of education	0.078**	0.036
IRFAMSVC	Family recieves welfare	-0.058**	0.023

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