

**Do Welfare Distribution Methods Changing from Cash Payment to Digital
Transfer Influence Drug Abuse Problem?**

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I. Introduction

In a wide extent, Drug abuse is always a big problem in economy development considering to a strong relationship between substance use and poverty. It costs both the communities and families' substantial economic loss directly and indirectly. The health issues and impaired productivity brought by drug abuses are detrimental to drug abusers' economic status. Besides, impulsive criminal acts caused by drug abuses also cast shadow on economic growth. Government has devoted substantial efforts into mitigate drug abuse problems. In 2002, government devoted substantial efforts to reduce criminal activities and drug consumption: in 2002 drug abuse costs the US economy \$180 billion (estimated in the Office of National Drug Control Policy). Out of this \$180 billion, \$30 billion is attributed to crime, \$16 billion to health care and the remainder to reduced productivity due to drug abuse. (ONDCP 2004a).

Among welfare recipients, drug abuse is identified as a solid barrier to economic improvement and social performance. Around 10% of patients to substance treatment facilities nationwide from 1992 to 2005 mainly relied on public assistance(TEDS-A). The prevalence of substance abuse among welfare recipients indicates an inefficient allocation of government spending and welfare benefits, which is an irresponsible distribution of taxpayers' money. It also violates the primary goal of most welfare problems to provide welfare recipients with nutrition needs, work opportunities and education.

Illicit drug purchase activities are performed secretly in underground economy and cash transactions are featured significant in these activities because cash leaves behind seldom digital records for authorities and is hard to track. In the underground economy, cash is a significant factor in the functioning of black economy because of its liquidity and transactional anonymity

(Varjavand, 2011). It is also estimated that 5 billions US dollars in cash per year may have been used in US drug trade (UNODC, 2011). Therefore, reduced cash supply is highly possible to hamper drug purchases. In this paper, I will address whether an restricted access to cash influences drug abuse problems and I hypothesize that limiting welfare recipients' access to cash will decrease drug abuse problems.

Because the measurement of percentage usage of cash in total transactions on individuals at each period is unavailable, it is important to tacitly design a clear identification of changing cash access. This study takes a closer look at the Electronic Benefit Transfer (EBT) program in the United States. In 1990s, federal government mandated EBT system to improve welfare benefit distribution method in varied welfare programs. EBT is enacted by state governments and the implementation period of EBT program is varied by states. It was gradually carried out in the United States from 1984 and was successfully implemented nationwide in 2004 (2014). Welfare programs had distributed their benefits through sending paper checks/cash and food stamps. EBT replaces the original distribution method and provides individuals with EBT cards which similarly functions like prepaid debit cards and provides with a quick access to benefits through EBT cards. It delivers reliable and secure access to welfare payment to millions of households nationwide and distributes benefits for a large quantity of benefits, such as, Temporary Assistant to Need Families(TANF), child care assistance, child support payments, Supplemental Nutrition Assistance Program (SNAP) or WIC (Women, Infants and Child) (2014). A more detailed description of EBT program will be provided in Background section. It is estimated that 671.2 million US dollar cash was removed by EBT in 1997 in Missouri (Wright, 2014). More importantly, since EBT distributes benefits through EBT credits and, more importantly, restricts cash withdrawals and cash backs for EBT card users. In turn, EBT hampers recipients' access to cash. Based on EBT's effects on availability of cash access, I evaluate EBT program as a treatment indicator in this study to identify the effects of cash access on drug abuses. Noted that

EBT program was carried out by state governments and the implementation time is varied by state, I am able to exploit the variation of the implementation time and measure whether drug abuses response to EBT from a Difference-in-Difference-in-Difference(DDD) approach.

To measure drug abuse problems, this study collects patient-level admissions records nationwide to substance abuse treatment facilities from 1992 to 2005 and assembles annual data on drug-related admissions. I further aggregate and sort the records to obtain a state level data and analyze with a panel specification. Demographic characteristics, such as, gender, age, and race, and sources of referral for admissions are also analyzed to determine whether the populations with varied characteristics vary the response to EBT program. Our results indicate that fully implementing EBT program decreases the total drug-related admissions to drug abuse treatment facilities. Specifically, the cocaine-related admissions have the most evident reduction. Furthermore, I also find the evidence that substance abuse behaviors of the aged 18-29 males are more likely to response to EBT than those of the aged 30-49 males. I also find suggestive evidence that the crime-related admissions reduces following the full implementation of EBT. It indicates a positive correlation between criminal activities and drug abuses and provides with evidences to literatures that study relationship between criminal activities and drug use.

II. Literature Review

a. EBT program and Substance Abuse Problems Remain in Populations

This study is one of the few researches that closely examines distribution method of welfare benefits and identifies policy impacts on drug problems. It highlights the value of digital payments in welfare distribution as a mechanism to help welfare recipients regulate drug use behaviors. EBT policy implementation has been evaluated in terms of distribution efficiency and less costly digital transfer of welfare benefits. Detailed direct benefits from EBT implementation will be further described in Background Section. However, sparse economic literatures examine the effects of distribution method of welfare benefits on economic factors and the influence on

cash access. The official reports of the welfare problem SNAP published by USDA show that cash-out for the welfare benefits appears to reduce household food expenditure and leads to higher expenditure on some items other than food (USDA, 1993). This is consistent with the idea that if recipients involve with illicit drug activities are more likely to have cash-out and spend less on food. Wright's study is so far the only study I have noticed examining EBT program on crime factors. Wright(2014) addresses the correlation between cash circulation in street life and criminal activities and finds that the implementation of EBT reduces circulation of cash that stems from welfare benefits and further decreases criminal activities. He points out that EBT reduces street crime activities by 9.8 percent total crime rates across Missouri counties. As this program expands in breath and depth, the associated reduction in cash circulated in the welfare recipients' pockets is an alternative interpretation of the changing availability of cash. By reducing the cash available to the offenders and victims, EBT hampered the crime activities related with direct cash acquisition, such as, burglary, assault and larceny. Wright's fresh insights inspired me to further explore the relationship between cash and drug consumption by examining EBT.

One study shows that the welfare recipients removed from the federal disability roll because of diagnosed drug or alcohol disorders are undergoing more significant hardship than pre-disenrollment. (Swartz, Lurigio et al. 2000) Out of 204 former recipients in the Chicago area, 107 reported monthly income below 500 dollars and no cash assistance aid. With screening strategy and assessment of drug dependence, welfare policies might be able to effectively exclude the recipients who satisfy screening criteria out of the list. However, Swartz's study suggests the need for caution about policies that simply exclude this population from the welfare rolls without providing additional services. Compared to the screening, EBT, indirectly restricting cash access but maintaining deliver of benefits, is potentially a safer and more conservative way of regulating drug disorders.

Substance use trend and the related health problem among welfare recipients are also important themes. With the nationally representative data from the NHSDA, approximately one fifth of TANF recipients report recent heavy use of alcohol and drug use (Pollack, 2002). Polley (2011) also points out the fact that more than 10% of the reported incidents of crimes in 12 cities are committed by the welfare recipients from the TANF, the SNAP and the Supplemental Security Income (SSI) programs. Even though the willing and determination to be self-sufficient for welfare recipients are both important to reduce drug use; drug use, in turn, is a barrier to economic self-sufficiency. Not only the comparative low education and job skills for the poor population in the job market, but only the social performances restrict recipients' ability to perform well in work. Mental and behavioral health problems caused by drug use disappoint the outcome of some welfare-to-work interventions. Many recipients obtain employment but lose the jobs because of confrontations with coworker and supervisors, lateness and similar violations of workplace norms (Jayakody et al., 2000). Interpersonal problems and irritability also bring difficulty of maintaining jobs (Jayakody et al., 2000).

b. Behavioral Mechanisms Behind Substance Abuse

This study also contributed to the literature by suggesting behavioral considerations of the substance abuse behavior in economic explanations. Behavioral mechanism behind drug intake is an important topic to be studied in the addition literature. It could develop effective treatment methods to drug addicts in addition to labor market services. Some studies have explored the relationship between cash imbursement from welfare programs and trend of substance use. Through examining the hospital admission data in California, Dobkin (2007) found that the pattern of hospital admission and drug abuse behavior is coherent with the monthly cycle of government welfare distribution. The reported admissions for heroin, cocaine and amphetamine experience a sharp increase at the day of welfare distribution. Hospital mortality raises by

abruptly 22% increase after receiving their check from welfare. (Dobkin, 2007) The perceived cost of purchasing illegal drug is lower when welfare recipients have enough money to cover daily commodity expenses. However, a clinical research finds that a cash reimbursement is unlikely to predict the relapse of Cocaine by conducting a randomized experiment on the cocaine-addictive participants (Dempsey, 2009). This randomized experiment contained a sample size of around 300, meaning that this study might be inherited with problems from representativeness of sample and bias from a small survey data.

Multiple studies into incentives behind drug intake and criminal activities involved with the economic mechanism by which opportunity cost analysis influenced the perceived benefit of stopping drug intake. Economic Theory of Criminal Behavior by Nobel Laureate Gary Becker, which is an application of the neoclassical theory of demand stated that potential criminals are economically rational and they compare the gain from committing a crime with the expected cost in terms of probability and severity of punishment (Becker, 1968). Crime literature and addiction literature have provided empirical supports to Becker's model. As mentioned above, Foley's and Dobkin's researches into welfare imbursements encouraging recipients' drug intake by decreasing the perceived cost of buying drug. In Silverman and Robles's review into substance use from a behavioral economic perspective, they believe that drug use is maintained and modified by its consequences. (Silverman & Robles, 1998). They believes that the reason why unemployment can be treatment to substance abuse is that getting a job raises the opportunity cost, such as, impaired productivity, a loss of wages or job termination. It is also noted that economic tradeoffs between welfare and work have shifted for more-employable recipients.(Danziger, Corcoran et al., 2000). However, wages from jobs will also have a positive effect and motivate drug addicts to purchase drugs. Evidences come from a descriptive study that investigate the correlation between availability of cash and drug use on a clinical population. (Shaner et al.,

1995). They find that cocaine-dependence patients spend their welfare benefits on cocaine at the beginning of each month when their disability benefits are distributed, which is indicated by a much higher proportion of positive urine samples. The disability income, originally intended to pay for basic needs and medical expenses, is inefficiently spent. Therefore, opportunity cost analysis is effective mostly when welfare recipients are willing to pursue self-sufficiency and are determined to improve their situations.

Dobkin (2007) also suggests a mechanism by which the behavioral bias - short-run impatience - could affect people's decisions to engage in criminal activity. At the end of the welfare payment cycle, the recipients who are short of money are impatient and more likely to perform crime to require money. Another study supporting the behavioral bias raises evidence that income-generating criminal activity is increasing with amount of time passing since welfare payment occurred (Foley, 2011).

c. Criminal Activities

Literatures have addressed a lot of correlation between criminal activities and substance abuse problems. Foley (2011) noted that only the criminal activities which are relevant with income benefits will be more likely to happen as welfare payment is being spent. For welfare recipients who experience short-run impatience and have a difficulty of smoothing their consumption of welfare income, they are likely to perform criminal activities later in the later welfare payment cycles. Jofre-Bonet and Sindelar (2002) also address the direction of causality and magnitude of correlation between drugs and crime. Their study presents a causal impact and shows that reduced drug use due to drug treatment is associated with 54% fewer days of crime for profit (Jofre-Bonet and Sindelar, 2002). It performs a longitudinal study over the inner-city drug users who sought treatment indicating that drug treatment over this group effectively reduces the drug abuse behavior and then further reduces the crime activities. Shover claims that much

cash obtained from criminal activities is spent on hedonistic activities, especially illicit drug use (Shover, 2016).

Besides, the factors relating with criminal activities have been addressed. Studies indicate that crime has a negative influence on income per capita growth and income per capita (Gaibulloev and Sandler, 2008). Other evidences also show that education policy (Lochner, 2010), falling real wages (Grogger, 1998) and even weather shocks (Jacob, Lefgren and Moretty, 2004) are significantly correlated with crime activities. Grogger's study is consistent with Becker's framework. It concludes that falling real wages lead to rising youth crime during the 1970s and 1980s. It explores National Longitudinal Survey of Youth survey data and reasons that youth behavior is responsive to price incentives. The better real wages will be a higher opportunity cost of performing criminal activities.

III. Background on EBT

The clear identification of an exogenous influence on cash access- EBT (Electronic Benefit Transfer) program is applied nationwide. EBT program opened an electronic system that allows a recipient to authorize transfer of their welfare benefits from a Federal account to a retailer account to pay for products received (USDA, 2017). Before the program, government gave the average funding 125 dollars per participation by cash or food stamps from bank facilities (Wright, 2014). After the program, government issued a EBT card, acting similarly as a credit card. Welfare recipients receive their benefit from the EBT card and use a PIN to access benefit from ATM or retail point of sale (POS). Now, EBT has distributed the benefits through online PIN debit card, EBT card or smart cards. A variety of distribution methods EBT card made access to benefits immediate and tracked each transaction (Dib, Dodson, & Schocken, 2000). In 1994, this program successfully digitalized the payment for food stamps program in addition to cash-benefit programs and successfully distributed benefits to an average monthly

257,000 households in Maryland, which is the first state implemented EBT program (USDA, 1994). A telephone helpline is also available for cardholders to obtain account balances, report lost or stolen cards and reset PIN (MaloneBeach, Frank, & Heuberger, 2012). For governments, EBT is an efficient economic payment system costing government few pennies a day per recipient. In the transformation to EBT technology, the state trimmed \$45 million from its administrative costs (MaloneBeach, Frank, & Heuberger, 2012).

EBT program is mandated by Federal Reserve Bank; however, it is enacted by states in random order of time. Federal governments provides food stamp funding and licenses participating food retailers, while state government is responsible for administering the program locally (e.g., determine eligibility and benefits) and deliver benefits to recipients (2014). Federal government printed the coupons and shipped them to states. Local offices in states received the coupons and sent to recipients. Since the U.S. government carried out this program to eliminate the extra processes required by paper food stamp system and automate the accounting process rather than to directly affect welfare recipients' cash access, EBT program could be identified as an effective treatment estimator that is independent from other variables of the states in the model. Any change of cash access influenced by EBT program is exogenous to substance abuse problems. EBT begun as a pilot in Reading, Pennsylvania in 1984 Until California implemented the EBT program in June 2004, this program was not carried out nationwide. The different time periods in which different states operated the EBT program are sorted out in Figure 1. In this study, the beginning and the end of the implementation are both separately estimated as a treatment indicator to determine which generates a bigger impact on drug abuses problems based on the comparison of these two estimates.

Nowadays, most of the welfare program have used EBT to distribute their benefits, including Supplemental Nutrition Assistance Program (SNAP), TANF (Temporary Assistance to Needy Families) and WIC (Women, Infants and Child). Among the welfare programs that were

introduced EBT program, the welfare program Supplemental Nutrition Assistance Program(SNAP) has the greatest emphasis on nutrition and hunger crisis and is the only universal program in the United States. Prior research shows SNAP benefits are equivalent to cash for SNAP recipients (Hoynes and Schanzebnbach, 2007). Today, SNAP is the largest Federal food assistance program that has been serving 14% of the population and raising 3.6 million people from poverty (SNAPtoHealth). In 1993, out of 31.1 millions EBT caseload for all government benefit spending, 10.8 millions was distributed to SNAP recipients (Humphrey, 1996). In their EBT cards, SNAP recipients open an account linked to SNAP benefits. Any SNAP benefits can only be used to purchase food item and cash withdrawals and cash back are prohibited. However, noted that food stamp distributed before EBT program neither allow exchanges benefits of cash.

For other cash assistance programs, such as, TANF, EBT card will have its causal impact on cash. In 1993, out of 31.1 millions EBT caseload for all government benefit spending, 20.3 millions was accounted for cash assistance program; specifically, 3.7 millions was attributed to TANF (Humphrey, 1996). TANF, which succeeded the ADCF (Aids to Dependent Children program) on 1996. The impact of oldest federal welfare program that provides cash transfers to families with children is controversial. In terms of caseloads, the TANF successfully pull people out of poverty and push them to work because the number of caseloads in 2010 was lower than at any time since 1963(U.S. House of Representatives, 1994); however, the average monthly AFDC benefit declined from \$483 dollars (in 1993 dollars) in 1980 to \$373 in 1993 (U.S. House of Representatives, 1994). See Figure 2.

Cash withdrawals and cash backs from accounts for cash assistance programs are allowed. However, restricted cash withdrawals and additional fees charged for extra withdrawals are also applied for these programs. The maximum amount of free cash withdrawal per months is varied by state. For Kansas, two cash-only withdrawals are free and additional one costs 40 cents

from POS and 1 dollar for each withdrawal from ATM. Receivers can withdraw cash free four times a month at ATMs with the MoneyPass sign. But after the fourth withdrawal in a month, each additional ATM withdrawal will cost 80 cents. For some ATM without the MoneyPass sign, a withdrawal costs 4 dollars. Welfare recipients are able to search for the available ATMs with MoneyPass online.

For the distribution of welfare on consumption, the welfare benefits spent on hedonistic activities are prohibited. According to the Food and Nutrition Act of 2008, alcoholic beverages and tobacco products are ineligible for purchase with SNAP benefit (USDA, 2017). In 2012, the federal government mandated restrictions on EBT card use in liquor stores, gaming or gambling establishments (NCSL, 2015). The states that are not in compliance will face financial penalties. From direct cash distribution to EBT card that impose restrictions on drug purchases and has surcharges for cash withdrawals, EBT should influence the welfare recipients who distributed the welfare benefits on drug before. Therefore, I hypothesize that in addition to the surcharges of cash withdrawals, the restriction of alcohol purchases would decrease illicit drug and alcohol use. This hypothesis is constructed based on the result of the research by Schneider. The research finds that even though abolition of cash would not eliminate shadow economy, it would still raise the cost of illegal payment and thus might reduce the shadow economy by an estimated two to three percent.

Even though EBT card offers clients immediate access, some limitations are also identified. Firstly, Malonebeach shows that EBT potentially results in loss benefits for recipients. Before EBT program, recipients were able to collect food stamps and spend them based on needs. However, recipients under EBT program will be noticed of a warning if no benefits are used in two consecutive months and the accounts will be locked if no benefits are used in three consecutive months. If accounts are not accessed in 12 months, benefits contained in the account will be expunged (MaloneBeach, Frank, & Heuberger, 2012). Their research sending survey to

EBT user indicates that the difficulty of using the system is remain in welfare populations. Recipients reported that they have challenges to obtain benefits when seeking help from local offices. Problems of understanding the help line operator and experiencing loss of benefits are also reported in the survey. (MaloneBeach, Frank, & Heuberger, 2012)

IV. Methodology

To estimate the impact of EBT program on a nationwide range of socio-economic outcomes, I use a difference-in-difference-in-difference (DDD) approach with a panel specification. By exploiting the variations of timing of EBT implementation in different states and comparing affected and unaffected states in varied years, I identify the change of drug abuse behaviors. Noted that the variations of timing of EBT implementation and purpose of carrying out EBT is purely exogenous to any purpose of regulating drug behaviors. Besides, since the EBT implementation duration in each state varied, I analyze the baseline equation in two separate ways.

The first estimated baseline equation is:

$$y_{i,t} = \phi_i + \phi_t + \beta * EBT1_{i,t} + time1_{it} + time1_{it} * \phi_i + \delta * (control)_{it} + \epsilon_{it}, (1)$$

Where i indices the states and t represents year. In this study, I analyze data from year 1992 to 2005; thus, t ranges from 1992 to 2005. The $time1$ variable represents the number of years after starting implementing EBT for state i . California started EBT program statewide in year 2002; $time1$ for California equals 0 before and at year 2002, 1 at year 2003 and 2 at year 2004. This variable capture a linear trend of outcome variables over years after the implementation. The unobservable time invariant characteristics of different states will be controlled by the fixed effect ϕ_i , such as, geographical location and cultural features. In this study, more specifically, state fixed effect is effective in controlling the characteristics relevant

with the timing of EBT implementation. Suppose timing of EBT implementation is not random but systematically correlated with economic growth strength or implementation of banking system, state fixed effect could help capture these noises. The interaction between $time_{it} * \phi_i$ captures specific linear trend in varied states. $Control_{i,t}$ is a set of control variables that capture the state characteristics varied over years and potentially relevant to EBT program. Specifically, I control for the variables GDP per capita, unemployment rate, poverty rate, total welfare spending and share of SNAP welfare participants by state. Coefficients for control variables will be reported in Result section. Furthermore, the time dummy factor ϕ_t will be added to control for time-specific fixed effect that is restricted to specific year and is not correlated with other explanatory variables. $\epsilon_{i,t}$ is the error term. $EBT1_{i,t}$, the treatment indicator, represents whether the state i started implementing the EBT program in year t . It equals to 1 for the state that started the program in year t and to 0 for the state had not started the program yet in year t . The coefficients for $EBT1_{i,t}$ are the key results in this study and will be emphatically reported and analyzed in the result section. $y_{i,t}$ will be the dependent variable of my interests. I provide with a detailed description of dependent variables in Data Description section.

In addition, another baseline will be estimated for each dependent variable:

$$y_{i,t} = \phi_i + \phi_t + \beta * EBT2_{i,t} + time2_{it} + time2_{it} * \phi_i + \delta * (control)_{it} + \epsilon_{it}, (2)$$

$EBT2_{i,t}$ also represented the treatment indicator; however, it represents whether the state i fully implement the EBT program in year t . It equals 1 when state i has finished implemented EBT and 0 when it has not fully implemented EBT. Similarly, $time2_{it}$ represents the number of years after state i fully implementing EBT. In the example of California, it equals 0 before and at 2004 and equals 1 at 2005. EBT implementation periods in different states are fully described in Figure 1. By constructing specifications in two such ways, I compare the results and figure out whether the beginning and end of implementation periods has bigger impacts over drug use

behavior. Based on the comparisons, this study has noticed that EBT exerted a bigger impact on drug abuse behavior when it was fully implemented in states.

V. Data Description

This study explored drug abuse problems by combining patient level records of substance treatment admissions in a series of dataset Treatment Episode Dataset – Admissions (TEDS-A). This study retrievea data from Inter-university Consortium for Political and Social Research (ICPSR)¹. The investigator for TEDS-A is Substance Abuse and Mental Health Service Administration (SAMHSA), Center for Behavioral Health Statistics and Quality (CBHSQ). TEDS-A is a national census data system of annual admissions to substance abuse treatment facilities that are licensed or certified by the state substance abuse agencies. It collects all admission records nationwide and requires all treatment facilities to report information on treatment admissions. The first year of TEDS-A data is 1992. This study exploits data from year 1992 to 2005, a time period in which most of states started and finished implementing EBT program and data on 50 states² and Washington, DC in the United States. The patient-level demographic characteristics, employment status and primary source of referral are recorded for each admission. Noted that each admission represents one treatment record. One client may visit substance treatment facilities for many times and TEDS-A records all admissions. In this study, the number of admissions for each type represents the number of admission records rather than the number of patients as well. Table 1 presents summary statistics for all admissions from 1992 to 2005. The primary substance problem reported is commonly related with cocaine, heroin and marijuana; though nearly half of admission related with alcohol. Cocaine, heroin and marijuana

¹ Data is retrieved from <https://www.icpsr.umich.edu/icpsrweb/ICPSR/series/56>

² TEDS-A has missing data for Alaska (2004-2005), Arizona (1992-1997), Arkansas (2004), Washington D.C. (1992-1993, 2004-2005), Indiana (1997), Kentucky (1992-1996), Mississippi (1992-1994) , West Virginia (1994, 1997-1998, 2000-2002) and Wyoming (2004 – 2005) .

do not varied in amounts in terms of admissions records. Since, the admissions of 14 other subtypes of drugs besides cocaine, heroin, marijuana and methamphetamine take up only 6% of total admissions, they are neither reported nor analyzed in this study but will be counted into the calculation of total drug-related admissions in Table 2.

Table 2 presents summary statistics on patients' age, gender, employment status, race and resources of referral. It is consistent with intuitively sense that drug abuse problems are much more common in males (70%) than females (30%). Moreover, drug abuse problems for aged 30-49 males are more common than those for aged 19-29. Males in these two age ranges have a relatively high risk of drug overdose in terms of high frequency and large amount of illicit drug intake. This study will take a closer look at these two populations and examines their response to EBT. Besides, not-in-labor-force takes up the biggest proportion of admissions. This is also consistent with the idea that unemployment correlates with drug use.

This study counts admissions by year and state and sort them in a panel data. To control for varied size of population in each state, I further divide the admissions by estimated state populations³ and measure the admissions in number of admissions per million populations. Various control variables will also be added to get a better estimate of the responses to EBT program, such as, real GDP per capita⁴, unemployment rate⁵, poverty rate⁶, total welfare spending⁷ and share of SNAP welfare participants by state⁸. Information about share of total welfare participants on a state level are inconclusive in year 1992 -2005. Real GDP per capita and total welfare spending are both inflation-adjusted ($CPI_{2010} = 100$). Both real GDP capita and total welfare spending are reported in millions per million population.

³ Source: Population Division, U.S. Census Bureau.

⁴ Source: US Bureau of Economic Analysis

⁵ Source: US Bureau of Labor Statistics

⁶ Source: U.S. Census Bureau

⁷ Data is retrieved from usgovernmentspending.com. Original source: Historical Tables, Federal Budget.

⁸ Source: SNAP table, USDA, published in 2015.

The reason why this study explore substance abuse problem on TEDS-A dataset it because the substance use is covert and true data on total drug consumed on a state basis in the period when EBT was carried out are inclusive. Dobkin examined hospitalization data and specifically used admissions per day for heroin, cocaine and amphetamine to identify prevalence of drug consumption (Dobkin, 2007). Another study by Dobkin and Nicosia about effects of government intervention on methamphetamine also applied hospital admission and treatment admission records to identify methamphetamine consumption. (Dobkin & Nicosia, 2009)

Hospitalization data have the advantage of not requiring self-reporting. The change of health issues indicated by the hospitalization data can capture partial change of drug abuse problem. As a direct approach, employing well-designed surveys and samples to estimate the underground economy is widely used but this measurement is inherited with biases (Schneider, 2016). Under-reporting is widespread among clients of substance abuse treatment programs. (Magura and Kang 1996; NIDA 1996) A proportion of people have the propensity to leave a part of the illegal story out or hesitate to report the fraudulent behavior. Besides, a direct measurement of drug consumption in the United States is subject to several implications. Firstly, the drug purchase activities are largely anonymous and off the records. Secondly, the data on drug prices are noisy and inconsistent (Corman & Mocan, 2000) and thus it is unreliable to alternatively measure drug consumption by law of supply and demand. Even though economists have been believing that drug consumption responds to price change, it is difficult to estimate the price elasticity of drug consumption (Dobkin & Nicosia, 2009). Analyzing treatment records to substance abuse treatment facilities has its advantages of closely identifying substance abuse problems. However, the inherited limitation in this study is that it cannot address the substance abuse problems among the welfare recipients.

VI. Result

In this section, I will present the responses of admissions for overall drug-related and each subtype of drug to EBT program. This study estimates all coefficients in a fixed effect model. Table 3 presents the coefficients in specification (1). Results show no significant change of total drug-related admissions in response to an initial development. The decline of cocaine admissions is pretty striking. It significantly reduces by 73 admissions per million population. The coefficient for *time1* also indicates no growing impacts of EBT.

However, results estimated in the specification (2) presents that the fully-developed EBT significantly reduces the total drug related admission by around 440 records per million population (Table 2). The magnitude of decline shows a considerable response to policy implementation in relative to 5861 total drug-related admissions in each state per year. Most of the subtypes of drugs also declines its admissions following the treatment. The coefficients of cocaine, marijuana and methamphetamine consistently shows negative; though only cocaine shows a significant change and heroin, instead, shows a significant and positive correlation. Variations of subtypes of drug response might be due to potential noises and pharmacological effects of drugs. In Dobkin's study, cocaine-related hospital admissions change most evidently to the cash imbursement from welfare benefits. He reasons based on Gawin's idea(1991) that the cycle of drug use among cocaine users varies to a much greater extent than the cycle among users suffering from opiate or alcohol withdrawal. He also points out that heroin is more likely to be used in a daily basis but cocaine is used in a cyclic pattern based on the pharmacological research by Johanson and Fischman (1989). This is consistent with the idea that drug abusers, when having not enough cash in pockets, are more likely and easier to curb cocaine intake and heroin admissions indicate no decreasing trend. However, little is about significant increase of heroin admissions. As a robustness check, alcohol abuse admissions also decrease following to the developed stage of EBT, though not significantly.

time variables are also not significant in the specification (2). Overall, EBT only exhibits a shock to drug abuse problem but does not influence more population after it has been fully implemented. This is consistent with the intuitive sense that EBT, by affecting recipients' cash access, influences much on the portion of welfare recipients who rely on welfare to drug purchase and no other sources of cash. The welfare recipients relatively more self-sufficient might not be influenced by EBT and are still able to maintain drug addicts. Over time, EBT cannot have growing effects through other potential mechanisms.

Literature shows that drug of use, drug of choices, and prevalence of drug use disorders are likely to vary across different subgroups in the welfare population (Pollack, 2002); therefore, this study further estimates the responses to EBT in varied populations and presents results in Table 5 and 6. Drug-related admission records are grouped according to several observable factors, such as, age, gender and race. They, in the similar style, are measured in number per million population. Groups with characteristics frequently shown substance abuse problem are specifically estimated. Consistently, aged 18-29 males, age 30-39 males, white population and black population do not have significant changes in the early stage of EBT implementation (Table 5). Only admissions for aged-18-29 males significantly reduces for 42 records per million population to the developed stage of EBT. This implies that the drug abuse problem for younger age are more likely to be affected. Different response between aged 18-29 males and aged 30-39 males might be due to varied volatility of economic environmental factors in terms of education opportunities, job seeking and marital status. Younger age more competitive in job seeking and more likely to adjust their behavior to achieve education performances and build families. This is result is still consistent with the opportunity cost analysis. However, drug-related admissions do not indicate significant change and neither do not varied in white and black populations.

This paper has been addressed a lot on the important role of employment in drug abuse problems. Drug-related admissions records are also grouped in terms of employment status. Table 7 presents the estimates for drug-related admissions controlled for unemployed, not in labor force, full time and part time in the specification (2). Interestingly, this study hypothesized that varied employment status would generate different responses to EBT. However, the coefficients of *ebt2* for four categories consistently insignificant and are not varied. Relative to average statistics, the number of admissions whose employment status considered not-in-labor-force decreases by a slightly larger scale. It shows a 2.9% decrease of average admissions following fully implementation of EBT. Based on coefficients of *ebt2* in Table 7, I do not find evidences that employment status can be a significant factor. However, I do find evidences from coefficients of variable unemployment rate. across all types of admission in all tables, unemployment rate, as the control variables, is consistently positively correlated with the admissions.

In Table 8, data are grouped according to two types of resource of referral: criminal referral and self-referral. Results indicate that crime-related admissions significantly reduces 189 cases in response to the fully implementation of EBT per million population. However, admissions referred by clients themselves, parents or friends do not respond to EBT. This is consistent with the common belief that criminal activities and substance use are closely correlated. The declines of crime-related admissions provides with solid evidence that criminal activities are positively correlated with drug abuse problems. Potentially, the decreasing drug abuse problems further reduce impulsive acts. This result is also consistent with Wright's idea (2014) that EBT reduced criminal activities by reducing cash circulation. However, the result contradicts one potential behavioral bias reasoned by Foley (2010) that the recipients who are short money are more likely to perform crime and require money. But still, this study is not able to prove the causality between criminal activities and drug abuse.

Consistently, welfare spending per capita are negatively correlated total-drug admissions. Table 4 shows that in the specification (2), one million dollars welfare spending per million population decrease 3 admissions records per million population. Welfare spending, primarily intended to offer income assistance, work or education opportunities, indirectly reduces drug uses, even though in a very small magnitude. Table 4 also shows that if the share of SNAP welfare recipients increases by 0.01, total drug-related admissions increases by 164 records. which shows the prevalence of drug abuse problems among SNAP recipients. This evidence shares with the same idea with welfare literatures that drug abuse problems are popular among welfare recipients.

VII. Conclusion

Overall, this study finds evidences that EBT reduces substance abuses by affecting cash access. EBT indicates a much more impact on substance abuse problem at the later developed and fully implemented stage than at the early primitive implementation. At the developed stage, EBT has grown in breadth and has a much more evident impact. Even though the correlation between SNAP share of welfare recipients and substance abuse problem indicates a striking fact that substance abuse problems root in the poor population, the sizeable declines of both drug-related admissions and cocaine-related admissions following EBT show evidences that a changing welfare distribution method can alleviate the substance abuse problems among welfare recipients by affecting cash access. By restricting the cash access among the group of recipients who relies on cash reimbursement from welfare benefits to maintain drug addicts, EBT, in a non-pervasive way, keeps them out of the underground drug market and impedes their consumption on drugs. Evidences have also shown a positive correlation between criminal activities and drug abuse problems when analyzing admissions records to substance treatment facilities. The declining crime-related admissions supports that less substance abuse problems can, in turn,

reduce criminal activities, which mostly performed from impulses and irrational thoughts.

Official reports (2017) published by USDA also show that EBT is now also an effective digital tool to identify and track the trafficking, which means exchange of benefits of cash for SNAP program. The irregularity of purchase activities or cash withdrawal patterns can further raise the efficiency of fraud investigation process. Further action and prosecution can be taken by federal governments to sanction and disqualify the retailers which engage in trafficking. With governments' dedication into fight SNAP trafficking, EBT will have a more noticeable effect on recipients' access to cash.

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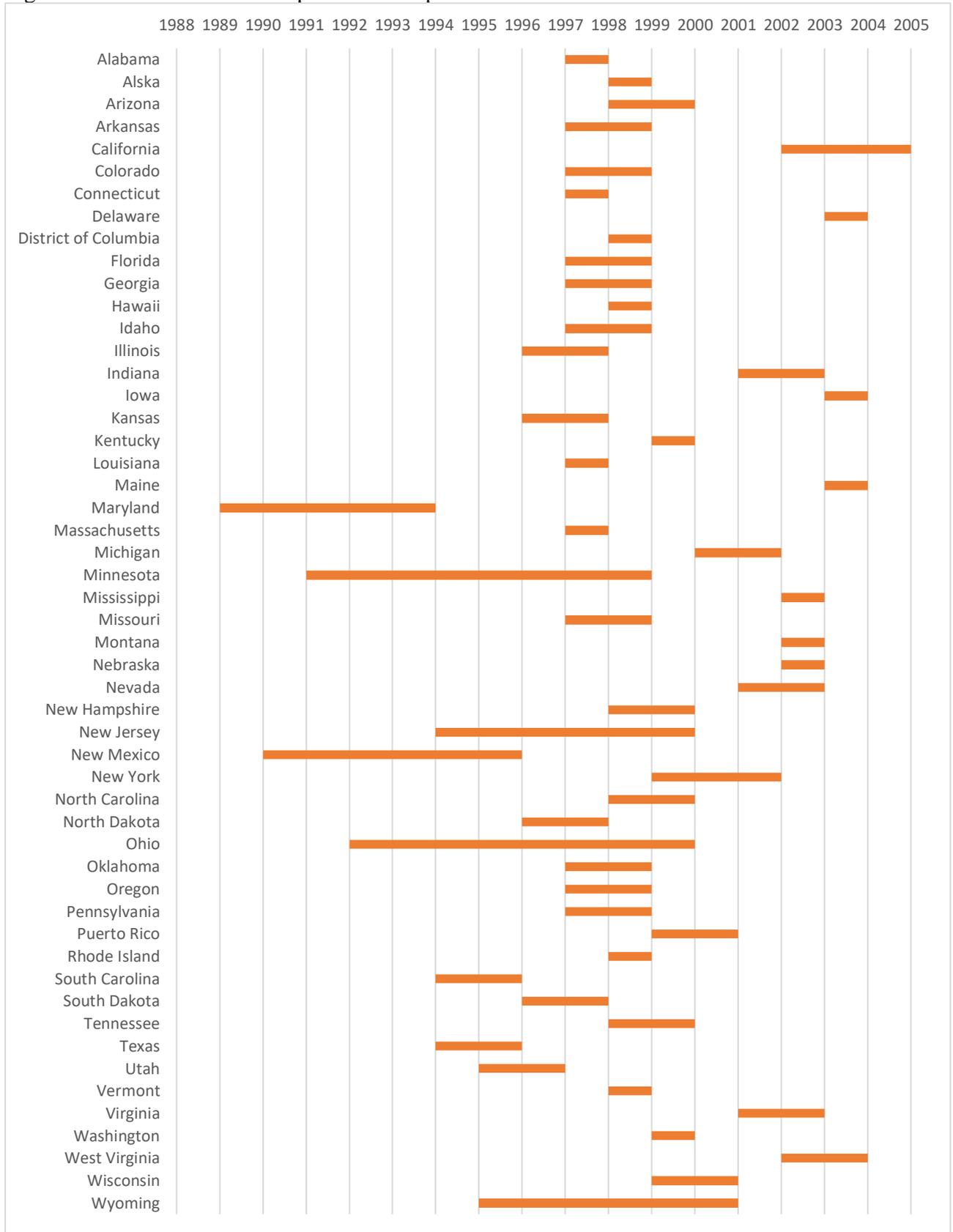
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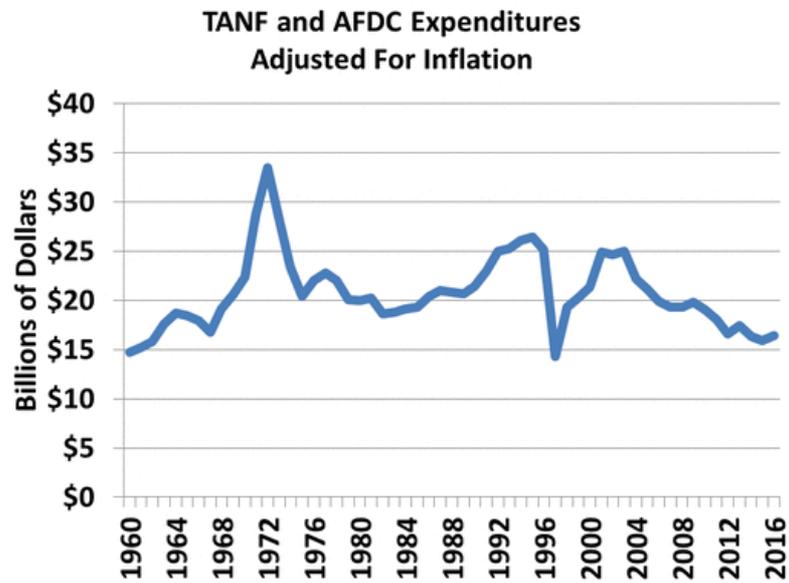
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Figure 1A. Timeline for the implementation period for each of the state.



Note: The graph shows the years in which different states implemented the EBT program. The bar indicates the period in which the state was expanding the EBT statewide. Data is collected from USDA and retrieved from: <https://fns-prod.azureedge.net/sites/default/files/snap/electronic-benefits-transfer-ebt-status-report-state.pdf>

Figure 2. TANF and AFDC Expenditures Adjusted for Inflation



Note: The graph shows the TANF and AFDC expenditures per year adjusted for the inflation (stated in 2015 dollars). Source: TANF. URL: <http://federalsafetynet.com/tanf.html>

Table 1.

Treatment records by type of drug indicated as primary problem of admissions

Percentage of total admission records

Primary problem of admission

Total drug-related admissions	0.52
Cocaine/crack	0.15
Heroin	0.14
Marijuana/Hashish	0.13
Methamphetamine	0.04
Alcohol	0.48

Total admissions

23,510,079

Admissions whose primary cause problem is identified as None (n = 301,670) or Missing/Unknown (n = 315,321) will be excluded from analysis. Total admissions reported in the table do not include None or Missing/Unknown admissions.

Table 2.	
Demographics of treatment records	
	Percentage of total drug-related admissions
<i>Gender</i>	
Male	0.70
Female	0.30
<i>Age for male</i>	
12-14	0.021
15-17	0.085
18-20	0.071
21-24	0.111
25-29	0.152
30-34	0.170
35-39	0.161
40-44	0.120
45-49	0.066
50-54	0.028
55 and over	0.016
<i>Race</i>	
White	0.61
Black	0.25
Other races	0.14
<i>Resource of Referral</i>	
Criminal referral	0.30
Individual referral	0.37
Substance abuse care referral	0.11
Other referral	0.22
<i>Employment status</i>	
Full-time	0.17
Part-time	0.06
Unemployed	0.28
Not in labor force	0.45
Total drug-related admissions	12,001,853

Total drug-related admissions are all the admissions whose primary problems are related with drugs.

Table 3.

Measuring responses of admissions to the beginning of EBT implementation

	Total Drug- related	Cocaine	Heroin	Marijuana	Metham- phetamine	Alcohol
ebt1	15.84 (0.17)	-73.83*** (2.03)	87.12** (2.08)	23.06 (0.70)	13.70 (0.56)	62.10 (0.48)
time1	10.66 (0.18)	-19.26 (-0.83)	21.41 (0.81)	38.90* (1.84)	-37.41** (-2.49)	92.63 (1.14)
rGDP per capita	5.84*** (4.23)	-.27 (-0.49)	4.88*** (7.83)	1.93*** (3.89)	-.39 (-1.07)	-2.86 (-1.50)
Poverty rate	-.43 (-0.07)	-1.63 (-0.68)	2.71 (0.97)	-1.46 (-0.66)	1.53 (0.94)	-9.43 (-1.11)
Welfare Spending per capita	-2.45*** (-6.27)	-1.04*** (-6.85)	-1.12*** (-6.44)	-0.34** (-2.48)	-0.15 (-1.4)	-2.072*** (-3.88)
Unemployment rate	74.44 (1.53)	63.18*** (3.36)	-64.70*** (-3.00)	50.61*** (2.96)	73.54*** (5.70)	-82.97 (-1.25)
Share of welfare recipients	53.51* (1.82)	2.13 (0.19)	61.72*** (4.71)	-7.23 (-0.70)	2.23 (0.29)	-68.32* (-1.71)
Average admissions per year by year	5861	813	721	874	287	3680
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State specific time trend	Yes	Yes	Yes	Yes	Yes	Yes

Note: Each cell represents the coefficient of corresponding variable. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. t-values are included in the parenthesis under the coefficients. Coefficients means the change of numbers of admissions per million population. Average admissions per year by state means the average numbers of admissions for specific type per million population in each year and each state.

Table 4.

Measuring responses of admissions to the end of EBT implementation

	Total Drug- related	Cocaine	Heroin	Marijuana	Metham- phetamine	Alcohol
ebt1	-439.70** (-2.05)	-74.26** (-2.08)	86.63*** (2.12)	-29.86 (-0.90)	-27.99 (-1.12)	-51.28 (-0.40)
time1	165.30 (1.18)	-18.69 (-0.80)	46.28* (1.75)	30.65 (1.42)	-38.01** (-2.44)	44.25 (0.53)
rGDP per capita	5.03 (1.57)	-0.29 (-0.55)	5.06*** (8.30)	1.61*** (3.23)	1.14*** (3.05)	-3.63* (-1.90)
Poverty rate	6.20 (0.42)	-1.97 (-0.80)	2.54 (0.90)	-1.78 (-0.78)	1.02 (0.60)	-11.35 (-1.30)
Welfare Spending per capita	-3.12*** (-3.34)	-0.94*** (-6.22)	-1.14*** (-6.61)	-0.34** (-2.54)	-0.27** (-2.32)	-2.00*** (-3.72)
Unemployment rate	35.80 (0.32)	62.45*** (3.31)	-71.56*** (-3.34)	53.53*** (3.06)	83.61*** (6.27)	-80.22 (-1.19)
Share of SNAP welfare recipients	163.98** (2.41)	5.47 (0.48)	68.05*** (5.24)	-4.10 (-0.39)	3.21 (0.40)	-59.85 (-1.49)
Average admissions per year by year	5861	813	721	874	287	3680
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State specific time trend	Yes	Yes	Yes	Yes	Yes	Yes

Note: Each cell represents the coefficient of corresponding variable. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. t-values are included in the parenthesis under the coefficients. Coefficients means the change of numbers of admissions per million population. Average admissions per year by state means the average numbers of admissions for specific type per million population in each year and each state.

Table 5.
Dependent Variable: total drug-related treatment records per million population

	Age 18-29 Male	Age 30-39	White	Black
ebt1	-13.52 (-0.54)	10.42 (0.30)	-10.14 (-0.16)	-12.32 (-0.26)
time1	-12.24 (-0.77)	4.56 (0.21)	-30.05 (-0.75)	60.13** (20.01)
rGDP per capita	2.37*** (6.51)	1.97*** (3.95)	3.20*** (3.47)	2.49*** (3.64)
Poverty rate	-0.27 (-0.16)	0.56 (-0.25)	-0.20 (-0.00)	0.12 (0.04)
Welfare Spending per capita	-0.21** (-2.03)	-1.05*** (-7.43)	-0.17 (-0.64)	-2.00*** (-10.31)
Unemployment rate	24.03* (1.87)	25.63 (1.46)	16.22 (0.5)	66.25*** (2.73)
Share of welfare recipients	11.85 (1.53)	26.57*** (2.51)	17.83 (0.91)	9.89 (0.68)
Average admissions per year by year	3947	5861	1794	809
Time fixed effect	Yes	Yes	Yes	Yes
State Fixed effect	Yes	Yes	Yes	Yes
State specific time trend	Yes	Yes	Yes	Yes

Note: Each cell represents the coefficient of corresponding variable. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. t-values are included in the parenthesis under the coefficients. Coefficients means the change of numbers of drug-related admissions for specific type per million population. Average drug-related admissions per year by state means the average numbers of admissions for specific type per million population in each year and each state.

Table 6.
Dependent Variable: total drug-related treatment records per million population

	Age 18-29 Male	Age 30-39 Male	White	Black
ebt2	-42.11* (-1.68)	-10.90 (-0.33)	-49.33 (-0.79)	-18.38 (-0.40)
time2	-10.78 (-0.66)	13.28 (0.61)	-17.75 (-0.43)	67.17** (67.18)
rGDP per capita	2.16*** (5.73)	1.66*** (3.31)	2.77*** (2.95)	2.52*** (3.68)
Poverty rate	-0.59 (-0.34)	-0.92 (-0.40)	-1.09 (-0.24)	-0.13 (-0.04)
Welfare Spending per capita	-0.18* (-1.72)	-1.02*** (-7.18)	-0.08 (-0.31)	-1.94*** (-10.04)
Unemployment rate	23.24* (1.76)	24.41 (1.38)	8.13 (0.25)	68.15*** (2.83)
Share of welfare recipients	17.06** (2.14)	33.23*** (3.13)	37.33* (1.88)	12.93 (0.89)
Average admissions per year by year	3947	5861	1794	809
Time fixed effect	Yes	Yes	Yes	Yes
State Fixed effect	Yes	Yes	Yes	Yes
State specific time trend	Yes	Yes	Yes	Yes

Note: Each cell represents the coefficient of corresponding variable. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. t-values are included in the parenthesis under the coefficients. Coefficients means the change of numbers of drug-related admissions for specific type per million population. Average drug-related admissions per year by state means the average numbers of admissions for specific type per million population in each year and each state.

Table 7.
Dependent Variable: total drug-related treatment records per million population

	Unemployed	Not in Labor Force	Full-time	Part-time
ebt2	-12.23 (-0.23)	-35.42 (-0.7)	-13.37 (-1.37)	-4.30 (-0.49)
time2	-38.23 (-1.12)	80.98** (2.45)	-9.17 (-0.61)	-5.49 (-0.95)
rGDP per capita	1.50* (1.91)	3.10*** (4.09)	2.88*** (7.89)	0.77*** (5.73)
Poverty rate	-3.01 (-0.83)	3.45 (0.99)	-0.04 (-0.03)	0.22 (0.36)
Welfare Spending per capita	-1.14*** (-5.12)	-0.61*** (-2.87)	-0.27*** (-2.62)	-0.11** (-2.83)
Unemployment rate	57.43** (2.06)	11.72 (0.44)	16.94 (1.32)	8.35* (1.76)
Share of welfare recipients	41.07** (2.47)	28.89** (1.80)	6.51* (0.84)	8.26*** (2.96)
Average admissions per year by year	918	1192	550	208
Time fixed effect	Yes	Yes	Yes	Yes
State Fixed effect	Yes	Yes	Yes	Yes
State specific time trend	Yes	Yes	Yes	Yes

Note: Each cell represents the coefficient of corresponding variable. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. t-values are included in the parenthesis under the coefficients. Coefficients means the change of numbers of drug-related admissions for each employment status per million population. Average drug-related admissions per year by state means the average numbers of admissions for each employment status per million population in each year and each state.

Table 8.
Dependent Variable: total drug-related treatment records per million population

	Criminal Referral	Self Referral
ebt2	-188.58** (-2.03)	-18.45 (-0.25)
time2	13.13 (0.22)	30.19 (0.64)
rGDP per capita	1.60* (1.10)	2.82** (1.13)
Poverty rate	-4.49 (-0.70)	-4.14 (-0.82)
Welfare Spending per capita	-0.88** (-2.23)	-1.73*** (-5.63)
Unemployment rate	146.79*** (2.99)	-16.25 (-0.42)
Share of welfare recipients	-16.60** (-0.56)	62.96*** (2.74)
Average admissions per year by year	2314	1988
Time fixed effect	Yes	Yes
State Fixed effect	Yes	Yes
State specific time trend	Yes	Yes

Note: Each cell represents the coefficient of corresponding variable. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. t-values are included in the parenthesis under the coefficients. Coefficients means the change of numbers of drug-related admissions for each employment status per million population. Average drug-related admissions per year by state means the average numbers of admissions for each employment status per million population in each year and each state. Criminal referral include the admissions referred by any policy official, judge, prosecutor, probation officer or other person affiliated with a federal, state, or county judicial system. It also includes by a court for DWI/DUI, clients referred in lieu of or for deferred prosecution, or during pretrial release, or before or after official adjudication. Includes clients on pre-parole, pre-release, work or home furlough, or TASC. Self-referral includes the admissions referred by the client, a family member, friend (SAMHSA)