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An Econometric Investigation of the Impact of Gender Income Gap on the Gender Gap in Crime: The Case of Arkansas State

Cinsiyet Gelir Farkı'nın Cinsiyet Suç Oranı Üzerine Etkisi Üzerine Ekonometrik Bir İnceleme: Arkansas Eyaleti Örneği

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ÖZ

Bu çalışma, cinsiyet hususunu dikkate alarak suçun belirleyicilerini açıklamayı hedeflemektedir. Arkansas eyaleti ve bu eyalet içerisinden 4 şehir rassal olarak seçilmiştir. Standart en küçük kareler ekonometrik tahmin sisteminin küme dirençli standart hatalar yöntemiyle kullanılmasıyla elde edilen tahmin sonuçları, gelir düzeyinin negatif ve tutuklanma olasılığının suç piyasasına katılımı pozitif ve istatistiki olarak anlamlı olarak etkilediğini göstermiştir. Bu çalışmanın en önemli bulgusu erkek ve kadınlar arasında gelir farkının artmasının erkeklerin, kadınlara göre, suç işleme oranını arttırdığını göstermesidir. Sonuçlar literatürden farklı olarak, tutuklanma olasılığının belirli bir eşik değerinden sonra, suç oranlarını arttırdığını göstermektedir.

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ABSTRACT

The paper examines the determinants of crime by focusing on gender issue. We randomly select the state of Arkansas and four counties in Arkansas. We estimate econometric models to examine the determinants of crime market participation. Estimations based on ordinal least squares using clustered robust standard errors imply that probability of arrest affects the crime market participation. One of the significant contribution of the paper is that, according to the estimation results crime gap increases as gender income gap increases explaining the decline in the gender wage gap and gender gap in crime in the last decades. Furthermore the results contrary to literature, imply that there is threshold level after which increase in probability of arrest leads to the crime market participation.

1. Introduction

Crime rates have been declining over centuries for humanity. Particularly, homicide rates, men to men conflict in public space decreased worldwide. However, for decades the crime rates are fluctuating around some steady values in different regions of the worlds.

There are economic, social, juridical, and political determinants of crime. These determinants constitute the incentive structure for the offenders in different age cohorts. In other words, individual from certain race, family, income level, neighborhood would compare his future self with the income level of the individual in the old age cohort at the current period with same background and then invest in skills either for legal market or for the crime market. Therefore, economic and social conditions are closely related to incentive to entering to the crime market. Particularly, if individual from certain race with certain

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family income, which is, say, low, observes that he would earn low income level regardless of his/her education level, he would have low incentive to accumulate skill, or demand education. Instead, he would accumulate skills for crime market if there would be higher income stream to capture.

Therefore, racial/ethnic/cleavage based discrimination in the job market might result in variation in crime rates across these cleavages which would exacerbates with poverty level in the country. Moreover, immigration might exacerbate the crime rate in the country. Buonanno and Montolio (2008) using panel data set of Spanish provinces from 1993 to 1999 and using GMM-system estimator report that immigration affects positively crime rate. They report that immigration in one way contributes to the economic growth due to labor shortage in the country, however, in other way it affects positively crime rate in Spain.

Economic analyses of crime market participation mostly base their arguments on rational choice based explanations of committing crime. Becker (1968) benchmark model provides rational choice theory ground for most of the following researches on crime. Becker (1968) argue that probability of arrest and severity of punishment affect negatively crime participation whereas rewards obtained from criminal activity affect positively the crime participation. Therefore, criminal activity is taken if there are more expected gains than costs. From this respect, it can be claimed that arrest rate should affect negatively crime rate.

Economic incentives or crime offend include economic rewards/returns of criminal activity (Becker, 1968), the poverty level of the individual (Ehrlich, 1973) or low level legal wage income. Wage level used in the literature (Machin and Meghir, 2004; Grogger, 1998) as the indicator of the level of economic well-being of the individual that would be correlated with the criminal behavior. On the other hand, economic inequality level also would be correlated with the crime participation rate in the country because people would not submit the social contract that distributes resources unequally among citizens (Fajnzylber, 2002). Unemployment rate also highly referred in the literature as the economic determining factor for the crime market participation. Allan and Steffensmeier (1989) particularly emphasize that youth unemployment rate affects positively arrest rate for youth whereas full time employment affects negatively arrest rate for youth. Edmark (2005), using a panel of Swedish counties data over the period of 1988-1999 argue that unemployment increase property crimes and do not make any significant effect on the violent crimes.

There are other determinants of the crime referred in the literature such as education level, age, arrest rate and effectiveness of the law enforcement. Imrohoroglu et al. (2006) report that 50% of sentences in England and Wales require sentencing more than 2 years, however it is valid only 6 % of sentences in France. Imrohoroglu et al. (2006) also report that arrest rate negative significantly affect crime rate.

On the other hand, since Mincer's (1962) benchmark study on education and earnings, there are several researches seeking to provide evidence on the fact that additional years of schooling increases wage level. Therefore, from this respect, it is obvious that additional schooling years increases opportunity cost of going to jail. Lochner (2004) shows that education decreases crime market participation if only the reward of education in the form of the high legal wage income exceeds the rewards from crime market participation.

Age is another factor determining the crime rate referred in the literature. Hirschi and Gottfredson (1993) argue that distribution of crime on age looks like normal distribution so that crime rate increases by age and peaks at early adulthood and then falls. Greenberg (1983) argues that employment status of youth has the determinant role on this particular shape of crime rate distribution whereas Benson (2001) argue that having varying level of family responsibilities over different ages has determinant role on this particular shape of crime rate distribution.

Crime committing in Becker's (1968) argument is the outcome depending on individual expected utility maximization. However, macroeconomic conditions affecting general economy also would make significant impact on various crime types. Particularly, business cycles would affect the level of criminal activity in the country. Arvanites and Defina (2006) show that property crimes are driven by the business cycle and have counter cyclical components. They report that strong economic performance diminishes the number of property crimes. On the other hand, Cook (1985) shows that economic performance of the country does not make any significant impact on the homicide rate.

The gender issue is closely related in decision to commit a crime because incentives and disincentives differ between genders. Particularly, convergence of social roles of sexes, feminization of labor market, and changing bargaining power of female in household in recent decades, changes the scope of mobilization of female labor power. Goldin (2006) used the term of "quiet revolution" to describe the increase in women's labor force participation rate. Over recent decades women become more part of the economic machine, and attached to the labor market. Women's income particularly married women's income partly offsets the husband's income loss which would make significant effect on the probability of committing crime (for anyone) in the household.

The wage gap between genders and blockages on reaching top, managerial positions for female workers which is also called as "glass ceiling" in the literature in gender (labor) economics are significant factors determining the (legal) labor supply decision of female workers. According to OECD 2017 Gender Wage Gap Data, female median income is less than median male income by 18 % in United States, 16% in United Kingdom, 18% in Canada, %17 in Germany.

There are several empirical studies focusing on the determinants of gender wage gap. Pissarides et al. (2005) argue that recent decrease in gender wage gap can be attributed to the increases in education investments by women. Blau et al. (2014) argue that women become more highly educated than men in recent decade. However, women having low education level would commit crime with higher probability than highly educated women. Moreover, poor families adapting traditional gender labor division use less resources for educational investment of daughters than sons. Therefore, it can be claimed that women with poor and traditional families would be more likely to commit crime. Polachek (1981) argue that work

experience is significant factor explaining the gender wage gap. Altonji and Blank (1999) argue that because women has interrupted work history due to their social roles such as childbearing, firms discriminate on women in wages. Gender wage gap would put certain conditions on the maximum market wage women can possibly achieve that would result in increase in the probability of crime committing by women.

Therefore, even the labor market became more feminine, female workers earn less than male colleagues even if they have same educational history. We consider that would affect female workers' decision to enter the crime market partially to compensate wage gap, or totally leaving the legal market to enter the crime market. Economic activity if centered on male power, and if there is not gender mobility in the labor market then opportunity cost of participating crime market is small. In other words, if the probability of replacement of male worker that is paid higher than median male by female worker is very low, then female worker would seek to participate to higher rewarding crime activity that has very small opportunity cost.

Mostly, in developed countries family establishment is not on traditional mechanics, women mostly uses her income stream to smooth consumption. Women worker would calculate the expected future income given the probability distribution of gender wage gap in future to accumulate the skill needed for future job positions. However, because skill accumulation is costly and the present value of future wage stream is small then the return on skill accumulation would be very small which would disincentive to accumulate skills. However, median income for unskilled labor would be lower than skilled labor. Additionally, crime market activities require mostly risk taking behavior than being skilled labor, therefore, the wage gap between crime job and legal job for unskilled workers would be high compared to wage gap between crime job and legal job for skilled workers which would motivate women worker to participate in crime market.

Additionally, gender wage gap which disincentives the skill accumulation although it doesn't motivate mother to participate in crime market, it might cause children to participate in crime market. Because less skill accumulation would result in low education that ensures the certain level of illiteracy or low educational capital in lower economic classes. Families that consist of members that has less educational capital would suffer from high crime rate more likely. Thus, gender wage gap would affect crime rate in general.

Additional to labor market conditions, social mobilization, and gender based norms, implementation of crime prevention policies also explain the crime rate. If there is strong police force presence, and if judicial system functions effectively then incentives to commit a crime would be lower. For example; we would expect that crime rate would reduce in those times when the probability of arrest high. Therefore, the size of offender population would be very closely affected by crime prevention methods, and effectiveness of these methods in crime prevention.

This study aims to examine determinants of crime rate by emphasizing the role of economic, social factors with gender focus. The literature on crime is gender blind, and there are very few studies on the determinants of gender gap in crime and few studies emphasize socio economic and juridical factors in explaining gender gap in crime. This paper contributes particularly into the literature by linking crime rates to economic and socio economic factors and arrest rate both in linear and non-linear fashion. Therefore, the paper brings evidences on the existence of the causal link between crime and socio economic and juridical variables (i.e. arrest gap) relation. One of the significant contribution of the paper is that, according to the estimation results crime gap increases as gender wage gap increases explaining the fact that gender wage gap is declining as well as gender crime gap in the last decades. Moreover, this result suggests that Becker's (1968) theorem as well as Adler's (1975) theorem could both be part of the explanation for the current trend in wage and crime gap.

We collect data from NIBRS, and randomly select state of Arkansas and four counties in Arkansas that are Pulaski, Saline, Benton, and Washington for the purpose of the study. We set up particular set of econometric estimation to examine the determinants of crime rate for both gender in these counties.

2. Literature: Gender Gap in Crime

Gavrilova and Campaniello (2013) reports that arrest rate for shoplifting and robberies is higher for female than male while in other crime activities women face lower probability of arrest than men. They also report than females are not less likely to be arrested than males in recently, and females do not respond much to increase in arrest rate for females but responds strongly to increase in earnings from criminal acts. Simon (1976) reports that females mostly have record of property crimes.

Campaniello (2014) argues that technological advancement and transformation of (old fashion- sexist) social norms provided women space to participate in labor market and the crime market. She argues that crime rates for women is lower than men because ,for married women, they are not very exposed to the negative income shocks as they depend on spouse's income, are more risk averse than men. Moreover, she also argues that having children lowers the incentive to commit a crime for women. Additionally, she argues that because judicial system is akin to be forgiving against women offenders, number of female offenders has been rising.

Campaniello (2014) argues that given there is significant wage gap between educated and uneducated women, and the gender wage gap within the highly educated female cluster is smaller than the gender wage gap within the uneducated female cluster, so that rising schooling per women would reduce the incentive to commit the crime for women.

Akerlof and Kranton (2005) argues that if the social norms impose that the crime is masculine job then either other males would discriminate against the females, or females themselves would despise criminal acts resulting in lower female crime participation even there is significant gender wage gap.

Campaniello and Gavrilova (2018), report that women participate more in shoplifting than men. They report that men have higher elasticity of crime income than women, whereas both genders have similar elasticity of arrest. They

report that women earn 13 % less than men from participating crime, but they face 9 % lower probability of arrest.

Suppose that female workers do not participate in home production, but mostly in legal market activity. However, because of the high gender wage gap, women would participate both in home production and market production which results in highly valued leisure time for women. Women would then make a decision to give birth and leave the market for a while when she also consumes leisure, or to stay in market. If women decides on making child then her work flow would be discontinuous which would affect the wage gap she offers to employer to be employed. If female worker postpones childbearing later in her life time she would face higher opportunity cost as the wage rate increases with age, and would use less her leisure time. In crime market there is no need for regularity and continuous job attendance which would attract female workers. Female workers by participating in crime market would save time for home production and legal market production. Therefore, female workers would compensate wage premium in legal market by crime market earnings which also affect their childbearing decision. This scenario would be very valid if arrest rate gap between male and female offenders is high, and arrest rate is low.

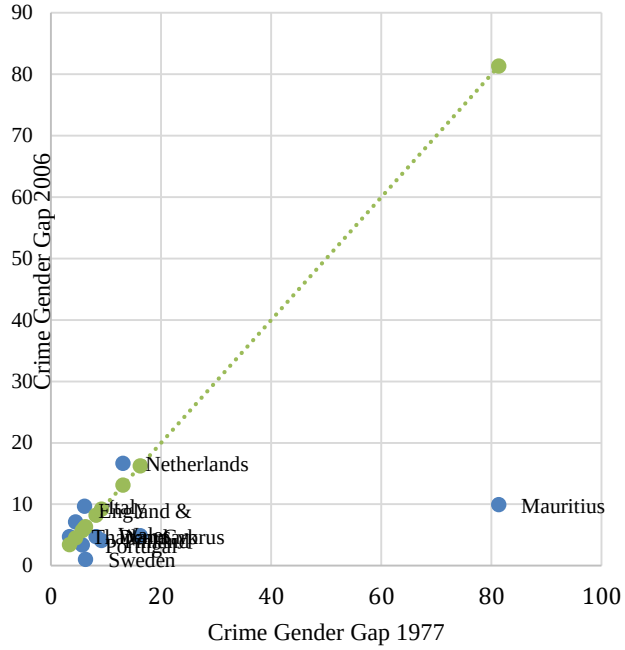
There are also sociological theories on the gender gap in crime. Simons et al. (1980) argue that because men are more inclined to have deviant peers than women, it is the natural outcome that there is crime gender gap. Gilligan (1982) argue that because women are more exposed to social stigma than men, they behave under more socially convenient way so that are less inclined to commit a crime. Mears (1998) provides the evidence confirming the Gilligan's argument that because women are more constrained in moral boundaries set by the society are less inclined to have deviant friends thus having lower crime rates than men

Steffensmeier et al. (2005, 2006) argues that ("net widening enforcement" approach) that the transformation of societal view of the crime (and content of crime) would affect the arrest rate for women even if it would not affect the actual crime rate. Steffensmeier et al. (2005, 2006) argue that such a change would decrease gender gap in crime by increasing female arrest rate more than male arrest rate.

Adler (1975) argue that- ("offender behavioral changes" approach) that as society discriminates less on the gender ground, and becomes more egalitarian, female crime rate increases. They argue that women become more inclined to crime as they have wider economic and political rights and improved public image.

Because of the lack of the data we could find the crime gender gap for some of the countries where crime gender gap is measured as the number of male offenders per female offender. The graph illustrates that for some of the countries such as Italy, England, Netherlands the number of male offenders per female offender is higher in 2006 than 1977. However, for some countries such as Sweden, Cyprus, Portugal, Finland Netherlands the number of male offender per female offender is lower in 2006 than 1977. The graph does not reveal any general trend of gender gap across countries. We can at this point conclude some of the root causes of gender gap in crime vary considerably across countries that lead to very different gender gap trend across time.

Figure 1. Crime Gender Gap in 1977 and in 2006



Committing crime is not different than any other decision made by the rational economic agent. It has expected costs, and benefits. Becker (1968) identifies main determinants of committing the crime, the probability of imprisonment, probability distribution of the jail years, harshness of sentence, the expected loss in income if jailed[1], physical cost of spending time in the jail[2] the expected earnings from the illegal activity; income level provided by legal labor market; and risk aversion. According to Becker (1968) the economic conditions, police force, judicial system, relative earnings in crime market would affect crime behavior across countries.

This study focus on determinants of crime rates by focusing on the gender dimension in crime. We claim that drivers of the crime in both genders are different, hence, determining the size of effects for each variable affecting the crime would suggest variation of policies on gender axes that would be more effective in crime prevention.

3. Data

We used the data set of National Incident Based Reporting System (NIBRS) for the year of 2015. This data set provides us information regarding the number of offenses, arrests, and demographic profile of criminals such as age, gender, and race. The crimes are coded according to the geographical location, state and county it committed. Additionally the data provides the information regarding the content of the crime. However, the data set does not provide information regarding the income, wealth, education profile of the offenders.

We employed Us Census Data for Social, Economic and Health Research (IPUMS) to obtain the average income and education level for individuals that have same gender, age cohort, race, and county.

We randomly select the Arkansas as the case study, and randomly select the four counties in Arkansas which are Benton, Pulaski, Saline, and Washington. We used the data from NIBS, and IPUMS for these counties. We constructed income and education data for each gender/race/age/county cohorts. Additionally, we used IPUMS data set to construct crime rate variable that is the number of crimes committed in each cohort of each gender/race/age/county divided by the number of people (general population) in this specific cohort. Rate of arrest that is the number of arrests divided by the number of offenses given that each incident does not entail more than one offense, represents the probability of arrest of offenders calculated by the crime statistics in NIBRS.

We used the data set of NIBRS for crime statistics, IPUMS and US Census Statistics data set for demographic variables for the year 2015. We used random sampling from NIBRS data through which we obtain 4296 observations.

Furthermore, to reveal the causality between crime gender gap, arrest gender gap, and gender pay gap we calculated the income, arrest and crime rate differences for each gender that is the difference between average crime (income level, arrest rate) rate differences for each race/age/county cohorts.

There are two categories of race which are black and white. There are two age for each gender/race/county cohorts. One age cohorts contain offenders younger than 20 years old, another age cohorts contain offenders older than 20 years old. There are different type of crimes committed. Table 1 below illustrates the demography of the crime in these counties. In table, number of offenders, black and white offender population, average age, average income, education, crime rate, and rate of arrest information for both genders for each county are provided.

Table 1. Descriptive Statistics of Female and Male Offenders across Counties

	Female				Male			
	Benton	Pulaski	Saline	Washington	Benton	Pulaski	Saline	Washington
Average Income	25443	36537	27832	25520	46882	41150	48365	43191,6
Average Schooling	12,5	12,8	12,9	12,35352	12,06	11,98	13,04	12,6
Average Crime Rate	0,0097	0,003	0,003	0,004	0,03	0,009	0,009	0,0139
Average Rate of Arrest	0,77	0,5	0,203	0,65	0,73	0,54	0,184	0,62
Age	34,5	33	35,8	34,5	31,6	34,5	37,9	34,6
Black	30	139	-	-	97	507	-	-
White	274	304	123	280	542	708	354	935
People	304	443	123	280	639	1215	354	935

Table 1 illustrates that in the sample; men and women do not much differ in terms of educational background, and year of schooling for both genders are almost same in all counties. The average schooling for both genders are around 13 years. However, average crime rate differ significantly across genders where the crime rate for men is well above the women. Average arrest rate for women is higher in Benton, and Saline, but lower in Pulaski, and Washington. However the difference between average rate of arrest for women and men is not significant. Additional to significant crime gap for both genders, there is significant wage gap, income gap for both genders in all counties.

Table 2 below illustrates gender profile of different crime categories which are grouped according to their main purpose. One category is Violent Crimes which include Murder, Negligent Manslaughter, Kidnaping, Aggravated Assault, Simple Assault, Intimidation, Arson. Another Category is Theft which includes Robbery, Burglary, Shoplifting, Theft (from building/motor vehicles/Part of Motor Vehicles), and Larceny. Other crime category is Electronic/Organized Robbery which includes Counterfeiting, Swindle, Credit Card/Automatic Teller Machine Fraud, Impersonation, Confidence Game, and Wire Fraud. The final category is Other Crimes containing Drug and Prostitution.

Table 2. Decomposition of Crime Categories According to Gender and County (%)

	Female				Male			
	Benton	Pulaski	Saline	Washington	Benton	Pulaski	Saline	Washington
Violent Crime	28	24	31	21	72	76	69	79
Theft	40	31	31	26	60	69	69	74
Electronic/Organized Robbery	50	41	30	36	50	59	70	64
Other Crimes	27	30	56	27	73	70	44	73

According to the data female mostly abstain from violent crimes, and are more prone to theft and organized, mostly electronic, theft. Decomposing the theft crime category for all counties show that 14 % of theft is burglary, 33 % is shoplifting, and 44% is larceny. These statistics indicate that women committing theft crime which involves less violent action. For example, even though average rate of arrest for burglary is 0,5 and for shoplifting is 0.67, female commit more shoplifting than burglary.

Furthermore, we run the two tail z-test to compare the means for female and male share of different crimes after pooling data in Table 2. Means are 33 % for female, and 67 % for male. The test results suggest that means are not same for these two groups. Therefore we can conclude that for, overall, these counties there is significant crime gender gap.

4. Econometric Model

In this section we investigate the determinants of crime for both genders. We claim that rate of arrest, and income level are main drivers for committing crime. Particularly, if the rate of arrest is low, and personal income is low, then crime rate would be high. We claim that legal and illegal earnings are substitutes so that as the market income level diminishes, participation to crime market would increase.

Additionally, we expect that education level significantly affects the crime participation behavior because cost of education increases the opportunity cost of crime. Furthermore, education provides social status, as well as more stable social relations that would entail huge crime rewards to forgo and commit a crime. Education, in essence, are anti-crime activity, and to this purpose it entails processes through which attenders are educated to solve problems in civilized manner. Therefore, we expect that it would affect the crime rate. We also examine the presence of the non-linear relations between regressors and dependent variable.

We should be aware that education level and income level are not individual specific values but averages for each gender/race/age/county cohorts in general population. Therefore we interpret estimations based on cohorts of general population, and individuals (offenders) within these cohorts.

We used standard OLS techniques for estimation. The nature of the data indicates potential heterocedasticity problem which can be dealt with estimation with cluster robust standard errors. Cluster-robust standard errors first proposed by White (1984) for OLS, Liang and Zeger (1986) for linear and non-linear models, and by Arellano (1987) for the panel data. Cameron and Miller (2015) argue that failing of taking into account the within cluster variation leads to very small standard errors, and low p values. Therefore, we use gender/race/age/county cohorts as the clusters. We therefore based our estimation on cluster robust standard errors which is also heterocedasticity consistent. Additionally, number of observations are 4296 which is sufficient to enable Law of Large Numbers to hold that ensures statistically correct confidence interval estimation for estimated coefficients. Because estimation based on cluster robust standard errors there is no need to check for heterocedasticity.

The cluster based econometric model frame is the following;

$$Z_{gm} = \alpha + X_{gm}{}'\beta + U_{gm} \quad (1)$$
where $m = 1, \ldots, M_G$; $g = 1, \ldots, G$

$$U_{GM} = V_G + F_{GM} \quad (2)$$
where $m = 1, \ldots, M_G$

Wooldridge (2006: 8) argues that "If U_{gm} has the form in (2), the amount of within-cluster correlation can be substantial, which means the usual OLS standard errors can be very misleading". The variance matrix estimator, also provided by Stata, is based on absence of cluster correlation and heteroskedasticity. The variance matrix estimator, also provided by Stata, is based on absence of cluster correlation and the heteroskedasticity.

The cluster robust covariance matrix estimator which is the generalization of the Huber (1967) and White (1980) is the following:

$$Cov(\widehat{\beta}) = (X'X)^{-1}\left[\sum_{g=1}^{G} X_g{}' \widehat{v_g}\widehat{v_g} X_g\right]$$

Econometric Model is the following:

$$\begin{aligned} Crime\ Rate_{ig} = {} & \delta + \theta\ Rate\ \text{of Arrest}_{ig} + \beta\ Income_{ig} \\ & + \varphi\ Education_{ig} + \gamma\ Age_{ig} + \eta Age_{ig}^2 \\ & + \alpha Rate\ of\ Arrest_{ig}^2 + \gamma Education_{ig}^2 \\ & + \theta Income_{ig}^2 + \Gamma\ X_{ig} + \varepsilon_{ig} \end{aligned} \quad (3)$$

Demographic profiles of the population would also affect the crime rate. To this purpose, we used time invariant heterogeneities such as age, race information for the offenders as control variables. We use county dummies to control county fixed effects, such as different size, and effectiveness of police force presence in these counties, or juridical system heterogeneities.

We also consider the curved relation between crime rate and independent variables. Therefore we added squared terms into the model. X is the vector of control variables containing individual time invariant characteristics for individual observations (race/age), and variables controlling county fixed effects. The sub index of i represents individual observation, and c is the cluster the i^{th} observation belongs to. We estimate this equation for both female and male. We illustrated certain descriptive statistics for female offenders below

Table 3. Descriptive Statistics for Female Offenders

Variables	Obs.	Mean	Std. Deviation	Min.	Max.
Income	1152	25098	12714	1557	36577
Education	1148	12.6	2.7	4.05	15.5
Rate of arrest	1152	.58	.17	0	.774
Crime rate	1151	.005	.006	.002	.04
Age	1151	34	12.2	11	99

Estimation outcomes for female is below.

Table 4. Econometric Estimation Results for Female Offenders

Variables	Model 1	Model 2
Rate of Arrest	-.89*	-1.02*
Income	-.00*	-.00*
Education		
Age		
Race	-.009*	
Income Squared	.000*	
Education Squared		
Rate of Arrest Squared	.922*	1.1*
Dummy Pulaski	-.03*	-.012
Dummy Benton	.03*	.044*
Dummy Saline	.07*	.102*

The estimated coefficients with * are significant at 5 % statistically significance level indicating that all of the variables except the Dummy Pulaski are statistically significant. We also should state that the models are selected among the models by excluding insignificant variables and according to F value by which we check the overall significance of the variables in the model. The models estimations suggest that wage level negatively affects the crime rate for women even though it is not very much.

Model 1 indicates that there is threshold level for rate of arrest, 0.42, above which increase in rate of arrest increases

crime rate. Additionally, there is rate of income level, 18970- which is very close to minimum level of income, above which increases in income level, crime rate increases. This result can be interpreted as legal work and illegal work are complement rather than substitutes for female offenders.

In most of the models age variable is insignificant so that it is dropped from estimation. Additionally, education and income variable show significant correlation so that education variable is dropped. We also estimated model without imposing non-linear relation between crime rate and income level in Model 2. In Model 2 the rate of arrest threshold is, 0.56, above which increases in income level, crime rate increases

In both model, rate of arrest has threshold level, U-turn relation, which indicates that after certain value of probability of arrest, participation to crime increases. It can be claimed that increase in arrest rate would signal offenders that it is more probable to be arrested which would decrease the rate of crime. On the other hand, it would signal police forces that crime rate would be low because the first effect is significant, which would reduce the police attention resulting in increase in crime rate. This finding contradicts with what Becker (1968), argued that probability of arrest reduces incentive to commit a crime.

Table 5. Descriptive Statistics for Male Offenders

Variables	Obs.	Mean	Std. Deviation	Min.	Max.
Income	3142	43734	18686	1965	61492
Education	3130	12.29	2.52	4.837	13.92
Rate of arrest	3143	.56	.15	.183	.742
Crime rate	3143	.014	.016	.007	.1
Age	3143	34	12.6	10	99

Table 6. Econometric Estimation Results for Male Offenders

Variables	Model
Rate of Arrest	-8.75*
Income	-.000*
Education	
Age	
Race	-.033*
Income Squared	
Education Squared	
Rate of Arrest Squared	7.41*
Dummy Pulaski	-.046*
Dummy Benton	-.13*
Dummy Saline	-1.22*

The estimated coefficients with * implies that the relevant variable is statistically significant at 5 % significance level. The model is selected among the models by excluding insignificant variables and according to F value by which we check the overall significance of the variables in the model. The model estimations suggest that wage level negatively affects the crime rate for men even though it is not very much. There are not compatible models for men. Age, Education, and income squared variables are ignored because of multicollinearity, and the F test results. Model indicates that the threshold level for rate of arrest is also present for men. The threshold level is 0,56 which is higher than for female offenders.

5. Crime Gap

In the section above we investigate the main determinants of crime rate for both gender. This section is devoted to analyze the determinants of crime gap. The econometric model that is set up for this purpose is the following.

$$Crime\ Gender\ Gap_{ig} = \delta + \alpha\ Gender\ \text{Arrest Gap}_{ig} + \beta\ GenderIncome\ Gap_{ig} + \gamma\ Age_{ig}\ \Gamma\ X_{ig} + \varepsilon_{ig} \quad (4)$$

Gap variables are calculated by taking difference of income levels, rate of arrest, and crime rates between male and female offenders within the same cohort of age/race/county. The model outcome is below.

Table 7. Econometric Estimation Results for Determinants of Crime Gender Gap

Variables	Model 1	Model 2
Arrest Gap	-.036*	-.036*
Income Gap	.000*	.000*
Age	-.000*	-.000*
Race	-.007*	-.016*
Dummy Pulaski	-.003*	-.0025*
Dummy Benton	-.002*	.000*
Dummy Saline	-.002*	-.0022*
Arrest Gap Squared		-.045*

The estimated coefficients with * implies that the relevant variable is statistically significant at 5 % significance level. The coefficient for income gap indicates that if income gap between male and female rises (in favor of male), crime gap increases (in favor of male). The result indicates that the effect is significant and positive and becomes very significant if the wage gap is very high. This result seems to contradicts with the Becker's hypothesis on the ground that if (economic) opportunity cost of committing crime decreases, in terms of (relative) market wage forgone, the individual (women) becomes more inclined to commit a crime decreasing the gender gap in crime (or as men becomes less inclined to commit a crime). However, it can be argued that as the gender wage gap increases the labor force participation rates decreases or women becomes less inclined to invest in human capital that decreases their position in possessing social capital. Therefore, the effect of rise in gender income gap would trigger the women to position itself at job market and public sphere at lower ranks which according to Adler's (1975) theory of offender behavioral change theory decreases female crime rate resulting the widened gender crime gap. Therefore, even there is negative impact of rising wage level for men on their crime market participation, increased gender income gap decreases women's crime market participation as well according to Adler's (1975) theory of offender behavioral change theory. This result also confirms the decline in gender wage gap and gender crime gap in the recent decade.

Arrest gap coefficient indicates that if rate of arrest gap between male and female within same cohort increases (in favor of male), crime gap decreases (in favor of men). These results indicate rate of arrest gap affects the crime gap as it is expected (negatively). Second Model indicates that there is no arrest gap threshold so that there is no U-turn relation between arrest gap and crime gap. Therefore, if male become to get arrested more frequently then female, they commit less

crime, and this negative effect is valid in all arrest rate, and it is more significant at higher arrest rate gap levels.

6. Violent Crime vs. Shoplifting

Decomposing crime for all counties reveal that male offenders are more prone to commit violent crimes, including murder, kidnap, assault, intimidation, etc. On the other hand, female offenders are more prone to commit shoplifting, larceny, etc. We below reveal the determinants of crime rates for each crime category for relevant gender.

Econometric estimation results for violent crimes for male offenders:

Table 8. Econometric Estimation Results for Violent Crimes for Male Offenders

Variables	Model 1
Rate of Arrest	-.296*
Income	-.000*
Rate of Arrest Squared	-.445
Race	-.017
Dummy Pulaski	.025
Dummy Benton	.061
Dummy Saline	-.029

Econometric estimation for shoplifting and larcency for female offenders:

Table 9. Econometric Estimation Results for Shoplifting for Female Offenders

Variables	Model 2
Rate of Arrest	-.05*
Income	-.000*
Race	-.009*
Rate of Arrest Squared	.061*

The model examining the determinants of violent crime for men indicates that both rate of arrest and income is significant and affects crime rate negatively, at least after certain threshold level, 0,34. This result contradicts the result provided previously imply that for violent crimes that is subject to long years of jail if the probability of arrest increases offenders abstain from committing the crime

Model 2 indicates that there is threshold level of arrest rate, 0,39, after which the rate of arrest increase leads to increase in the crime rate. This result complies with the result provided previously.

7. Discussion and Conclusion

This paper attempts to reveal the determinants of crime for male and female. To this end, we collect data from NIBRS, and randomly select state of Arkansas and four counties in Arkansas that are Pulaski, Saline, Benton, and Washington. We have 4296 observations to estimate econometric model. Observations are offenders which are coded according to gender, age, race, location of crime, arrest and offense code, and whether they are arrested or not. These information with the information we collect from IPUMS regarding income level, education level, population for each age/gender/race/county cohort constitute our data set to estimate econometric model.

Econometric estimation outcomes provide the ground for explanation of the current trend in gender wage gap and crime gender gap. According to estimation results in the paper, there is economic cost of crime market participation which supports the Becker's (1968) rational choice based explanation of crime market participation. On the other hand, results on gender gap in crime and gender wage gap indicates that as the economic cost of the crime committing rises for men (relative to women) they become more inclined to commit a crime (relative to women). Eventhough the result does not completely confirm the Beckers' hypothesis it would comply with the Adler's (1975) explanation of crime market participation of women. Therefore, we suggest that as the gender income gap rises the women become less inclined to accumulate skills and become more inclined to position itself at the lower ranks of job market and public sphere that decreases crime rate for women as claimed by Adler (1975). Adler (1975) argues which is also known as liberation theory of female criminality that as women shows up at the public sphere more the crime rate for women increases. Therefore, we argue that even though increase in wage gap decreases the crime rate for men, it decrease in crime rate for women as the mechanism described by Adler (1975) would be at work.

We argue that there are strong policy implications of the model in the sense that economic growth accompanying gender wage gap decline should be accompanied with changes in law enforcement rules to increase the cost of committing crime. Therefore, gender wage gap decline that is in favor women should not trigger higher crime participation rate for women.

Econometric model outcomes indicate that there is threshold issue center playing between the crime rate and probability of arrest. The results confirm that income threshold level does not arise in all models significantly, and education level is much correlated with income level which is corrected by excluding it.

Rate of arrest shows the probability of getting arrested given that offense is committed. The econometric result indicates that after certain threshold the crime rate increases following increase in arrest rate. We conceive that because rate of arrest signal both police forces and offenders that committing crime would go down would imply that there would be more offenders seeking opportunity to commit a crime given that police forces put less attention.

On the other hand, estimation results for male committing crime suggest that there is no threshold level indicating U-turn relation. We conceive this result as the outcome of the harsh sentencing, and long years of jail for violent crimes if arrested. Therefore, male offenders, which is the gender that committing the most of the violent crimes, that are potentially ready to commit violent crime would not commit, if the rate of arrest increases.

Estimation result for shoplifting indicating that following increase in probability of arrest, committing crime increases after threshold level. This result confirms the findings from other estimations except for violent crimes .We consider that because shoplifting is not punished very heavily, and does not result in long years of jail if arrested, the result of estimation differs from violent crimes.

According to estimations for crime gap between male and female (not vice versa) indicates that (rate of) arrest gap is significant and affect negatively the crime gap. In other words, if male get arrested more than female they abstain more from committing crime than female. Additionally, estimation results indicate that there is no arrest gap threshold so that there is no U-turn relation between arrest gap and crime gap. Therefore, if male become to get arrested more frequently then female, they commit less crime, and this negative effect is valid in all arrest levels, and it is more significant at higher rate of arrest gap levels.

Notes

[1] There would not be income stream in the jail. Additionally, after jail, there would be loss in potential income due to the criminal record of the offender.

[2] This includes health cost of spending time in jail. Additionally, the criminal would have less opportunity to become happy in Daily life which would affect the health, particularly stress level, condition of the person.

References

Adler, F. (1975). *Sisters in crime: The rise of the new female criminal*. McGraw-Hill.

Akerlof, G. A., & Kranton, R. E. (2000). Economics and identity. *The Quarterly Journal of Economics*, *115*(3), 715-753.

Altonji, J. G., & Blank, R. M. (1999). Race and gender in the labor market. *Handbook of labor economics*, *3*, 3143-3259.

Arellano, M. (1987). Computing Robust Standard Errors for Within-Group Estimators. *Oxford Bulletin of Economics and Statistic*, 49(4), 431-434.

Arvanites, T. M., & Defina, R. H. (2006). Business cycles and Street crime. *Criminology*, *44*(1), 139-164

Becker, G. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy*, 2, 169-217.

Benson, M. L. (2001).*Crime and the Life Course: An Introduction*. Los Angeles: Roxbury.

Blau, F. D., Kahn, L. M., Liu, A. Y. H., & Papps, K. L. (2013). The transmission of women's fertility, human capital, and work orientation across immigrant generations. *Journal of Population Economics*, *26*(2), 405-435.

Buonanno, P., & Montolio, D. (2008). Identifying the socio-economic and demographic determinants of crime across Spanish provinces. *InternationalReview of law and Economics*, *28*(2), 89-97.

Cameron, A. C., & Miller, D. L. (2010). *Robust inference with clustered data* (No.10, 7). Working Papers, University of California, Department of Economics.

Cameron, A. C., & Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of Human Resources*, *50*(2), 317-372.

Campaniello, N. (2014). Women in crime. *IZA World of Labor*, (105).

Campaniello, N., & Gavrilova, E. (2018). Uncovering the gender participation gap in crime. *European Economic Review*, (In Press). https://doi.org/10.1016/j.euroecorev.2018.03.014

Cook, P. J., & Zarkin, G. A. (1985). Crime and the business cycle. *The Journal of Legal Studies*, *14*(1), 115-128.

Edmark, K. (2005). Unemployment and crime: Is there a connection?. *The Scandinavian journal of economics*, *107*(2), 353-373.

Ehrlich, I. (1973). Participation in illegitimate activities: A theoretical and empirical investigation. *Journal of political Economy*, *81*(3), 521-565.

Fajnzylber, P., Lederman, D., & Loayza, N. (2002). Inequality and violent crime. *The Journal of Law and Economics*, *45*(1), 1-39.

Gavrilova, E., & Campaniello, N. (2013). Gender in the Crime Market: Arrest and Wage Gaps. http://conference.iza.org/conference_files/riskonomics2014/campaniello_n9943.pdf

Gilligan, C. (1982). *In a different voice*. Harvard: Harvard University Press.

Goldin, C. (2006). The quiet revolution that transformed women's employment, education, and family. *American economic review*, *96*(2), 1-21.

Greenberg, D. (1983). Age and crime. In: *Encyclopedia of crime and justice*. Macmillan.

Grogger, J. (1998). Market wages and youth crime. *Journal of Labor Economics*, *16*(4), 756-791

Hirschi, T., & Gottfredson, M. (1993). Commentary: Testing the general theory of crime. *Journal of research in crime and delinquency*, *30*(1), 47-54.

IPUMS (2017). US Census Data for Social, Economic and Health Research. (Accessed 02.12.2017), https://www.ipums.org/

İmrohoroğlu, A., Merlo, A., & Rupert, P. (2006). Understanding the determinants of crime. *Journal of Economics and Finance*, *30*(2), 270-284.

Liang, K. Y., & Zeger, S. L. (1986). Longitudinal data analysis using generalized linear models. *Biometrika*, *73*(1), 13-22.

Lochner, L. (2007). Education and crime. *University of Western Ontario*, *5*(8), 1-14.

Machin, S., & Meghir, C. (2004). Crime and economic incentives. *Journal of Human resources*, *39*(4), 958-979.

Mears, D. P., Ploeger, M., & Warr, M. (1998). Explaining the gender gap in delinquency: Peer influence and moral evaluations of behavior. *Journal of Research in Crime and Delinquency*, *35*(3), 251-266.

Mincer, J. (1962). Labor force participation of married women: A study of labor supply. In: *Aspects of labor economics* (pp. 63-105). Princeton University Press.

NIBRS (2012). National Incident-Based Reporting System Series. (Accessed 1.2.2012),

https://www.icpsr.umich.edu/icpsrweb/NACJD/series/128

Pissarides, C., Garibaldi, P., Olivetti, C., Petrongolo, B., & Wasmer, E. (2005). Women in the labour force: How well is Europe doing?. *Women at work: an economic perspective*, 7-63.

Polachek, S. W. (1981). Occupational self-selection: A human capital approach to sex differences in occupational structure. *The review of Economics and Statistics*, 63(1), 60-69.

Steffensmeier, D. J., Allan, E. A., Harer, M. D., & Streifel, C. (1989). Age and the distribution of crime. *American journal of Sociology*, *94*(4), 803-831.

Steffensmeier, D., Schwartz, J., Zhong, H., & Ackerman, J. (2005). An Assessment of Recent Trends In Girls' violence Using Diverse Longitudinal Sources: Is The Gender Gap Closing?. *Criminology*, *43*(2), 355-406.

Steffensmeier, D., Zhong, H., Ackerman, J., Schwartz, J., & Agha, S. (2006). Gender gap trends for violent crimes, 1980 to 2003: A UCR-NCVS comparison. *Feminist Criminology*, *1*(1), 72-98.

White, H. (1984). *Asymptotic Theory for Econometricians*. San Diego: Academic Press.

Wooldridge, J. M. (2006). Cluster-sample methods in applied econometrics: and extended analysis. Working Paper.