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Does Female Unemployment Increase Crime? Evidence in Selected Sub-Saharan African Countries

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Abstract: A large body of theorical and empirical research have revealed that there is a positive effect of unemployment on crime. But some studies have proven the contrary that, unemployment has a negative effect on crime. Furthermore, other literature has revealed a mixed effect between unemployment and crime. In this context, this paper seeks to examine the direct effect of female unemployment on crime in a sample of 40 Sub-Saharan African countries over the period 1990-2020. By using the scatter plot and Two-Stage Least Squares (2SLS) methods, the study found a positive effect of female unemployment on crime. The econometric analysis suggests that a higher level of female unemployment increase crime.

Keywords: Female unemployment; crime; Non-Parametric; Parametric method

JEL Classification: E24

1. Introduction

For several years, considerable contributions have been made on the link between unemployment and crime. For instance, Hamzah and Lau (2013) have conducted the studies in this direction. Mixed and contradictory results have been provided in this literature[4]. Furthermore, majority of studies have shown that crime affect unemployment through its capacity to raise or reduce homicide. However, it is known that male unemployment is not the only variable which affects crime (Carmichael & Ward, 2001). Female unemployment rate can also be seen as a determining factor which increases crime. Therefore, it is important to study or determine, the effect of female unemployment on crime. The purpose of this paper is thus to investigate the effect of female unemployment on crime.

Several papers have investigated the effect of unemployment on crime, but very few have studied the effect of gender-related unemployment on crime. Jongman (1983) and Carmichael & Ward (2001) have

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[4] Raphael & Winter (2001) have shown that unemployment has a significantly positive effect on crime. This result was supported by several contributions such as Witt et *al*. (1999), Lee and Holoviat (2006), Hamzah & Lau (2013). However other contributions have shown that the unemployment has a negative effect on crime (Cantor & Land (1985); Greenberg (2001). The third contributions have shown the mixed effect of the relationship between unemployment and crime [Fallahi and Rodriguez (2007); Sachsida et *al*. (2010)].

proven that male unemployment increases crime, but not more than gender inequality. Lee & Holoviat (2006) have concluded in their studies that unemployment among young men has a long-term effect on crime, they neglected the aspect of female unemployment. Fanjnzylber *et al.* (2002) have disclosed that unemployment rate has no effect on crime. Similarly, Imrohoroglu *et al.* (2001) have also revealed that unemployment has a negligible effect on crime. However, in their work they have not referred to the unemployment of men and women, they have considered unemployment on a general perspective.

Therefore, what could be the effect of female unemployment on crime? theory state that, the decision to commit a crime follows a rational cost-benefit analysis; in other words, a criminal response to incentives, like any rational economic agent (Becker, 1968). This approach is also found in Ehrlich (1973). According to the pioneers' investigations of economics of crime, individuals who are unemployed are rational in making decision to commit a crime because they have no income from legal activities and will naturally turn to illegal activities and also the benefit from criminal activities is greater than the benefit from legal activities. This is part of the neoclassical and Marxist economic theory of crime (Box, 1987). However, the motivational effect of crime theory has shown a positive relationship between unemployment and crime (Cantor & Land, 1985). Indeed, people who are unemployed have a reduced purchasing power and this can push them to commit crimes to have monetary benefits.

Since there are theorical reasons for unemployment to enhance crime, the problem also deserves to be examined empirically. Therefore, an empirical assessment of the link between unemployment and crime is presented as follow: In their study on England and Wales, Witt et *al.* (1998) and Carmichael & Ward (2001) found a positive relationship between crime and male unemployment. These results are in line with those found by Ayang *et al.* (2020) in the context of Sub-Saharan Africa. Based on US data, Raphael & Winter (2001) also disclosed that there is a positive and significant effect of unemployment on property crime. In contrast, Lee & Holoviat (2006) using data from three Asian and Pacific countries, found a long-term relationship between male youth unemployment and crime. According to Hamzah & Lau (2013), unemployment and poverty are positively correlated with violent crime. However, Greenberg (2001) has gone further by analyzing the effect of lagged unemployment and unemployment duration on theft. He has joined Cantor & Land (1985) in their conclusion that the lagged value and duration of unemployment have a negative effect on theft. Furthermore, by linking social factors (unemployment and income inequality) to crime, Sachsida et al (2010) revealed a mixed relationship between social factors and crime. Imrohoroglu *et al.* (2001) also concluded that there is a relationship between unemployment and crime, but the relationship is negligible.

This paper is organized into the following: section 1 dwells with the introduction, section 2 hosts the methodologies used to capture the objective of the study, section 3 presents the analysis and discussion of results while Section 4 provides the conclusion and recommendations of the study.

2. Empirical Data and Methods

This article is an empirical study of the effect of female unemployment on crime. First of all, a non-parametric approach is used to describe the link between female unemployment and index of crime. Afterward, an econometric model of crime is estimated.

2.1. Non-Parametric Method

A non-parametric scatter plot linking crime and female unemployment was developed, for this purpose, the LOWESS[1] methodology presented by Cleveland (1994) was adopted. Recently, Carmignani & Avom (2010) or Nourou (2014) have used this methodology. It relies on the construction of a smooth robust locally weighted scatter plot. The method is non-parametric because it performs minimal assumptions on the relationships between variables. This method, which is particularly useful for large data sets where trends may be difficult to visualise, could help to assess visually the relationship between female unemployment and crime.

Before implementing this methodology, it is important to give the definition of crime and female unemployment and how they are measured. The World Bank (2020) defined female unemployment as the share of the female labor force that is unemployed but available, and seeking for work. A measure of female unemployment in percentage of female labor force is considered. However, crime is measured by data on intentional homicides per 100 thousand people. The data are obtained from World Bank database. The other data used in this study are also obtained from World Development Indicators (WDI) published by the World Bank (2020).

To achieve this empirical exercise, female unemployment and crime index variables covering 40 countries[2] over the period 1990-2020 are used. Table 2 gives the summary statistics of these variables and other variables used for econometric analysis.

Table 2. Data Description and Summary Statistics

Variables	Description and data source	Mean	Stand. Deviation	Minimum	Maximum
CRIME	Intentional homicides (per 100 thousand people). WDI	11.60448	13.06128	0.5	63.9
GDP_Gro	GDP growth (% annual). WDI	4.25961	7.639665	-50.24807	149.973
PoGR	Population growth. WDI	2.571631	1.08249	-6.766223	8.117929
Gini	GINI Index. WDI	45.26839	8.372518	29.8	65.8
Hi_Edu	School enrolment, higher education. WDI	5.420381	5.034958	0.32069	30.23934
Female_Unempl	Unemployment, women. WDI	8.636167	9.192739	0.149	47.649

Notes: WDI stands for World Development Indicators, The World Bank (available at www.data.worldbank.org/data-catalog).

The econometric study of the effect of female unemployment on crime can be performed using the variables above.

[1] LOWESS stands for Locally weighted Scatter plot Smoothing.

[2] List of the 40 sub-Saharan African countries in our study sample in alphabetical order: Angola, Benin, Botswana, Burindi, Burkina Faso, Cameroon, Chad, Congo, DRC, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea Bissau, Guinea, Ivory Coast, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, CAR, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

2.2. The Empirical Model of Crime

For the purpose of this investigation the econometric crime model of Vaillant & Dervaux (2011) is used. This model is defined from the theoretical framework, based on Becker (1968) and Ehrlich (1973) which is presented as follow:

$$CRIME_{i,t} = \alpha + \gamma CRIME_{i,t-1} + \theta Female\_Unempl_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

Where *i* is the country, *t* is the time, *CRIME* represents intentional homicide per 100 thousand people. The lagged crime variable ($CRIME_{i,t-1}$) is considered as an explanatory variable. $X_{i,t}$ is the set of control variables and β is the vector of coefficients of this set of control variables that will be estimated with γ and θ, The coefficient of the key variable is θ and Female_Unempl is the female unemployment rate, which is the key variable. If the coefficient of female unemployment is positive, it means that female unemployment fosters crime and ε is the term of error.

To evaluate this, the following empirical strategy is implemented. The econometric model is estimated under the assumption $\gamma = 0$. This avoids the problems that could arise if the lagged dependant variable is taken into consideration. This estimation could help to solve the problem of endogeneity of exogenous variables. Then after, the dynamic model where $\gamma \neq 0$ is estimated. This one will consider the lagged effect of crime.

3. Evidence of Crime Effect of Women Unemployment

This section presents some stylized facts derived from a scatter plot relating female unemployment to crime and then, to verify these stylized facts through an econometric analysis.

3.1. Graphic Evidence of the Criminal Effect of Female Unemployment

Figure 1 presents the scatter plot of female unemployment and crime. This figure shows that the slope of curve linking crime to female unemployment is positive; in other words, a high level of female unemployment leads to a higher level of crime.

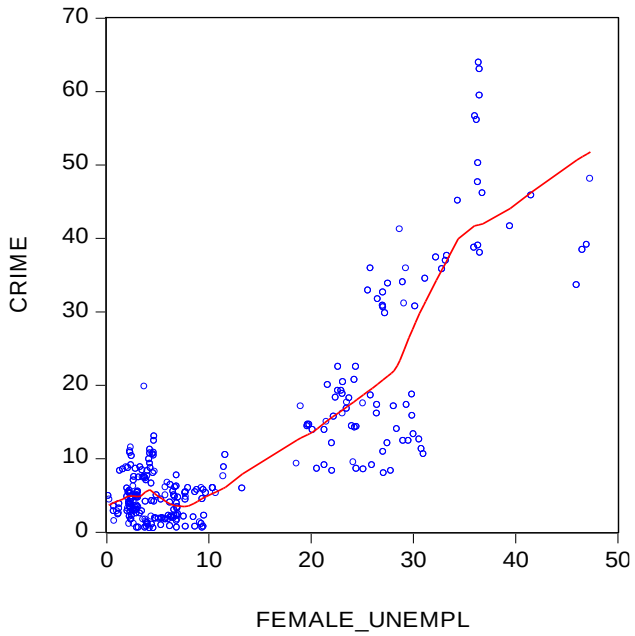

Figure 1. A scatter plot of crime and female unemployment

Notes: *CRIME* is an index of crime while *FEMALE_UNEMPL* represents female unemployment rate. The scatter plot shows upward relationship between female unemployment and crime.

This figure presents stylized facts about female unemployment and crime. The relationship between female unemployment and crime is clearly positive; meaning that the higher level of female unemployment is associated with higher level of crime. To examine in depth this stylized fact, an econometric analysis of the relationship between female unemployment and crime is undertaken.

3.2. Econometric Evidence on Female Unemployment and Crime

The results of econometric analysis presented in tableau 3 follow the two-stage least squares (2SLS) panel estimation method. First of all, the basic crime model was estimated under the assumption $\gamma=0$. The two-stage least squares (*2SLS*) panel estimation method was used to avoid any possibility of endogeneity. Column I presents the results of the estimation. The stylised facts presented above are confirmed by these results. The coefficient of female unemployment is positive, which means that female unemployment leads to increase the level of crime. Most of the estimated coefficients are statistically significant, as is the adjusted R^2. In fact, when female unemployment increases by 1%, then the level of crime raises by 0.9. This result is similar to that obtained by Cezary *et al.* (1998). Indeed, the increase in female unemployment results in a loss of purchasing power and a loss of social ties for women. This situation can lead to increase crime. In many sub-Saharan African countries where the female unemployment rate is high, there is also a high crime rate; For example, South Africa's female unemployment rate rose from 29% in 2016 to 29.29% in 2017, an increase of 0.29%. its crime rate also rose from 34% in 2016 to 35.9% in 2017. The similar case is also observed in Lesotho and Namibia.

In column II, control variables are added to the base model. These added variables are: income inequality (GINI), enrolment in higher education (Hi_Edu), GDP growth (GDP_Gro) and population growth (PoGR). Some of these variables are significant except GDP growth and enrolment in higher education

which turn out to be insignificant. Income inequality and population growth have positive effect on crime.

Table 3. Two-step least squares panel estimates of the relationship female unemployment and crime

Variables	Column I	Column II
Constant	0.092228	-43.25332***
	(0.144184)	(-3.173437)
Female_Unempl	0.907116***	0.930624***
	(24.73706)	(6.311004)
Hi_Edu	-	0.231759
		(1.132075)
Gini	-	0.363801*
		(1.759429)
GDP_Gro	-	0.404184
		(1.296919)
PoGR	-	8.615137***
		(3.230481)
R2	0.700202	0.851894
F Statistic	611.9222***	24.15805***

Notes: ***, ** and * denote significance at 1%, 5% and 10% levels of significance.

Now, the objective is to examine whether the results presented above are sensitive to the insertion of lagged values of female unemployment and the dependent variable as regressors.

The lagged effect of one-period, two-period, three-period and four-period female unemployment is examined and the results are presented in table 4.

The one-period, two-period, three-period and four-period lag of the female unemployment variable is considered in columns I, II, III and IV respectively. The results obtained did not differ fundamentally from those presented in Table 3. Female unemployment has a positive effect on crime regardless of the specification.

Table 4. The lagged Effect of Female Unemployment on crime

Variables	Column I	Column II	Column III	Column IV
Constant	-43.05080***	-42.52815***	-42.78039***	-34.64800***
	(-3.156598)	(-3.096895)	(-3.127966)	(-2.345662)
Female_Unempl	0.953235***	1.011587***	0.983425***	0.657305**
	(6.414550)	(6.550583)	(6.385488)	(2.443225)
Hi_Edu	0.244654	0.277931	0.261871	0.202961
	(1.192941)	(1.338834)	(1.266315)	(0.992553)
Gini	0.344552	0.294875	0.318850	0.384234*
	(1.660986)	(1.395234)	(1.514042)	(1.843893)
GDP_Gro	0.419324	0.458396	0.439539	0.173423
	(1.343774)	(1.454513)	(1.400177)	(0.484573)
PoGR	8.737284***	9.052512***	8.900375***	6.241283*
	(3.272342)	(3.358239)	(0.0033)	(1.936147)
R^2	0.851728	0.849768	0.850990	0.667669
F Statistic	26.12753***	30.21775***	25.86856***	6.690155***

Notes: Two-stage least squares estimates. ***, ** and * denote significance at 1%, 5% and 10% levels of significance.

The restriction on the coefficient γ is removed. Now, the estimation under the assumption γ different from zero ($\gamma \neq 0$) is performed. Table 5 presents the results of this estimation.

First, Dynamic panel regression is used to estimate the basic crime model given in Column I. The coefficient of female unemployment remains positive and significant. The results also show that the lagged crime variable has a positive and significant coefficient. The conclusion is that there is conditional convergence of the crime index within our sample of Sub-Saharan African countries, as the coefficient on the lagged crime variable is less than one (1).

Control variables are added in column II. The female unemployment's coefficient is still positive and significant. Even, the lagged dependent variable has a positive and significant coefficient. Therefore, female unemployment increases crime in Sub-Saharan countries.

Table 5. Dynamic panel estimates of the relationship female unemployment and crime

Variables	Column I	Column II
CRIME(-1)	0.385750***	0.862684***
	(5.212450)	(5.817854)
Female_Unempl	0.427055***	0.215510***
	(4.787080)	(4.735564)
Hi_Edu	-	0.074942**
		(4.457016)
Gini	-	0.088176*
		(2.512165)
GDP_Gro	-	0.093148**
		(2.870204)
PoGR	-	-0.927043
		(-1.344133)
J Statistic	166.6181***	4.527692**

Notes: GMM estimates. ***, ** and * denote significance at 1%, 5% and 10% levels of significance.

4. Conclusion

This empirical exercise investigates crime effect of female unemployment in Sub-Saharan African countries. It uses the rate of female labor force that is unemployed to assess the crime effect of female unemployment. According to this analysis the female unemployment increases the level of crime. Literature on the effect of unemployment on crime has received a lot of attention. In fact, after controlling for index of GINI and various other determinants of crime indicators, results showed that the coefficient of female unemployment is positive and strongly significant.

To overcome the effect of female unemployment on crime, Sub-Saharan African countries should adopt an employment policy that promotes the integration of women in the workplace, with the aim of reducing women's unemployment. Moreover, Sub-Saharan African countries should encourage and facilitate women's entrepreneurship.

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