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Black Economy, Financial Inclusion, Financial Liberalization Nexus: A Panel Analysis of Developing Countries

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<center>**Black Economy, Financial Inclusion, Financial Liberalization Nexus:**
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ABSTRACT
This study has examined the impact of financial liberalization and financial inclusion on the black economy in the case of developing countries from 2004 to 2019. The black economy is selected as an explained variable, whereas financial inclusion, financial liberalization, tax collection, level of corruption and political instability are selected as explanatory variables. Panel unit root issue has been checked with the help of PP-Fisher Chi-square (PP-FC), ADF-Fisher Chi-square (ADF-FC), Im, Pesaran, and Shin W-stat (IPSW), and Levin, Lin & Chu t* (LLC) unit root tests. The fixed-effect model has been used for examining the dependence of the black economy on selected explanatory variables. Panel Granger causality test has been applied for checking the causal relationship among the selected variables. The results show that financial liberalization has a negative and insignificant impact on the black economy. Financial inclusions, the level of corruption, and political instability have a positive and significant impact on the black economy. Tax collection has a negative and significant impact on the black economy. The results of the causality test show that most of the variables have unidirectional causality between each other. Based on estimated results, the developing countries should control corruption, political instability, hence level of financial inclusion and tax collection for the reduction of the black economy.

Keywords: Financial Liberalization, Financial Inclusion, Black Economy
JEL Codes: G53, O15

I. INTRODUCTION
Presently, the world has become a global village. The latest technology, convenient means of communications, and easy access to finance have removed the barriers across the borders for business and trade (Azeem and Haroon 2012). Despite all these facilities, there are some commercial activities, which still operate illegally, exceptions of taxes, and don't follow national rules and regulations (Mehmood et al., 2019) i.e., known as black economy, shadow economy, or informal economy. These activities may be intentionally unrecorded or may be due to some errors, omissions, or missed out and become part of the unreported economy. Some studies highlight that the black economy contributes to the GDP of the countries (Ashraf et al., 2019; Ahmed and Ahmed 1995). There are various challenges and issues in developing countries regarding the measurement and control of the black economy (Arby et al., 2010). In the past few years, the developing countries' financial sector helps in the reduction of poverty. There are three stages for this purpose: first, through the availability of direct credit progress in industrial and agricultural sectors; second, progress in markets through liberalization and deregulation; and third, progress in institution building that purposes at balancing market and government failures. In the monetary progress, industry, and trade liberalization policies of financial inclusion help to understand the magnitude of basic concern sector like supportive banks and institutions borrowings in ensuring growth. Trade and industry liberalization policies of inclusive growth connect every citizen in the monetary development to understand the magnitude of main concern sectors such as supportive banks' lending in ensuring comprehensive growth (Barhate and Karir, 2011). The other challenge is to quantity the extent of the black economy, few studies have used the latent factors and indicators to evaluate unnoticed parts of the economy (Almenar et al., 2019; Hunjra et al., 2020).
The black economy in developing world touched to almost one third of Gross Domestic Products whereas in high income OECD countries it is 18% of the GDP (Arby et al., 2010). In fact, black economy is major obstacle for the development of the economies because it captivates formal economy labor and other major resources (Ashraf et al., 2019; Ahmed and Ahmed 1995). Moreover, extension of the black economy can be a reason of for budget deficit increasing and reducing groundwork excellence. Globally, with trade, businesses are interacting with one another, this further increases the links among developed and developing countries. The financial interaction among developing and developed countries sometimes known as financial liberalization (Chauvet and Jacolin 2017). Financial liberalization can remove the barriers and interventions in financial markets and may impact the size of the black economy (Bakaert et al., 2006). Extensive studies examine the association amongst economic growth and monetary liberalization but the black economy and financial liberalization is hardly studied. Financial liberalization

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may help in the reduction of entry barriers, reduction of credit controls, interest rate deregulation, and reduction of reserve needs. In 1996, the German bankers' association introduced a voluntary code for a bank account that facilitates basic banking transactions, known as the 'everyman' banking account. All individuals and businesses, who have the best relationships with banks and financial institutions always facilitate with banking products and services as compare to the small firms. Financial inclusion provides furnished guidance for the correction of market failures to policymakers and researchers. The basic purpose of financial inclusion is to serve the ignored and rural population with banking service like opening bank accounts, credit facilities, borrowings, insurance, payments and deposits, remittances through proper banking channels with coordination of financial intermediaries. Financial inclusion also demands some initiative regarding cover small and marginal farmers as well as vulnerable social groups. Financial inclusion and financial liberalization can play a pivot role for reducing the size of lack economy and encouraging the pace of currency in emerging nations. There are studies (Aslam, 1998; Ali and Bibi, 2017; Ali and Ahmad, 2014; Ali and Audi, 2016; Ali and Audi, 2018; Ali and Zulfiqar, 2018; Ali et al., 2016; Ali et al., 2021; Ali et al., 2021, Ali et al., 2015; Arshad and Ali, 2016; Ashraf and Ali, 2018; Audi and Ali, 2017) which explain that how political instability, high-interest rates, corruption, tax evasion, tariffs, inflation, strict regulation regarding demand and supply of goods. This purpose of this study is to scrutinize the effect of financial liberalization and financial inclusion on the black economy in the case of developing countries, this type of study is not available to the best of our knowledge, so this study will contribute to this field of study.

The black economy is a platform where goods and services can be exchanged illegally, these goods and services may be exchanged virtually (through fake transactions) and physically (direct cash) but these are prohibited by the governments and legislative authorities. Therefore, it has no records. Mostly, participants don't have the intention to act illegally or maliciously, but due to the lack of legal work, they indulge themselves in illegal activities for meeting their economic and social needs. Sometimes people don't report their jobs or income to the government, this leads to the black economy for the reason of tax evasion and hiding income. The urge of higher profits, businessmen, and individuals to turn into illegal activities such as selling of illegal drugs, smuggling, endangered species, weapons, slave labor, designer knockoffs, and ticket scalping. Individual ethics, beliefs, and moral values also determine the black economy in such a way that there may be some individuals who don't feel ashamed or hesitate to buy the stolen products from others because of half the prices of the products. The black economy in the emerging sphere has lied in between 40% to 60 % of GDP. This reveals that the black economy is certainly disturbing the revenues as well as development expenditures of developing countries. This study has tried to examine the impact of financial liberalization and financial inclusion on the black economy in the case of developing countries.

II. LITERATURE REVIEW

Many studies examine the theoretical and empirical determinants of the black economy in the case of developed and developing countries. Here in this section of the thesis, we have selected the most relevant and recent studies as the review of the literature. The literature has been arranged in chronological order i.e., from recent to past studies. Almenar et al., (2019) demonstrate the measuring of the shadow economy and its drivers. This study covers period 1965-2015. This study has adopted a panel analysis and chosen a long-run perspective for peripheral EMU countries to explore the size and trend of the informal economy. The multiple indicators and multiple causes (MIMIC) and structural equation modeling (SEM) has used for empirical analysis. To quantity the extent of the black economy two sets of variables (i.e. potential determinants and indicator variables) are used. For analyzing the association of other institutional and social issues (e.g. productivity, economic growth, tax evasion, and corruption) with the black economy may hurt the progress of various economies. The activities of the black economy increased and also influenced on economies of developing countries in the sampled countries, it can also see that the economic cycle has an impact on the black economy.

In the absence of other financial tools, in the black economy, all transactions have done in cash (Chaudhry et al., 2019). For measure the size of informal economy in Argentina, this study uses the hours worked data and MIMIC approach from 1999 to 2007. Hence, retaining of currency will fall with the increase in size of black economy and vice versa. Schneider et al., (2018) examine the measurement of the black economy, its issues, and methods of estimation, results with open questionnaires. This study covers 143 countries from all over the world for the period 1996 to 2014. This study has three conclusions with weaknesses and strengths of different methods for measuring size of shadow economy. Firstly, the results from different techniques vary from each other. From these approaches, the MIMIC approach is considered most useful due to its flexibility for measuring the black economy. Secondly, this study has a wide range of definitions of a black economy with the perfect combination of those factors, which

significantly contribute to the growth of the black economy. Thirdly, this study has the latest estimation methods for results for the measurement of the black economy.

Akinsola and Odhiambo (2017) inspect the impact of financial liberalization on economic growth in sub-Saharan Africa by covering 36 years of data, starting from 1980 to 2015. This study predicts the effect of currency crises and financial openness on economic development in 30 African countries. In this literature, the proxy for economic growth is gross domestic product per capita and domestic credit for the private sector. The empirical results from Generalized Method of Moments (GMM) estimator demonstrate that the currency crisis has a negative and insignificant correlation with economic growth. Whereas financial openness has positively linked and has a significant correlation with the economic development for all examined cross-sections. Celik and Citak (2016) investigate the relationship between financial liberalization, banking competition, and economic development in the case of Turkey by employs the data from the period of 1990 to 2014. The study uses the gross domestic product as explained or dependent variable and the Hirfindahll Hirschman index, Panzar, and Ross Competition index, and credit growth have been used as explanatory or independent variables. The Multiple Regression Analysis is used to investigate the association among the above-discussed variables and for test the stationarity of the data, this study uses the Augmented Dickey-Fuller (ADF) test and Phillips Perron (PP) tests. The results of this study predict that financial Integration has a negative impact and the level of banking competition has a positive impact on economic development in Turkey.

Bejaković (2015) explores the revision of the shadow economy in Croatia with the causes and effect from 1994 to 2000. Including the whole range of various principles, this study also indicates the relationship between economic policy and the black economy. This study provides the comprehensive methods for the measurement of the size of black economy on the situation in Croatia in section 3 with having a short introduction, definition, and measures with an explanation in section2. Section 4 has the association between black economy and economic crises. Blackburn et al., (2012) explore the impact of tax evasion on the underground economy and financial development. By considering bank intermediation and tax evasion, this study examines the association between the black economy and financial development as well as heterogeneous skills of agents regarding investment. The results of the analysis show that the increase in the marginal net benefit of income disclosure causes to increase in the level of financial development and the higher tax evasion will lower the financial development and consequently larger will be the size of the black economy.

III. THEORETICAL MODEL
Following the Ceteris Paribus, the lesser the share of the black economy, the higher will be the demand for legal currency and the higher will be the velocity of circulated money (Breusch, 2005). Theoretical framework about the black economy is mainly developed by (Bakaert et al., 2006), which highlights that, how fiscal authorities manage the missing income. The limited use of currency and higher number of unregistered transactions is known as the black economy. We collected data over the period of time from 2004 to 2019. Following the existing literature (Audi and Ali, 2017; Audi et al., 2021; Audi et al., 2021; Audi et al., 2021; Audi and Ali, 2021; Audi et al., 2021; Haider and Ali, 2015; Kassem et l., 2019; Roussel et al., 2012, Sajid and Ali, 2018; Senturk and Ali, 2021; Sulehri and Ali, 2020) , the functional form of the model becomes as:

$$BE_{it} = F(FINL_{it}, FINI_{it}, TC_{it}, COR_{it}, POL_{it}, X_{it}) \qquad (1)$$

To check the responsiveness of the dependent variable concerning the independent variable the equation can be written as;

$$BE_{it} = \alpha FINL_{it}^{\beta 1} FININ_{it}^{\beta 2} TC_{it}^{\beta 3} COR_{it}^{\beta 4} POL_{it}^{\beta 5} X_{it}^{\beta 6} \qquad (2)$$

The econometric model becomes as:

$$BE_{it} = \alpha + \beta_1 FINL_{it} + \beta_2 FININ_{it} + \beta_3 TC_{it} + \beta_4 COR_{it} + \beta_5 POL_{it} + \beta_6 X_{it} + \mu_{it} \qquad (3)$$

α =Intercept constant
$\beta_{i=}$ Slope coefficient
i= selected developing countries
t= selected time period (2004-2019)
u= white noise error
X= set of control variables

IV. PRINCIPAL COMPONENT ANALYSIS
We have constructed indices for financial inclusion and financial liberalization with the help of principal component analysis. Principal component analysis (PCA) is the oldest but most famous multivariate technique, used by all

scientific disciplines. When the dependent variables are intercorrelated in the data table, for such observations PCA technique is useful. The basic purpose of the PCA technique is to create a new orthogonal variable called principal components by extract useful and important information from the data table. Then the size of the data set is compressed to simplify the description. In this way, structural observations and variables are available for analysis in which the different individual dimensions of the data are linearly uncorrelated. Being the PCA is the most modern technique for index construction, it is a best-fitting line that can be originated from points. Which helps to minimize the average squared distance. For making the predictive models, PCA can be used in independent data analysis. Suppose that $n \times p$ is a data matrix, X with column-wise zero mean, where each of the n rows represents a different repetition of the experiment, and each of the p columns gives a particular kind of feature.

The transformation is defined by a set of size l of p-dimensional vectors of weights or coefficients;

$$W_{(k)} = (w_1, \ldots w_p)_{(k)} \qquad (4)$$

This maps each row vector $X_{(i)}$ of X to a new vector of principal component scores;

$$t_{(i)} = (t_1, \ldots t_l)_{(i)} \qquad (5)$$

$$t_{k(i)} = X_1 . w_k \qquad (6)$$

For i=1… n and k=1, ….1

In such a way that individual variables $t_1, \ldots t_l$ of t considered over the data set successively inherit the maximum possible variance from X, with each coefficient vector W constrained to be a unit vector.

To maximize variable first weight vector $W_{(1)}$, thus has to satisfy

$$W_{(1)} = \arg max_{||w||=1} \{ \Sigma_i(W_{(1)})^2_{(i)} \} = \arg max_{||w||=1} \{ \Sigma_i(X_{(i).}W)^2 \} \qquad (7)$$

Equivalently, writing this matrix gives

$$W_{(1)} = \arg max_{||w||=1} \{ ||XW||^2 \} = \arg max_{||w||=1} \{ W^T X^T Xw \} \qquad (8)$$

Since $W_{(1)}$ has been defined to be a unit vector, it equivalently also satisfies;

$$W_{(1)} = \arg max \{ \frac{W^T X^T XW}{W^T W} \} \qquad (9)$$

The quantity to be maximized can be recognized as a Rayleigh quotient. A standard result for a positive semidefinite matrix such as $X^T X$ is that the quotient's maximum possible value is the largest eigenvalue of the matrix, which occurs when W is the corresponding eigenvector. With $W_{(1)}$ found, the first principal component of a data vector $X_{(i)}$ can then be given as a score $t_{1(i)} = X_{(i)}. W_{(i)}$ in the transformed coordinates, or as the corresponding vector in the original variables, $\{X_{(i)}. W_{(i)}\}W_{(1)}$.

V. ECONOMETRIC METHODOLOGY

Levin, Lin & Chu t* (LLC) unit root tests have been applied and the common form of an LLC is as:

$$\Delta y_{i,t} = \gamma_{0i} + p y_{it-1+} \sum_{i-1}^{pi} \gamma_{1i} \Delta y_{i,t-j} + u_{i,t} \quad 10)$$

γ_{0i} is the intercept in the equation (3) with having unique across the cross-sectional entities and p is identical for the autoregressive coefficient, whereas γ_i denotes for lag order, $u_{i,t}$ is the residual term which has been supposed to be independent for all the across of panel entities. The equation (10) follows the ARMA stationary process for each cross-section becomes as:

$$u_{i,t} = \sum_{j-0}^{\infty} \gamma_{1i} \Delta y_{i,t-j} + \varepsilon_{i,t} \qquad (11)$$

Following the equation (11), null and alternative hypotheses can be developed as:

H_0: $p_i = p = 0$

H_a: $p_i = p < 0$ for all i

LLC model is based on t-statistic, where p is supposed to fix across the entities under the null and alternative hypothesis.

$$t_p = \frac{\overset{\Lambda}{p}}{\overset{\Lambda}{SE(p)}} \qquad (12)$$

In this whole procedure, we have supposed that the residual series is white noise. Further, the regression of the panel has t_p test statistic, which presents the convergence of standard normal distribution when N and $T \rightarrow \infty$

$\sqrt{\dfrac{N}{T}} \rightarrow 0$. On the other hand, if any sectional unit is not independent, then the residual series are corrected and have the issue of autocorrelation. Under such these circumstances LLC test proposes a modified test statistic as:

$$t_p = \frac{t_p - N T \overset{\sqcap}{\hat{S}_N} \hat{\sigma}^{-2}(\hat{p}) \overset{*}{\mathrm{u}}_m}{\sigma_m^*} \qquad (13)$$

Where u_m^* and σ_m^* are modified the error term of the error term and standard deviation of the error term, the values of these are generated from Monte Carlo Simulation by LLC (2002).

Im et al., (2003) develop a panel stationarity test in the case when panel data is heterogeneous. This panel unit root test is also based on ADF unit root methodology, but this test is based on the arithmetic mean of individual series, this test is followed as:

$$\Delta y_{i,t} = \bar{w}_i + p y_{it-1+} \sum_{i-1}^{pi} \gamma_{1i} \Delta y_{i,t-j} + v_{i,t} \qquad (14)$$

The IPS test allows for heterogeneity in v_i value, the IPS unit root test equation can be written as:

$$\bar{t}_T = \frac{1}{N} \sum_{i-1}^{N} t_{1,i}(p_i) \qquad (15)$$

Where $t_{i,t}$ the ADF test statistic, pi is the lag order. For the calculation process, this test follows:

$$A_t - = \frac{\sqrt{N(T)}[\bar{t}_T - \mathrm{E}(t_T)]}{\sqrt{Var(t_T)}} \qquad (16)$$

V.I. HAUSMAN TEST FOR FIXED AND RANDOM EFFECT MODEL

By following the procedure of fixed-effect analysis, it is also known as a dummy variable, because when every group has a different intercept in one equation then a specific dummy has been introduced for every group. So, the following equation becomes:

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \ldots\ldots + \beta_k X_{kit} + u_{it} \qquad (17)$$

Which can be written in a matrix notation as:

$$Y = D\alpha + X\beta' + u \qquad (18)$$

$$Y = \begin{pmatrix} Y_1 \\ Y_2 \\ . \\ . \\ . \\ Y_N \end{pmatrix}, \quad D = \begin{pmatrix} i_T & 0\ldots.. & 0 \\ 0 & i_T & 0 \\ 0 & 0 & i_T \end{pmatrix}_{NTxk}$$

$$X = \begin{pmatrix} x_{11} & \cdots & x_{1k} \\ \vdots & \ddots & \vdots \\ x_{N1} & \cdots & x_{NK} \end{pmatrix}_{NTxk}$$

$$\alpha = \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ . \\ . \\ . \\ . \\ \alpha_N \end{pmatrix}_{Nx1} \qquad \beta' = \begin{pmatrix} \beta_1 \\ \beta_2 \\ . \\ . \\ . \\ . \\ \beta_k \end{pmatrix}_{Nx1}$$

For each section independently the dummy variable takes unlike group's specific estimation procedure. So, to make sure about fixed effects method we can use Hausman test.

V.II. PANEL GRANGER CAUSALITY

To check the causality among unlike mutable the panel Granger (1969) has been used in this study because it control heterogeneity problem to increase the accuracy of the regression estimates. For testing the relationship between two variables in the Granger sense, the following linear panel model can be used.

$$Y_{it} = \alpha_i + \sum_{k=1}^{K} \gamma_i^{(k)} y_{it-k} + \sum_{k=1}^{K} \beta_i^{(k)} T_{it-k} + E_{it} \qquad (19)$$

Here α_i quantity the individual exact outcome across i, and the coefficients $\gamma^{(k)}$ and $\beta^{(k)}$ are tacitly supposed to be persistent for all i.

The null hypothesis of the test is $\beta^{(1)} = ...\beta^{(K)} = 0$, there is no causal relationship between x and y, whereas the alternative hypothesis is the x and y have a causal relationship for all the cross-sectional units.

VI. EMPIRICAL RESULTS AND DISCUSSIONS

The estimated descriptive statistic results have been given in table 1. The results reveal that the black economy has a maximum value of 33.87767, the minimum value of 21.13265, with an average of 28.14005. The standard deviation of the back economy is 28.14005. The results show that the black economy is negatively skewed. Financial liberalization has an average value of 51.1000, the minimum and maximum values are 24.11822 and 75.93546 respectively. The standard deviation of the financial liberalization is 13.62014. The data of financial liberalization is negatively skewed. The results demonstrate that the financial inclusion index has a maximum value of 1.332492, minimum value of 0.021154, with an average of 0.506584. The standard deviation of the financial inclusion index is 0.326292. The results show that financial inclusion is positively skewed. The tax collection has an average value of 12.93872, with minimum and maximum values of 2.331967 and 34.84990 respectively. The standard deviation of the tax collection is 6.732471. The data of financial liberalization is positively skewed. The results of Table 1 also presents that corruption has a maximum value of 1.159934, the minimum value of -1.672876. Corruption has the lowest average value of -0.363739. The standard deviation of the corruption is 0.621815. The results show that corruption is positively skewed. The estimated results of table 1 show that political instability has the second-lowest average value of -0.617339. The standard deviation value is 0.957965. Whereas the maximum value is 1.200234 and the minimum value is -2.810035. The political instability is negatively skewed.

Table 1

	BE	FINL	FININ	TC	COR	POL
Mean	28.14005	51.10008	0.506584	12.93872	-0.363739	-0.617339
Median	28.44632	52.01397	0.472362	12.56508	-0.411751	-0.551961
Maximum	33.87767	75.93546	1.332492	34.84990	1.159934	1.200234
Minimum	21.13265	24.11822	0.021154	2.331967	-1.672876	-2.810035
Std. Dev.	3.158480	13.62014	0.326292	6.732471	0.621815	0.957965
Skewness	-0.113773	-0.116326	0.321940	1.090735	0.362933	-0.014888
Kurtosis	2.036788	1.918234	2.068080	4.300436	2.688550	2.271510
Jarque-Bera	10.44858	13.00867	13.68594	68.79941	6.654739	5.670232
Probability	0.005384	0.001497	0.001067	0.000000	0.035887	0.058712

Sum	7203.852	13030.52	129.6854	3312.312	-93.11728	-158.0387
Sum Sq. Dev.	2543.879	47119.05	27.14895	11558.17	98.59671	234.0126
Observations	256	255	256	256	256	256

Table 2 presents the correlation matrix among variables. Correlation provides the degree of association between the variables, and the degree of relationship between the explanatory variables also decides the level of multicollinearity. The results show that the black economy has a negative and insignificant correlation with financial liberalization. There is a positive and significant correlation between the black economy and financial inclusion. The estimated outcomes show that the black economy has a negative and significant correlation with tax collection, level of corruption, and political instability in selected developing countries. Financial liberalization has a positive and significant correlation with financial inclusion, tax collection, level of corruption, and political instability. The estimated results explain that financial inclusion has a positive and significant correlation with tax collection, level of corruption, and political instability. Tax collection has a positive and significant correlation with the level of corruption and political instability. There is a positive and significant correlation between the level of corruption and political instability. The overall results show that most of the explanatory variables have a significant correlation with the black economy as a dependent model. The results explain that the selected explanatory variables for the regression model, have a low and moderate correlation with each other. Hence, there is no issue of multicollinearity among the selected explanatory variables.

Table 2

Variables	BE	FINL	FININ	TC	COR	POL
BE	1.000000					
FINL	-0.032271	1.000000				
FININ	0.318643***	0.560915***	1.000000			
TC	-0.349201***	0.380200***	0.256448***	1.000000		
COR	-0.227460***	0.393196***	0.414712***	0.552565***	1.000000	
POL	-0.443257***	0.407464***	0.359684***	0.556071***	0.770715***	1.000000

Note: ***, present 1 percent level of significance.

Table 3: Unit Root Outcomes at Level

Variables	LLC	IPSW	ADF-FC	PP-FC
BE	-9.50670***	-4.17551***	79.2107***	176.311***
FINL	-4.46953***	-2.03493**	54.1981**	43.2711**
FININ	0.68030*	3.05776*	7.91609*	12.1854*
TC	-1.28412**	-0.78309***	44.7489**	45.3824**
COR	-1.60248**	-0.44142***	38.4867**	38.9937**
POL	-7.27082***	-4.45081***	69.9185***	85.1709***

Note: ***, **,* present significance level 1%, 5% and 10% level of significance respectively

The estimated results of unit root tests have been presented in Tables 3 and 4. This study has used PP-Fisher Chi-square (PP-FC), ADF-Fisher Chi-square (ADF-FC), Im, Pesaran and Shin W-stat (IPSW), and Levin, Lin & Chu t* (LLC) unit root tests for examining the stationarity in selected panel data set. The detailed methodology for the unit root tests has been given in the econometric methodology session. The estimated results show that all the selected variables are stationary at the level and first difference and all the variables of the model have the same order of integration. This situation urges us to use the fixed-effect model or random-effect model.

Table 4: Unit Root Outcomes at First Difference

Variables	LLC	IPSW	ADF-FC	PP-FC
BE	-4.54734***	-1.99045**	49.0811**	48.8808**
FINL	-6.95889***	-5.86484***	93.5005***	175.248***
FININ	-3.36862***	-3.02173***	61.6137**	107.831***
TC	4.91671*	-0.95981*	34.6234***	149.363***
COR	-6.47674***	-5.73151***	91.8297***	194.059***
POL	-8.26546***	-7.02693***	109.721***	192.496***

Note: ***, **,* present significance level 1%, 5% and 10% level of significance respectively.

Table 5 shows the Hausman test results. Panel data of developing countries have been used for empirical results, after reviewing the nature of the data set, a fixed effect or random effects model has been recommended for final analysis. For this purpose, the Hausman test has been applied. For the estimation of regression analysis, the endogenous explanatory variables are used by the Hausman test. The estimated outcomes of the Hausman test have been given in table 5. The outcomes show that the Hausman test is significant at the 5 percent level, this explains fixed effect model is appropriate for our panel of developing countries.

Table 5: Hausman Test

Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	12.185330	5	0.0323

Table 6 presents the estimated outcomes of panel fixed effect. The results show that financial liberalization has a negative and insignificant impact on the black economy in the case of selected developing countries over the selected period. Batten and Kearney (2006) mentions that financial liberalization reduces the size of the black economy. This reveals that the rising level of financial globalization reduces the size of the informal sector and raises the formal sector of the economy. The expansion of the formal economy opens new productive opportunities for the firms, the less efficient firms reallocate their resources or disappear from the official economy (Chaudhry et al., 2010). The process creates job opportunities and raises the level of wages, there is no more attraction for informal firms. Moreover, a rise in wages increases the wage gap between formal and informal jobs as well, labor also prefers to work in the formal sector rather than the informal sector. Furthermore, financial liberalization also increases the level of deregulation in labor and financial markets (Buehn and Schneider, 2008). This shows that financial liberalization depresses the level of the black economy. But in the case of our selected developing countries, there is a negative but insignificant relationship, this shows that selected developing countries are not fully utilizing the benefits of financial liberalization. Thus, we cannot reject the null hypothesis i.e. financial liberalization does not impact the black economy.

The estimated results show that financial inclusion has a positive and significant impact on the black economy, the estimates reveal that with a 1 percent increase in financial inclusion, the black economy increases by (0.454452) percent. The extensive literature finds that financial inclusion has a negative and significant impact on the black economy. Chortareas et al., (2015) and Bayar and Ozturk (2016) point out that in the case of developing countries, financial inclusion is raising the level of the black economy. As a huge amount of population of developing countries is still not fully equipped with financial tools and facilities, this will create a positive relationship between financial inclusion and the black economy. Our estimated outcomes are in line with these studies (Chortareas et al., 2015; Bayar and Ozturk, 2016). Thus, we reject the null hypothesis i.e. financial inclusion does not impact the black economy, this shows that financial inclusion is contributing to the black economy. The estimated outcomes show that tax collection has a negative and significant impact on the black economy. The coefficient shows that a 1 percent increase in tax collection brings (-0.032768) percent decrease in the black economy. Auerbach (2017) and Bayar et al., (2018) mention that rising tax collection means low unregistered activities, and higher volatility of money. The findings of our study are consistent with these studies. Thus, we reject the null hypothesis i.e. tax collection does not impact the black economy, this shows that tax collection is contributing to the black economy. The estimated results show that level of corruption has a positive and significant impact on the black economy. The results show that a 1 percent increase in the level of corruption brings (0.567594) percent increase in the size of the black economy. Corruption raises the level of the unregistered and informal sector of the economy which reduces the velocity of money. In the presence of a high level of corruption, there is a higher level of black economy. Our estimated outcomes are consistent with these findings. Thus, we reject the null hypothesis i.e. level of corruption does not impact the black economy, this shows that the level of corruption is contributing to the black economy of the developing countries. The estimated outcomes of the fixed model show that political instability has a affirmative and substantial impact on the level of the black economy. The outcomes show that a 1 percent rise in political instability (0.135014) percent rise has arose in the black economy of developing counties. There are several studies (Carr and Chen, 2002; Ali and Rehman, 2015; Ali and Senturk, 2019; Ali and Naeem, 2017; Ali, 2011; Ali, 2015; Ali, 2018) that link the political instability to the size of the black economy. In the presence of political instability, the informal and unregistered sector of the economy grows sharply and reduces the velocity of money. Our findings

are consistent with the findings of these studies. Thus, we reject the null hypothesis i.e. political instability does not impact the black economy, this shows that political instability is contributing to the black economy of the developing countries.

Table 6: Panel Fixed Effect Outcomes

Dependent Variable: BE				
Ind. Variables	Coefficient	Std. Error	t-Statistic	Prob.
FINL	-0.002095	0.003915	-0.535251	0.5930
FININ	0.454452	0.192156	2.365013	0.0189
TC	-0.032768	0.010604	-3.090122	0.0023
COR	0.567594	0.101880	5.571187	0.0000
POL	0.135014	0.070088	1.926353	0.0554
C	28.71584	0.248520	115.5476	0.0000

Table 7 presents the estimated outcomes of the panel Granger causality test. The results show that there is bidirectional causality is running between financial liberalization and the size of the black economy. We reject the null hypothesis of no causality, hence there is a causal relationship between financial liberalization and the black economy in the case of developing countries. The estimated outcomes reveal that financial inclusion does not cause the black economy. The results reveal that unidirectional causality is running from black economy to financial inclusion in the case of developing countries. Thus, we accept the null hypothesis i.e. financial inclusion does not causal black economy. The results show that there is unidirectional causality is running from tax collection to the size of the black economy. The estimates explain that there is bidirectional causality is running between the level of corruption and the size of the black economy, between political instability and the size of the black economy in the case of developing countries. The results explain that unidirectional causality is running from financial inclusion to financial liberalization in the case of developing countries. Thus, we reject the null hypothesis, as there is a causal relationship between financial inclusion and financial liberalization over the selected sample countries and periods. The results show that there is no causal relationship between tax collection and financial liberalization, between financial liberalization and political instability, between tax collection and level of corruption, between political instability and tax collection in the case of selected developing countries. The outcomes show that there is unidirectional causality is running from the level of corruption to financial liberalization, from financial inclusion to tax collection, from financial inclusion to the level of corruption, from financial inclusion to political instability, from political instability to level of corruption. The overall causality results show that expect few most of the variables have a unidirectional causal relationship in the case of developing countries.

Table 7: Panel Granger Causality Outcomes

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
FINL does not homogeneously cause BE	4.85983	2.63039	0.0085
BE does not homogeneously cause FINL	7.91361	6.14971	8.E-10
FININ does not homogeneously cause BE	2.99665	0.49302	0.6220
BE does not homogeneously cause FININ	7.79764	6.05949	1.E-09
TC does not homogeneously cause BE	5.25594	3.11253	0.0019
BE does not homogeneously cause TC	3.36719	0.92264	0.3562
COR does not homogeneously cause BE	5.84061	3.79043	0.0002
BE does not homogeneously cause COR	4.55364	2.29826	0.0215
POL does not homogeneously cause BE	4.33644	2.04643	0.0407
BE does not homogeneously cause POL	5.47346	3.36474	0.0008
FININ does not homogeneously cause FINL	5.42415	3.28074	0.0010
FINL does not homogeneously cause FININ	3.85374	1.47093	0.1413
TC does not homogeneously cause FINL	2.84368	0.30689	0.7589
FINL does not homogeneously cause TC	1.57823	-1.15147	0.2495

COR does not homogeneously cause FINL	4.73641	2.48816	0.0128
FINL does not homogeneously cause COR	3.58568	1.16201	0.2452
POL does not homogeneously cause FINL	2.44261	-0.15532	0.8766
FINL does not homogeneously cause POL	2.73502	0.18167	0.8558
TC does not homogeneously cause FININ	2.94456	0.43262	0.6653
FININ does not homogeneously cause TC	5.01940	2.83828	0.0045
COR does not homogeneously cause FININ	2.98620	0.48090	0.6306
FININ does not homogeneously cause COR	4.29242	1.99539	0.0460
POL does not homogeneously cause FININ	3.22100	0.75314	0.4514
FININ does not homogeneously cause POL	4.18630	1.87236	0.0612
COR does not homogeneously cause TC	3.68164	1.28723	0.1980
TC does not homogeneously cause COR	2.09702	-0.55005	0.5823
POL does not homogeneously cause TC	2.31301	-0.29962	0.7645
TC does not homogeneously cause POL	2.50354	-0.07871	0.9373
POL does not homogeneously cause COR	4.46919	2.20035	0.0278
COR does not homogeneously cause POL	3.14533	0.66541	0.5058

VII. CONCLUSIONS

This study has examined the impact of financial liberalization and financial inclusion on the black economy in the case of developing countries from 2004 to 2019. WDI databases have been used to collect data of selected countries. The black economy is selected as an explained variable, whereas financial inclusion, financial liberalization, tax collection, level of corruption and political instability are selected as explanatory variables. The intertemporal properties of the variables have been checked with the help of descriptive statistic. Panel unit root issue has been checked with the help of PP-Fisher Chi-square (PP-FC), ADF-Fisher Chi-square (ADF-FC), Im, Pesaran, and Shin W-stat (IPSW), and Levin, Lin & Chu t* (LLC) unit root tests. The fixed-effect model has been used for examining the dependence of the black economy on selected explanatory variables. Panel Granger causality test has been applied for checking the causal relationship among the selected variables. The outcomes of descriptive statistic explain that selected variables have reasonable and correct intertemporal properties. The results of the correlation matrix explain that most of the variables have significant correlation and there is no issue of multicollinearity among the selected explanatory variables. The estimated unit root test outcomes show that there is the same order of integration among the selected variables of the model. The results of the Hausman test show that the fixed effect model is the more appropriate model to examine the regression coefficient. The results show that financial liberalization has a negative and insignificant impact on the black economy. Financial inclusion has a positive and significant impact on the black economy. Tax collection has a negative and significant impact on the black economy. The outcomes show that the level of corruption and political instability have a positive and significant impact on the black economy. The results show that there is bidirectional causality is running between financial liberalization and the size of the black economy. The results reveal that unidirectional causality is running from black economy to financial inclusion in the case of developing countries. The results show that there is unidirectional causality is running from tax collection to the size of the black economy. The estimates explain that there is bidirectional causality is running between the level of corruption and the size of the black economy, between political instability and the size of the black economy in the case of developing countries. The overall results show that financial inclusion, level of corruption, and political instability are encouraging the size of the black economy in developing countries. Whereas tax collection is depressing the size of the black economy in the case of selected developing countries. On the basis of estimated outcomes, discussion and conclusions, there are some policy suggestions to reduce the size of the black economy in developing counties. Financial liberalization has an insignificant impact on the black economy, the developing countries should promote the benefits of financial liberalization, as the financial bindings among the counties reduce the size of the informal sector and illegal transactions. Financial inclusion has a affirmative and substantial effect on the black economy, the emerging countries should educate the masses about financial facilities and their benefits, e.g. fewer chances of fraud and cheating when financial transactions are made through banking. Moreover, the banking sector promotes saving and current account and increase the number of branches, so, that positive impact can vanish and financial inclusion can reduce the size of the black economy. Higher collection means there is a higher registered number of populations, and there are fewer informal and unregistered activities. Thus, developing countries should promote tax registration and its benefits. Moreover, for the reduction of the black economy developing countries should control corruption and political instability at the same time. Following all the good qualities of the study, there are certain limitations,

the study can be improved by reducing these limitations. First, there is the availability of data, by increase the data range, more significant results can be obtained. Second, by making a comparative analysis of developing and developed countries, the scope of the study can be increased. Third, there is a dire need for some solid proxy measure for the black economy, for this primary survey is need, which can provide the best realistic policy options.

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