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Malvika Mahesh

The Effect of Remittances on Crime in India

Abstract

There is a well-established literature that finds a strong causal association between remittance flows and economic growth and poverty. Owing to the poverty-alleviating and income-generating effects of remittances, it may theoretically reduce crime by increasing the opportunity cost of committing crime. This paper studies the effects of remittance receipts on crime outcomes in India. The identification strategy, exploits the variation in rainfall as an instrument for remittance receipts. The results suggest that remittance receipts have a negative effect on violent crimes and a positive effect on nonviolent crimes. Since remittance flows mean that more economic resources are available, remittances provide an incentive for certain crimes that thrive in the presence of economic resources. Therefore, an important implication of this result is that as remittance receipts increase income and welfare, there is a diverse effect on the costs and benefits of different types of crimes. It may result in unfavorable outcomes in the form of increases in certain nonviolent crimes.

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1 Introduction

Human migration is as old a phenomenon as the history of human beings themselves. People have been consistently moving from one place to another, throughout history, in search of opportunities and economic gains. As of 2015, more than 243 million people or 3.4% of the world population does not reside in the country of its birth (World Development Indicators, 2019). The growing numbers of migrants have sparked an interest in the study of the social and economic consequences of migration.

The economic footprint of these migrants can be seen in the phenomenal size of the remittances sent to home countries. In 2017, migrants sent \$ 613 billion as remittances to their home countries, with developing countries receiving a major chunk (World Development Indicators, 2019). These remittances are an abundant source of financing the development programs of developing countries.

The extent of international financial flows into developing countries, of which remittances are an important component, is an important measure of financial development. Until a few decades ago, international financial flows mainly consisted of official grants and loans that went through governments and international organizations. These were soon followed by foreign direct and portfolio investments by multinational organizations. The official financial flows were soon overtaken by remittances. Remittance flows continue to grow every year. While remittance flows have overtaken other kinds of capital flows in South Asia and Latin America, this has not been the case for sub-Saharan Africa (Gupta et al., 2009). Even then, it is believed that the official remittance flows recorded are understated because of the use of illegal channels to transfer money. Remittances to developing countries are important from an economic viewpoint because they represent sizable capital flows to countries that are in need of financial assistance in order to aid their development process. Because remittances have grown phenomenally in the last few decades and are viewed as the most stable form of financial flows, they have become an important source of income for developing countries. Hence, their impact on growth indicators is important.

Considerable evidence from various studies, such as Gupta et al. (2009), Adams and Page (2005), Acosta et al. (2008), Yang (2008), and Pradhan and Mahesh (2016), has shown that remittance flows have reduced poverty, income inequality, and unemployment in recipient countries. They find that remittances have aided overall development in poorer countries and when used for consumption smoothing, a multiplier effect ensues. Furthermore, remittance flows are known to be more stable as compared to foreign direct and portfolio investment flows.

Evidence has shown that remittances result in an increase in consumption, investment, and education expenditure, whereas households that do not receive remittances see a fall in consumption. They also serve as an insurance against negative shocks to income (Yang and Choi, 2007). Remittance flows also increase entry into entrepreneurship and education expenses, thereby reducing unemployment (Yang, 2008), which is a contributing factor of crime (Lin, 2008; Krohn, 1976). The effect of remittance flows on the economy depends on the allocation of the transfers. When remittances are invested in productive ways, they are more likely to be favorable for development as opposed to when used for consumption.

Catrinescu et al. (2009) found that the economic policies, political policies, and institutions of the home country play an important role in determining the effect of remittances

on development, using data from 163 countries from 1970 to 2003. Remittances as a percentage of gross domestic product are interacted with various indices of institutional development to study the impact on the rate of growth of per capita income. It is found that the effects of remittances on income are higher for countries that have better policies and institutions. Cross-country evidence from various studies shows that remittances have a direct effect on income and increase consumption, which then has a multiplier effect. Various studies found that remittance flows significantly reduce poverty and income inequality (Gupta et al., 2009; Adams and Page, 2005; Acosta et al., 2008; Pradhan and Mahesh, 2016).

Since remittance receipts directly increase income, they may also have an impact upon crime, as it is empirically and theoretically well-established that changes in income alter the opportunity costs of engaging in crime (Becker, 1968; Bignon et al., 2016).

Remittances increase incomes of the recipient households and enable consumption and investment. They also enable households to invest in education and encourage entrepreneurial activities, which creates a source of income independent from remittances and also boosts employment. This may lead to a reduction in crime rates, but at the same time, higher remittances imply the presence of increased economic resources, which may yield greater returns from certain criminal activities. Thus, remittances may have different effects on different types of crimes. Moreover, remittances lead to higher human capital, which may lead to a decrease in violent and property crimes but an increase in white-collar crime (Lochner, 2004, 2011).

Iyer and Topalova (2014) showed that changes in income levels result in an increase in violent and property crimes. Blakeslee and Fishman (2014) found evidence from India that changes in agricultural output caused due to rainfall shocks, leads to increases in property crimes as opposed to violent crimes. They suggest that the main mechanism at work underlying the effect of rainfall shocks on agricultural output is the income channel. Sarsons (2015) found that in predominantly agricultural areas, negative rainfall shocks increase the chances of conflict because of decreased agricultural income. Using historical data from France, for the years 1826–1936, Bignon et al. (2016) found that a negative income shock, caused by the phylloxera crisis that destroyed vineyards, increased property crimes, including theft, and decreased violent crimes. Mehlum et al. (2006) examined the impact of rising poverty levels on crime, using nineteenth century data from Bavaria, Germany, and their results showed that it led to an increase in property crimes – “crimes of poverty” – but to significantly fewer violent crimes – “crimes of passion”. Traxler and Burhop (2010) found similar evidence from Prussia. They replicated Mehlum et al. (2006) using data from Prussia for the years 1882 to 1910. Therefore, a decrease in income may be positively correlated with certain types of crime but negatively related to others. In the same way, remittance receipts that increase income may have different effects depending upon the type of crime being studied.

Despite the theoretical reasons for existence of a relation between crime and remittances, it has been left largely unexplored in existing literature. Brito et al. (2014) examined the impact of remittances from the USA on crime rates in Mexico. Remittance receipts are the third largest source of foreign exchange and are larger than tourism receipts and foreign direct inflows in Mexico. Using cross-sectional municipal level data for 2010, they found that higher remittances are strongly correlated with a decrease in the homicide rate and robbery. To control for possible endogeneity between migration and crime, they used distance to the United States

border as an instrument for remittances. Furthermore, analyzing a state panel from 2003 to 2010, they found that per capita remittances reduce violent crimes like homicide rates.

Vargas-Silva (2009) studied the opposite effects, i.e., the effects of crime in the recipient country on remittance receipts, and found negative impact on remittance inflows. Using data from Colombia, the study explained that crime in the recipient country may have a negative impact on household assets and the return on investments, therefore, discouraging the sending of remittances for future inheritance or household investment. Thus, the evidence suggests that crime and remittance inflows are endogenously determined and empirical studies need to be cautious about the bias in ordinary least squares (OLS) estimates due to reverse causality and omitted variable bias.

This chapter studies the causal impact of remittance receipts on crime using household-level survey data from India for the year 2007–2008. To deal with the endogeneity of remittances, an instrumental variable approach is used. The instrument exploits variation in rainfall shocks, taken as deviations from average, as the exogenous source of variation in remittances. It has been empirically established in Yang and Choi (2007) that income loss due to rainfall shocks is compensated for by an increase in remittance flows.

The results suggest that increased deviations in rainfall do lead to an increase in remittance receipts. The main results of the study indicate that remittance receipts lead to decrease in violent crimes and increase in nonviolent crimes. The impact on total crime is insignificant, as the varied effects on violent and nonviolent crimes offset any impact on total crime. The reason behind this effect may be the varied impact on the “costs” and “benefits” derived from the two types of crimes. An increase in income increases the “costs” of engaging in violent crimes, but at the same time, it may increase the “benefits” from certain nonviolent crimes like cheating, which require the presence of monetary resources. The effects on individual crime indicators uphold this premise. The results also show that the effects on crimes are driven by the rural areas and the effects are insignificant for urban areas.

The rest of the article is organized as follows: section 2 describes the empirical framework, section 3 describes the data sources and variables, section 4 discusses the results, section 5 presents the robustness checks, and section 6 concludes.

2 Empirical framework

The response of crime rates to exogenous changes in the inflow of remittances to households is empirically examined for Indian districts, using cross-sectional data for 2007–2008, using the following identification strategy.

2.1 OLS estimation

An OLS model of the following form is estimated, where crime is a function of the remittances received:

$$C_{is} = b_0 + b_1(R_{is}) + b_2(X_{is}) + S_s + e_{is} \quad (1)$$

“ C_{is} ” is the measure of crime in district “ i ” of state “ s ”. “ R_{is} ” is the amount of remittances received in 100,000 rupees by the households in the last 365 days. “ X_{is} ” is the vector of controls

including demographic indicators such as size of household; household's social group, i.e., scheduled caste, scheduled tribe, or other backward class, which take the value 0, or general category, which takes the value 1; and a dummy variable for urban households. The general education level of the head of the household is included as a proxy for education level. The size of land possessed in hectares is included as a proxy for the income level of the household. The number of bank branches in a district in 2007 is included as a measure of financial development/infrastructure in the district. " S_s " are the state fixed effects, which account for the permanent differences across states. " e_{is} " is the error term.

However, the OLS estimation results are biased due to the endogeneity of remittances received. While remittances can have an effect on crime, crime can also affect remittance flows. Moreover, there could be omitted variables that simultaneously affect both remittances and crime, like political and socioeconomic institutions. To address this identification challenge, an instrumental variable model is estimated, which uses rainfall shocks as an instrument for remittances.

2.2 Instrumental variable estimation

For an instrument to be valid, it is essential that it satisfies the following restrictions: it is strongly correlated to the variable it is instrumenting and it is uncorrelated to the error term, i.e., it is completely exogenous. For this reason, rainfall shocks, calculated as deviations in rainfall from the historical average (1951–2000), are used as an instrument for remittances received, as used in Yang and Choi (2007). Rainfall shocks are completely exogenous and unpredictable. In a primarily agrarian country like India, rainfall shocks are likely to be a strong predictor of income.

Evidence on the relation between rainfall shocks and income is quite robust. Various studies use rainfall shocks as an exogenous predictor of income. This is because in primarily agrarian economies, rainfall shocks affect outcomes through their effect on income levels, making this effect exogenous. Empirical evidence from Yang and Choi (2007) shows that a rainfall shock can affect the flow of remittance receipts, through the effect on income. They used data from Philippine households to show that as rainfall shocks negatively affect income, remittance receipts increase to compensate for the fall in income. They found that a rainfall shock results in a fall in income, which causes the remittance flows to increase. Remittances, therefore, serve as an insurance against income shocks. Iyer and Topalova (2014) studied data from Indian districts and used rainfall shocks as an instrument for poverty levels and found that they have an effect on crime through their effect on income levels. Moreover, they found that income shocks due to rainfall shocks affect consumption evenly across the entire income distribution as opposed to affecting only a certain section of the income distribution. Blakeslee and Fishman (2014) also used data from Indian districts and found evidence from India that rainfall shocks affect crime through their effect on income and serve as a valid instrument. The literature shows that the income channel in the main channel through which rainfall shocks have an impact on various outcomes.

2.3 Impact of rainfall shocks on remittance receipts (first-stage estimation)

In the first stage of the model, an equation of the following form is estimated:

$$R_{is} = b_0 + b_1(D_{is}) + b_2(X_{is}) + S_s + z_{is} \quad (2)$$

“ R_{is} ” is the amount of remittances received in 1000 rupees by the households in the last 365 days. “ D_{is} ” is the deviation in rainfall or the rainfall shock (in millimeters) that is calculated as deviations in absolute rainfall in 2006 from the historical average for district “ i ” in state “ s ”. The year 2006 is used as the survey began in the June of 2007, and June to October is the principle wet season in India, which is followed by the harvest season, making the rainfall in 2006 most relevant. “ X_{is} ” is the vector of controls, which is the same as that in equation (1). “ z_{is} ” is the error term.

2.4 Impact of remittance receipts on crime (second-stage estimation)

In the second stage of the model, an equation of the following form is estimated:

$$C_{is} = a_0 + a_1(R_{is}) + a_2(X_{is}) + S_s + e_{is} \quad (3)$$

where “ C_{is} ” is the measure of crime in district “ i ” of state “ s ”. The right-hand side variables are the same as those in equation (1).

3 Data sources and variables

District-level crime data in 2008 for India are sourced from the National Crime Records Bureau of India. The indicators of crime that are analyzed are as follows: murder, attempt to murder, culpable homicide not amounting to murder, kidnapping, dacoity, robbery, burglary, theft, riots, breach of trust, cheating, counterfeiting, arson, grievous hurt, dowry deaths, and total Indian Penal Code (IPC) crimes. Additionally, these are grouped into violent and nonviolent crimes. Violent crimes include murder, attempt to murder, culpable homicide not amounting to murder, kidnapping, dacoity, riots, arson, grievous hurt, and dowry deaths. Nonviolent crimes include robbery, burglary, theft, criminal breach of trust, cheating, and counterfeiting.

The remittances received data are sourced from the 64th round of survey data conducted by the National Sample Survey Office (NSSO), in the years 2007–2008, which are available from the Indian Council of Social Science Research (ICSSR) data service. While the World Bank provides data on the remittance flows to India, there are no other disaggregated data available for Indian states or districts where remittances receipts are concerned. Therefore, this survey on household remittance inflows is an important source of data.

The NSSO was set up by the Government of India in the year 1950 to collect socio-economic data with the use of scientific sampling methods. The 64th round started from 1 July 2007 and continued up to 30 June 2008. The 64th round (July 2007–June 2008) of the National Sample Survey (NSS) conducted surveys on “Employment–Unemployment and Migration” and also recorded remittance data. The questionnaire on “Employment–Unemployment and Migration” (Schedule 10.2 of the 64th round) includes questions on household characteristics such as household size, household industry, occupation, religion, social group, household type, land possessed, migration particulars of the households that migrated to the place of enumeration during the last 365 days, amount of remittances received and use of remittances by those households from which there were some out-migrants, and monthly household consumer expenditure. Out-migrants were defined as former members of the household who had migrated out of the village or town at any time in the past and were alive at the time of the survey. Questions on out-migrants included the present place of their residence, pattern

(temporary or permanent) of migration, reason for migration, the rupee value of remittances sent by them during the last 365 days, and the use of those remittances.

The survey covered 125,578 households, out of which 79,091 households were in rural areas and 46,487 households were in urban areas. Out of these households, out-migrants were reported from 59,961 households. Among these households, remittance receipts were reported from 29,963 households. Remittances were defined in the survey as “transfers, either in cash or in kind, to the households by their former members who had migrated out” (Migration in India, 2007–2008). The figures include both formal and informal channels, although the mode of money transfer used by the out-migrants is not specified.

It is observed that in both rural and urban areas, most of the households migrated for employment-related reasons. Almost 55% of the households in rural areas and 67% of the households in the urban areas had migrated out for employment-related reasons (Migration in India, 2007–2008).

Rainfall data (in millimeters) for the year 2006 are sourced from the India Meteorological Department database. The historical rainfall data spanning 50 years from 1951 to 2000 are sourced from the Open Government Data Platform, India, and the data are published by the Indian Meteorological Department, Ministry of Earth Sciences. Rainfall shocks are calculated as deviations in absolute rainfall in 2006 from the historical average of 50 years for a district.

The controls, with the exception of bank branches, are sourced from the “Employment–Unemployment and Migration” survey of the 64th round of the NSS, from the ICSSR data service. The bank branches data are sourced from the Reserve Bank of India database.

Table 1 summarizes all the variables in the analysis and their description and sources.

Table 2 gives the descriptive statistics of the variables in this study. It shows the number of observations, mean, and standard deviations. As it has been noted earlier, the crime variables are aggregates for districts, calculated per 100,000 of population.

Table 1 Description of variables and data sources

Variable name	Description	Source
Violent crimes	Total number of violent crimes in a district includes murder, attempt to murder, culpable homicide not amounting to murder, kidnapping, dacoity, riots, arson, grievous hurt, and dowry deaths	National crime records bureau of India
Nonviolent crimes	Total number of nonviolent crimes in a district includes robbery, burglary, theft, criminal breach of trust, cheating, and counterfeiting	National crime records bureau of India
Remittances received	Total amount of remittances received by the household in the last 365 days in 1000 rupees	64th round of the NSS from ICSSR data service
Rainfall	Total rainfall in a district in the year 2006 in millimeters	India Meteorological Department database
Historical rainfall	Average rainfall in a district for the years 1951–2000 in millimeters	India Meteorological Department database

(Continued)

Table 1 (Continued).

Variable name	Description	Source
Controls		
Size of household	Size of household given by the number of members in the household	64th round of the NSS from ICSSR data service
Social group	Whether the household belongs to scheduled caste, scheduled tribe, other backward caste, or general category	64th round of the NSS from ICSSR data service
Education	General education level of the head of the household	64th round of the NSS from ICSSR data service
Urban households	A dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households	64th round of the NSS from ICSSR data service
Property owned	Property owned by a household is given by the size of land possessed in hectares	64th round of the NSS from ICSSR data service
Bank branches	Number of bank branches in a district in 2007	Reserve Bank of India database

NSS, National Sample Survey; ICSSR, Indian Council of Social Science Research.

Table 2 Descriptive statistics

Variable	Observations	Mean	Standard deviation
Violent crimes per 100,000	16,473	41.64	27.06
Nonviolent crimes per 100,000	16,473	39.06	29.65
Remittances received (rupees)	16,473	26,392.3	52,045.4
Rainfall 2006 (mm)	16,473	1242.51	796.96
Historical avg. rainfall (mm)	16,473	1280.66	749.20
Size of household	16,473	4.27	2.54
Social group	16,473	0.36	0.48
Education	16,473	5.81	4.15
Urban households	16,473	0.316	0.47
Property owned	16,473	3.57	2.17
Bank offices	16,473	165.49	124.49

Figure 1 shows the 10 highest remittance reporting states in the survey. Uttar Pradesh reported the highest amount of remittance receipts of rupees 5.6 crores, with Punjab following close behind with approximately rupees 5.5 crores in remittance receipts. Kerala comes in at the third place with approximately rupees 5.1 crores in remittance receipts.

Figure 2 shows the 10 states with the highest rates of violent crimes using National Crime Records Bureau of India (NCRB) data. Madhya Pradesh has the highest violent crime rate per 100,000, with 2805 counts. It is followed by Andhra Pradesh with 1351 counts per 100,000. All the 10 states with the exception of Orissa show a violent crime rate above 1000 counts per 100,000 of population.

Figure 3 shows the 10 states with the highest rates of nonviolent crimes using NCRB data. Madhya Pradesh has the highest nonviolent crime rate per 100,000, with 2077 counts. It is followed by Rajasthan with 1530 counts per 100,000. The top 5 states show a nonviolent crime rate above 1000 counts per 100,000 of population.

Figure 1 Top 10 remittance reporting states in 2007–2008.

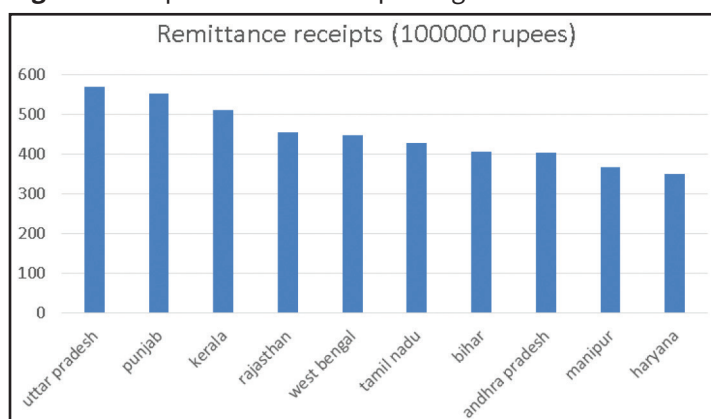


Figure 2 Top 10 states – violent crimes in 2008.

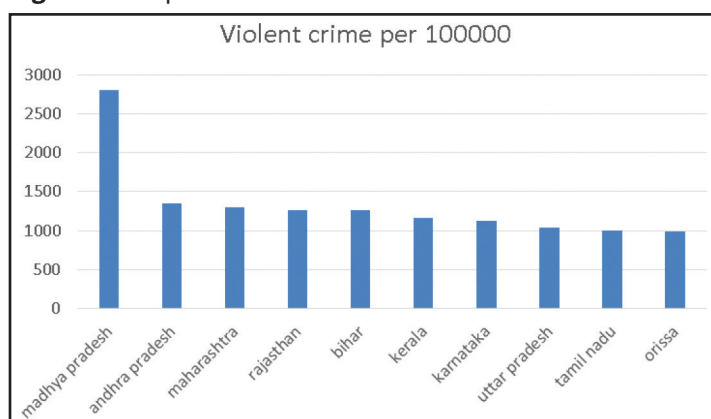
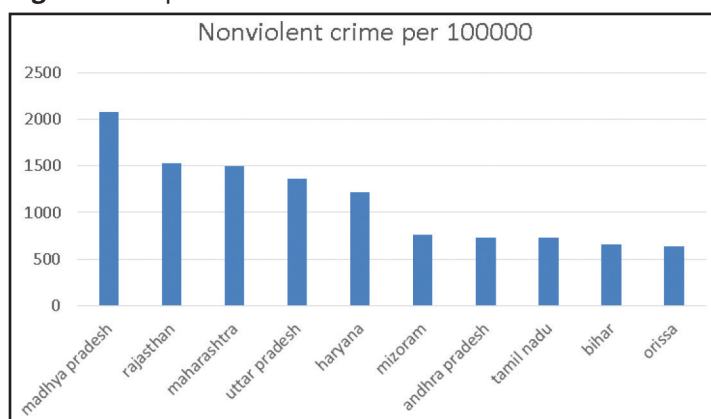


Figure 3 Top 10 states – nonviolent crimes in 2008.



4 Results

This section presents and discusses the results of the study. It describes the impact of remittances received on crime, first using the OLS estimator. It then presents the impact of remittances received, instrumented by rainfall shocks, on crime.

4.1 OLS estimation

Tables 3 (at the end of the manuscript) and 4, present the results of the OLS estimation presented in equation (1) for disaggregate and aggregate measures of crime, respectively.

Table 3 OLS results – disaggregate crime indicators

Dependent variable	Remittances received (in 100,000 rupees)
Murder	0.003 (0.84)
Attempt to murder	0.078** (0.02)
Culpable homicide not amounting to murder	−0.004 (0.14)
Kidnapping	0.048** (0.03)
Dacoity	0.006* (0.07)
Robbery	0.056*** (0.006)
Burglary	0.151* (0.06)
Theft	0.347* (0.08)
Riots	−0.085 (0.12)
Breach of trust	0.057*** (0.008)
Cheating	0.096 (0.18)
Counterfeiting	0.005 (0.15)
Arson	0.016 (0.25)
Grievous hurt	0.216 (0.41)
Dowry deaths	0.009** (0.02)
Controls	Yes
State fixed effects	Yes
No. of observations	21,149

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% level, respectively. *p*-values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively, for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by the household given by the size of land possessed in hectares; and number of bank branches in a district in 2007. OLS, ordinary least squares.

The first column shows the crime indicator that is used, and the second column shows the coefficient of the remittance receipts, with the *p*-value in parentheses. The OLS estimation results, with the exception of attempt to murder, kidnapping, robbery, burglary, theft, breach of trust, breach of trust, and dowry deaths, are insignificant. The results show that remittances have had a positive effect on all the aforementioned indicators of crime. In Table 4, the effects of remittances on total IPC crime and nonviolent crimes are also positive and significant. The OLS results imply that for 100,000 rupees in remittance receipts, the total IPC crime increases by 2.666 counts per 100,000 of population, and nonviolent crimes increases by 0.712 counts per 100,000 of population. The effect on violent crimes is insignificant.

4.2 Instrumental variable estimation

4.2.1 Impact of rainfall shocks on remittance receipts (first-stage estimation)

Table 5 presents the results of the first stage of the instrumental variable (IV) estimation as presented in equation (2). The results show that remittance receipts and rainfall shocks are

Table 4 OLS results – aggregate crime indicators

Dependent variable	Remittances received (in 100,000 rupees)
Total IPC crime	2.666** (0.02)
Violent crimes	0.288 (0.33)
Nonviolent crimes	0.712** (0.04)
Controls	Yes
State fixed effects	Yes
No. of observations	21,149

Note: ** denote statistical significance at 1%, 5%, and 10% level, respectively. *p*-values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group, i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively, for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by the household given by the size of land possessed in hectares; and number of bank branches in a district in 2007. OLS, ordinary least squares; IPC, Indian Penal Code.

Table 5 First-stage results

Dependent variable	Rainfall shocks (mm)
Remittances received (in 100,000 rupees)	0.000057*** (0.004)
<i>F</i> -statistic (33, 16,473)	69.06
Controls	Yes
State fixed effects	Yes
No. of observations	16,473

Note: *** denote statistical significance at 1%, 5%, and 10% level, respectively. *p*-values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group, i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively, for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by the household given by the size of land possessed in hectares; and number of bank branches in a district in 2007.

positively related, and the result is highly significant at 1%. This implies that higher deviations in rainfall or greater rainfall shocks lead to increases in remittance receipts. For every 1 mm deviation in absolute rainfall in 2006 from the historical average, remittance receipts increase by 0.000057 (in 100,000 rupees) or 5.7 rupees. This result is supported by theoretical and empirical evidence from Yang and Choi (2007) that rainfall shocks cause remittance receipts to increase as a way of compensating for the loss in incomes caused due to rainfall shocks. Therefore, rainfall shocks serve as a valid instrument for remittance receipts because of the highly significant relation and their complete exogeneity. They are a strong predictor of remittance receipts.

4.2.2 Impact of remittance receipts on crime (final-stage estimation)

Tables 6 and 7 present the results of the final stage of the IV estimation for disaggregate and aggregate measures of crime, respectively. It shows the impact of remittance receipts,

Table 6 Instrumental variable (IV) results – disaggregate crime indicators

Dependent variable	Remittances received (in 100,000 rupees)
Murder	-7.59*** (0.004)
Attempt to murder	4.47** (0.01)
Culpable homicide not amounting to murder	-0.32 (0.14)
Kidnapping	0.71 (0.55)
Dacoity	-2.98*** (0.005)
Robbery	-2.92* (0.09)
Burglary	-10.01* (0.07)
Theft	59.87*** (0.007)
Riots	31.74** (0.04)
Breach of trust	6.04*** (0.008)
Cheating	6.14* (0.07)
Counterfeiting	1.26*** (0.005)
Arson	24.28** (0.02)
Grievous hurt	-151.15*** (0.003)
Dowry deaths	-4.11*** (0.003)
Controls	Yes
State fixed effects	Yes
No. of observations	16,473

Note: ***, **, and * denote statistical significance at 1%, 5% and 10% level, respectively. p -values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group, i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by household given by the size of land possessed in hectares; and number of bank branches in a district in 2007.

Table 7 Instrumental variable (IV) results – aggregate crime indicators

Dependent variable	Remittances received (in 100,000 rupees)
Total IPC crime	88.31 (0.15)
Violent crimes	-104.96** (0.011)
Nonviolent crimes	60.38** (0.019)
Controls	Yes
State fixed effects	Yes
No. of observations	16,473

Note: ** denote statistical significance at 1%, 5%, and 10% level, respectively. p -values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group, i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by the household given by the size of land possessed in hectares; and number of bank branches in a district in 2007.

instrumented by rainfall shocks, on crime, as given in equation (3). The first column shows the crime indicator that is used, and the second column shows the coefficient of the remittance receipts, with the p -value in parentheses. The IV results show that remittance receipts

are significantly correlated with crime. Violent crime indicators, such as murder, dacoity, grievous hurt, and dowry deaths, are negatively and highly significantly related to remittance receipts. Some violent crime indicators such as attempt to murder, riots, and arson are positively and significantly related to remittance receipts. Out of nine violent crime indicators, four are negatively related to remittance receipts and three are positively related to remittance receipts. Culpable homicide not amounting to murder and kidnapping are insignificant.

Among the nonviolent crime indicators, theft, breach of trust, cheating, and counterfeiting are positively and significantly correlated to remittance receipts, while robbery and burglary are negatively and significantly related to remittance receipts at the 10% level of significance. Among the six indicators of nonviolence, remittance receipts are positively related to four indicators.

In Table 7, total IPC crime is insignificantly related to remittance receipts. This may be due to the varied impact on violent and nonviolent crimes. Total violent crime is negatively and significantly related to remittance receipts. It decreases by 104.96 counts per 100,000 of population, for every 100,000 rupees in remittance receipts. Total nonviolent crime is positively and significantly related to remittance receipts. It increases by 60.38 counts per 100,000 of population for every 100,000 rupees in remittance receipts.

The results suggest that remittance receipts have sharply decreased violent crimes and had the opposite effect on nonviolent crimes. Brito et al. (2014) found similar evidence from Mexico, where remittance flows have decreased violent crimes like homicide. Barua and Mahesh (2019) found evidence from the state of Andhra Pradesh in India that suggests that a negative effect on income leads to an increase in violent crimes and a decrease in nonviolent crimes like theft. Remittances receipts may have an opposite effect, since they have a positive effect on income.

This relation is also theoretically supported by the opportunity cost theory of crime (Becker, 1995). An increase in potential future income, in the form of remittance receipts, would increase the “cost of crime”, thereby decreasing the incentive to commit certain crimes, like murder. Remittance receipts encourage investment in education and entrepreneurship, which further increases potential future income and the earning capacity (Lochner, 2004, 2011). However, at the same time, remittance flows mean that more economic resources are available, and this may increase the “benefit from crime”, providing an incentive for certain crimes, such as theft, breach of trust, cheating, and counterfeiting, which require the presence of economic resources. Since remittance receipts directly increase income, it implies that they may have a varied effect on different types of crimes. This is seen in the opposite effects on violent and nonviolent crimes.

This effect is also supported by the “opportunities theory”, proposed by Kick and LaFree (1985). It argues that crime takes place when there is a favorable “environment” or “opportunities” available for crime. This “environment” may refer to the availability of material resources available for inciting criminal activities. An increase in remittance receipts represents an ideal “opportunity” for crimes such as theft, breach of trust, cheating, and counterfeiting.

Another mechanism underlying the increase in nonviolent crime may be income inequality. Not all households receive remittances, and if remittance receipts increase

income inequality, it might increase certain types of crime. The evidence on the positive relation between income inequality and crime is unanimous (see Bignon et al., 2016; Kelly, 2000; Krohn, 1976).

5 Robustness checks

There could be several threats to the identification. For instance, natural disasters could affect crime and drive remittance flows to the affected areas or a high number of emigrants may ensure higher inflows of remittances. In order to check the robustness of the results, alternate robustness checks are conducted. First, we control for natural disasters like the 2007 South Asia floods. Second, we estimate the model after dropping the top 2 states that receive the highest amounts of remittances to ensure that the volume of remittances is not driving the results. Third, we carry out the estimation for rural and urban households, separately, because incomes in rural areas are more likely to be dependent on rainfall and this may mean increased remittance flows.

5.1 2007 South Asia floods

In 2007, India, Pakistan, Bangladesh, and Nepal were affected by severe flooding, due to the earlier onset of the monsoon season. A number of states were affected by the floods in India. A natural disaster like this may have an effect on remittance flows to the affected areas and also on the crime rates. Therefore, in order to control for the flood, severely affected states are dropped for the sample and the instrumental variable model given in equations (2) and (3) is estimated for the remaining sample. Table 8 presents the results. The states that are dropped from the sample are Assam, Bihar, West Bengal, Gujarat, and Uttar Pradesh. Similar to the

Table 8 Instrumental variable (IV) results – controlling for the 2007 South Asia floods

Panel A	Remittances received (in 100,000 rupees)
Violent crimes	-76.16** (0.04)
Nonviolent crimes	50.17** (0.04)
Controls	Yes
State fixed effects	Yes
No. of observations	12,384
Panel B	Rainfall shocks (mm)
First-stage results	
Remittances received (100,000 rupees)	0.00007*** (0.003)
F-statistic (31, 14,375)	68.15

Note: ***, and ** denote statistical significance at 1%, 5%, and 10% level, respectively. *p*-values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group, i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively, for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by the household given by the size of land possessed in hectares; and number of bank branches in a district in 2007.

main results in Table 7, the results show a significant and negative impact on violent crimes and a positive and significant effect on nonviolent crimes. The effect of rainfall shocks on remittance flows is also significant and positive. This shows that the results are robust to factors that may influence remittance flows and crimes.

5.2 Highest remittance recipient states

In order to ensure that it is not just the volume of remittance flows that is driving the main results, the top 2 states that receive the highest amount of remittances, Uttar Pradesh and Punjab, are dropped from the data and the instrumental variable model given in equations (2) and (3) is estimated for the remaining sample. Table 9 presents the results. Similar to the main results in Table 7, the results show a significant and negative impact on violent crimes and a positive and significant effect on nonviolent crimes. The effect of rainfall shocks on remittance flows is also significant and positive.

5.3 Rural–urban households

In the third robustness check, the sample is divided into rural and urban households. Then, the instrumental variable model given in equations (2) and (3) is estimated for the remaining sample. Table 10 presents the results. This is done so as to establish whether the results are driven by the rural households or the urban households. In the rural areas, the results show a significant and negative impact on violent crimes and a positive and significant effect on non-violent crimes. The effect of rainfall shocks on remittance flows is also significant and positive. However, for the urban areas, the results are insignificant. Thus, the results show that the rural households are driving the results. This may be because in rural areas, remittances are more likely to be sent as a compensation for income shocks due to abnormal rainfall. The incomes of

Table 9 Instrumental variable (IV) results – without Uttar Pradesh and Punjab

Panel A	Remittances received (in 100,000 rupees)
Violent crimes	-188.1** (0.04)
Nonviolent crimes	126.46** (0.04)
Controls	Yes
State fixed effects	Yes
No. of observations	14,407
Panel B	Rainfall shocks (mm)
First-stage results	
Remittances received (100,000 rupees)	0.000034* (0.07)
F-statistic (31, 14,375)	73.96

Note: **, and * denote statistical significance at 1%, 5%, and 10% level, respectively. *p*-values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group, i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively, for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by the household given by the size of land possessed in hectares; and number of bank branches in a district in 2007.

Table 10 Instrumental variable (IV) results – rural–urban households

Panel A	Remittances received (in 100,000 rupees)	
	Rural households	Urban Households
Violent crimes	-108.18** (0.02)	-244.77 (0.52)
Nonviolent crimes	46.89** (0.04)	21.68 (0.83)
Controls	Yes	Yes
State fixed effects	Yes	Yes
No. of observations	11,265	5208
Panel B	Rainfall shocks (mm)	
First-stage results		
Remittances received (in 100,000 rupees)	0.000064*** (0.001)	0.00002 (0.65)
F-statistic	48.92	19.01

Note: ***, and ** denote statistical significance at 1%, 5% and 10% level, respectively. *p*-values are reported in parentheses. Robust standard errors are estimated. The vector of controls includes size of household; social group, i.e., scheduled caste/scheduled tribe/other backward castes or general category, which takes the value 0 or 1, respectively, for each group; general education level of the head of the household; a dummy variable for urban households, which takes the value of 1 for urban households and 0 for rural households; property owned by the household given by the size of land possessed in hectares; and number of bank branches in a district in 2007.

households in rural areas are more likely to be dependent on rainfall and agriculture, whereas in urban areas, incomes are more likely to be uncorrelated with rainfall shocks. Therefore, it is not surprising that the results are being driven by rural households.

6 Conclusion

This article explores the relation between crimes and remittance receipts in Indian districts using cross-sectional data from the 64th round of the NSS. International remittances are the focus of most research on remittances, and India is the leading recipient country of remittance flows. However, domestic migration can also play a significant role and domestic remittances make up a sizable number as there are hardly any obstacles to domestic migration when compared to international migration. India, being a large country, has a fair number of people migrating to urban areas, mostly for employment (Migration in India, 2007–2008). Therefore, remittance receipts are an important source of income in India. To the best of my knowledge, no paper had studied the effects of remittance on crimes for India. Remittance flows are well known to increase income levels and consumption, but their impact on crimes is not explored. This article is a first attempt to study the impact of remittance receipts on crimes in India.

The results indicate that exogenous changes in remittance receipts to households have an impact on crime rates. A negative relation exists between violent crimes and remittance receipts, whereas nonviolent crimes have a positive relation with remittance receipts. A major concern is the endogeneity bias arising due to the reverse causality between crimes and remittance receipts. Therefore, a key feature of this study is that it uses an instrumental variable approach that takes care of this endogeneity bias. This study uses rainfall shocks as an exogenous predictor of remittance flows. In a primarily agrarian economy like India, rainfall shocks are strongly related to income (Iyer and Topalova, 2014; Blakeslee and Fishman, 2014; Sarsons, 2015). It is found that

greater rainfall shocks lead to an increase in remittance receipts, which compensate for the fall in income as a result of rainfall shocks. This evidence is similar to the evidence from Yang and Choi (2007), who found that remittance receipts made up for loss of income in the Philippines.

The main findings of this article indicate that remittance receipts reduce violent crimes but increase nonviolent crimes. For every 100,000 rupees in remittance receipts, violent crimes decrease by almost 105 counts per 100,000 of population and nonviolent crimes increase by 60 counts per 100,000 in a district. The results indicate that the nature of crime determines the effect on the crime. Nonviolent crimes such as theft and cheating have increased.

In economic theory, crime is explained as the result of a rational decision-making process in which the potential criminal weighs the costs and benefits of indulging in crime. An increase in potential future income would increase the “cost of crime”, thereby decreasing his incentive to commit a crime. Remittance receipts are a part of income and increase the “cost of crime”. This has been true in case of violent crimes. However, it is observed that nonviolent crimes have increased due to increased remittance receipts. Since remittance flows mean that more economic resources are available, this may provide an incentive for certain crimes. These are the type of crimes that require and thrive in the presence of economic resources. This is true for certain nonviolent crimes such as theft and cheating, which are positively and significantly related to remittance receipts. In these cases, the “benefit from crime” outweighs the “cost of crime”. In other words, an increase in economic resources creates an ideal environment for these kinds of crimes that thrive with increasing “opportunities”. In addition, violent crimes, also known as “crimes of passion” may be a result of frustration caused by a negative income shock and the resulting income inequality and poverty. However, the opposite is true for remittance receipts. They are an example of an infusion of funds that increase income and ease liquidity constraints. This direct monetary transfer may reduce poverty and inequality, and also help with consumption smoothing during periods of unemployment. All these factors are highly correlated with violent crimes. However, not all households receive remittances, and if remittance receipts increase income inequality, it might be the reason behind an increase in certain types of crime. Therefore, one of the most important mechanisms underlying this result may be that as remittance receipts increase income, they end up changing the costs and benefits of engaging in different types of crimes.

It is agreed that remittance flows have favorable outcomes for the recipient households, states, and countries, alike, at the household level by increasing income and relaxing liquidity constraints and encouraging investment in education and entrepreneurship and at the macro level by aiding overall economic development. The main implication of this article is that while remittance flows decrease violent crimes, they may have an unfavorable impact: an increase in some types of nonviolent or property crimes that thrive in the increased presence of economic resources.

Declarations

Availability of data and material

The datasets generated and/or analysed during the current study are publicly available in the National Crime Records Bureau of India database. The remittance receipts data is available from the 64th round of the National Sample Survey Office data (India). Data sources are mentioned in the paper for rest of the variables used.

Competing interests

The author declares that she has no competing interests.

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Author's contributions

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