

Migration and the Incidence of Crime in Indian Cities: An Analysis of Delhi and Surat

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Abstract

Recent decades have seen a marked proliferation of inter-state migration in India. With increasing urbanisation and population density, various socioeconomic factors are affected. This paper aims to investigate the relationship between migration and crime in two Indian metropolitan cities, Delhi and Surat. Migration data is calculated using Vital Statistics Reports from the Economic Survey of Delhi, Census Reports on Vital Statistics, and the Surat Municipal Corporation, and crime data was sourced from the National Crime Records Bureau of India (NCRB). Analysis was conducted for a range of crime heads capturing violent crimes, property crimes, and economic crimes, as well as an aggregate Crime Harm Index. Non-parametric tests have been utilised to engage in exploratory analysis, revealing heterogeneous relationships that stem partly from comovement with time, and are linked to demographic characteristics. Our findings emphasise the possible role of temporal dynamics in suggesting a relationship between crime and migration. Data limitations in the availability of city-wise per year population estimates necessitate caution in the interpretation of results. Our findings aim to contribute to the limited empirical literature on city-level crime-migration patterns in India.

Keywords: Crime, Urbanisation, Inter-state migration

1. Introduction

Human mobility has been a defining characteristic of evolution and development throughout history. From the prehistoric dispersal of *Homo Sapiens* across ecological landscapes, to the rapidly increasing diversity in urban cities, migration has played a crucial role in the dissemination of ideas, knowledge and culture. Over the last few centuries in particular, migration has been at the forefront of the drive towards modernization, with expanding trade networks and globalisation restructuring labour settlement patterns.

Despite this historically crucial role, present-day discussions tend to frame migration in terms of increasing social disorder. This is largely driven by a sociological “othering”¹ of migrants due to differences in culture and ethnicity, and a perceived threat to resource control and social organization. This is reinforced by legal frameworks being defined in terms of “dominant interest groups” which are usually the native residents, leading to increased marginalization of migrants. Further, the migrant population tends to live in poor neighbourhoods, work in informal sectors, and enjoy a lower level of inclusion in society and access to political rights, all of which may place them at a higher risk of being involved in crime.

India has had a long history with internal migration, starting with the 1947 partition which left 14 million² people displaced between India and Pakistan. A large share of migration draws from social reasons such as marriage and family movement. As per the 2011 Census, nearly 50% of total migration was due to marriage, while 10.22% was for economic reasons. The latter creates a contest for resources, including employment opportunities, which can lead to further alienation of the migrant population.

The reasons for migration are broadly divided into two categories: push and pull factors. Push factors are those which influence the decision to move out of the original place of residence. Places marked by negative conditions such as war, poverty, famine, joblessness, political unrest, and natural disasters drive people to seek better opportunities elsewhere. For example, coastal regions in Odisha are prone to devastating cyclones, which is a push factor that encourages residents to migrate elsewhere. Pull factors, on the other hand, are attractive characteristics of a destination that incentivise people to migrate to the new place of residence. These may include better employment opportunities, higher wages, improved education and healthcare, making urban cities a major destination for migrants.

¹ Prakash, A. (2018). Identity, migration and crime : conceptual underpinnings and select evidence from India [JD]. *Rivista Degli Studi Orientali*, XCI, supplemento. <https://doi.org/10.19272/201803824011>

² Pravin Visaria, 1969. "Migration between India and Pakistan, 1951–61," *Demography*, Springer; Population Association of America (PAA), vol. 6(3), pages 323-334, August.

In recent decades, urbanisation in metropolitan cities has been driven by the establishment of industries that rely on unskilled labour from neighbouring states. In this paper, we analyse the relationship between migration and crime in two Indian metropolitan cities, Delhi and Surat.

1.1 Contextualizing Delhi and Surat

Delhi first became the capital of India in 1911, and has since experienced a steady increase in population. The most significant demographic change occurred following the 1947 partition, with a sharp influx of refugees from West Punjab. Since 1950, Delhi has continued to attract migrants due to its political centrality, expanding service sector, and concentration of employment opportunities. The net decadal migration to Delhi has been increasing in absolute terms³, with nearly 40% of the increase in population being due to migration as of 2001. The sustained reliance on migrant inflows for urbanization, combined with it consistently being the city with highest incidence of crime in India, makes Delhi a primary focus for the present study.

Surat, Gujarat is a major economic hub, and holds much historical significance despite the irregular migration pattern of the past decade. Portuguese traveler Duarte Barbosa described Surat in 1513 as a port frequented by many ships from Malabar. In 1573, the city was a vital port for trade and commerce, as well as a part of the journey taken for Hajj. During the colonial period, many would have had reason to migrate to Surat as it was once again a bustling port, after a brief period of stagnant growth caused by the development of railways by the British, primarily exporting textiles. It remains a major trading centre, and is among the largest diamond processing cities in the world, thus attracting a sustained inflow of migrant workers.

2. Literature Review

There are various mechanisms through which migration may affect the incidence of crime in an area. First, there exists a purely mechanical population effect. Migration may increase the number of crimes committed simply because it increases the population. Hazra (2020) finds that for every one unit increase in population density, crime rate increases by almost 0.11 units in India. Second, crime rates may also be affected by the composition of the migrant population.

³ As per data available at https://ncrpb.nic.in/pdf_files/05_chapter%202_cma.pdf

The Social Disorganization Theory proposed by Shaw, C., McKay, H (1942) that higher levels of residential mobility, diversity, and poverty result in increased propensity of crime. Hirschi and Gottfredson (1983) observe that arrest rates rise with age, peak in the mid to late teens or early twenties, and subsequently fall. Hence, an influx of migrants in their twenties may increase crime rates.

Literature examining the effect of international immigration on crime rates report mixed results. Spenkuch (2010) finds that in the United States the effect of immigration on crime is stronger for crimes motivated by financial gain, for instance theft, but not for “crimes of passion”, such as rape or aggravated assault. Additionally, a 10% increase in the share of immigrants in the United States is estimated to lead to an increase of approximately 1.2% in the property crime rate, while the rate of violent crimes remains essentially unaffected. Similar findings were shown by Kollamparambil (2018), where the foreign-immigrant ratio in South Africa did not impact crime rate in any of the crimes analysed with the exception of crime relating to property.

Butcher and Piehl (2007) suggest that the process of migration selects individuals who either have lower criminal propensities or are more responsive to deterrent effects than the average native, as an explanation for the improvement in immigrants' relative incarceration rates in the United States during the period of 1980-2000.

Bianchi et al. (2012) find that neither the overall crime rate nor the number of most types of criminal offense are significantly related to the size of the immigrant population for the provinces of Italy between 1991 and 2000. Egger (2021) finds that a 10% increase in low-skill internal migrants relative to the local population resulted in an increase of 9.4% in the homicide rate in Brazilian microregions on average between 2005 to 2010.

Lee et al. (2001) studied the cities of El Paso, Miami, and San Diego to find the impact of recent immigration on urban homicide. Their results show no overall increase in homicide, except for higher Black homicide rates in San Diego, which they attribute to intergroup conflicts and immigrant settlement patterns in high-crime neighborhoods. By contrast, Haitian immigration in Miami was associated with reduced homicide rates in predominantly Black areas.

Ozden et al. (2017) examine economic immigration to Malaysia and find a sizable negative causal impact of economic immigration on property and violent crime rates. They note that access to the labor market, which is the primary motive for economic immigration, reduces the benefits and increases the costs of engaging in criminal activities.

Another school of thought approaches this relationship in reverse, investigating whether crime influences migration. Using a survey of approximately 49,000 respondents residing in 17 countries in 2002, 2003, and 2004, Wood et al. (2010) found that the probability of considering family migration to the United States was approximately 30% higher among respondents who reported that they or a member of their family was a victim of a crime in the year prior to the survey. Nunziata (2015) employed Monte Carlo simulations on European data, finding that an increase in immigration did not affect crime victimization, but was associated with an increase in the fear of crime. Additionally, this fear was found to be consistently and positively correlated with the natives' unfavourable attitude toward immigrants.

In the Indian context, Debnath and Roy (2013) find no significant association between interstate migration and odds of crime. Instead they find that economic deprivation as captured by poverty ratio has a significant positive impact on crime while factors like the strength of civil police force, adult literacy rate, and urbanisation all have negative impact on crime.

Bhagat and Keshri (2020) note the gendered pattern of migration in India where female migration is almost entirely driven by marriage whereas male migration is largely due to the combined effects of education and employment.

Gazala and Jha (2025) observe that urban migration in India does not affect all regions equally and has a more pronounced impact in states already struggling with crime, likely due to infrastructural stress, socioeconomic exclusion, and weak urban planning. They note that urban migration has no significant effect in low-crime states. States with robust institutions and employment opportunities experience weaker links between migration and crime, while those with weaker governance structures and higher inequality see intensified effects.

3. Methodology

Secondary data sources on migration and crime in major metropolitan cities in India (Delhi and Surat) were used to investigate our research question. The variables used to represent migration and crime were drawn from pre-existing frameworks to ensure reliability, and analysis was carried out by means of descriptive statistical tools and small-sample tests.

3.1. Data Collection : Migration

We first estimate the yearly in-migration to our selected cities, Delhi and Surat. The 2021-22 Economic Survey of Delhi⁴ conducted by the The Planning Department, Government of NCT of Delhi calculated this trend of migration using the following formula :

$$\text{Migrated population} = \text{Increased population} - \text{Natural increase}$$

where,

$$\text{Natural increase} = \text{Total births} - \text{Total Deaths}$$

The increase in population from year to year was measured using the estimated mid-year population. This is the population in a given year as of July 1st, and is derived by the National Commission of Population between census years. In addition to the data for Delhi for the years 2002 - 2022 taken directly from the Economic Survey described above, a similar table was constructed for Surat using the above formula and mid-year estimated population from Vital Statistics available on the Surat Municipal Corporation⁵ website. Birth and Death rates were extracted from annual Civil Registration System reports on the Vital Statistics of India.⁶ This allowed for calculation of migration data for the years 2010 - 2021.

Year	Estimated Mid-Year Population	Increased Population Over Previous Year	Total Birth	Total Death	Natural Increase	Migration
2002	142.1	2.7	3.01	0.86	2.15	0.55
2003	144.86	2.76	3.01	0.88	2.13	0.63

⁴ Accessed in Statement 19.14 Trend of Migration in Delhi at

https://delhiplanning.delhi.gov.in/sites/default/files/Planning/e19_demography.pdf

⁵ Accessed under Vital Statistics at a Glance <https://www.suratmunicipal.gov.in/departments/birthdeathregistration>

⁶ Accessed under Tables for Number of Births (Deaths) Registered - States/Union Territories/Districts in year-wise reports at <https://censusindia.gov.in/census.website/en/data/VSREPORT>

2004	147.68	2.82	3.06	0.85	2.21	0.61
2005	150.54	2.86	3.24	0.94	2.3	0.56
2006	153.47	2.93	3.23	0.99	2.24	0.69
2007	156.45	2.98	3.22	1.01	2.21	0.77
2008	159.49	3.04	3.34	1.08	2.26	0.78
2009	162.58	3.09	3.54	1.12	2.42	0.67
2010	165.74	3.16	3.59	1.24	2.35	0.81
2011	169.14	3.4	3.53	1.12	2.41	0.99
2012	172.92	3.78	3.6	1.05	2.55	1.23
2013	176.7	3.78	3.7	0.97	2.73	1.05
2014	180.47	3.77	3.74	1.21	2.53	1.24
2015	184.25	3.78	3.74	1.25	2.49	1.29
2016	188.03	3.78	3.79	1.42	2.37	1.41
2017	191.82	3.79	3.67	1.36	2.31	1.48
2018	195.61	3.79	3.63	1.46	2.17	1.62
2019	199.4	3.79	3.66	1.45	2.21	1.58
2020	203.19	3.79	3.02	1.43	1.59	2.2
2021	207.03	3.84	2.72	1.71	1.01	2.83
2022	210.96	3.93	3	1.28	1.72	2.21

Table 1. Delhi Migration (Source: Office of Chief Registrar, Births & Deaths, Government of NCT Delhi.)

Year	Estimated Mid-Year Population	Increased Population Over Previous Year	Total Birth	Total Death	Natural Increase	Migration
2009	4523022		67254	16747		
2010	4786002	262980	70632	18628	52004	210976
2011	4462002	- (324000)	68559	18681	49878	-(373878)
2012	4662078	200076	72719	18740	53979	146097
2013	5051908	389830	76178	20310	55868	333962
2014	5164332	112424	75824	21383	54441	57983
2015	5395852	231520	76443	22569	53874	177646
2016	5637750	241898	77671	23190	54481	187417
2017	5890493	252743	77747	22589	55158	197585
2018	6078457	187964	76289	24577	51712	136252
2019	6352273	273816	79735	25145	54590	219226
2020	6637703	285430	68502	32650	35852	249578
2021	6936534	298831	68515	36690	31825	267006

Table 2. Surat Migration (constructed using data sources : Surat Municipal Corporation, Census Reports on Vital Statistics based on the CRS)

3.2. Data Collection: Crime

The National Crimes Record Bureau (NCRB) publishes annual data in various formats including a summary of the number of incidences categorized by crime heads for each metropolitan city⁷. Six crimes were selected for the purpose of our study, namely Murder (Sec. 302 IPC), Attempt to Murder (Sec. 307 IPC), Kidnapping & Abduction (Sec.363 IPC), Rape (Sec. 376 IPC), Theft (Sec. 379), Dacoity (Sec.395 - 398 IPC), Robbery (Sec. 392 - 394, 397, 398 IPC), Burglary (Sec. 449 - 452, 454, 455, 457 - 460 IPC), Arson (Sec.435, 436 & 438 IPC). These were selected as they are among the crimes with the highest social costs as estimated by Heeks et al. (2018), who assess the economic and social costs of crime, by including costs incurred in anticipation of, as a consequence of, and in response to crime. Further, the crime heads selected exhibit broadly analogous counterparts under UK Law to facilitate cross-jurisdictional indexing.

To create an index of the selected crime heads, the Cambridge Crime Harm Index (CCHI) was used. Weights are attached to crime heads based on the length of sentence that would be served by a given individual if they were to hypothetically commit each of the crimes. A temporary Indian index has been formed by the Cambridge Centre for Evidence-Based Policing team, by transpositioning each crime in the Indian Penal Code (IPC) to a counterpart used by the Sentencing Council England and Wales and using corresponding weights.

Crime	Section under IPC	UK Offence matched to	UK CCHI 2020 score
Murder	302	Murder	5475
Attempt to Murder	307	Attempt murder	3285
Rape	376	Rape	1825
Kidnapping & Abduction	363	Kidnapping	1460
Theft	379	Theft	2
Dacoity	395 - 398	Robbery professionally planned commercial	730
Robbery	392 - 394, 397, 398	Robbery	365

⁷ Accessed under IPC Crimes (Crime Head-Wise and City-Wise) under Summary (Metropolitan Cities) for years 2014 onwards, and under Incidence & Rate of Cognizable Crimes (IPC) under different Crime Heads (State, UT & City-wise) for prior years at <https://www.ncrb.gov.in/crime-in-india-table-content.html>

Burglary	449 - 452, 454, 455, 457 - 460	Burglary	19
Arson	435, 436, 438	Arson	5

Table 3. Cross-jurisdictional construction of a Crime Harm Index (data source : Cambridge Centre for Evidence-Based Policing⁸)

Using the UK CCHI weights, the following formula was created to index our selected crimes into an aggregated index:

$$\text{Crime Harm Index} = 5475 * (\text{Murder}) + 3285 * (\text{Attempt to Murder}) + 1460 * (\text{Kidnapping \& Abduction}) + 1825 * (\text{Rape}) + 2 * (\text{Theft}) + 730 * (\text{Dacoity}) + 365 * (\text{Robbery}) + 19 * (\text{Burglary}) + 5 * (\text{Arson})$$

Year	Migrati on (lakhs)	Murder	Attempt to murder	Kidnappin g and Abduction	Rape	Theft	Dacoity	Robbery	Burglary	Arson	Crime Harm Index
2002	0.55	438	373	1086	320	15626	42	432	2027	52	6051280
2003	0.63	401	330	968	406	14332	22	372	1566	54	5644283
2004	0.61	401	439	1066	457	17894	30	403	1586	36	6263072
2005	0.56	369	387	1302	562	1826	23	451	1826	42	6438101
2006	0.69	396	448	1272	533	16524	12	480	1767	29	6720351
2007	0.77	411	458	1460	524	15962	30	501	1868	26	7114966
2008	0.78	451	343	1317	396	17528	17	493	1721	36	6501790
2009	0.67	444	327	2149	404	20088	33	473	1566	26	7646730
2010	0.81	453	260	2629	414	21373	30	554	1355	48	8221006
2011	0.99	438	323	3007	453	21095	28	473	1226	33	8934784
2012	1.23	408	369	3274	585	20218	23	522	1483	72	9569923
2013	1.05	430	502	5406	1441	27982	26	1103	2395	85	15049374
2014	1.24	472	675	6016	1813	71937	65	5847	8839	166	19387910
2015	1.29	464	674	6630	1893	96924	61	6766	11121	182	20809192
2016	1.41	479	601	5925	1996	126467	38	4560	13346	171	19089513
2017	1.48	400	557	5203	1168	161818	32	2838	8859	127	15299547
2018	1.62	416	473	5124	1080	178953	24	2154	3591	110	14513860

⁸ Accessed at the ICCHI 2021 spreadsheet at <https://www.cambridge-ebp.co.uk/the-icchi-2021>

2019	1.58	416	473	5124	1080	178953	24	2154	3591	110	14513860
2020	2.2	461	562	4011	967	178228	9	1946	2168	68	13105828
2021	2.83	454	752	5475	1226	199327	25	2315	2622	87	16499052
2022	2.21	501	781	5318	1204	205545	18	1802	6189	105	16470216
Mean	1.2	433.476	481.286	3512.476	901.048	76600	29.143	1744.714	3843.429	79.286	11611649.43
Median	1.05	438	458	3274	585	21373	26	554	2027	68	9569923
Std. Dev.	0.623	32.890	148.564	2012.985	541.089	75969.807	13.69	1873.779	3602.581	49.713	5117028.333

Table 4. Delhi Migration, selected IPC Crime-Heads, and aggregated CHI

Year	Migration (lakhs)	Murder	Attempt to Murder	Kidnapping and Abduction	Rape	Theft	Dacoity	Robbery	Burglary	Arson	Crime Harm Index
2010	2.10976	87	19	82	23	1712	12	80	273	7	747041
2011	-(3.73878)	100	38	112	36	1830	12	78	356	4	949224
2012	1.46097	98	26	91	40	1886	6	68	333	3	867134
2013	3.33962	99	30	309	76	1570	11	56	364	6	1268971
2014	0.57983	85	41	263	94	1315	14	30	257	4	1184293
2015	1.77646	101	17	247	43	1168	18	33	240	4	1080016
2016	1.87417	102	44	270	121	1174	5	63	201	7	1350862
2017	1.97585	89	103	332	32	1905	20	159	325	8	1451410
2018	1.36252	108	132	373	46	2087	29	181	378	12	1752101
2019	2.19226	108	132	373	46	2087	29	181	378	12	1752101
2020	2.49578	116	82	163	27	1358	3	36	220	9	1213996
2021	2.67006	121	74	270	52	1555	10	39	199	11	1423146
Mean	1.508	101.167	61.5	240.417	53	1637.25	14.083	83.667	293.667	7.25	1253357.917
Median	1.925	100.5	42.5	266.5	44.5	1641	12	65.5	299	7	1241483.5
Std. Dev.	1.793	11.011	42.165	104.645	29.4	331.493	8.533	57.065	69.552	3.223	317616.504

Table 5. Surat Migration, selected IPC Crime Heads, and aggregated CHI

3.2. Quantitative Analysis

Due to the limited size of the sample for both Delhi and Surat, our analysis will be largely exploratory in nature. We began by constructing scatter plots for each crime head and the aggregated CCHI against migration. Scatter plots allow for pairs of data points to be mapped, revealing an underlying pattern of comovement. Correlated variables fall along a trend line, with higher correlation leading to points more tightly clustered along this line.

Next, the coefficient of Spearman's rank correlation, which measures the strength and direction of a monotonic relationship between two variables, was calculated for migration and each crime head and the aggregated index using RStudio. Represented by rho (ρ), this statistic can take values between -1 to +1, with positive values indicating a positive correlation and negative ones indicating a negative correlation. The presence of a relationship is tested for against the following null hypothesis:

$$H_0 : \rho = 0 \text{ (no monotonic association between crime and migration)}$$

Spearman results may be a result of migration and crime heads having strong trends, so the Mann-Kendall test is conducted to test for the presence of monotonic trends of each variable with time. This statistic (represented by tau, τ) measures the monotony of a variable with time, varying between -1 and 1; it is positive when the trend increases and negative when the trend decreases. This allows for the analysis to distinguish between co-movement between migration and crime levels and the independent temporal trends in crime incidence. This distinction is essential, as a variable may exhibit a statistically significant trend over time even in the absence of a strong contemporaneous association with migration, thus overestimating the coefficient of correlation. Here the null hypothesis is given by,

$$H_0 : \tau = 0 \text{ (no trend of given variable with time)}$$

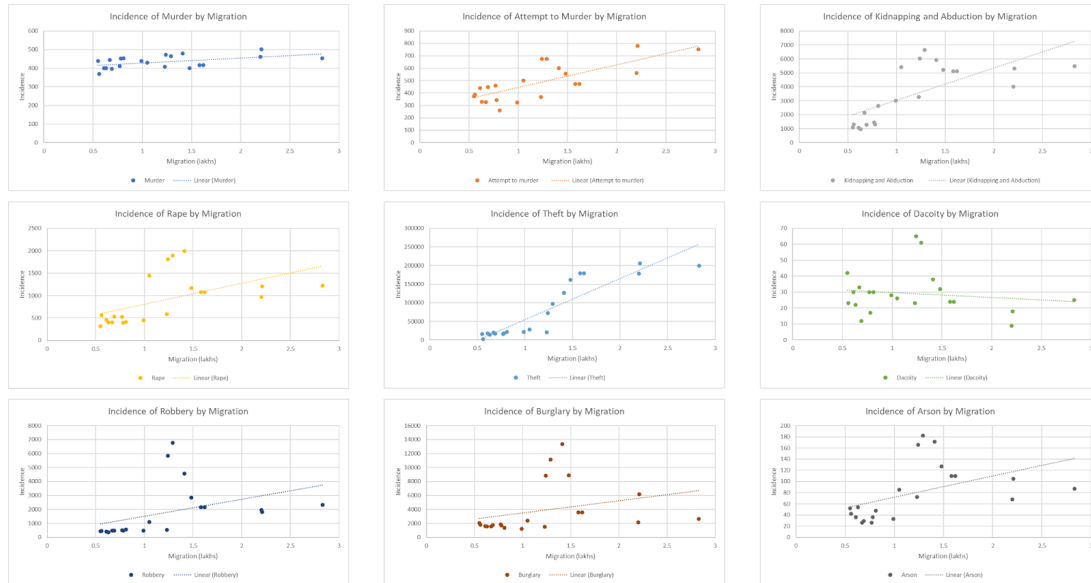
The Mann-Kendall test and Spearman's rank correlation are both non-parametric in nature, meaning they do not require assumptions about the distribution of underlying data, and are applicable for relatively small samples ($N > 10$ recommended) making them suitable for the present analysis.

4. Results

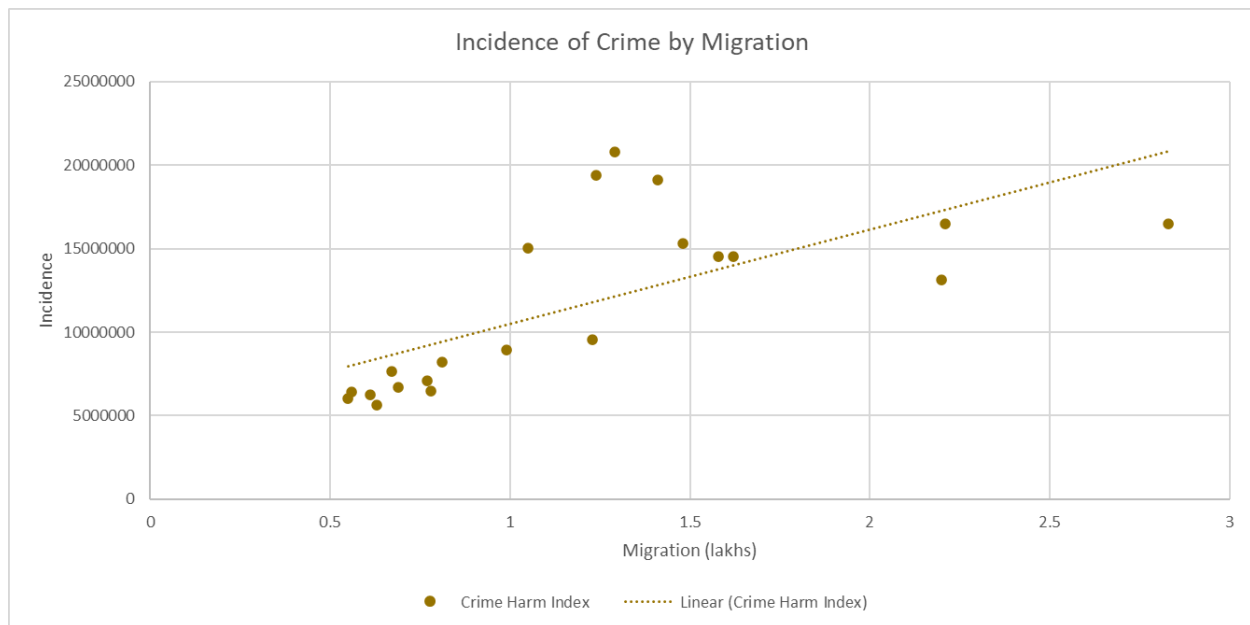
A combination of the descriptive analytics and small sample non-parametric tests reveals that while crime and migration exhibit positive correlation on both aggregated and disaggregated terms in Delhi, this is in part a result of each variable independently trending upwards with time rather than bivariate association. Further, no statistically significant correlation is found between crime and migration in Surat, despite the presence of upward trends in some crime heads, highlighting the role of demographic factors in determining the relationship between crime and migration.

4.1. Scatterplots

Scatterplots constructed for both cities reveal the bivariate relationship between migration and the selected crime heads as well as the aggregated crime harm index. For Delhi, visual inspection suggests a positive relationship between most violent and property crimes, with the exception of Dacoity. The strength of association varies widely between crimes, with Theft exhibiting a far steeper gradient than Murder, which has a fairly moderate dispersion. The scatterplot of migration and the crime index also exhibits an upward sloping trend line. However, there is significant deviation of datapoints away from the trend line. Interesting to note here is the marked peak in incidences of most crimes (with the exception of Murder) around the median level of migration (1.05 lakh).



Scatterplots (Delhi - Individual crime heads)



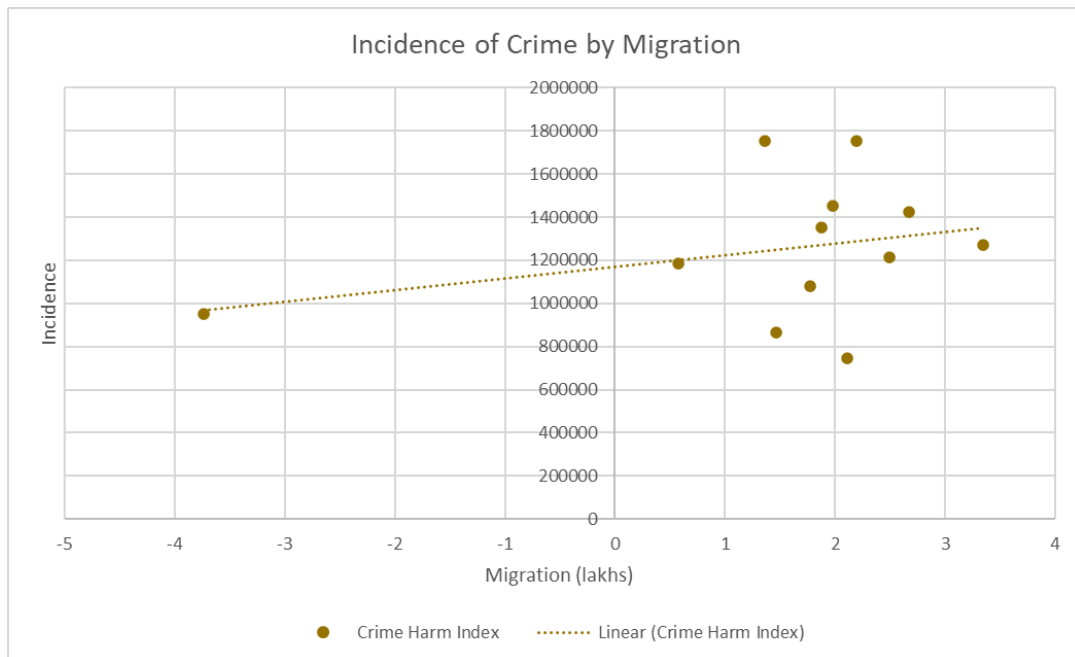
Scatterplot (Delhi - Crime Harm Index)

A similar assessment of the scatterplots derived from the data for Surat puts forth the first piece of evidence toward the heterogeneity in results across demographic contexts. The graphs suggest a weaker and less consistent pattern across crime heads. Murder and Rape show mild upward trends, and while Kidnapping and abduction, and Arson show mild positive trends, the dispersion is far wider than the Delhi data. The trend lines for Murder, Dacoity, and Robbery are nearly flat.

The composite crime index exhibits a slightly upward trend, however, observations are widely dispersed around the median level of migration (1.925 lakh).



Scatterplot (Surat - Individual crime heads)



Scatterplot (Surat - Crime Harm Index)

4.2. Spearman's Rank Correlation Test

Consistent with the graphical observations, the results from Spearman's Rank Correlation test also led to distinctly different results for Delhi and Surat. While nearly all the crime heads exhibit statistically significant positive associations with migration in Delhi, the corresponding coefficients for Surat are smaller in magnitude and statistically insignificant.

Crime	Spearman_rho	p_value
Murder	0.5167373	0.0164622
Attempt to Murder	0.7112699	0.0003003
Kidnapping & Abduction	0.8061059	0.0000103
Rape	0.7177655	0.0002489
Theft	0.9542060	0.0000000
Dacoity	-0.1268708	0.5836803
Robbery	0.8252114	0.0000041
Burglary	0.6042886	0.0037156
Arson	0.6850832	0.0006107
Crime Harm Index	0.8294901	0.0000033

Spearman's Rank Test for Delhi

With the exception of dacoity, all the crime heads exhibit statistically significant positive associations with migration, rejecting the null hypothesis. The strongest correlations are observed for Theft ($\rho = 0.954$, $p < 0.001$), Robbery ($\rho = 0.825$, $p < 0.001$), Kidnapping and Abduction ($\rho = 0.806$, $p < 0.001$), and the Crime Harm index ($\rho = 0.829$, $p < 0.001$). Weaker positive correlations are also found for attempt to Murder ($\rho = 0.71$, $p < 0.001$), Rape ($\rho = 0.72$, $p < 0.001$), Burglary ($\rho = 0.60$, $p < 0.01$), Arson ($\rho = 0.69$, $p < 0.001$), and Murder ($\rho = 0.52$, $p < 0.05$). Dacoity exhibits a weak and statistically insignificant ($p > 0.5$) negative relationship with migration.

Crime	Spearman_rho	p_value
Murder	0.37128	0.23474
Attempt to Murder	0.13310	0.68006

Kidnapping & Abduction	0.22807	0.47588
Rape	-0.00701	0.98276
Theft	-0.06305	0.84566
Dacoity	-0.29123	0.35841
Robbery	-0.06305	0.84566
Burglary	-0.19615	0.54121
Arson	0.46646	0.12636
Crime Harm Index	0.28722	0.36537

Spearman's Rank Test for Surat

In line with the scatterplot results, the Spearman correlations are substantially weaker for Surat. None of the estimated coefficients are statistically significant at zero ($p > 0.1$ across crime-heads and CHI) and the calculated coefficients are small and heterogeneous across crimes. While Arson displays a moderate positive correlation ($\rho = 0.466$), it is not statistically significant ($p = 0.126$). Thus the weak associations illustrated by the scatterplots and calculated Spearman coefficient of correlations are statistically insignificant, and the null hypothesis of no association between crime and migration cannot be rejected for Surat.

Although the correlation analysis above suggests co-movement between migration and crime for Delhi, it cannot distinguish between association driven by common temporal dynamics and independent trends. Accordingly, Mann-Kendall tests are employed to assess monotonic trends in both migration and crime heads for Delhi and Surat.

4.3. Mann-Kendall Test

Migration is found to have a strong and statistically significant upward trend ($\tau = 0.914$, $p < 0.001$), indicating growth in migration to Delhi over the period of study, 2002 - 2022. The aggregated CHI also exhibits an upward trend ($\tau = 0.692$, $p < 0.001$). Further, a strong positive monotonic trend is detected for Theft ($\tau = 0.874$, $p < 0.001$), and moderate but statistically significant upward trends are detected for the remainder of the crimes with the exception of Dacoity, which exhibited a minor downward, but statistically insignificant trend ($\tau = -0.082$, $p > 0.5$).

These results suggest that the observed Spearman correlation is likely driven by the strong upward trend with time in migration as well the crimes. Thus, we cannot comment on independent association but rather observe evidence of shared temporal movement across the variables.

Variable	Mann_Kendall_tau	p_value
Migration	0.91428572	0.0000
Murder	0.38849926	0.0156
Attempt to Murder	0.48210162	0.0025
Kidnapping & Abduction	0.66348636	0.0000
Rape	0.51074129	0.0014
Theft	0.87351084	0.0000
Dacoity	-0.08193365	0.6281
Robbery	0.59330821	0.0002
Burglary	0.34450155	0.0319
Arson	0.39809182	0.0132
Crime Harm Index	0.6921261	0.0000

Mann-Kendall Test for Delhi

For Surat, the null hypothesis of no trend in migration cannot be rejected ($p > 0.05$). However, the CHI shows an upward trend ($\tau = 0.626$, $p < 0.01$). Statistically significant upward trends are observed for Murder ($\tau = 0.657$, $p < 0.001$), Arson ($\tau = 0.583$, $p < 0.05$), Attempt to Murder ($\tau = 0.565$, $p < 0.05$), and Kidnapping and Abduction ($\tau = 0.583$, $p < 0.05$). Rape, Theft, Dacoity, Robbery, and Burglary do not have statistically significant trends ($p > 0.05$). This suggests that while the aggregated index of crime exhibits upward movement with time, there is heterogeneity among the crime heads.

Variable	Mann_Kendall_tau	p_value
Migration	0.39393935	0.0864712
Murder	0.65650767	0.003891349
Attempt to Murder	0.56490195	0.013344646

Kidnapping & Abduction	0.49236596	0.032694459
Rape	0.19847906	0.409478188
Theft	0.04580286	0.890660286
Dacoity	0.12309149	0.629606366
Robbery	-0.01526762	1
Burglary	-0.19847906	0.409478247
Arson	0.58312923	0.012343407
Crime Harm Index	0.62597245	0.005970955

Mann-Kendall Test for Surat

5. Conclusion

This study aims to explore the relation between crime and migration in two Indian metropolitan cities, namely Delhi and Surat. We employ non-parametric statistical tests to examine the association between migration and crime across aggregate and disaggregated crime categories.

Surat shows no statistically significant correlation between migration and crime, even though certain crimes indicate increasing trends. In Delhi, while non-parametric tests indicate a positive correlation between migration and crime on both aggregated and disaggregated terms, further analysis suggests that this association is largely driven by the independent upward trends of both variables over time, rather than a direct causal or bivariate relationship.

These findings suggest that crime may be better understood by taking into context broader city-specific urban, socio-economic, and institutional factors rather than migration alone.

6. Limitations and Scope for Future Study

The results of our study are bound by limitations, primarily arising from constraints in data availability. Firstly, migration data could not be reliably constructed for major metropolitan cities such as Mumbai, Kolkata and Chennai. While birth rates and death rates for all metropolitan cities were available on Census Reports on Vital Statistics based on the Civil Registration System (CRS), city-wise estimated mid-year populations are not consistently available. In particular, no data was available for Kolkata, official records for Mumbai's population were

estimated using a constant annual increase, and data for Chennai was sporadic, preventing the creation of a continuous time-series dataset. As a result, the sample size for this study is relatively small, limiting the feasibility of conducting meaningful regression. The empirical analysis is therefore limited to descriptive statistics and small sample correlation tests.

These methods themselves are further limited due to potential plausible autocorrelation, particularly in migration data. Mann-Kendall tests are more likely to conclude the presence of a trend when there is autocorrelation, which may affect the interpretation of our results.

Additionally, official statistics on crime must be interpreted with caution, as they are reliant on accurate reporting of crimes. Owing to the lack of India-specific research on the social harm of crimes, this study draws on European research which operates within different sociopolitical contexts. In addition, the crime harm indexing approach used is not based on Indian institutional processes, once again for the lack of existing literature. We have made use of the temporary harm index calculated by Neyroud (2021) in the absence of a more recent index.

A more accurate indexing of crimes under IPC would be possible if data on the length of sentence served under different crime heads in Indian prisons was made available. While NCRB Prison statistics report the length of sentence on an annual basis, this is not categorized across crime heads. Future research would also benefit from the updated Census scheduled to be released in 2027, and consequent derivations of mid-year population estimates by city.

References

1. Bhagat, R. B., & Keshri, K. (2020). Internal Migration in India. In *Internal Migration in the Countries of Asia* (pp. 207–228). https://doi.org/10.1007/978-3-030-44010-7_11
2. Bianchi, M., Buonanno, P., & Pinotti, P. (2012). Do immigrants cause crime? *Journal of the European Economic Association*, 10(6), 1318–1347. <https://doi.org/10.1111/j.1542-4774.2012.01085.x>
3. Butcher, K., & Piehl, A. M. (2007). Why are Immigrants' Incarceration Rates so Low? Evidence on Selective Immigration, Deterrence, and Deportation. <https://doi.org/10.3386/w13229>

4. Debnath, A., & Roy, N. (2013). Linkage between internal migration and crime: Evidence from India. *International Journal of Law, Crime and Justice*, 41(3), 203–212. <https://doi.org/10.1016/j.ijlcj.2013.06.001>
5. Devy, G. N. (2021). Thinking of Crime: The State, Migrant Population and the Missing Justice. *Social Change*, 51(2), 151–159. <https://doi.org/10.1177/00490857211012102>
6. Egger, E. (2021). Internal migration and crime in Brazil. *Economic Development and Cultural Change*, 71(1), 223–259. <https://doi.org/10.1086/714740>
7. Gazala, S., & Jha, N. (2025) Urban Migration, Crime, and the Sustainability Paradox in India. *Tenth International Conference on Economic Growth and Sustainable Development: Emerging Trends*, SDMIMD
8. Hazra, D. (2020). What does (and does not) affect crime in India? *International Journal of Social Economics*, 47(4), 503–521. <https://doi.org/10.1108/ijse-03-2019-0206>
9. Hirschi, T., & Gottfredson, M. (1983). Age and the Explanation of Crime. *American Journal of Sociology*, 89(3), 552–584. <https://doi.org/10.1086/227905>
10. Imran Khan, M., Alharthi, M., Haque, A., & Illiyan, A. (2023). Statistical analysis of push and pull factors of migration: A case study of India. *Journal of King Saud University - Science*, 35(8), 102859. <https://doi.org/10.1016/j.jksus.2023.102859>
11. Kollamparambil, U. (2018). Immigration, internal migration and crime in South Africa: A multi-level model analysis. *Development Policy Review*, 37(5), 672–691. <https://doi.org/10.1111/dpr.12382>
12. Lee, M. T., Martinez, R., & Rosenfeld, R. (2001a). Does immigration increase homicide? Negative evidence from three border cities. *Sociological Quarterly*, 42(4), 559–580. <https://doi.org/10.1111/j.1533-8525.2001.tb01780.x>
13. Nunziata, L. (2015). Immigration and crime: evidence from victimization data. *Journal of Population Economics*, 28(3), 697–736. <https://doi.org/10.1007/s00148-015-0543-2>
14. Ozden, C., Testaverde, M., & Wagner, M. (2017). How and Why Does Immigration Affect Crime? Evidence from Malaysia. *The World Bank Economic Review*, 32(1), 183–202. <https://doi.org/10.1093/wber/lhx010>
15. Prakash, A. (2018). Identity, migration and crime : conceptual underpinnings and select evidence from India [JD]. *Rivista Degli Studi Orientali*, XCI, supplemento. <https://doi.org/10.19272/201803824011>

16. Shaw, C.R. and McKay, H.D. (1942) *Juvenile Delinquency and Urban Areas: A Study of Rates of Delinquents in Relation to Differential Characteristics of Local Communities in American Cities*. The University of Chicago Press, Chicago.
17. Spenkuch, J. L. (2010). Understanding the impact of immigration on crime. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1612849>
18. Wood, C. H., Gibson, C. L., Ribeiro, L., & Hamsho-Diaz, P. (2010). Crime victimization in Latin America and intentions to migrate to the United States. *International Migration Review*, 44(1), 3–24. <https://doi.org/10.1111/j.1747-7379.2009.00796.x>