Mixed Impact of Police-monitored CCTV Cameras on Crime Patterns

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Digitalisierung der Verwaltung

Slot IV Digitale Daten und gesellschaftliche Sicherheit

Presentation Overview

- Objectives of the Study
- Previous Studies on Deterrent Effect of Police-monitored CCTV Cameras
- Research Design and Methodology
- Results
- Policy Implications

The Objectives of the Study

- Previous Studies
  - Lack of rigor
    - Welsh & Farrington (2007)
      - Excluded 23 of 45 new studies due to insufficient research designs
  - Little explanation of why deterrence effect of the cameras is so varied

Previous Studies on Deterrent Effect of Police-monitored CCTV Cameras

- Methodological Concerns
  - Unit of analysis
  - One-dimensional research methodology

- It is assumed that deterrent effect of CCTV systems has not been proven through empirical studies.

The Objectives of the Study

- Presented Study
  - Previous studies + Risk of Crime at Place + Environmental Backcloth operationalized with Risk Terrain Modeling (RTM)

Theories Used in the Study
Core Assumptions

Risk of Crime at Place	Rational Choice Theory	Deterrence Theory
• Cameras are features of the environment that have spatial influences, and these spatial influences affect legal behavior.	• Offender calculates cost and benefits • Makes decision • The role that immediate environments play in behavior.	• Punishment of crime is enough to restrain an offender's criminal intention to commit crime. • CCTV footage can provide significant evidence for offender's identity in courts and can prove their criminal act.

Research Design and Methodology

Research Questions and Hypotheses

RQ-1

Does the addition of CCTV cameras to a landscape reduce the numbers of aggravated assault, auto theft, theft from auto, and larceny theft incidents within the camera's viewshed areas?

- **H1**

  The number of the selected crimes will decrease respectively across all CCTV camera's viewshed areas for up to a one year period after installation when compared to one year prior to cameras' installations.

- **H2**

  Certain individual CCTV camera's viewsheds will have a reduction in the number of the selected crimes in time period 2 compared to time period 1, while others will not, regardless of whether there is a system-wide effect.

Research Design and Methodology
Research Questions and Hypotheses (Cont'd)

RQ2

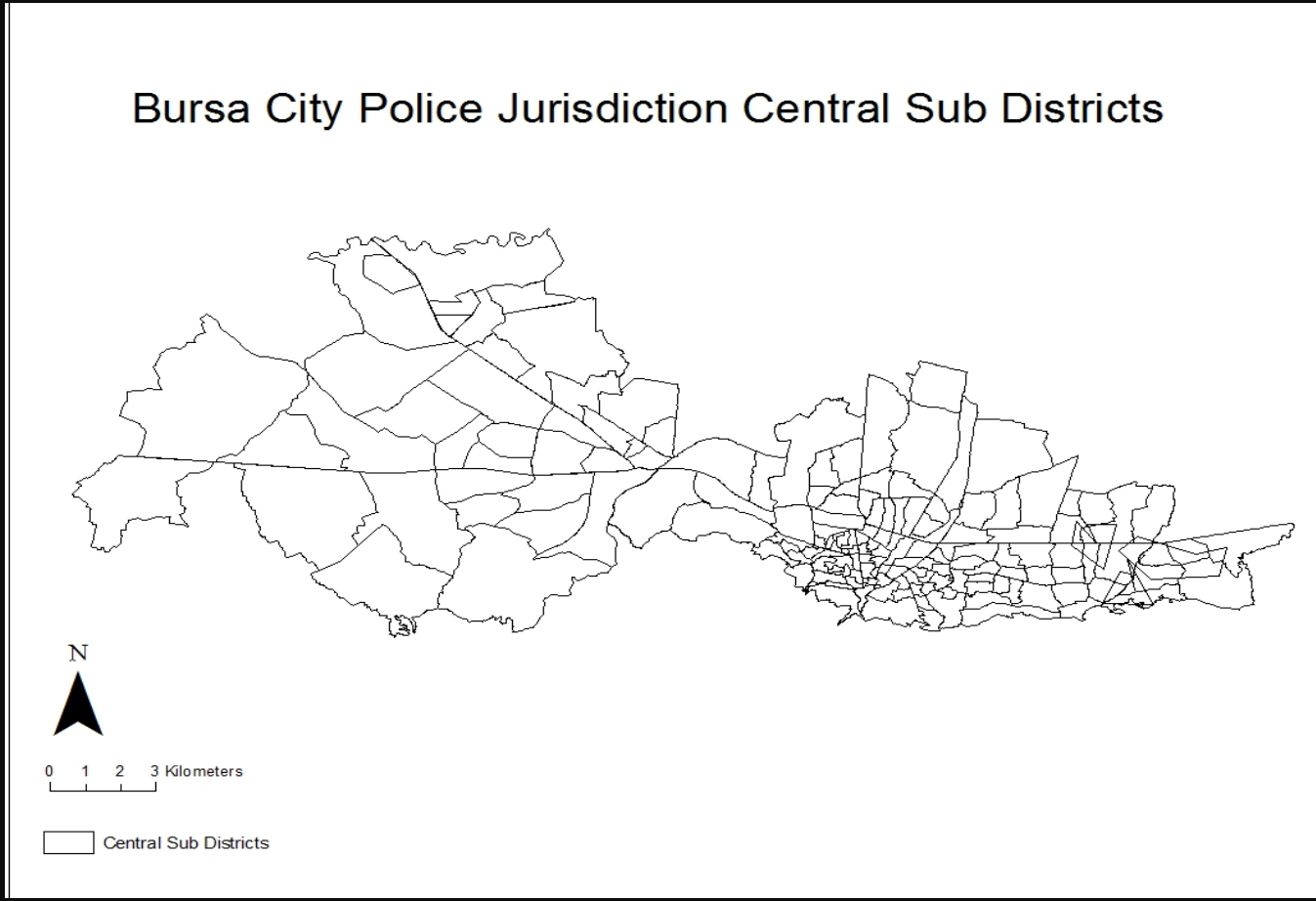
Do environmental risk values mitigate the deterrent effect of CCTV cameras on aggravated assaults, auto thefts, thefts from auto, and larceny thefts at their viewsheds?

- **H3**

  Individual CCTV cameras that don't have a reduction in the selected crime types will have significantly higher average environmental risk values compared to CCTV cameras that do have a reduction in these crimes in time period 2 compared to period 1.

Research Design and Methodology

Study Setting



Research Design and Methodology

Crime Selection

- This study will:
  - Examine crime types that are thought to be affected by the Police-monitored CCTV system. (Indoor & Outdoor)
    - Aggravated Assaults
    - Larceny Thefts
    - Thefts from Autos
    - Auto Thefts

Research Design and Methodology

Operationalization of Key Concepts

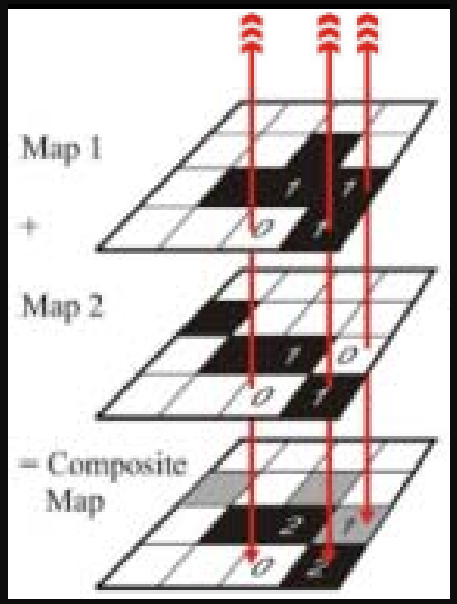
- Definition of Police Monitored CCTV cameras

- Dome cameras have the ability to zoom, pan 360 degrees and tilt 180 degrees
- They are placed at various locations (N=119).

Research Design and Methodology

Operationalization of Key Concepts

- Risk Terrain Modeling

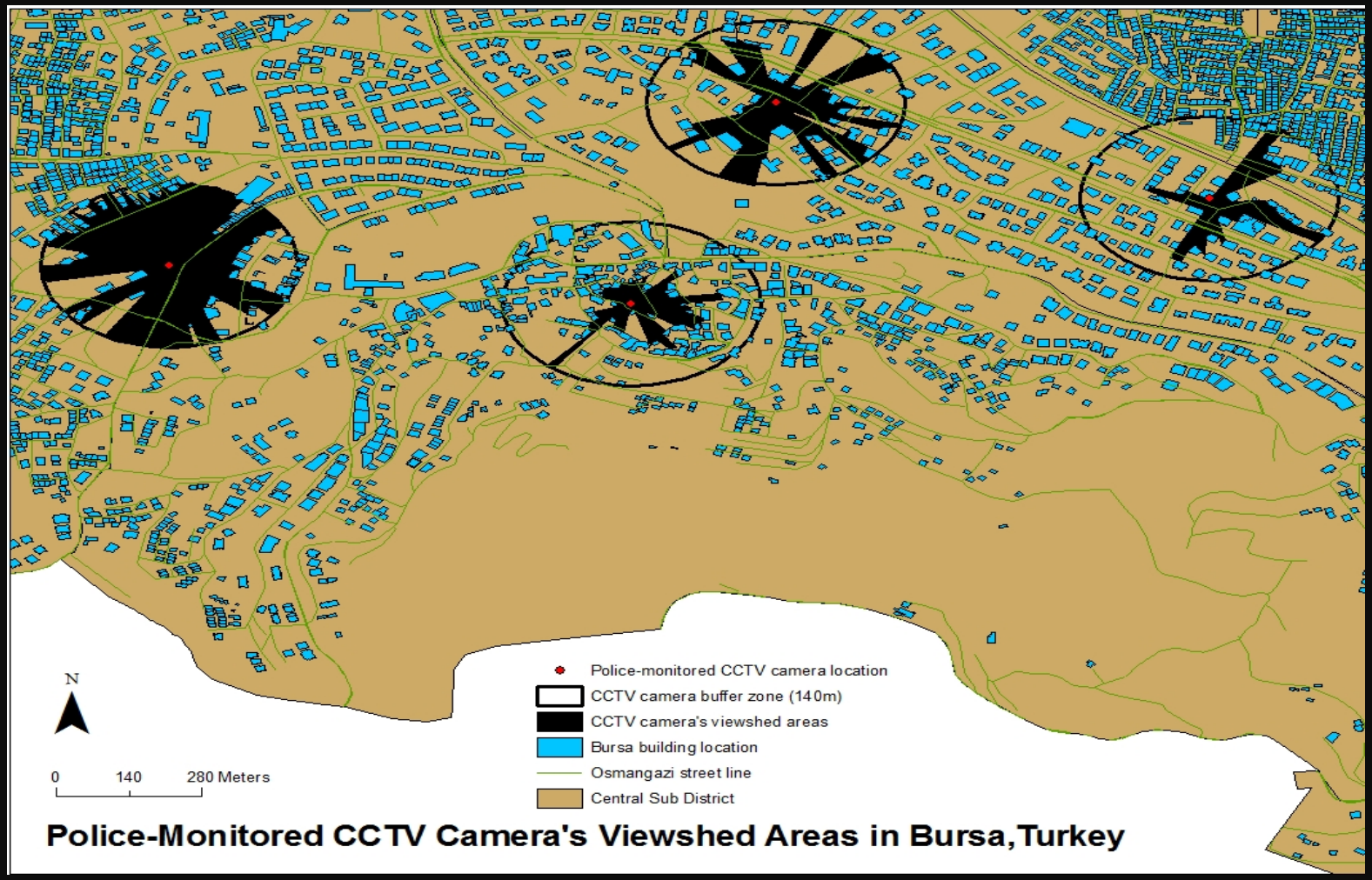


- "RTM standardizes all risk factors to common geographic units over a continuous surface" (Kennedy & Caplan , 2011).

Research Design and Methodology
Selecting and *Operationalization Environmental Risk Factors for Each Crime Type*

Research Design and Methodology

Preparation The Cameras' Viewshed Areas



Research Design and Methodology

Analysis for Hypothesis 1(System-wide effect)

- The Number of Aggravated Assaults, Larceny Thefts, Thefts From Autos and Auto Theft Incidents

Crime Types	Pre-Installation Period	Post-Installation Period	% Change	Difference
Aggravated Assaults	48	44	-8.33%	-4
Larceny Thefts	235	177	-24.60%	-58
Thefts From Autos	76	52	-31.50%	-24
Auto Thefts	25	22	-12%	-3

Research Design and Methodology

Difference of Mean Analysis for Hypothesis 1 (System-wide effect)

Crime Category	Mean	SD	Min	Max	n	*t*	*df*	p
Aggravated Assault						0.361	118	0.719
Pre-CCTV	0.4	0.886	-0.151	0.218	119			
Post-CCTV	0.37	0.735			119			
Larceny Theft						***2.112****	118	0.037
Pre-CCTV	1.97	3.468	0.03	0.944	119			
Post-CCTV	1.49	2.372			119			
Theft from Auto						***2.531****	118	0.013
Pre-CCTV	0.64	0.989	0.044	0.359	119			
Post-CCTV	0.44	0.755			119			
Auto Theft						0.446	118	0.657
Pre-CCTV	0.21	0.535	-0.087	0.137	119			
Post-CCTV	0.18	0.469			119			

Research Design and Methodology

Analysis for Hypothesis 2 (The Certain Individual Cameras' effect)

Calculation of Location Quotient value – for each camera's viewsheds

Location Quotient

(LQ) = (Cx / Tx) / (∑Ccw / ∑ Tcw) (Modified from Caplan, 2010)

- Cx :

The number of aggravated assaults, thefts from auto, auto thefts and larceny thefts, respectively in the individual (x) police-monitored CCTV camera's viewshed area,

- Tx:

Total area of each per-viewshed (x) within the police responsible sub- districts in the city of Bursa,

- ∑Ccw:

Total numbers of aggravated assaults, thefts from auto, auto thefts and larceny thefts, respectively, in all police-monitored CCTV camera's viewshed areas

- ∑Tcw:

Total area of the each viewshed within the police responsible sub-districts in the city of Bursa.

Research Design and Methodology

Analysis for Hypothesis 2

CRIME TYPE	Negative Difference LQ	Neg. %	Positive Difference LQ	Pos. %	No Change LQ	% No Change
Aggravated Assault	23	19.30%	27	22.70%	69	58.00%
Larceny Theft	45	37.81%	38	31.93%	36	30.25%
Theft From Auto	34	28.57%	29	24.36%	56	47.05%
Auto Theft	14	11.76%	17	14.28%	88	73.94%

Research Design and Methodology

Analysis for Hypothesis 3

- Validate Risk Terrain Modeling map on aggravated assault, larceny theft, theft from auto and auto theft, respectively.

- Ordered Logistic Regression.
  - Using average risk value and
  - Location Quotient Change for each camera's viewshed.

Variables	Aggravated Assault		Larceny Theft		Auto Theft		Theft From Auto
Environmental Risk Factors	%Percentile	***Environmental Risk Factors***	%Percentile	***Environmental Risk Factors***	%Percentile	***Environmental Risk Factors***	%Percentile
Bus Stops	**79.20*** **	Bus Stops	**78.20*** **	Bus Stops	**76.70*** **	Bus Stops	**77.2*** **
Internet Cafes	**60.70*** **	Public Phones	**61.90*** **	Internet Cafes	**50.70*** **	Public Phones	**52.8*** **
Public Phones	**57.80*** **	Internet Cafes	**58.30*** **	Pharmacies	**42.20*** **	Internet Cafes	**51.9*** **
Pharmacies	**45.70*** **	Drug Related Places	**42.10*** **	Schools	**31.50*** **	Pharmacies	**37.7*** **
Drug Related Places	**42.70*** **	Schools	**40.20*** **	Alcohol restaurants & Late dining	**28.90*** **	Drug Related Places	**36.8*** **
Alcohol restaurants & Late dining	**35.40*** **	University Course Buildings	**20.80*** **	Bakers	**23.30*** **	Schools	**30.4*** **
Caffee Houses	**22.90*** **	Caffee Houses	**20.30*** **	Caffee Houses	18.90***	Alcohol restaurants & Late dining	**27.3*** **
Wedding Saloons	**22.90*** **	Bars & Liquor Stores & Night Clubs	**19.60*** **	Parks	16.30***	Bakers	**19.8*** **
University Course Buildings	**19.10*** **	Banks & ATM's	18.90***	University Course Buildings	15.90***	Caffee Houses	17.3***
Banks & ATM's	18.50***	Parks	17.10***	Bars & Liquor Stores & Night Clubs	14.10***	Wedding Saloons	17.3***
Bars & Liquor Stores & Night Clubs	18.20***			Banks & ATM's	12.20***	Parks	15.1***
Hotels	9.70***			Gas Stations	5.90***	University Course Buildings	14.9***
Gas Stations	5.20***			Hotels	4.40***	jewelrys	13.2***
Sport Facilities	3.80***			Sport Facilities	4.10***	Bars & Liquor Stores & Night Clubs	12.5***
				Historic Places	2.20***	Banks & ATM's	10.8***
						Hotels	6.2***
						Sport Facilities	3.7***
						Gas Stations	3.3***
						Historic Places	1.4***
CORRECTED P-VALUE	**0.014**	**CORRECTED P-VALUE**	**0.01**	**CORRECTED P-VALUE**	**0.015**	**CORRECTED P-VALUE**	**0.019**
***p<.05; **p<.01; ***p<.001							

Calculation of Environmental Risk Values

Environmental Risk Factors	# of Aggravated Assaults	of *all cells* intersected with streets	RSI	Risk Factor's Weight
Caffee Houses	**177**	462	**0.383**	**2.4**
Wedding Saloons	**177**	463	**0.382**	**2.4**
Pharmacies	**353**	1165	**0.303**	**1.9**
Drug Related Places	**330**	1188	**0.278**	**1.8**
Internet Cafes	**469**	1795	**0.261**	**1.7**
University Course Buildings	**148**	605	**0.245**	**1.5**
Alcohol restaurants & Late dining	**274**	1124	**0.244**	**1.5**
Public Phones	**447**	2003	**0.223**	**1.4**
Bus Stops	**612**	3862	**0.158**	**1.0**

Environmental Risk Factors	Larceny Theft	of *all cells* intersected with streets	RSI	Risk Factor's Weight
Coffee Houses	**188**	462	**0.407**	**2.2**
Bars & Liquor Stores & Night Clubs	**181**	491	**0.369**	**2.0**
Drug Related Places	**389**	1188	**0.327**	**1.8**
University Course Buildings	**192**	605	**0.317**	**1.7**
Schools	**372**	1194	**0.312**	**1.7**
Internet Cafes	**539**	1795	**0.300**	**1.6**
Public Phones	**573**	2003	**0.286**	**1.5**
Bus Stops	**723**	3862	**0.187**	**1.0**

Environmental Risk Factors	Auto Theft	of *all cells* intersected with streets	RSI	Risk Factor's Weight
Bakers	**63**	571	**0.110**	**2.0**
Pharmacies	**114**	1165	**0.098**	**1.8**
Internet Cafes	**137**	1795	**0.076**	**1.4**
Schools	**85**	1194	**0.071**	**1.3**
Alcohol restaurants & Late dining	**78**	1124	**0.069**	**1.3**
Bus Stops	**207**	3862	**0.054**	**1.0**

Environmental Risk Factors	Theft From Auto	of *all cells* intersected with streets	RSI	Risk Factor's Weight
Bakers	**173**	571	0.303	**1.7**
Pharmacies	**329**	1165	0.282	**1.6**
Drug Related Places	**321**	1188	0.270	**1.5**
Internet Cafes	**453**	1795	0.252	**1.4**
Public Phones	**461**	2003	0.230	**1.3**
Schools	**265**	1194	0.222	**1.3**
Alcohol restaurants & Late dining	**238**	1124	0.212	**1.2**
Bus Stops	**674**	3862	0.175	**1.0**

Research Design and Methodology

Variables for Ordered Logistic Regression

Dependent Variables

Location Quotient Change in aggravated assaults, larceny thefts, thefts from autos and auto thefts within police jurisdiction in Bursa, Turkey.

Negative Change = 0, No change = 1, Positive Change =2)

Independent Variables

- Environmental risk values for each aforementioned crime type.

Descriptive Statistics of Dependent and Independent Variables

DEPENDENT VARIABLES					
Recoded LQ Change in Crime Category					
Crime Category	**Mean**	**SD**	**Min**	**Max**	**N**
Aggravated Assault LQ Change	0.9579832	0.6430193	0	2	119
Larceny Theft LQ Change	1.05042	0.8320766	0	2	119
Tehft from Auto LQ Change	1.042017	0.7294641	0	2	119
Auto Theft LQ Change	0.9747899	0.5119286	0	2	119
INDEPENDENT VARIABLES					
Environmental Risk Value					
Aggravated Assault Risk Value	5.469033	3.377821	0	11	119
Larceny Theft Risk Value	5.150695	2.777757	0	10	119
Tehft from Auto Risk Value	4.474566	2.185999	0	7.5	119
Auto Theft Risk Value	3.241716	1.797609	0	6	119

Results of Ordered Logistic Regression

All Viewsheds				
Variables	***Independent Variable (Environmental Risk Values)***			
Dependent Variables (The LQ Change in Crime Category)	***Coeff.***	***Std. Err.***	***Odds Ratio***	***Pseudo R2***
Aggravated Assault Risk Value	**-0.1148112***	0.054369	**0.8915345**	**0.0199****
Larceny Theft Risk Value	**-0.327812*****	0.0701913	**0.7204985**	**0.095*****
Theft from Auto Risk Value	**-0.3615678*****	0.0863101	**0.6965834**	**0.0768*****
Auto Theft Risk Value	**-0.2840073***	0.1197831	**0.7527611**	**0.0329***
*p<.05;**p<.01;***p<.001				

Research Design and Methodology

Hypotheses of Study

- H1: Crime categories will experience a statistically significant reduction
  - *Reject null hypothesis*

- H2: Individual cameras will exhibit variability (both “effective” and “ineffective” sites)
  - *Reject null hypothesis*

•H3: Individual CCTV cameras that don't have a reduction in the selected crime types will have significantly higher average environmental risk values compared to CCTV cameras that do have a reduction in these crimes in time period 2 compared to period 1.

  - *Reject null hypothesis*

Findings of The Study

- Discussions of macro level (city-wide system effect) analysis,
- Discussions of cultural relativity of crime indicators,
- Discussions of micro level (individual camera level) analysis,
  - *“some places are likely to be more crime prone than others…” (Caplan et al., 2011, p. 265).*
- The effect of environmental risk value on CCTV in deterrence effect

Policy Implications

This study:

- Advance CCTV research of crime at place when using environmental risk value.
- Emphasize a pre-evaluation of likely impact of the CCTV cameras before policy is implemented. Ideal Environments for CCTV Cameras
  - Certain areas “criminogenic” to CCTV

- Explored the impact of environmental risk on the deterrent effect of CCTV cameras on aggravated assault, auto theft, theft from auto, and larceny theft at their viewsheds.

Thank you for your patience.

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