Chapter - I

INTRODUCTION
1.0 INTRODUCTION

Crime is an integral part of the society. A number of socio-economic factors are believed to induce individuals to commit crimes. Number of theories were proposed, tested, corrected and reformulated about crime. The activity based crime analysis as proposed by Gary S. Baker and Issac Earlich are path breaking.

Earlich *(1973)* hypothesized that an individual can participate in two market activities, viz., legal and illegal. Each of these activities results in a pay off. A utility function is defined as a function of two composite goods which are combined with a subjective probability distribution which leads to expected utility. Time to be spent in legal and illegal activities can be determined maximizing the expected utility function. Earlich's contribution to crime analysis is discussed at length in the next chapter.

Gary S. Baker **(1968)** believed that apart from sociological factors, probability of capture and apprehension and opportunities lost due to prison sentence leaves a strong impact on the number of crimes committed by an individual.

There are studies in literature that enquires for measuring the impact of criminal justice system (CJS) on crime participation of individuals. CJS is constituted by police, courts and prisons.

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Alfre Blumstein and Richard Larson *(1969) proposed and estimated linear models of criminal justice system.

There were attempts to study particular types of crimes such as property crimes, homicide, crime against women and children and so on.

David Lawrence Sjoquist **(1973) proposed a model to analyze property crimes. The work begins with the hypothesis that crime may be explained by Economic Theory at least by part. Crime analysis is based on the crime type: robbery and burglary. The crime model is a restricted version of Earlich's model of crime. Empirical results imply that an increase in the probability of apprehension and conviction and an increase in the cost of crime (Punishment) both are found to decrease in the number of property crimes committed.

In a study Ehrlich*** hypothesized that capital punishment deters individuals from committing murder and empirical evidence has lead to the acceptance of the hypothesis.

Stephen et al. ****(1980) postulated a structural model to study murder behaviour. The article appears to be a critic of Earlich's article on

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murder behavior. The authors feel that capital punishment leads to a boomerang effect on number of murders since capital punishment induces the criminal to eliminate the witnesses too. A simultaneous equation model is postulated and estimated by the two stage least squares method.

1.1 OBJECTIVES OF THE STUDY

The present study has little concern to socio-economic factors influencing criminal behaviour. Neither it has any relevance to the psychic behaviour of a criminal. The work refers to only one component of the criminal justice system viz., police who deal with IPC (Indian Penal Code) crimes. These people attempt to solve a variety of crimes which we have grouped as follows:

- Crime against women and children
- Violent crimes
- Property crimes
- Other IPC crimes
- Custodial crimes

The first four crime types are committed by offenders but the last one committed by police themselves. The objectives of the present study are:

- to formulate linear programming problems and estimate efficiency distribution of the police organizations of 28 states of India.
• to appropriately postulate linear programming problems and obtain police efficiency distribution for such Indian states whose bad outputs are positive.

• to formulate linear programming problems, tied with directional distance functions to evaluate good output augmentation and bad output reduction for 13 major states of India.

• to perform variable prediction of crime by Data Envelopment Analysis

1.2 DATA AND VARIABLES

Police spend most of their resources for crime prevention and apprehension of criminals. Since no data are available on prevented crime, police outputs are proxied by the ratio of number of crimes solved to the total number of crimes committed in each crime category. Upon solving a crime police file charge sheet in the court as such the ratio of number of cases for which charge sheets are filed to the total number of reported crimes, in a crime category is an output of police. We have four police outputs referring to the crime categories, (i) crime against women and children \(y_1\) (ii) violent crimes \(y_2\) (iii) property crimes \(y_3\) (iv) other IPC crimes \(y_4\). These we consider as good outputs of police. Number of custodial crimes committed by police themselves \(y\) is treated as bad output of police.
Number of police personnel ($x_1$), number of motor vehicles ($x_2$) and number of walkie and talkie sets and other communication equipment ($x_3$) are chosen as police inputs.

Thus, we have four good outputs, one bad output and three inputs of police. Combining three inputs police produce five outputs of which four are good and one is bad. The source of data is 'Crime India 2003', a publication of Ministry of Home Affairs, Govt. of India.

1.3 ORIGIN OF PRODUCTIVE EFFICIENCY MEASUREMENT

Farell in a path breaking article outlined how input efficiency of production units can be measured under a set of hypotheses. The benchmark for efficiency measurement is chosen to be unit output isoquant. Farrell's input efficiency measure is radial. to attain efficiency it enquires for possible input reduction. To gain efficiency an inefficient decision making unit (DMU) should contract its inputs proportionately onto the efficient frontier. If such gains are possible the DMU is inefficient, otherwise efficient. The bounds for Farrell's input distance function are 0 and 1.

$$0 \leq F_i(y, x) \leq 1$$

- $F_i$: Farrell's input distance function
- $y \in \mathbb{R}^n$, is output vector.

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• \( x \in \mathbb{R}^n_+ \), is input vector.

• For inefficient units \( F_i(y, x) < 1 \)

• For efficient units \( F_i(y, x) = 1 \).

Farrell's output efficiency measure enquires possible augmentation of outputs with a radial expansion on to the frontier. If any such expansion is possible the DMU is output technical inefficient. Otherwise output technical efficient. Farrell's output measure is finite and bounded below by one.

\[ 1 \leq F_0(x, y) < \infty. \]

\( \triangleright F_0(x, y) = 1 \Rightarrow \text{output technical efficiency} \)

\( \triangleright F_0(x, y) > 1 \Rightarrow \text{output technical inefficiency} \)

Thus, technical efficiency can be measured by two approaches, contracting inputs or expanding outputs. The approach followed throughout the work is output oriented technical efficiency measurement.

To fulfil the first objective 'Null Joint Hypothesis' is imposed which implies that production of good outputs always leads to the production of bad outputs, reduction of bad outputs to zero level requires reduction of good outputs to the same level too. It is further hypothesized that bad outputs are weakly disposable in the sense that clearance of bad output requires effort and cost.

Imposing the hypothesis of 'Null Joint' and weak disposability of bad outputs a primary goal programming problem is formulated and solved
to estimate additional augmentation of good outputs. Formulating a secondary goal programming problem the possibility of reduction of bad output (custodial crimes) is enquired. However, the later linear programming problem requires the presence of non-zero bad outputs.

The police of each state of India is a DMU. As such we have 28 DMUs. Some of these DMUs do not produce bad output. Such DMUs are removed, for the rest the goal programming problems are solved. Eighteen out of 28 DMUs produce bad outputs.

The second objective is fulfilled formulating and solving linear programming problems assuming that inputs are freely disposable. The linear programming problems look for augmentation of good outputs and reduction of bad output simultaneously. Unlike the Farrell's distance functions the directional distance functions are additive and satisfy a set of properties.

For planning purpose the policy maker government always requires to know against a target cost of police, the desired number of police and potential output.

To fulfil the third objective we formulated and solved linear programming problems of the following type:
Max \( \lambda \)

subject to

\[
\sum \lambda_i x_i \leq x
\]

\[
\sum \lambda_i y_i \geq \lambda y_0
\]

px \leq C

\( \lambda_i \geq 0 \)

for each target cost \( C \), one linear programming problem is solved.

CHAPTER SCHEME

1. INTRODUCTION

2. REVIEW OF LITERATURE

3. THEORY AND METHODOLOGY

4. EMPIRICAL IMPLEMENTATION

5. SUMMARY AND CONCLUSIONS