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## Estimation of Crime Rate Based on Socio-economic Indices

### — Second Interim Report: An Approach by Time-Series Analysis —

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#### I. Purpose

The ultimate purpose of this study is to develop in terms of behavioral science a practical method of identifying the social phenomena in relation to a criminal policy, and thereby to make a substantial contribution to a more effective criminal policy.

In the 1st Interim Report, an attempt has been made to identify the correlation between the general crime trends as represented by the rates of crimes such as larceny, fraud, homicide, bodily injury, rape, professional or gross negligence causing death or injury, including the rates of juvenile and female offenders apprehended by the police for Penal Code offenses and the socio-economic phenomena as represented by the eight basic factors selected from among the 50 original socio-economic factors. Based on such preparatory steps, the estimate rate of each of crimes listed above in each of 46 prefectures was calculated for 1950, 1955, 1960, 1965 and 1970. Further, it has been found out in the process of these analyses that there are a certain number of patterns in which the social and economic conditions and the incidence of crime are related with each other.

The 2nd Interim Report, which succeeds the 1st one with the same objective in view, seeks to examine in terms of time-series analysis the relationship between the eight basic factors representative of general socio-economic phenomena and the above mentioned rates of crimes as indicators of the crime trends in general. In other words, the present report tries to find out how each of the socio-economic basic factors is related to each crime indicator at each year of survey for a certain continuative span of time and thereby proceeds to determine whether such a relationship is a simultaneous and constant one or is found with a time lag effect.

## II. Method

1. In the first place, a multiple regression analysis is undertaken by using the rates of crimes mentioned above as the criterion variables and eight basic factors of socio-economic phenomena as the prediction variables. From this analysis are obtained the structure coefficients, which will be arranged by each item of the crime factors in order to make a comparison between the trends of the years surveyed.

2. Based on the weight vectors thus obtained, the crime rates are estimated for each of crimes for each year of survey for each prefecture, and each of such estimated scores is compared with the observed one to find the difference between both scores for a further analysis.

3. As for the study of time lag, a multiple regression analysis is undertaken between the eight basic factors of socio-economic phenomena fixed at a given time as the basic year and each of the rates of crimes as observed for a period of five years from that time.

4. The multiple correlation coefficients between the estimated crime rates obtained from the synthesis of the eight basic factors and the observed ones are also calculated in order to examine the accuracy of estimation.

The eight basic factors referred above are understood here to represent the following aspects of socio-economic phenomena for the purpose of this report.

Factor 1 represents economic affluence.

Factor 2 represents the level of urbanization in industrial and demographic structure.

Factor 3 represents the productivity potential.

Factor 4 represents the density of population and police activities.

Factor 5 represents the labour situation and unstable condition of living connected with it.

Factor 6 represents the level of urbanized culture.

Factor 7 represents socio-pathological phenomena.

Factor 8 represents stable and cultural condition of living.

## III. Results of the analyses and some notes on them

1. As for the correlation between larceny and the basic socio-economic factors, the analyses have revealed that Factor 1 constantly performed the function of deterrent to the crime throughout the period surveyed; and Factor 2, Factor 5 and Factor 6 proved less and less conducive to the commission of this crime, while, on the other hand, Factor 3, Factor 4 and Factor 7 functioned increasingly as a prompting influence upon the crime with the progress of time. These findings lead us to the conclusion

that the factors directly connected with economic conditions of society, such as Factor 2 which represents the level of urbanization in industrial and demographic structure and Factor 5 which represents the labour situation and unstable condition of living connected with it, had at the initial stage of growing economy in the postwar period of reconstruction of Japan a prompting effect on the occurrence of larceny, but, with the progress of economic, social and cultural development, came to have less and less of such a function; and Factor 7 which represents socio-pathological phenomena and Factor 4 which represents density of population and police activities, with more of social and cultural influence in general, and Factor 3 which represents productivity potential, came to work together to function as a prompting influence upon the crime of larceny, thus superseding the place of the former group of factors.

The multiple correlation coefficient for this crime is found the highest of all the crime indicators, and there has been no time lag relation of the crime observed with any of the eight basic factors.

2. Regarding the crime of fraud, Factor 2, Factor 4 and Factor 5 were getting less and less conducive to it with the progress of time on the whole. In 1955, Factor 1 had the function of deterrent to the crime, but it became the expediter of the crime in 1965 and continued to be so through 1970. That is to say, in the initial stage of the postwar period of reconstruction, while Factor 1 which represents economic affluence acted as a deterrent to the commission of the crime of fraud, Factor 5 representing the labour situation and unstable condition of living connected with it, Factor 2 representing the level of urbanization in industrial and demographic structure and Factor 4 standing for density of population and police activities all acted as an expediter of the crime; however, these factors began to change their functions with respect to the crime from 1960 as a turning point, and Factor 1 representing economic affluence completely reversed its former function of a deterrent to the crime, becoming its expediter in 1970, hand in hand with Factor 6 and Factor 7 which represent the level of urbanized culture and the socio-pathological phenomena respectively.

No time lag relation of the crime was observed with any of the basic factors.

3. For the occurrence of homicide, Factor 5 representing the labour situation and unstable condition of living connected with it was seen acting as the expediter, and Factor 8 which represents the level of stable and cultural condition of living as the deterrent throughout the period surveyed; and Factor 7, Factor 1 and Factor 6, which represent the socio-pathological phenomena, the economic affluence and the level of urbanized culture respectively, were proving more and more conducive to the crime with the progress of time, while Factor 2 representing the level of urbanization in industrial and demographic structure was showing less and less of the func-

tion of deterrent as time went on. There was observed no time lag relation of the crime with any of the basic factors.

4. For the crime of bodily injury, Factor 4 and Factor 5, which represent the density of population and police activities and the labour situation and unstable condition of living connected with it respectively, proved almost constantly conducive to its occurrence, while Factor 8 representing stable and cultural condition of living showed almost constantly the function of deterrent to the occurrence of the crime; and Factor 1 representing economic affluence lost its deterring influence upon the crime, and Factor 6 and Factor 7, which represent the level of urbanized culture and the socio-pathological phenomena, came to change their function of the deterrent to the crime to that of the promoting agent, while Factor 2 and Factor 3, which respectively represent the level of urbanization in industrial and demographic structure and the productivity potential, came to assume the function of deterrent for the latter half of the period surveyed. That there has been observed a considerable change in the correlation between the Factor 1, Factor 2, Factor 3, Factor 6 and Factor 7, and the occurrence of the crime of bodily injury from around 1960, in addition to the decline in the multiple correlation coefficients in 1960, is yet to be examined.

With respect to the time lag relation of the crime with the basic factors, Factor 4 was having less and less effect of any significance in its relation to the crime year after year, while Factor 1 and Factor 2 were observed producing their strong effects on the occurrence of the crime in 1st year and 5th year respectively; and with Factor 3 and Factor 6, they lost their deterring influence upon the crime in the 2nd year and 3rd year respectively. These facts clearly show that there exists a time lag relation between the crime of bodily injury and each of these five basic factors. In this connection, in what combination which data of the time-series survey should be examined to predict the future rate of the crime of bodily injury is the problem to be solved yet.

5. As for the crime of rape, the 1958 revision of the law relating to the crime was considered responsible for a change in the occurrence of the crime. Taking account of this fact, that Factor 1 representing the economic affluence and Factor 3 representing the productivity potential reversed their functions after 1960 in relation to the occurrence of the crime, that is, from deterrent to expediter in the case of the former factor and vice versa in the case of the latter, indicates that a great change was taking place in the socio-economic situation responsible for the occurrence of the crime of rape.

The multiple correlation coefficients were low on the whole, and particularly right after the 1958 revision of the law it marked the lowest count ever recorded, ( $r=0.48$ ).

In respect of time lag effect, whereas any significant effect of the Factor 1, Factor

4 and Factor 8, on the occurrence of the crime has not survived longer than two to three years, it is found that three years had to pass before Factor 3 came to have any degree of effect on the crime.

6. For the crime of professional or gross negligence causing death or injury, while Factor 2 and Factor 6, which represent the level of urbanization in industrial and demographic structure and the level of urbanized culture respectively, were found almost constantly conducive to the occurrence of the crime, Factor 1 representing the economic affluence acted as the deterrent to it.

No time lag relation of the crime was observed with any of the basic factors.

7. With regard to the juvenile offenders cleared by the police for the Penal Code offenses, Factor 5, Factor 2, Factor 4 and Factor 6, which respectively represent the labour situation and unstable condition of living connected with it, the level of urbanization in industrial and demographic structure, the density of population and police activities and the level of urbanized culture, after having functioned as the promoter of the crime in the initial stage of the survey, stopped exerting any significant influence on the occurrence of the crime after 1965. Factor 1 representing the economic affluence was the deterrent to the crime until 1960 and after that came to have less and less of that function, and in 1970 the function of deterrent was observed changed to that of expediter in relation to the occurrence of the crime. Factor 7 which represents the socio-pathological phenomena proved more and more conducive to the crime with the progress of time after 1955. To sum up, while around 1950 and 1955 the socio-economic factors played significant roles in relation to the occurrence of the crime, it was rather the cultural background and the socio-pathological factors that played the function of expediter in this regard after 1965 and downwards.

As for the time lag effect of the factors on the occurrence of the crime, the effects of Factor 1 and Factor 2, became greater after the lapse of two or three years.

8. In the case of the female offenders cleared by the police for the Penal Code offenses, Factor 5, Factor 2 and Factor 4, which respectively represent the labour situation and unstable condition of living connected with it, the level of urbanization in industrial and demographic structure and the density of population and police activities, at first were prompting the occurrence of the crime, but later came to show less and less of a such function, while, on the other hand, Factor 1 representing the economic affluence, which had functioned as deterrent to the crime until 1960, stopped to show much of that function since then. What has become clear in the correlation between the female Penal Code offenses and the basic factors is that the promoting factors and the deterring ones that were functioning independently during the period from around 1950 to around 1955 ceased to be of any significance to the occurrence

of the offense after 1965, and that the multiple correlation coefficients were found declining after 1960.

The time lag effect was recognized declining of both groups of factors, Factor 1, Factor 2 and Factor 7, that had the function of deterrent, and Factor 3, Factor 5 and Factor 6, that had the function of expeditor. In any way the effect of each of the basic factors on the occurrence of the offense, it was found, was gradually weakening with the progress of time.

To recapitulate these findings in the context of those obtained in the First Interim Report, the First Report examined the correlation between the given crime indicators and the basic socio-economic factors for the whole period under survey. In the present report it has been possible to carry out the more concrete observations of this correlation in the light of the historical and social process characterized by the change of time during the period of survey.

What has become clear in this report is that the manner whereby the basic factors are related with the occurrence of respective crimes varies with the times and that the variation is observed occurring around 1960 in almost all of these correlations; and that the factors of more economic nature were having less and less of the function of deterrent in the case of Factor 1 and that of expeditor in the case of Factor 2 and Factor 5, and that the factor of more cultural nature like Factor 7 representing the socio-pathological phenomena was observed showing more and more of the function of expeditor, particularly in relation to the occurrence of juvenile and female offenders under the Penal Code, and that in some of the correlations between the basic factors and the crime indicators time lag phenomena were observed existing; and that there is expected to be a degree of unbalance in the geographical distribution of the difference scores to be produced from comparison between the observed crime rate and the estimated one.

In other words, the fact that the correlation between the basic socio-economic factors and the occurrence of crimes is not a constant one, but varies with the change of social structure which is taking place from time to time might be interpreted to demonstrate that the formulation of an equation to predict a more precise rate of crime, which is the ultimate goal to be attained by our study, presupposes a very detailed examination of the basic factors for each period of survey and at the same time requires a more careful consideration of which data on each of the basic factors at what year of the survey period should be adopted.

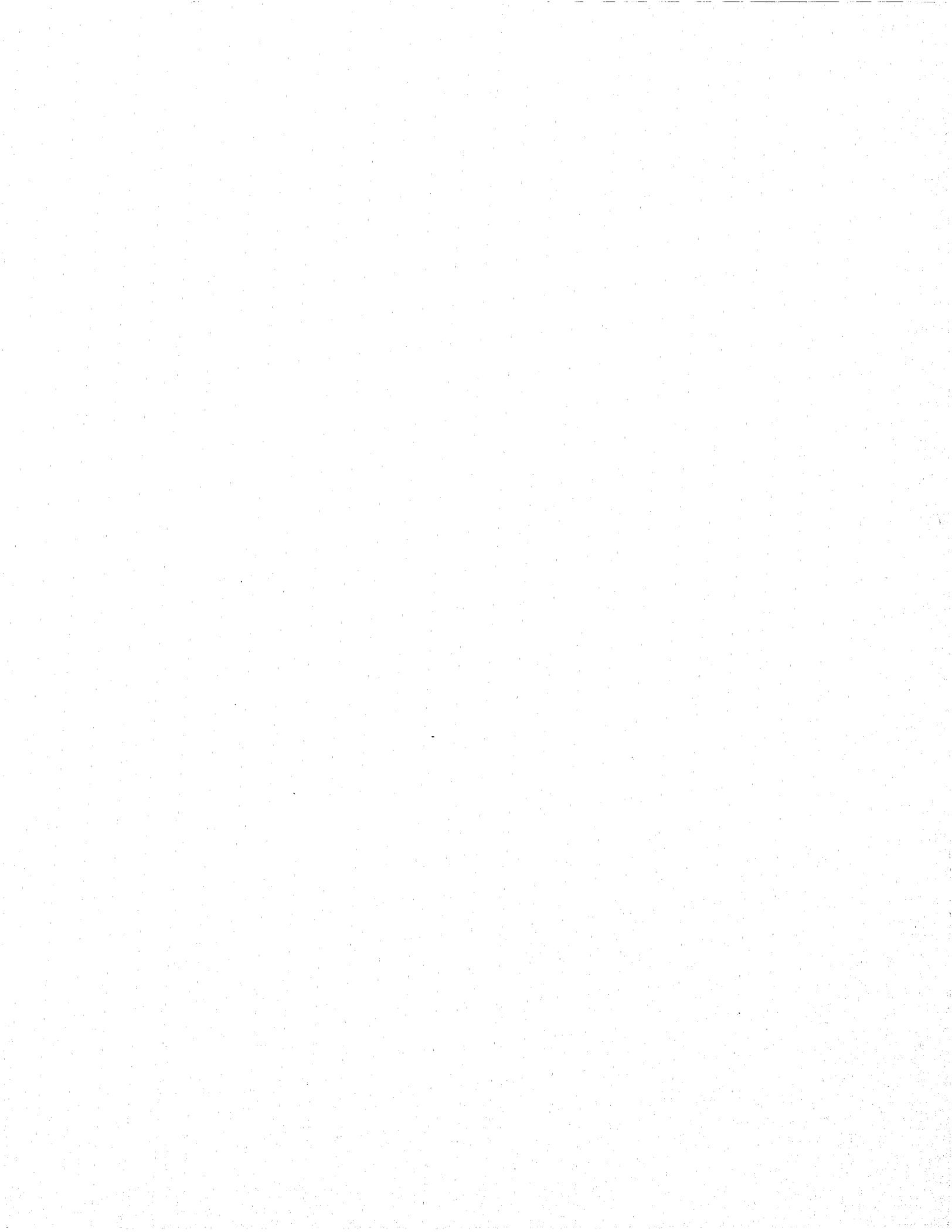
#### IV. Future Prospect

After all these foregoing studies, what is now left for a further efforts will be as follows:

1. A more careful consideration on the question of selection and manufacturing of the social indicators.
2. Reconsideration by crime of the Penal Code offenses committed by juveniles and females as against the earlier study of them carried out comprehensively as a whole.
3. A more detailed and concrete study of each crime on the basis of the modus operandi and the motivation of the crime.
4. Socially and culturally a more intensive approach to the examination of the geographically unbalanced distribution of the difference scores obtained from comparison between the observed crime rate and the estimated one.

With regard to the correlation between crime indicators and the basic socio-economic factors, the earlier study revealed that some crimes are more affected by factors with more of economic nature as in the cases of professional or gross negligence causing death or injury and larceny and some by those with more of social and cultural nature as in the cases of crimes of bodily injury, homicide and rape. The present study, having conducted a time-series analysis in this connection, has succeeded in showing that such relationship varies with the change of times. In other words, the present study, in observing that each of various crimes is one of the many social phenomena emerging from time to time in the ever changing circumstances of the complex economic and social structure and the cultural and human relationship, has at last found a clue to the law which the emergence of crime as a social phenomenon is suspected to follow.

In this sense, there is a very fair prospect that the whole body of our study which includes all the results of the earlier efforts will make an important contribution to the eventual establishment of the law of crime occurrence and to the more efficient criminal policy which should be based on it, through exchange of its findings gathered from its original approach, i.e. from the formulation of an equation for predicting a more precise crime rate by each category of crimes, by each prefecture and for each year of the survey, with those of such other kinds of approaches of human sciences as psychological and cultural anthropological approaches.



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