My Work

[*This is a purely descriptive account of my research work and its contextual relevance. It does not say much on the substantive content of the work, nor does it present the exact references to the related publications as usually done in research papers. Interested readers may however easily find these references in my CV that appears at the end of this memoir*.]

When I joined the IIMC in 1965 I had no clear idea about what kind of research I would pursue. I was quite happy teaching a couple of courses and spending a lot of time in the library looking up old issues of journals in statistics. While giving a lecture on nonparametric methods for testing randomness in a sequence of observations, it occurred to me that the total (ascending or descending) run length has not been considered. [In the sequence 72341 the set 234 is an ascending run of length 3]. Out of curiosity I derived some recurrences that lead to the relevant distribution. Soon, the work turned into a research paper and I promptly sent it to *Biometrika.* To my surprise and delight the paper was accepted but its length was drastically reduced, with the removal of parts deemed irrelevant. This experience however was valuable because it taught me the steps involved in getting a paper published: from the submission stage to the proof reading of the final copy. In between there are of course editorial suggestions for revision to be taken care of, and so on. Despite the enthusiasm that this paper generated, I soon found out after some further effort that non-parametrics was not my cup of tea.

At that time, that is 1965 and 1966 I was interested in the size distribution of income of households in India on which there are hardly any data with full coverage of the income scale. Instead we have only the distribution of the tiny section of income tax payers by size; and apart from it distributions of consumer expenditure for the entire population over time and space in India. (Thereby hangs a tale. The designers of large scale surveys at that time including possibly Professor. PCMahalanobis, who initiated the National Sample Surveys in India, thought that incomes of rural households were difficult to estimate because they are derived from multiple sources. Consequently, expenditure surveys continued forever.) In my readings at that time I stumbled on a paper by CRRao on what he called a damage model characterising the Poisson distribution. I realised that the concept of damage could be used in many contexts. For example, it is well known that incomes at the upper end are underreported to evade taxes. We can thus write $Y=RX$ where Y and X are reported and actual incomes respectively, and R is the underreported ratio. With assumptions about the distribution of this ratio it is then possible to find out for which

type of distribution ededed Y *and* X are identical (as in the Poisson case in Rao's damage model). This idea of extending the concept of damage enabled me to characterise several discrete and continuous distributions. The very first of these was on Pareto distribution (in a framework of underreported incomes). The resulting paper was published in *Econometrica, 1970*. This was thrilling because it was a very prestigious journal. I published a few of these papers in *Sankhya and The Annals of Mathematical Statistics.* During this period, 1965 to 1972, I began my research collaboration with my IIM colleague Manish Bhattacharjee, mainly on heavy-tailed distributions (such as the Pareto). This collaboration continued until Manish's unexpected death a few years ago, although we worked in different places most of the time. We published a couple of papers but had piles of unpublished stuff.

After moving to the Centre for Development Studies (CDS) in early 1973 I continued my research on probability distributions, but was getting increasingly drawn into empirical work on the Indian economy, which all my colleagues were engaged in. I was no stranger to this type of work, having done some work at the IIM on agricultural wages and prices (published in the EPW). So it didn't take me much time and effort to join them and participate in empirical work on the Indian economy that was the hallmark of the CDS in those days.