
Introduction

This volume is a collection of papers, drawn together to honour the memory of Camilo Dagum and his outstanding contributions to the study of personal income distribution and inequality measures. It is part of the book series “Economic Studies in Inequality, Social Exclusion and Well-Being” edited by Jacques Silber. One of Professor Dagum’s significant contributions to this area is his 1977 paper, reprinted here, which introduces a new model for income distribution. This new model is widely used in empirical work and is also known as the Dagum model. To honour this contribution the focus of the book is on modeling income distributions and Lorenz curves.

The volume is organized in three parts. Part One is a collection of five influential papers that have had a significant impact on this area. Part Two contains four survey papers on Lorenz functions, and generalizations and extensions of some income distributions, while in Part Three there are eight papers on current research and development written by well-known scholars who have worked extensively in the area.

Part One begins with the 1977 paper by Dagum (1977) on a new model for the size distribution of incomes that satisfies a set of important assumptions. In this paper Dagum established empirical foundations in the form of properties for a probability function to describe the size distribution of income. Given the established properties he proposed a model to represent the distribution of income. This model later became known as the Dagum distribution and is now widely used in empirical studies as one of the models that well represents income distributions.

The second chapter in Part One is a reprint of the paper on the model for income distribution proposed by Singh and Maddala (1976). The model is a three parameter income distribution derived from a generalization of the Pareto and the Weibull distributions and is based on the concept of failure rate. This model is also used widely in empirical studies as an income distribution model that fits the data from various countries very well.

Chapter 3 is a reprint of the paper by McDonald (1984) on using two generalized beta distributions as a model for the size distribution of incomes. These two generalized beta distributions are four parameter distributions and they were shown to include the beta of the first kind, the beta of the second kind, the Singh-Maddala, the lognormal, gamma, Weibull, Fisk and exponential distributions as special cases.

The fourth chapter is on the Lorenz curve. It is a reprint of the paper by Kakwani and Podder (1976) on a new coordinate system and the efficient estimation of the Lorenz curve using grouped data. The new coordinate system is an innovative representation of the Lorenz curve which proves to fit the data very well.

The final paper in Part One is a reprint of Paap and van Dijk (1998). They study the distributions of real GDP per capita for a combined 120 countries over the period 1960 to 1989. These distributions appear to be bimodal. In this paper a mixture of Weibull and truncated normal densities is used to model the bimodal distributions.

Part Two of the volume starts with Chapter 6, a survey paper written by Christain Kleiber entitled “A Guide to the Dagum Distributions”. This paper introduces the Dagum distributions and their interrelations with other statistical distributions. It provides the basic statistical properties and inferential aspects of the Dagum distributions and a survey of their applications in economics.

Chapter 7 written by Barry Arnold provides a survey paper on the classical Pareto model and a hierarchy of generalized Pareto models. The properties of these models are introduced and the related distributions and inferential issues are discussed. The paper concludes by introducing the multivariate Pareto distribution.

Chapter 8 is another survey paper, this time written by James B. McDonald on the use of the generalized beta distribution for income distributions. It derives some inequality measures, the Gini, Pietra and Theil indices, as functions of the distributional parameters. It explores the use of numerical methods to calculate inequality measures for the case of the generalized beta distribution.

Jose M. Sarabia contributes Chapter 9 on “Parametric Lorenz Curves: Models and Applications”. This chapter includes the basic properties for a function to represent a Lorenz curve and the Lorenz specifications corresponding to different classical income distributions. A general method for obtaining a hierarchical family of Lorenz curves is introduced. Sarabia also derives the Lorenz ordering conditions for a large number of well-known income distributions and also introduces the concept of the multivariate Lorenz curve which is an extension of the Lorenz curve to higher dimensions.

Part Three starts with Chapter 10 written by Hang K. Ryu on “Maximum Entropy Estimation of Income Distribution from Bonferroni Indices”. This paper proposes using the Bonferroni Index (BI) to measure inequality in the distribution of income. The BI is defined using the ratio of the area between the Lorenz curve and the horizontal axis to the area between the 45 degree line and the horizontal axis. Based on this definition, more weight is given to the lower income groups and less weight to the upper income groups. The paper proceeds to compare the performance of the BI and the Gini coefficient by comparing the underlying distributions derived from them using the maximum entropy method with the empirical distributions from the income deciles of 113 countries.

Chapter 11 is written by William J. Reed on “A New Four- and Five-Parameter Models for Income Distributions”. This paper introduces two new models to represent income distributions. They are the normal-Laplace distribution (NL) with four parameters and the generalized normal-Laplace distribution (GLN) with five parameters. The properties and the maximum likelihood estimation method for these

two models are discussed. These two functional forms are fitted to nine empirical income distributions and the performances are compared to the four and five generalized beta distributions. It was found that both NL and GLN outperform the generalized beta.

Gianni Betti, Antonella D'Agustino, and Achille Lemmi provide Chapter 12 on "Fuzzy Monetary Poverty Measures under a Dagum Income Distributive Hypothesis". This paper derives the *Integrated Fuzzy Relative* poverty measure under the assumption that income follows the Dagum distribution. The authors apply their approach to Italian data obtained from the EU-SILC survey conducted in 2004.

Chapter 13 by Frank A. Cowell and Maria-Pia Victoria-Feser is on "Modelling Lorenz Curves: Robust and Semi-Parametric Issues". This paper considers the semi-parametric Lorenz curve and the estimation problem associated with contaminated data that normally occurs in the upper tail of the distribution. The semi-parametric Lorenz curve considers fitting a parametric distribution to the data on incomes above a certain level and the incomes below that level are treated non-parametrically using the empirical distribution function. The paper uses a Pareto distribution for the parametric distribution fitted to the upper tail. This approach is demonstrated and applied to UK household disposable incomes for 1981 with 7470 observations.

Chapter 14 by J. M. Henle, N. J. Horton and S. J. Jakus is on "Modelling Inequality with a Single Parameter". In this paper a new single parameter model is proposed for the Lorenz curve. This new functional form is tested using decile share data on income for 89 countries from the Luxembourg Income Study. This new specification for the Lorenz curve can also be used to represent a dynamic model for income growth.

Chapter 15 on "Lorenz Curves and Generalised Entropy Inequality Measures" is written by Nicholas Rohde. The paper establishes the general relationship between the Theil T inequality measure and the Lorenz curve. Analytical expressions for the Theil index are also derived from three parametric Lorenz curves. The empirical validity of the relationship between the Theil index and the Lorenz curve is examined using a simulation experiment.

Chapter 16 is the penultimate chapter by Duangkamon Chotikapanich and Bill Griffiths on "Estimating Income Distributions Using a Mixture of Gamma Densities". A Bayesian inference procedure to estimate a gamma mixture with two and three components is introduced. The predictive density and distribution function of income are described. The flexibility of the mixture is illustrated using a sample of Canadian income data. The paper obtains the posterior density for the Lorenz curve ordinates and the Gini coefficient.

The last chapter, Chapter 17, is written by Quentin Wodon and Shlomo Yitzhaki on "Inequality in Multidimensional Indicators of Well-Being: Methodology and Application to the Human Development Index". This paper introduces the Human Development Index which, in general, is a weighted average of three well-being indices involving life expectancy, educational attainment, and per capita GDP. The weighting schemes used are arbitrary and normally depend on the purpose of the analysis. The paper investigates the extent to which the Human Development Index is sensitive to a change in the weights.

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