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Massimo Baldini, University of Modena, Italy.

Christian Toft, University of Kassel, Germany, and Visiting Fellow, UNU-WIDER, Helsinki, Finland.

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Poverty and Equity. Measurement and Analysis

Jean-Yves Duclos, Abdelkrim Araar and Carl Fortin

Massimo Baldini *
Christian Toft **

Jean-Yves Duclos, Abdelkrim Araar, *Poverty and Equity: Measurement, Policy, and Estimation with DAD*, Springer Publishing Company, 2006.

Jean-Yves Duclos, Abdelkrim Araar and Carl Fortin: "DAD: a software for Distributive Analysis / Analyse Distributive", MIMAP programme, International Development Research Centre, Government of Canada, and CIRPÉE, Université Laval.

Distributional concerns and analyses have become a central part of public policy research. Having for a period been relegated out in the cold – to use a metaphor of Tony Atkinson (1997) – it has now during the recent decade become common for distributional issues to play a central role in economic analyses and policy discourses, both in the global context and in Western Europe and North America. From having been an issue that was mainly featuring in the attacks of globalization, internationalization, and World Bank critics, distributional and related equity issues have in the new millennium gained mainstream priority in most global and international organizations. Under the guidance of scholars such as François Bourguignon equity concerns have reached a core position in World Bank research activity and development policy strategy thinking (World Bank, 2006). Development economists and economic historians have taken to re-examining the growth-inequality-poverty nexus leading to a general recognition that there need not be a tradeoff between growth (efficiency) and poverty reduction (equity) and that, in fact, a properly designed equity policy may be conducive to economic growth and expansion (Thorbecke, 2007). Regarding its member countries, the OECD have implemented a major program of analysis of income

*. University of Modena, Italy.
**. University of Kassel, Germany, and Visiting Fellow, UNU-WIDER, Helsinki, Finland.

distribution and poverty, aiming in the first instance to gain a better grasp of the main correlations and interdependencies (see e.g. Förster and d'Ercole, 2005), and in the European Union the debate about what an EU social dimension might imply has been enriched and given a more solid foundation as a result of the social indicators project which developed a set of union wide indicators to map and monitor poverty and social exclusion/inclusion in Europe (Atkinson *et al.*, 2002).

Specialists around the world have responded to the new challenges and interests in the topic by developing new methodologies, insights, and international networks – 2005 saw the launching of the "Society for the Study of Economic Inequality" and the "International Microsimulation Association" with related, specialist journals. But with the broadening of the general interest and the debate, a new need and demand for the broadening of access to the tools and results of distributional analyses has also emerged, both for interested policy makers and scholars from adjoining disciplines and specialisms as well as for the wider groups of university students that now attend courses on the topic.

There is a need for the dissemination to a larger audience of the fact that inequality analysis implies more than just calculating the Gini coefficient for different income concepts and that poverty analysis implies more than just counting the number of people falling below a poverty threshold, and to transmit to this audience when the use of alternative measures is appropriate and indeed what these are meant to say and imply. With innovations in computer technology and the greater availability of relevant data sources, there is a further and equally important need to reach beyond passive learning approaches, emphasizing the acknowledgement and interpretation of results, and to develop approaches that facilitate and enhance the capabilities of those interested to do their own computations and analyses, without imposing unrealistic demands on computer programming skills and the ability to derive complex mathematical formulae. Macroeconomists, public finance specialists, and the wider congregation of welfare state scholars need a basis for making informed scientific choices and for performing their own computations within the context of their own models and research interests without necessarily having to master all the ramifications of the highly complex and mathematically demanding field constituting the more advanced branches of modern distributional analysis.

Jean-Yves Duclos and his collaborators' DAD project at the University of Laval in Quebec, Canada, represents to our mind a most innovative and far reaching attempt at such a democratization of distributional analysis. Taking advantage of the bilingualism in that part of the world, DAD is an abbreviation of "Distributive analysis/Analyse distributive". The project consists of developing and maintaining a software program that is available free of charge and that is designed to facilitate the analysis and the comparison of social welfare, inequality, poverty, and equity using household level (micro) data. It was initiated in 1998 following a request

by the Canadian International Development Research Centre (IDRC) to support research then carried out in Africa and had as a central objective the empowerment of researchers in the world's poorest nations to carry out their own analyses rather than relying on a top-down acceptance of results produced by outside scholars.

Since its inception the program has gone through several versions and improvements and experienced a steady increase in the number of registered users. There are currently 2577 registrations located in most parts of the world. The user manual from 2000 was translated into French by Nicolas Beaulieu but is now outdated. With the completion of the most recent DAD version in January 2006 a related book was also published. The published version of the book costs more than 100€ but is also freely available on the website of the IDRC in Ottawa under "IDRC Books free online" and a link to it exists from the DAD website but is rather poorly signposted. Not everyone would hit upon the idea that a click on "see also IDRC link" would lead to free access to the entire book.

The book and the DAD software constitute a fully integrated package. Every method to analyse poverty, inequality, and the other equity issues that are described in the text can be directly applied in the software and the book provides continuous references to the commands that need to be used in DAD when readers wish to apply the different indices that are described in practice. But the book has also value in its own right for scholars not necessarily wanting to use DAD and on the project website there is also a help page with a useful manual intended for those not wanting to look through the book for guidance when trying to come to grips with the software. We begin our discussion with an overview of the book before we turn to the software and the package as a whole.

The book consists of six parts including a part describing the DAD software and its applications and another part containing a large number of exercises that can be done in DAD as well as a description of six data sets that are available on the DAD website. On the project website further exercises and data sets are available. The first four parts of the book provide a broad overview of the field which is substantially wider in scope than the standard English language textbooks such as Frank Cowell's (1995) book on inequality measurements and Peter Lambert's (2001) Lorenz and Gini based book on the distribution and redistribution of income. Each chapter has a reference section containing a brief annotated listing of relevant references but there are few references in the actual text.

Part I of the book discusses conceptual foundations and contains two chapters dealing with concepts and measurements of well being, the pros and cons of traditional welfarist and alternative non-welfarist approaches, the advantages and disadvantages of using income or consumption as the focus of analysis, and the estimation of equivalence scales. The remainder of the book and indeed the DAD software remains largely within the realms of the standard welfarist approach but it is helpful to be given the wider picture from the outset.

Part II is the longest section of the book comprising seven chapters explaining the different approaches to the measurement of inequality, poverty, and the progressivity of taxes and transfers. The part begins with an introductory chapter (the book's chapter three) which, among other things, explains the meaning of poverty gaps and the difference between making cardinal and ordinal poverty and equity comparisons. The rest of this section of the book investigates cardinal issues with ordinal comparisons being the subject matter of part III. The book's chapter four provides an overview of the different approaches to the measurement of inequality and social welfare which in addition to the standard measures include S-Gini indices and also a useful section describing the main features of the Shapley value approach, which has been increasingly used in recent work in the area. Chapters five and six cover the measurement of poverty, decomposability, the relationships between poverty and inequality, and the estimation of absolute, relative, and subjective poverty lines. Chapters seven and eight are concerned with the analysis of vertical and horizontal equity as well as the measurement of tax and transfer progressivity which are subject matters that Jean-Yves Duclos in other work have helped shape our understanding of. The third part of the book contains three chapters discussing distributive dominance (chapter nine), poverty dominance (chapter ten), and welfare and inequality dominance (chapter eleven). The latter chapter concludes with a brief section on pro-poor growth which is then taken up for further treatment in two chapters in the fourth part of the book on policy and growth. As already indicated part five of the book introduces the DAD software but also contains two chapters on statistical inference and how this issue is treated in practice and in DAD.

As is apparent from this summary, this book covers a lot of ground and, to our knowledge, certainly constitutes the most comprehensive overview of the field that currently exists. This breadth of coverage reflects the expansion of the DAD program. The third version from 2003 made substantial steps forward in the use of more sophisticated statistical methods, in particular the opportunity of performing hypothesis tests and calculating bootstrap standard errors, and the current 2006 version has substantially expanded the scope further and contains many new analytical techniques that were not available in past versions, including measures of the degree of the polarisation of the income distribution, indicators of the sensitivity of poverty to price changes, and relative deprivation curves.

We now have a mature DAD at our disposal covering most of the areas that a scholar might need to master. Even though, thanks to the programming efforts of many scholars but not least of Stephen Jenkins from the University of Essex, computation of a number of the relevant indices has in the meantime been made easier to do in the popular Stata software program (Jenkins 2006), no other software rivals DAD as a package for distributive analyses. The adjoining table provides an overview of the scope and the richness of applications that are now included.

Table : *Overview of the menu and applications in DAD*

Main Menu	No. of Applications	Examples of applications
Inequality	13	Atkinson, Gini, Entropy indices; quantiles and share ratios; coefficient of variation; variance of logarithms; relative mean deviation; effects of proportional growth in income components
Polarization	2	Wolfson index; Duclos, Esteban and Ray index
Poverty	14	FGT, Sen, Watts indices; impact of price changes, tax reform, economic growth, and demographic changes; inequality-neutral targeting; FGT elasticity
Welfare	6	Atkinson, Gini, and Atkinson-Gini indices; impact of price changes, tax reform, and income-component changes on welfare
Decomposition	12	FGT by groups and sources; S-Gini by groups and sources; squared coefficient of variation; Entropy by groups
Redistribution	8	Impact of taxes and transfers; horizontal inequity index; indices of redistribution; coefficient of concentration
Dominance	3	Poverty, inequality, and indirect tax dominance
Curves	12	Lorenz and generalized Lorenz; concentration and generalized concentration; quantiles; poverty gaps; relative deprivation
Distribution	12	Descriptive statistics; confidence intervals; density and distribution functions; plot scatters of microdata; non-parametric regression

One of the most fascinating features of DAD is that it can be used at very different levels of sophistication and difficulty. It requires few additional skills beyond what is needed to master Excel. Pop-up application windows and spreadsheets are the main working tools and small data sets can easily be entered manually. From a teaching point of view, DAD has the advantage that it can be used in at least two very different ways: as an easy accessible and free software to accompany introductory and intermediate courses in distributional analysis, but it can also be used by more ambitious students as an advanced tool to obtain a solid knowledge of many of the most recent developments in the field. Having said this, it needs to be stressed that neither the book nor the software program are suitable for absolute beginners and novices.

Possibly because of the wide scope it has set out to cover, the book's explanations of the different approaches and indices are kept short and the level of mathematical attainment that is needed to understand it is somewhat higher and certainly more overwhelming than in Cowell and Lambert, which in our experience already reach beyond what most students are capable of dealing with. It is arguably most suitable for the partially informed – e. g. a scholar specializing in a sub-field of the area – wishing to gain an overview of the field as a whole, or as a handbook which one can consult on specific issues. In any case readers wishing to gain an understanding of the issues that are covered would quickly need to move on and dig into some of the articles that are listed in the references sections at the end of each chapter, a number of which are also available for downloading on the DAD website. Perhaps some pedagogical guidance relating to which articles are of a more introductory nature could be included in a future edition of the book. Scholars and students wishing to use DAD might be advised to begin with the website manual and to use the book more as a handbook for deeper consultation.

A certain level of prior knowledge reaching beyond familiarity with the conventional poverty and inequality indices is required of users of the software. A user would need to know that the conventional headcount poverty index can be obtained by computing the FGT index with $\alpha = 0$. A command called "headcount ratio" or something similar is not included. Similarly, the conventional Gini coefficient is computed under the "Gini/S-Gini" application by selecting $\rho = 2$. Running the program also requires some prior experience or instruction. DAD's strength lies in data computation but it has less strength in data manipulation. While, for example, the generation of dummy variables is simple, other useful operations on a dataset such as creating new variables containing classes of existing variables (e.g. age groups) is more difficult. A richer set of options for the editing of variables could very usefully be included in future versions of DAD. As it stands, the best option is to set up a relatively rich dataset before starting DAD, and then to use DAD for the analysis. What is more, the treatment of missing observations continues to pose problems, even though improvements have been made in the new version.

A single missing observation prevents the calculation of many indices, while it might still be interesting to compute these on the non-missing observations. There are ways of circumventing the problem by using a dummy variable but it requires some inventive ingenuity to hit upon this. Finally, with increasing maturity DAD's graphs have become clearer and simpler and the graph editing options have greatly improved. But it is still not easy to transfer their coordinates to other software. Most users are accustomed to the option of being able to copy and paste numbers or graphs by simple clicks on the mouse and an introduction of this facility in future DADs would be a most welcome addition.

At a time when the productivity of scholars tends to be measured in units of articles published in refereed journals, Jean-Yves Duclos and his Laval team can hardly be praised highly enough for having invested considerable time and effort to produce a package that is of great service to the wider scholarly community and beyond. Many issues became a lot clearer to us from reading the book and with the new, mature DAD version being available to everyone a new world of distributional analysis reaching beyond conventional Gini and poverty head count analyses has been opened for students and scholars in the social sciences as well as public policy makers with university level training in these sciences. A project such as DAD is of course a never ending story and we are already looking forward to the next version which is likely to expand on issues such as multidimensional poverty comparisons and the analysis of the poverty impact of economic growth and economic policy, both of which are under fast development in the specialist literature and widely discussed in policy circles.

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