Introduction

It is a difficult task to write an introduction to a collection of essays which come from separate areas of economics. The essays cover a rather broad range of topics. Essay 1 is a methodological contribution to the analysis of densities and distributions. Essays 2 and 3 apply state-of-the-art parametric statistical techniques to analyze the world income distribution from both cross-country and individual perspectives. Essay 4 concerns the welfare effects of recently negotiated trade agreements between the European Union and African countries. Finally, Essay 5 addresses some interesting correlations between the non-income dimensions of human development and democracy. Due to the breadth of the topics, this is not an introduction in the classical sense, introducing the field of research treated by the essays, but rather more of an overview. Below, the main results of each essay are highlighted, followed by an explanation of how the essay contributes to its field of research.

Essay 1: A Likelihood Ratio Test for Bimodality in Two-Component Mixtures

This essay proposes a parametric test for bimodality based on the likelihood principle by using two-component mixtures. (Bimodality means that the density function of a distribution has two modes.) The hypothesis that the density function only has one mode is tested against the alternative that it has two modes. The test uses explicit characterizations of the modal structure of such mixtures in terms of their parameters. The asymptotic distribution of the proposed test is analyzed. Analyzing the modality of the distribution of a random sample is an important problem, particularly for proper graphical visualization of the data. In particular, it is important to decide whether modes present in a certain fit are merely sampling artifacts or whether they are actual features of the underlying density. (We will see in the second essay, however, that it might be misleading to rely upon the number of modes alone when analyzing a distribution.)

The essay is foremost a methodological contribution to the literature which already comprises two major tests for the number of modes, the test by Silverman (1981) and the dip test by Hartigan and Hartigan (1985). Both tests are nonparametric and therefore applicable to more flexible settings than the likelihood ratio test (LRT). The finite sample performance of the LRT is investigated in a simulation study and compared to Silverman’s test and the dip test. The simulation confirms that the LRT is keeping its level and has a greater power than either Silverman’s test or the dip test if the principle distributional assumptions are fulfilled. The nonparametric tests also work well for cases where the distributional assumptions of the LRT are violated. Hence, this essay provides a new statistical tool which is more powerful for certain types of applications.
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than existing techniques. An additional highlight of the LRT compared to the nonparametric tests is that the LRT is also applicable to mixtures of multivariate normal distributions and the von Mises distribution (the so-called circular data), cases for which no tests for bimodality have to date been available.

The final section of the essay is an empirical application with real data. The modal structure of the cross-sectional distribution of per capita log GDP across EU regions from 1977 to 1993 is investigated using mixtures. While these mixtures clearly involve two components over the whole time period, the resulting distributions evolve from bimodality toward unimodality at the end of the seventies. This example proves how useful the LRT is in some settings because Silverman’s test is not able to identify the transition from bimodality to unimodality in this case due to its lack of power in such settings.

Essay 2: Twin Peaks or Three Components?
What is it that makes some countries so much more prosperous on average than others? This and related questions are at the heart of the second essay. The topic of this essay is the world’s cross-country distribution of GDP per capita and its evolution from 1970 to 2003. It contributes to a large body of empirical growth literature which tests for absolute and conditional convergence among the countries of the world (Barro 1991 and Quah 1996a, among others), but also to a more theoretical branch of the growth literature which predicts multiple equilibria in the world’s cross-country income distribution (Quah 1996b and Galor 1996, among others). Quah describes these equilibria as emerging Twin Peaks, while Galor (1996) introduces the concept of multiple steady-state equilibria without any restriction on the number of steady states. Bianchi (1997) was the first to formally test for the number of modes in the world’s cross-country distribution of income using the method by Silverman (1981). He confirmed the predictions of Quah (1996).

Paap and Dijk (1998) model the cross-country distribution of income as parametric mixture; however, they obtain the number and type of mixture components merely by visual inspection and not by statistical inference.

This essay challenges the Twin Peaks claim. It can easily be shown that the number of modes is not invariant of the scale; this means that the number of modes might change when switching to the logarithmic scale from a regular scale. Such a property is extremely undesirable for this type of economic analysis. Since the scale of GDP per capita does not alter the economic characteristics of a country, it should therefore not be responsible for the assignment of a country to one convergence club or the other. Though the number of modes is of interest in a different context, one can argue that the concept of Twin Peaks is misleading and does not help to identify convergence clubs.

Thus, the essay proposes to model the cross-country income distribution as a mixture of normal distributions. The number of components is determined by recently published modified likelihood-ratio tests by Chen et al. (2001, 2004) and Chen and Kalbfleisch (2005), as well as model-selection criteria. The parameters of the normal components are fitted from the data. One advantage of this approach is that the components in the mixture have a clear interpretation as income groups or convergence clubs and, in contrast to modes of the density, their number does not depend upon the scale of the data. It turns out that the cross-country distribution of GDP per
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capita consists of two components from 1970 to 1975. In 1976 a third component emerges and becomes progressively more pronounced with increasing statistical significance until 2003. The model allows a so-called posterior probability to be assigned to each country. The posterior probability describes the probability of a country belonging to a certain component (interpreted as convergence club) in a given year. This concept takes into account the fact that it does not make much sense to assign countries to income groups based on their GDP per capita, alone, but rather to show the different possibilities of group affiliations since GDP per capita alone does not provide enough information about the future growth path of a country. Looking at the development of each component’s mean income over time leads to some interesting observations. The mean income of the poorest component had a growth rate of 0 from 1976 to 2003, whereas the middle component had an average annual growth rate of 1.2 percent, and the richest component had an average annual growth rate of 2.2 percent during the same period. This implies that the three components were diverging both in absolute and in relative terms.

A drawback to this approach is that the \( \sigma \) parameters of the normal distributions in the mixture must be equal because there are no tests for unequal \( \sigma \) parameters available to date (at least not for two of three components). Another justification for this restriction is the fact that the fit of the richest component would be extremely narrow if one allowed for unequal \( \sigma \) parameters. The fit would be so narrow around a group of high-income European countries that the richest countries (in particular the United States) would be excluded by this component and instead captured by the longer tail of the middle component. Hence, the restriction of equal \( \sigma \) parameters forces the richest component to include the richest countries, which makes much more sense for economic interpretation. Nevertheless, one has to admit that the assumption of equal \( \sigma \) parameters is a restriction of the model.

Essay 3: Income Distribution Dynamics and Pro-Poor Growth

The second essay shows divergence of three components in the cross-country income distribution. About one third of the world’s countries are caught in a poverty trap without any economic growth. Nevertheless, official statistics from the World Bank show a rapid decline of poverty during the given period. How are these disparate facts reconcilable? The cross-country analysis also shows that particular populous countries grew quickly enough to catch up to richer countries; in fact, China, India, and Indonesia belong to the group of the largest gainers, as measured by differences in their posterior probabilities. While the cross-country perspective is useful to analyze growth, convergence, and income polarization, it fails to address size and income inequality within countries. Thus, a different perspective on world income distribution is necessary to further explore questions of welfare, inequality, and poverty.

From an individual perspective, world income distribution is an appealing topic for current research. A better understanding of the participatory nature of growth is clearly relevant for the world community when it comes to meeting the Millennium Development Goals of halving global poverty and hunger by 2015. There is an ongoing debate in the literature about how global growth, inequality, and poverty should be measured. National accounts or survey data? Micro or macro data? Measure poverty based upon income or upon consumption? These and other questions are discussed by Ravallion (2003), Deaton (2005), and Milanovic (2006), among others. Two main concepts are applied to obtain estimates of world income distribution: The first
approach, labeled Concept 2 by Milanovic (2006), combines national accounts income data with household survey inequality data to derive a global income distribution. The second approach, labeled Concept 3 by Milanovic, 2006, is purely based upon income and inequality data from household surveys.

Milanovic (2002) and Sala-i-Martin (2006) are the most important contributions to literature which actually estimates world income distribution. Milanovic (2002) estimates it based upon household survey data, alone, whereas Sala-i-Martin (2006) combines GDP data from the Penn World Tables with inequality data from the World Institute of Development Economics Research (WIDER) data set. Clearly, Milanovic's approach is the most adequate for analyzing world income distribution for recent years, but it is less useful for analyzing the dynamics of the past 40 years; only for recent years is there a sufficient amount of survey data available and it is also only recently that major efforts have been made to make household surveys more comparable over space and time. Thus, although the approach of Milanovic is, in principle, superior to other approaches, it cannot answer all questions of interest about world income distribution.

This essay takes a similar approach to Sala-i-Martin (2006); GDP data from the Penn World Tables are combined with improved Gini data based on the WIDER data set. Sala-i-Martin (2006) uses quintile and decile data to obtain estimates for national income distributions based on non-parametric techniques. One could argue that the data at hand are not sufficient to fully exploit these techniques; in fact, Sala-i-Martin (2006) claims to be more precise and sophisticated than is justified by the data. This essay thus exploits the information in the data by a simpler methodology—national income distributions are modeled parametrically as log-normally distributed. Although this is a no-progress approach from a methodological point of view, one can nevertheless argue that it is as good as Sala-i-Martin's approach, and, moreover, it is useful for answering questions regarding growth incidence and inequality decomposition which have not yet been treated by Sala-i-Martin (2006) or Milanovic (2002).

The results show that the past 34 years have witnessed a strong global income convergence accompanied by a drastic decline in global income inequality and poverty. Noticeably, overall inequality declined because of diminishing inequality between countries, while economic inequality within countries increased. Furthermore, the analysis of growth-incidence curves shows that the bottom-middle part of the income distribution experienced above average percentile growth rates, which growth explains the existing global income convergence. In particular, the late 1970s and early 1980s are characterized by high global rates of pro-poor growth, initiating the rapid decline of global poverty rates.

A regional decomposition of the data reveals that, in particular, the extraordinary growth record of East Asia and South Asia, which includes the two population heavyweights China and India, accounts primarily for the global income convergence and rapidly declining poverty rates. Latin America, the Middle East and North Africa showed slower but steady progress in poverty reduction. However, their more modest growth experience implies a relative income deterioration vis-a-vis the richer regions and also East and South Asia, and thus, can be seen as a remaining divergent factor in the global income distribution. Lastly, Sub-Saharan Africa has remained virtually stagnant and has become the poorest region in relative and absolute terms, implying a steady divergence and disconnection from the global growth process. Given the large share of extremely poor people and high poverty headcounts in Sub-Saharan Africa, it is clear from
the analysis that any further large gains in extreme poverty reduction can be only achieved by pro-poor, or at least distributionally neutral, growth in Sub-Saharan Africa.

**Essay 4: EU-ACP Economic Partnership Agreements**

The European Union (EU) and African, Caribbean, and Pacific (ACP) countries have a rather long common history. Due to these special historic relationships, the EU granted more-or-less duty and quota-free access for exports from ACP countries to EU markets. Other developing countries did not receive the same treatment. However, WTO rules only allow different treatment for different types of countries, i.e., it is possible to give preferential access to all developing countries while discriminating against high-income countries. In contrast, it is not possible to give preferential access to some developing countries while discriminating against other developing countries. Thus, the special treatment for ACP countries was not compatible with fundamental WTO principles. However, acknowledging the special relationship between the EU and ACP countries, the EU benefited from a WTO waiver until 2007.

Trade agreements on a reciprocal basis created the possibility of sustaining preferential market access to the EU for ACP countries. Hence, the EU started negotiations focused upon so-called Economic Partnership Agreements (EPAs) with six ACP regions which were self-defined by the ACP countries in 2003. These regions include the Caribbean (CARIFORUM), Central Africa (CEMAC), South-East Africa (ESA), West Africa (ECOWAS), Southern Africa (SADC), and the Pacific.

At the core of the EPAs are regional trade agreements between the EU and each of the six regions of ACP countries. However, the EPAs are also intended to support ACP regional integration, to foster their integration into world markets, and to improve coherence between trade and development. While the previous trade preferences for ACP countries were determined unilaterally by the EU, the current EPAs are jointly designed in negotiations between the EU and the ACP countries. ACP countries are requested to open their markets to EU products to some extent in return for their access to EU markets. However, it is possible that developing countries will open their markets to a much smaller extent than the EU does (in case of the EPAs, an average 80-percent increase in accessibility within 15 years).

Critics claim that EPAs are harmful for ACP countries mainly because the reciprocal market access for EU exports to ACP countries dramatically reduces tariff revenues in ACP countries. Moreover, local industries suffer from stiff competition with companies from the EU. One could argue against such critiques that there is no reasonable alternative to EPAs because the consequence of not having a trade agreement would be the loss of preferential access to EU markets (which would be severe). Nevertheless, the points mentioned by these critiques could be perhaps justified as the price ACP countries have to pay for sustained access to EU markets. Therefore, it is important to estimate the welfare effects of tariff reductions for products from the EU in ACP countries (e.g., the price ACP countries have to pay for sustained access to EU markets). This is done in the fourth essay using as examples nine African countries: Botswana, Cameroon, Côte d’Ivoire, Ghana, Kenya, Mozambique, Namibia, Tanzania, and Uganda.

Studies by Karingi et al. (2005), Milner et al. (2006), Busse and Großmann (2007), and Fontagné et al. (2008) take a similar approach. The main limitations of these previous studies are that elasticities of import demand were chosen rather arbitrarily and, in some cases, that only rather
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general scenarios of tariff reduction are simulated. This essay overcomes these limitations. First, the elasticities of import demand for the nine African countries are estimated from highly disaggregated trade data. Second, the real negotiated tariff reduction rates are applied to access the trade agreement’s real welfare effects on the African countries. The results show that Côte d’Ivoire, Ghana, Kenya, Tanzania, and Uganda experience small welfare losses, while Botswana, Cameroon, Mozambique, and Namibia experience remarkable welfare gains. A simulation comparing the EPA tariff reductions to the theoretical scenario of a full liberalization show that Tanzania and Uganda could also have experienced welfare gains. This indicates that different priorities were in place when excluding certain products from liberalization. Although consumption and trade-creation effects compensate or even overcompensate in most cases for the decline in tariff revenues and appropriate transition periods are in place, the question of revenues remains of importance for the national budget of the African countries (since all of them highly depend upon tariff revenues and because trade with the EU was previously an important source of such revenue). A possible solution to this problem of revenue losses would be for the EU to provide budget support to the most affected countries, to help improve tax administration, and to ensure reliable tax collection. The essay also provides policy conclusions for a number of other questions.

Essay 5: Political Institutions and Human Development

Sen (1983), among others, revolutionized the way economists look at development. Thanks to him, development today is a rather broad concept, whereas economic development oftentimes used to be only a synonym for economic growth. Development, as a whole, depends upon each individual’s capabilities, which define the freedoms to choose a valuable life in accordance with individual preferences. This approach inspired the emergence of the pluralist and integrative conception of "human development" and operationalization in the form of the United Nations Development Programme (UNDP) Human Development Index. It is not only income but also health, education, and other factors that enable people to shape their lives in accordance with their desires.

It is the purpose of this fifth essay to answer the question as to which political system is the best for obtaining a high level of human development for the population. Singapore’s former president, Lee Kuan Yew, claimed that authoritarian rule is more efficient than democratic governments and therefore beneficial to economic development (and as a consequence, also for human development). There are in fact many examples that could help to prove him right: His own country, Singapore, is today a high income country with life expectancy at birth of 79 years and a literacy rate of 97 percent. Also, the relatively poor Cuba managed to achieve a very high life expectancy rate at birth of 77 years and a literacy rate of 93 percent. The democracy Niger, in contrast, is not only much poorer (the average GDP per capita is eight times higher in Cuba and 32 times higher in Singapore) but also the life expectancy rate is very low at 44 years and only 18 percent of the population is literate. A similar picture holds true for India with a life expectancy rate at birth of 63 years and a literacy rate of 60 percent.

These examples and also controversies in the theoretical literature show that it is not self-evident that democratic governments are superior to autocratic leaders in terms of economic and human development outcomes. The literature points to a possible trade-off between growth-enhancing
property rights protection and redistribution. On the one hand, property rights protection is a necessary condition for an increase in the overall wealth of a nation (Acemoglu et al. 2001, 2002), but whether all can benefit depends on redistribution, as well. Moreover, corporatism may lead to lock-in effects and decreasing reform capacity in democracies. The causal direction is not clear: Is democracy a cause or a consequence of the development process? Finally, there is a debate as to which conditions are necessary for democracy to have a positive effect on human development.

Empirical studies with a focus on democracy and economic growth do not provide a coherent answer. Barro (1996), Tavares and Wacziarg (2001), and Minier (1998) find a moderately negative or nonlinear correlation between democracy and growth. In contrast, Persson and Tabellini (2006) and Rodrik and Wacziarg (2005) find a positive, or at least the absence of a negative, correlation between democracy and economic growth. There is also uncertainty about the correlation with democracy for the non-income dimensions of human development. Very few empirical studies focusing on the non-income dimensions of human development and democracy are available. Besley and Kudamatsu (2006) and Tsai (2006) find a positive correlation between democracy and human development, while Ross (2006) finds the opposite. All studies have certain limitations which might explain why they do not have a coherent theme. They are either confined to a sub-sample of developing countries, are focused upon only one dimension of human development, or are restricted to a cross-section which disregards the time dimension of the data. None of the previous empirical studies investigate possible conditions that might have an impact on democracy’s performance measured in human development outcomes.

This essay analyzes the relationship between democracy and the non-income dimensions of human development. It extends the existing literature in several ways. The essay develops a theoretical argument as to why democracy should lead to better non-income human development outcomes than authoritarian rule. Capital redistribution is less important for obtaining high levels of GDP per capita in a democracy; for instance, a society with a small group of extremely rich and many poor people could have the same GDP per capita as a society where everybody is moderately rich. However, this is not true for life expectancy or literacy. The life expectancy of a society where a small group reaches age 100 and everyone else dies at age 20 will be very close to 20 years. This is even more obvious for the literacy rate, being a direct measurement of the percentage of the public that reads. Thus, the theoretical reasoning of the essay rests upon the redistributive effects of democracy, based upon qualitative arguments by Sen (1999), among others, and a quantitative argument based on the median voter theory. The empirical section is a panel analysis that covers all countries of the world (subject to data availability) and a time span of 30 years. Moreover, interaction effects are included, as well, to determine whether the performance of democracy is affected by certain circumstances.

The empirical investigation shows a strong and robust correlation between democracy and human development, measured by life expectancy and literacy, and controlling for the level of economic development and other important variables. The model is constructed in such a way, that the correlation can be cautiously interpreted as causal. Interestingly, the interaction between democracy and its presumed conditions of functioning turned out to be insignificant or not robust.